# Appendix IV

# **Biological Data Sheets**

Waterbo	dy	Locati	on	Station	n ID		Date	Bioclassificatio	on
FRENCH BR	ROAD R	SR 11	29	EB1	0	0	8/16/07	Excellen	t
County	Subbasin	8 digit HUC	Latitude Longitude AU Number			Level IV Ecoregion			
Transylvania	1	06010105	350855	824759	6	6-(1)	Southern C	Crystalline Ridges and Mou	untains
Stream Classifica	ation	Drainage Area (mi <sup>2</sup>	) Elev	ation (ft)	Stre	am Width	ı (m)	Stream Depth (m)	
B; Tr	B; Tr 102			2200		26		0.2	
	F	orested/Wetland	Urban		Agricul	ture		Other (describe)	
Visible Landuse	Visible Landuse (%) 50				0			50 (fallow)	
Upstream NPI	DES Dischar	gers (>1MGD or <1N	IGD and withir	n 1 mile)	NF	PDES Nui	nber	Volume (MGD)	
Babcock Cor	npany LLC, E	xcelsior Packaging P	lant / Rosman V	WWTP	NC	0000108	/ NC0021946	0.015 / 0.25	
Water Quality Parameters Site Photograph									
Temperature (°C)		25.2				A REAL			
Dissolved Oxygen (mg	g/L)		1		10 10				
Specific Conductance	(µS/cm)	21		an.	1.20		利用語言の	AFRICE	
pH (s.u.)		7.7	the second		1.25%	199	E-IN I		开放
Water Clarity		clear	a the			and the	191		
Habitat Assessment	Scores (max	)	and the second second					and the second s	Carlo Carlo
Channel Modification	(5)	5						a series of the	
Instream Habitat (20)		16					1075	- Toppe	1
Bottom Substrate (15)	)	8				dist-		The States	
Pool Variety (10)		6		a to	10 Sec. 1		and a		
Riffle Habitat (16)		10			and a		And And And		
Left Bank Stability (7)		5							121
Right Bank Stability (7	7)	5	1000		2	AL	10 22	and the second	
Light Penetration (10)		6	16		and the		A SE	3° - 1 h	252
Left Riparian Score (5	i)	3				Table .	and the		
Right Riparian Score (	(5)	2							
			0						

Total Habitat Score (100)	66	Substr	ate	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 ephemerellid 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 lumbriculid 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.

Waterbody			Locat	ion	Station	ID		Date	Bioclassification
FRENCH BR	OAD	R	<b>NC</b> 1	146	EB8	9	08/15/07		Good
County	Subba	asin	8 digit HUC	Latitude	Longitude	AU N	lumber	L	evel IV Ecoregion
BUNCOMBE	2		06010105	352853	823328	6-(	54.5)b	southern cry	staline ridges and mountains
		_				_			
Stream Classificat	tion	D	rainage Area (mi	2) Elev	vation (ft)	Strea	am Width	i (m)	Stream Depth (m)
В			658.4		2043	50			0.5
		For	ested/Wetland	Urbar	,	Agricult	ure		Other (describe)
Visible Landuse (	(%)	1.01	50	0		0			50 (I-26 corridor)
	. /								
Upstream NPDES Dischargers (>1MGD or					n 1 mile)		DES Nu		Volume (MGD)
	Ashev		am Electric Power	r Plant		-	NC00003		4.8
			S Ecusta, Inc.		NC0000078 27.5				
			evard WWTP			NC0060534         2.5           NC0025534         4.8			
		TIEI							4.0
Vater Quality Parame	eters						Site Pho	otograph	
Femperature (°C)			26.1	T.	ALC: NO	4		1. 1. 1. A.	A Part of the second
Dissolved Oxygen (mg	/L)		8.3			रर		A AL	MALE.
Specific Conductance	(µS/cm)		42	1 8 3	-	1			
oH (s.u.)			7.5		ALL P	States of the local division of the local di	anwa T	1 4 4	
	Г			Contraction ( 1987)	Service States	Land - Street			a name
Vater Clarity			turbid	£ 35	The All States		B B	A State of the sta	
labitat Assessment S	- Scores (	max)		100	and per al		四月月		
Channel Modification (			5		and the second			and the second second	and the local state of
nstream Habitat (20)	5)		16	and the second		Har Ball			A DESCRIPTION OF TAXABLE PARTY.
Bottom Substrate (15)			10				the second	S. S. Sand	
Pool Variety (10)			12	a second	Service and	No. of Concession, Name	See Chi	and the second second	
Riffle Habitat (16)			7					and and a	Sec. Sal
eft Bank Stability (7)			7						
Right Bank Stability (7)	,		7					Rosald Balling	
ight Penetration (10)	1		2				1		
eft Riparian Score (5).			5		1000	-			1 American Contraction
Right Riparian Score (5)			5		and the second second	The second second		1 1 1	
Fotal Habitat Score (1	,		76	Substr	ate Mixtu	ire of grav	vel. cobbl	e, and boulder	
-			L CT		ÿ		·	Discloseifiertier	
<b>Sample Date</b> 08/15/07			Sample ID 10321	<b>ST</b> 63	<b>EPT</b> 27		<b>BI</b> 4.8	EPT BI 3.7	Bioclassification Good
06/15/07			10321	03	27		T.0	3.7	

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.

Waterbo	dy	Locat	ion	Station I	D	Date	Bioclassification
FRENCH BR	ROAD R	SR 1:	348	EB90	08	8/16/07	Good-Fair
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Lev	el IV Ecoregion
BUNCOMBE	2	06010105	353632	823441	6-(54.5)c		Broad Basins
Stream Classifica	ation	Drainage Area (mi	2) Elev	vation (ft)	Stream Width	(m)	Stream Depth (m)
B		943		1960	50		0.4
		545		1000			U.T
	For		Urban	1 <i>1</i>	Agriculture	0	ther (describe)
Visible Landuse	(%)	50	50		0		0
Upstream NP	DES Dischar	gers (>1MGD or <1M	MGD and within	n 1 mile)	NPDES Nur	nber	Volume (MGD)
Asheville Steam Elect				NC00003	96	4.8	
RFS Ecustra, Inc.					NC00000	78	27.5
Brevard WWTP					NC00605	34	2.5
Hendersonville WWT	Ρ				NC00255	34	4.8
Water Quality Param	eters				Site Pho	otograph	
Temperature (°C)		26					
Dissolved Oxygen (mg	a/L)	7.7					
Specific Conductance		62		Sec.			
pH (s.u.)	([	7.3					
,				100			+
Water Clarity		slightly turbid				-	And a
Habitat Assessment	Scores (max	<)	198		and del		
Channel Modification	(5)	5	and the second	and the second second			and a
Instream Habitat (20)		16					- Street and a street
Bottom Substrate (15)	)	10		Contract of the second		the second second	
Pool Variety (10)		10					
Riffle Habitat (16)		10					San Barris
Left Bank Stability (7)		7					
Right Bank Stability (7	7)	7	100	and the			and the second s
Light Penetration (10)		2		the second second			
Left Riparian Score (5	5)	4			and a second		
Right Riparian Score	(5)	3		-			
Total Habitat Score (	Total Habitat Score (100)     74     Substrate						nd 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	0/02 8867 73 30		30	4.76	3.98	Good	
07/09/97		7323	72	32	5.03	4.02	Good-Fair

## **Taxonomic Analysis**

07/23/92

08/03/87

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, Triaenodes ignitus, Ancyronyx variegatus, Macronychus glabratus, Argia, Calopteryx, Macromia, Polypedilum flavum, Rheotanytarsus, Simulium and Crangonyx.

32

23

73

70

5.24

5.26

4.30

4.02

Good-Fair

Good-Fair

5934

4190

## 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.

Waterbo	dy		Locatio	'n	Station	ID	Date	Bioclassification
FRENCH BR	ROAD F	२	SR 16	34	EB9	2 (	8/14/07	Good-Fair
County	Subbas	sin 8 c	digit HUC	Latitude	Longitude	AU Number	L	evel IV Ecoregion
BUNCOMBE	2	2 06010105		354230	823719	6-(54.d)d	Southern Cry	vstaline Ridges and Mountains
Stream Classifica	ation	Draina	ge Area (mi2)	Elev	ation (ft)	Stream Wid	:h (m)	Stream Depth (m)
В			1049.3		1786	50		0.4
Forested/Wetland			Wetland	Urban		Agriculture		Other (describe)
Visible Landuse	Visible Landuse (%)		0	0		0		30 (Residential)
Upstream NPDES Dischargers			MGD or <1M	GD and withir	n 1 mile)	NPDES N	umber	Volume (MGD)
•			d River WRF		,	NC0024	911	40
	e Steam El	lectric Power F	Plant		NC0000	396	4.8	
		RFS Ecu	usta, Inc.		NC0000078		078	27.5
			WWTP			NC0060	534	2.5
		Henderso	on WWTP			NC0025	534	4.8
Water Quality Param	eters					Site Pl	otograph	
Temperature (°C)			27.1					
Dissolved Oxygen (mg			7.4	-				
Specific Conductance	e (µS/cm)		84	and the second				-
pH (s.u.)			7.5	100				All and
Water Clarity		Tur	rbid	and the second	Contra and	-		and the second
				1			C. C	A CALLER AND
Habitat Assessment	Scores (m	nax)						
Channel Modification	(5)		5	100	- Carton			
Instream Habitat (20)			16	and the second second		A LE		
Bottom Substrate (15)	)		13	Statistics in			and the second	
Pool Variety (10)			10		and the second second			A MARK AND A MARKED A
Riffle Habitat (16)		14	the second	19.5			and the second sec	
Left Bank Stability (7)		7			and the second			
Right Bank Stability (7	Right Bank Stability (7) 7							
Light Penetration (10)		2		Cillion -		and Parker		
Left Riparian Score (5	5)		3	1-1-1-	Renta			

Substrate

2

79

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**

Right Riparian Score (5)

**Total Habitat Score (100)** 

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 recieving a higher rating in the future.

Waterbo	Waterbody			ion		Sta	tion	ID	Date			Bioclassification	
French Br	oad F	2	NC 2	213		EE	319	4	07	7/31/07	7	Good-Fair	
County	Subb	asin	8 digit HUC	Lat	itude	Longit	ude	AUN	lumber		Level IV Ecoregion		
Madison	4		06010105	35	4710	82393	39	6-(	54.5)f		Broad Basins		
Stream Classifica	ation	Dr	ainage Area (mi	2)	Elev	ation (ft)		Strea	am Width	(m)		Stream Depth (m)	
В			1,330		1	l,697			75			0.6	
	Forested/V				Urban			Agricult	ure		Ot	her (describe)	
Visible Landuse	(%)		40		60			0				0	
Upstream NPI	s (>1MGD or <1M	/IGD ar	nd within	1 mile)		NP	DES Nur	nber		Volume (MGD)			
·		Ŭ	None			,							
Water Quality Param	eters								Site Pho	tograph			
Temperature (°C)			34.3		and the	State Bar			ale o		and the		
Dissolved Oxygen (mg	a/L)		5.7		No. 14	and a state of	and the second	and a	No. State	1 Table		2000	
Specific Conductance			60.9			-		The second second		and the second second	hat?		
pH (s.u.)	u ,		6.7		No. Car	11 T	RA	A STATE		The second	1		
Water Clarity		Sli	ightly Turbid				-		Ser ?	1.			
Habitat Assessment	Scores	(max)									-	and the second sec	
Channel Modification	(5)		4							-time	-		
Instream Habitat (20)			15								1000	A CONTRACTOR	
Bottom Substrate (15)	)		12								4th	A A A	
Pool Variety (10)			4							- An	10	a second and the	
Riffle Habitat (16)			10						-		-	and the set	
Left Bank Stability (7)			6				100			topa -			
Right Bank Stability (7	7)		5					1					
Light Penetration (10)			4					State of				- 200	
Left Riparian Score (5			1								-	- Shinks	
Right Riparian Score (	. ,		1			. –							
Total Habitat Score (100)       62       Substrate       Sand, rubble, gravel, bedrock, and boulder.							er.						

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 spinae*, *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)

Waterbo	dy	Locatio	on	Station ID Da			Date	Bioclassification
W FK FRENCH	BROAD F	R US 6	4	EB4	15	0	8/28/07	GOOD
County	Subbasin	8 digit HUC	Latitude Longitude		AUN	AU Number		evel IV Ecoregion
Transylvania	1	06010105	350815	825105 6-2-(7.5) Southe			stalline Ridges and Mountains	
Stream Classifica	ation	Drainage Area (mi <sup>2</sup> )	) Elev	ation (ft)	Strea	am Width	. (m)	Stream Depth (m)
B; Tr, HQW		27		2300		12		0.3
	prested/Wetland	Urban		Agricult	ure		Other (describe)	
Visible Landuse	(%)	50	50		0			0
Upstream NPI	jers (>1MGD or <1M	GD and withir	n 1 mile)	NP	DES Nui	nber	Volume (MGD)	
		None						
Water Quality Parameters Site Photograph								
Temperature (°C)		20.5			and the			
Dissolved Oxygen (mg	g/L)	8.6	Sec. 1				ALC: NO	
Specific Conductance	(µS/cm)	19	家门的!			CLARK C	Section 2	
pH (s.u.)		6.5	1000	A Shares			<b>新生动的</b> 外	and the second
Water Clarity		clear					St. and	
Habitat Assessment	Scores (max)			ni			Min Protocolo	The second of the second of the second
Channel Modification	(5)	5			-			and the second se
Instream Habitat (20)		14			and and	Contraction of the local sector	The second second	A CONTRACTOR OF THE OWNER OWNER OF THE OWNER
Bottom Substrate (15)	1	12				- 100	1 2 2 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -	A CONTRACTOR OF THE OWNER OF THE
Pool Variety (10)		8		and the second second second	and the store		The Party of Street, or other	and the second se
Riffle Habitat (16)		16				C. La	and the second	A DECEMBER OF STREET, STRE
Left Bank Stability (7)		7	1. A. A.		and the second		- Andrews and the second	
Right Bank Stability (7	")	7	The second		100			A STATE OF STATE
Light Penetration (10)		7						
Left Riparian Score (5	)	2			and the second second	and the second		
Right Riparian Score (	(5)	3						

Total Habitat Score (100)	81	Substra	ate	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		

Substrato

04

#### **Taxonomic Analysis**

A dramatic drop in EPT richness occurred since 2002 driven mostly by the occurance 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). Sensitve 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.

Waterbo	Waterbody			on	n Station ID			Date			Bioclassification
N FK FRENCH	I BROA	DR	SR 13	22	E	EB28	3	0	8/17/07	7	EXCELLENT
County	Subba	asin	8 digit HUC	Latitude	e Longi	itude	AU N	lumber		Level IV Ecoregion	
Transylvania	1		06010105	350916	-		6-3	-(6.5)	Southe	Southern Crystalline Ridges and Mour	
Stream Classific	ation	D	rainage Area (mi <sup>2</sup> )		Elevation (ft	)	Strea	m Width	n (m)		Stream Depth (m)
B; Tr			35		2250			10			0.2
	Forested/V			Ur	ban		Agricult	ure		Otl	ner (describe)
Visible Landuse	€ (%)		20		20		60				0
Upstream NP	PDES Disc	s (>1MGD or <1M	GD and w	thin 1 mile)		NP	DES Nu	mber		Volume (MGD)	
		J.	None								
Water Quality Paran	neters							Site Pho	otograph		
Temperature (°C)			21.3				in the			Ser.	- Andrews
Dissolved Oxygen (m	na/L)			1000	STATE OF	No.	Sec.				A State in
Specific Conductance			20	5.50			100	19	The second		
pH (s.u.)	o (p.o, o)		6.5	155					a Are		ELECTRON -
Water Clarity	[		clear			in de la com					
Habitat Assessment	t Scores (	max)		-			1			ALC: NO	
Channel Modification	(5)		5				SEA	-		- Par	
Instream Habitat (20)			13	12.84	A Martin and	-				A second	
Bottom Substrate (15	5)		9		and the second	Will gen				10	State of the state
Pool Variety (10)			6				State P				Statistics of the second
Riffle Habitat (16)			14			and the second	the second	- Car		2	and the second s
Left Bank Stability (7)	)		6		and the second			100	0	-	
Right Bank Stability (	7)		2		et		-		and a		State of the state
Light Penetration (10)	)		7		15 - 14	College 2		-	No. Com		
Left Riparian Score (5	5)		4	20	-	-		11-12	24.3		and the second
Right Riparian Score	(5)		3								
Total Habitat Score (100)         69         Substrate         cobble, boulder, and sand											

	00			0.	essie, sealaer, a	
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., Acroneuria 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 ephemerellid mayflies, (Danella lita, Drunella lata, 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.

Waterbo	dy		Locati	on		Sta	ation I	ID		Date		Bioclassification
M FK FRENCH	BRO	AD R	SR 11	31		E	B21		08	8/16/07	7	EXCELLENT
County	Subb	asin	8 digit HUC	Lati	itude	Longi	tude	AUN	lumber		Leve	el IV Ecoregion
Transylvania	1		06010105	350	0716	8249			6-5	Southe		Illine Ridges and Mountains
Stream Classifica	ation	D	orainage Area (mi <sup>2</sup> )	)	Eleva	ation (ft)	)	Strea	am Width	(m)		Stream Depth (m)
B; Tr			4.9		2	2240			4			0.1
		For	ested/Wetland		Urban			Agricul	ture		Otl	ner (describe)
Visible Landuse	(%)		0		75			0				25
Upstream NP	DES Dis	charge	rs (>1MGD or <1M	GD an	nd within	1 mile)		NF	DES Nur	nber		Volume (MGD)
		J	None									
Water Quality Param	neters								Site Pho	tograph		
Temperature (°C)			22		-				See.	DR		
Dissolved Oxygen (mg	g/L)									A N		140
Specific Conductance	- /		26		1	100				53 X 12	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
pH (s.u.)			6.5		4		1	100	a los	Sere and		
Water Clarity			clear							in the second		
Habitat Assessment	Scores	(max)							1.1		1	
Channel Modification	(5)		5		1		HEE	37		-	1000	
Instream Habitat (20)			14			1.4		a come of		Sand .		
Bottom Substrate (15)	)		10					all	1		1	A STATISTICS AND A STATISTICS
Pool Variety (10)			6					1.1	and the second second	-		
Riffle Habitat (16)			16			ALC: NO		11 H	Constant of	Val		
Left Bank Stability (7)			5		133		2.6	100		Contraction of the second		
Right Bank Stability (7	7)		5					Sec. 2		1		A CONTRACTOR
Light Penetration (10)			10		201			- 10-	a mart	F-12 _276	1 aller	Station Street
Left Riparian Score (5	5)		1					in the	Tel Serie	32	S. Con	Bern May
Right Riparian Score	(5)		1	-								
Total Habitat Score (	(100)		73		Substra	ite			prima	arily cobbl	e, 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 occuring taxa of stoneflies collected were abundant. Some new taxa in 2007 were *Neoephemera purpurea*, *Malirekus hastatus*, *Ceratopsyche slossonae*, *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 potion 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.

Waterbo	ody		Locatio	n	Statio	on ID		Date		Bioclassification	
DAVIDS	ON R		US 27	<b>'</b> 6	EB	64	0	8/16/07	1	EXCELLENT	
County	Subbas	sin 8 digit	нис	Latitude	Longitud	e AU	Number		Level	IV Ecoregion	
Transylvania	3	06010	105	351628	824251		84-(15.5)	Southern		ne Ridges and Mountain	าร
Stream Classifica	ation	Drainage A	rea (mi²)	Elev	vation (ft)	Stre	eam Width	n (m)	s	tream Depth (m)	
WS-IV, B; Tr		40			2195		15			0.1	
	_	Forested/Wet	land	Urbar	1	Agricu	lture		Othe	r (describe)	
Visible Landuse	: (%)	70		0		0			(30) (	campground	
Upstream NP	DES Disch	nargers (>1MGI	) or <1MG	D and withi	n 1 mile)	N	PDES Nu	mber		Volume (MGD)	
		None									
Water Quality Param	neters	_					Site Pho	otograph			
Temperature (°C)			19.6	4.55	Server 1	Contraction of the second					
Dissolved Oxygen (mg	g/L)			1. A.			And and the second				
Specific Conductance	e (µS/cm)		22		Sec.		A STATISTICS	1.2			
pH (s.u.)			6.8	Last inter	N		p the set				
Water Clarity		clear			and the						
Habitat Assessment	Scores (m	nax)		-	7.		-		S. State		
Channel Modification	(5)		5			-					-
Instream Habitat (20)			16	100	-					States to Barry	
Bottom Substrate (15)	)		15	-							
Pool Variety (10)			6		and a substant			-			
Riffle Habitat (16)			16	1000	2 mil	55 T		-FEE		and and	
Left Bank Stability (7)			5		107 Da	-			and the second	and the state of the second second	
Right Bank Stability (7	7)		6	Con.	-		a.				
Light Penetration (10)	)		9		and the second s	-	al na	the second second	2.2	and and a strike Se	
Left Riparian Score (5	5)		3	Sec.		1	-	ALC OFFIC	the state	and the second	
Right Riparian Score	(5)		3								

		-				
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

cobble, boulder, and gravel

Substrate

84

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

EPT richness in Davidson River maintained it's 2002 level, although it has historically been higher. The reduction of ephemerellid 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 were abundant in 2007 and included 3 mayflies (*Epeorus vitreus*, *Heptagenia marginalis*, and *Maccaffertium pudicum*), 3 stoneflies (*Acroneuria abnormis*, *Paragnetina immmarginata*, 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 fishermman, although effects on the macroinvertebrate community are minimal. Davidson River has consistently maintained an Excellent rating and no water quality issues were identified.

Waterbo	dy	Locatio	'n	Station	ID	Date	Bioclassification
LITTLE	R	SR 15	60	EB1	8 0	8/16/07	EXCELLENT
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Lev	vel IV Ecoregion
Transylvania	1	06010105	350918	823744	6-38-(1)		talline Ridges and Mountains
Stream Classifica	ation	Drainage Area (mi <sup>2</sup> )	Elev	vation (ft)	Stream Width	n (m)	Stream Depth (m)
C; Tr		16		2200	5		0.2
	Fo	prested/Wetland	Urban		Agriculture	0	ther (describe)
Visible Landuse		40	20		0		10 (fallow field)
Upstream NPI	DES Discharg	ers (>1MGD or <1M0	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)
·		None					
Water Quality Param	eters				Site Pho	otograph	
Temperature (°C)		21.2			and the second		A State
Dissolved Oxygen (mg	g/L)					10 1	
Specific Conductance	e (μS/cm)	21				1922	and the second
pH (s.u.)		6.6			Ser Start	1. 19 Mar	
Water Clarity		clear			19 - Jacob	1	Constant of the
Habitat Assessment	Scores (max)					ALCON MAL	And States
Channel Modification	(5)	5	E .		N Sugar	and the second second	A DESCRIPTION OF
Instream Habitat (20)	. ,	14	188			N	
Bottom Substrate (15)	)	3					- Andrew Consider
Pool Variety (10)		7		1 19		1	The Second
Riffle Habitat (16)		4	S. 18				Course Days
Left Bank Stability (7)		3	- ALCON			and the family of	A STATISTICS AND A
Right Bank Stability (7	7)	3	Star 1	Contraction of the		A State State	
Light Penetration (10)		7	Contraction of the second	All I		Contractor	
Left Riparian Score (5	i)	3			- 35	the state of	and the second sec
Right Riparian Score (	(5)	4					

Total Habitat Score (100)	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. fuscula* (common), and *Triaenodes ignitus* (abundant). Stoneflies were also diverse with 9 taxa of which *Acroneuria 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 occured 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.

Waterbo	dy	Locatio	n	Station	ID	Date	Bioclassification
LITTLE	R	SR 153	33	EB16	6 0	8/16/07	GOOD-FAIR
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
TRANSYLVANIA	1	06010105	351518	823835	6-38-(20)		Broad Basins
Stream Classifica	ation I	Drainage Area (mi <sup>2</sup> )	Elev	ation (ft)	Stream Widtl	n (m)	Stream Depth (m)
С		44		2135	11		0.2
	Fo	rested/Wetland	Urban		Agriculture	Ċ	Other (describe)
Visible Landuse		0	30		50		20 (fallow field)
Upstream NPI	DES Discharge	ers (>1MGD or <1MG	GD and within	n 1 mile)	NPDES Nu	mber	Volume (MGD)
	-	est Foundation - cam			NC00510		0.008
Water Quality Param	eters				Site Ph	otograph	
Temperature (°C)		21.3				MES IS	
Dissolved Oxygen (mg	r/l )			A STATE FOR	Che K	100	CONTRACT AND
Specific Conductance		17	Statistics of the	A state			
pH (s.u.)	(µ0,011)	6.4		- M			
Water Clarity		slightly turbid	in a	1	12		
Habitat Assessment	Scores (max)		or the set	FLE	and the second second		
Channel Modification	(5)	5	and the second designed to		· Filebon		and the second
Instream Habitat (20)	<b>、</b>	12			H V Dale		AIT
Bottom Substrate (15)	1	3			in a	2-12	
Pool Variety (10)		8		-	1	100-00	The second
Riffle Habitat (16)		3	10000	the state	2101		
Left Bank Stability (7)		3		Service Service		Chiefe .	
Right Bank Stability (7	·)	3	and the second				A REAL PROVIDED
Light Penetration (10)		10			1.1.2		
Left Riparian Score (5	)	3		1	Una la se	- Server V	AND THE REAL

Total Habitat Score (100)	52	Substra	ate	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	

2

#### **Taxonomic Analysis**

Right Riparian Score (5)

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 Crystaline Ridges and Mountains ecoregion. The Little River has consistlenly 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.

			Location		Date	Station ID	Bio	oclassification
CRAB CR		:	SR 1532	0	6/13/07	EF20		Good
County Sub	basin a	8 digit HUC	Latitude	Longitud	6	AU Number	Lev	vel IV Ecoregion
	1	06010105	35.2344444	-82.6175		6-38-23		Broad Basins
		00010100	00.2011111	02.0170		0 00 20		
Stream Classification	Drainag	ge Area (mi2)	Elevatior	n (ft)	Stream Wic	ith (m)	Average Depth (I	m) Reference Site
C;Tr,HQW		7	2090		6		0.3	No
	Forest	ted/Wetland	Urb	an	Aa	riculture	Ot	her (describe)
Visible Landuse (%)		15	0			85		0
			•					
Ipstream NPDES Discharge	rs (>1MGE	O or <1MGD a	nd within 1 mile)			NPDES Nu	umber	Volume (MGD)
		None						
Vater Quality Parameters						Site	Photograph	
emperature (°C)		15.4					Lr.	
Dissolved Oxygen (mg/L)		8.8						A Part of the second second
pecific Conductance (µS/cm	)	27	5 mm					Carl Salar
H (s.u.)	,	5.5	and the second	AL Street	- Bitter		-	
11 (3.0.)		0.0		1	CR.L.		A CONTRACT OF	
Nater Clarity		Clear		and the	a series of	Store ar	A SHERE	
			and the second	Same a				
labitat Assessment Scores	(max)					Sale of	and the second	
Channel Modification (5)		5	and the second se			27		
nstream Habitat (20)		18						
ottom Substrate (15)		6					THE REAL PROPERTY.	
Pool Variety (10)		8		1. 180-200		Later 2	State of the second	
Riffle Habitat (16)		16		的原始	and the			
eft Bank Stability (7)		5			Carlos Carlos			
				CONTRACTOR OF A DESCRIPTION OF A DESCRIP		1 - 1		
				E T		No.		
Right Bank Stability (7)		4		E 81				
tight Bank Stability (7) ight Penetration (10)		4 7						
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5)		4 7 2		18 8 S				
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) tight Riparian Score (5)		4 7	Subs	trate Co	bble, gravel,	sand, and silt		
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) tight Riparian Score (5) <b>Total Habitat Score (100)</b>		4 7 2 2 73						
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) Right Riparian Score (5) <b>Total Habitat Score (100)</b> Sample Date		4 7 2 2 73 Sample		Species	s Total	N	CIBI	Bioclassification
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) tight Riparian Score (5) <b>iotal Habitat Score (100)</b> Sample Date 06/13/07		4 7 2 2 73 Sample 2007-75	 D	Species	s Total	N	56	Good
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) Right Riparian Score (5) <b>Total Habitat Score (100)</b> Sample Date		4 7 2 2 73 Sample	 D	Species	s Total	N		
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) ight Riparian Score (5) otal Habitat Score (100) Sample Date 06/13/07 06/03/02	 	4 7 2 2 73 Sample 2007-75 2002-62	 D	<b>Species</b> 21 20	s Total		56 50	Good Good ow Trout, Brown Trout,
tight Bank Stability (7) ight Penetration (10) eft Riparian Score (5) tight Riparian Score (5) <b>iotal Habitat Score (100)</b> Sample Date 06/13/07		4 7 2 2 73 Sample 2007-7 2002-62 Mottled Sculpir Gains -	and Central Stor	Species 21 20 heroller	Exotic Speci	Ne ies Roc and	56 50 syside Dace, Rainb I Redbreast Sunfish	Good Good ow Trout, Brown Trout,

~ 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.

Waterbo	dy	Locatio	on	Station	ID	Date	Bioclassification
BOYLSTO	ON CR	SR 13	14	EB15	i9 C	8/15/07	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 Classifica	ation	Drainage Area (mi <sup>2</sup> )	Elev	ation (ft)	Stream Widt	h (m)	Stream Depth (m)
С		16		2072	8		0.1
	F	prested/Wetland	Urban		Agriculture		Other (describe)
Visible Landuse	(%)	10	30		60		0
Upstream NP	DES Discharg	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES N	umber	Volume (MGD)
		None					
Water Quality Param	neters				Site Ph	otograph	
Temperature (°C)		22.4					
Dissolved Oxygen (me	g/L)				a start	0	
Specific Conductance	e (µS/cm)	43			a fille		
pH (s.u.)		7	12.5			1 1 ju	AND THE REAL PROPERTY.
Water Clarity		clear	New A	1			and the
Habitat Assessment	Scores (max)			Call The second	AT COM		
Channel Modification	(5)	5			T		
Instream Habitat (20)		16		A State of the sta	STREET AND IN CO.		- See Carde
Bottom Substrate (15)	)	6	1	Carlos -	-		
Pool Variety (10)		8		Section 21	Sec. 1		and the second s
Riffle Habitat (16)		12	and the second	the second second			
Left Bank Stability (7)		5		EN IN	The second second		
Right Bank Stability (7	7)	4			and the second		State of the second second
Light Penetration (10)		10	1 - A	and the second	Spectra	- 75	
Left Riparian Score (5	5)	1		All and a strength	T and -	1	
Right Riparian Score	(5)	2					

Total Habitat Score (100)	69	Substra	ate	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		

60

#### **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 Triaenodes 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.

Waterbo	ody	Locatio	n	Station I	D	Date	Bioclassification
MILLS	S R	SR 13	37	EB167	7 0	8/15/07	GOOD
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
Henderson	3	06010105	352355	823542	6-54-(1)b	Southern Cry	stalline Ridges and Mountains
Stream Classific	ation [	Drainage Area (mi <sup>2</sup> )	Elev	ation (ft)	Stream Width	ı (m)	Stream Depth (m)
WS-II; Tr, HQ	W	67		2130	23		0.2
	For	ested/Wetland	Urban		Agriculture		Other (describe)
Visible Landuse		50	50		0		0
Upstream NP	DES Discharge	rs (>1MGD or <1MG	D and withir	n 1 mile)	NPDES Nu	nber	Volume (MGD)
		None					
Water Quality Param	neters				Site Pho	otograph	
Temperature (°C)		21.5		Stranding.			A STORY
Dissolved Oxygen (m	ng/L)					10- 25 M	
Specific Conductance		18				- Constant of the	Carl Carlo Martin
pH (s.u.)		7.2	- 1.5°	* *		12.1.2	and the second
Water Clarity		clear	AT AT		1	America	
Habitat Assessment	t Scores (max)						A REAL PROPERTY AND A REAL
Channel Modification	(5)	5		-	and the second second		
Instream Habitat (20)		16		1	Charles and	1.1.1.1	
Bottom Substrate (15		13	-		2	Har -	and the second second second
Pool Variety (10)		6				A	the second second
Riffle Habitat (16)		14			Constant of the	Description of the local division of the loc	the second second second second
Left Bank Stability (7)	)	7		2	and the		
Right Bank Stability (	7)	6			and the second	the state of the	No. Same and the
Light Penetration (10)	)	9		Upphone in		A MER TON	And the second second
Left Riparian Score (5	5)	2				A CONTRACTOR	CANADA TO POP

Total Habitat Score (100)	82	Substra	ate	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		

4

#### **Taxonomic Analysis**

Right Riparian Score (5)

Fewer EPT taxa were collected in 2007 than in any other year. The decrease in EPT richness was small since 2002 (5 EPT) but dramatc 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, ephemerellid mayflies were almost completely absent, represented only by a single *Serratella serratoides* specimen. None of the 5 species of *Drunella* previously collected occured. Abundant intolerants that were found included *Neoephemera purpurea*, *Maccaffertium pudicum*, *Brachycentrus appalachia*, *Lepidostoma* sp. and *Neophylax oligius*. An increase of tolerant midge taxa occured concurrently with the drop in EPT and were represented by the abundant *Polypedilum 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 resposible 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.

Waterboo	ły	Locatio	on	Station	ID	Date	Bioclassification
MILLS	R	SR 13	53	EB16	30 8	8/15/07	GOOD
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
Henderson	3	06010105	352316	823246	6-54-(5)		Broad Basins
Stream Classificat	tion I	Drainage Area (mi <sup>2</sup> )	Elev	ation (ft)	Stream Width	(m)	Stream Depth (m)
WS-III		73		2066	11		0.3
	Fa	rested/Wetland	Urban		A ani a ultura		Other (deceribe)
Visible Landuse (		0	Orban 0		Agriculture 100	(	Other (describe)
			-				,
Upstream NPD	-	ers (>1MGD or <1MC	GD and withir	n 1 mile)	NPDES Nur		Volume (MGD)
	H	enderson WTP			NC00422	(1	0.18
Water Quality Parame	eters				Site Pho	tograph	
Temperature (°C)		24.9		Long and a			a the Alexandra
Dissolved Oxygen (mg	/L)			C. C. M. M.			
Specific Conductance	(µS/cm)	22	1.20	1.1.1 × 1			
pH (s.u.)		8.2	1. A. C.	Martin States	R. S. Martin		
Matar Clarity			8 Ja 19		TWEEL	1	
Water Clarity		clear	S. 27	Salar V	1 Jan 1	A BASK	ALL ALL
Habitat Assessment S	Scores (max)		N. Pres			The second	9-1-1-
Channel Modification (	5)	4	19-19-19-19-19-19-19-19-19-19-19-19-19-1	and the second	and the second sec		A A
Instream Habitat (20)	,	15				te ter de arrigides auto da la	A A A A A A A A A A A A A A A A A A A
Bottom Substrate (15)		11		THE REPAIR		and the second second	
Pool Variety (10)		6				1.1.1	
Riffle Habitat (16)		10					
Left Bank Stability (7)		6		States	Strates -		Service States
Right Bank Stability (7)	)	6	the second	A COMPANY	and the start	Care in	N. N. L. L. S.
Light Penetration (10)		7	and the second	7-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	2762510	the second	A CONTRACTOR OF THE OWNER OF THE
Left Riparian Score (5)		1		W. F.	Bar in		

Total Habitat Score (100)	67	Substra	ate	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**

Right Riparian Score (5)

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, *Neoephemera 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 bioclasification 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.

Waterbod	ły	Lo	ocation	Date	Station ID	Bi	oclassification
N FK MILI	LS R	SF	R 1341	06/13/07	EF69	E	Excellent
County	Subbasin	8 digit HUC	Latitude Long	gitude	AU Number	Le	vel IV Ecoregion
HENDERSON	3	06010105	35.393889 -82.6	24444	6-54-2-9	Southern Cry	stalline Ridges & Mountains
Stream Classificatio	on Drain	age Area (mi2)	Elevation (ft)	Stream W	/idth (m)	Average Depth (	m) Reference Site
WS-II;Tr, HQW		23.1	2185	14		0.4	Yes
	Fore	ested/Wetland	Urban	Α	griculture	Of	ther (describe)
Visible Landuse (%		35	15 (rural residential		(row crops)		0
Upstream NPDES Disc	hargers (>1M	GD or <1MGD and	within 1 mile)		NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Paramet	ors				Site	Photograph	
Temperature (°C)		17.4	Created	Repair		Notes and the second se	
Dissolved Oxygen (mg/L	_)	8.9	AP 1 STAN	Store 3	Star - Part		
Specific Conductance (µ		16			MARCE -		
pH (s.u.)		5.6				and the second	
		-				145	
Water Clarity		Clear	distance in the second				5 . St.
Habitat Assessment So	cores (max)		K A	14.74	1995	And	2700000
Channel Modification (5)	. ,	5	A THE A	Sec.		and the second second	State and
Instream Habitat (20)	)	19				- it-	
Bottom Substrate (15)		15	article		There a		A STATE OF
Pool Variety (10)		4		all the second	and the state	en me	
Riffle Habitat (16)		16	- salar in the	the state			
Left Bank Stability (7)		6	and the second second	1.1.1		a state	The second second
Right Bank Stability (7)		6			Carlos S. M.S.	3 Parts	
Light Penetration (10)		5	Store GAR SI				a state of the
Left Riparian Score (5)		3		EN PART	Star-		Aller and
Right Riparian Score (5)	)	2					
Total Habitat Score (10	00)	81	Substrate	Cobble and be	oulder		
Sample Date		Sample ID	Spe	ecies Total	NC	CIBI	Bioclassification
06/13/07		2007-77		21	6	60	Excellent
Most Abundant Spec	ies	Mottled Sculpin		Exotic Spe	cies	nbow Trout, Browr fish	Trout, and Redbreast
Species Change Since	Last Cycle	N/A					
Data Analysis	·····						
This is the first fish com	munity sample	collected at this site	e. Watershed a larg	e tributary to the	e Mills River and	ultimately the Frer	nch Broad River, drains

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.

Waterbo	ody			Location		Date		Station ID	E	Bioclass	ification
S FK MIL	LLS R	2	SR 1340 06/13/07 EF68					Go	od		
County	Sub	basin	8 digit HUC	Latitude	Long	itude		AU Number	L	evel IV	Ecoregion
HENDERSON		3	06010105	35.375555	-82.61	1		6-54-3-(17.5)			Ridges & Mountains
L											
Stream Classificat	tion	Draina	ige Area (mi2)	Elevatio	on (ft)	Stream	n Wid	th (m) A	verage Depth	n (m)	Reference Site
WS-II;Tr, HQW	/		39.6	2180	0		11		0.5		Yes
		Foro	sted/Wetland	Urb			۸ar	iculture		Other (de	ascriba)
Visible Landuse (	(%)	Fores	35	15 (rural r			-	pasture)	<u> </u>		
VISIBLE Landuse	(70)			10 (101011)	coldential		50 (	pastaley			
Upstream NPDES Dis	scharge	ers (>1MG	D or <1MGD ar	nd within 1 mile	e)			NPDES Num	ber	v	olume (MGD)
	Carr	np Highlar	nder (~1,000 ft. ι	ıpstream)				NC003325	1		0.0074
Water Quality Param	eters							Site Ph	otograph		
Temperature (°C)			16.1		March 1		1.1				
Dissolved Oxygen (mg	a/L)		9.3							and a	
Specific Conductance		)	13							See.	
pH (s.u.)	(µ0/011)	/	6.3					State and a	and the	-	
1 ()										A and	A ACTIVE
Water Clarity			Clear					A Contraction	Quer .	and the	
	L					24	a de la				a Marcala
Habitat Assessment	Scores	(max)		54		198.78		B. Store			A
Channel Modification (	(5)		5								
Instream Habitat (20)			19		-	4			- Cart		10 A 10 A 10 A
Bottom Substrate (15)	)		15			and the			1 201-2		The Maria
Pool Variety (10)			6		ta S	and the second					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Riffle Habitat (16)			16	-> 300	-			a mental second	and the		Chamber St.
Left Bank Stability (7)			6	Sec. 1			1	S 23 Ch	We want	- date	1
Right Bank Stability (7			6	in the					MINES	-	
Light Penetration (10)			8					To the second	Chill - 3	1	and the second
Left Riparian Score (5			3		151-		-07		Sten .	No.	Section Contraction
Right Riparian Score (			3		-4	Cabble	ار ما ام				
Total Habitat Score (	100)		87	Subs	strate	Cobble an	000	uer			
Sample Date	•		Sample I	D	Spe	cies Total		NCIE	81	Bi	oclassification
06/13/07			2007-76			19		56			Good
Most Abundant Spe	ecies		Mottled Sculpin	and Saffron Shi	ner	Exotic	Speci	es Brown	Trout and Re	dbreast	Sunfish
most Astinuant opt							50601	Diowi			
Species Change Sind	ce 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).

Waterbod	Waterbody Location				n ID		Date	Bioclassification	
MUD C	R	US 2	5	EB1	EB123 08/15/07		8/15/07	Fair	
County	Subbasin	8 digit HUC	Latitude	Longitude	ude AU Number		Le	evel IV Ecoregion	
HENDERSON	2	06010105	352315	823015	6-	55d		Broad Basins	
Stream Classificat	tion I	Drainage Area (mi2)	Elev	vation (ft)	Strea	am Width (m)		Stream Depth (m)	
С		110		2040		16		1	
	Fo	rested/Wetland	Urban	I	Agricult	ure	(	Other (describe)	
Visible Landuse (	(%)	50	50		0			0	
Upstream NPD	ES Discharge	ers (>1MGD or <1MC	GD and withir	n 1 mile)	NP	DES Nur	nber	Volume (MGD)	
Hendersonville WWTP	_	,		,	1	VC00255	34	6.0	
Mountain View WWTP					1	NC00741	10	0.005	
Water Quality Parame	eters					Site Pho	otograph		
Temperature (°C)		22.1			Sec.43	19 - 10		and the second second	
Dissolved Oxygen (mg	/L)	6.1	1		100 A			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Specific Conductance	(µS/cm)	97	26 1			Ser.			
pH (s.u.)		6.6	- 2	S all	14	A.	ton St.	$\lambda = \lambda + \lambda$	
Water Clarity		slightly turbid		16		2			
Habitat Assessment S	Scores (max)		1 m	SP 1					
Channel Modification (	5)	5		C. The C.		<b>新联</b> 之	- Constant - Constant		
Instream Habitat (20)		14	1.00			VI - 17		VIEW CARE	
Bottom Substrate (15)		3			in	-		A LE CHER A LEVEL AND A	
Pool Variety (10)		8		and the state		ALC: NO	- 10.0		
Riffle Habitat (16)		7		and the second	The star	180-20			
Left Bank Stability (7)		7	West -	1 m 2 m	Ser - 40				
Right Bank Stability (7)	)	6	100 - 10		The at	aller.	and the second s		
Light Penetration (10)		10	1	the state of a	Thursday.	2	The is a		
Left Riparian Score (5)		3	1	and the second	247		-	and the second s	
Right Riparian Score (5	5)	2	1	1.0	and the	and and	and the second second	a spin of the	
Total Habitat Score (1	100)	65	Substra	ate Alm	ost all sand	d with sm	all amounts of r	ubble 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.

Waterbod	ly	Locatio	n	Station	ו ID	Date	Bioclassification	
CLEAR	CR	SR 15 <sup>-</sup>	13	EB7	/3 0	8/13/07	Good-Fair	
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	Level IV Ecoregion	
HENDERSON	2	06010105	352113	822640	6-55-11-(5)		Broad Basins	
Stream Classificat	tion I	Drainage Area (mi2)	Elev	ation (ft)	Stream Width	n (m)	Stream Depth (m)	
С		42		2080	8		0.3	
	Fo	rested/Wetland	Urban		Agriculture	(	Other (describe)	
Visible Landuse (	(%)	25	0		75		0	
Unstream NPD	ES Discharge	ers (>1MGD or <1M0	D and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)	
Greystone Subdivision					NC00687		0.02	
Pine Park Retirement I	nn				NC00693	370	0.03	
Water Quality Parame	eters				Site Pho	otograph		
Temperature (°C) Dissolved Oxygen (mg, Specific Conductance pH (s.u.) Water Clarity Habitat Assessment S	(µS/cm)	23.5 6.8 64 6.6 turbid		1				
Channel Modification (	· · ·	4	and the					
Instream Habitat (20)	5)	16	1-24		aller the	and the fill	A CONTRACTOR OF A CONTRACTOR O	
Bottom Substrate (15)		10			And the second			
Pool Variety (10)		6		A.	a second			
Riffle Habitat (16)		16	A DESCRIPTION OF					
Left Bank Stability (7)		5			1-	and the same	Charles and the second	
Right Bank Stability (7)	)	3	1990 - C				See Street	
Light Penetration (10)		7						
Left Riparian Score (5)		3	in the second					
Right Riparian Score (5		2		- Contraction				
Total Habitat Score (1	00)	72	Substra	Mos Mos	tly 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.

Waterbo	dy	Locatio	n	Station	ID	Date	Bioclassification
CANE	CR	SR 10	06	EB66	6 0	8/13/07	Poor
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	L	evel IV Ecoregion
HENDERSON	2	06010105	352523	822958	6-57-(9)a		Broad Basins
Stream Classifica	ation [	Drainage Area (mi2)	Elev	ation (ft)	Stream Widtl	n (m)	Stream Depth (m)
С		80		2060	10		0.2
	=		Units and		A		
Visible Landuse		20	Urban 0		Agriculture		Other (describe) 80 (driving range)
			, i i i i i i i i i i i i i i i i i i i		0		
Upstream NP	DES Discharge	ers (>1MGD or <1MG	GD and within	n 1 mile)	NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Param	eters				Site Ph	otograph	
Temperature (°C)		25.6			Seale	Contraction of the	
Dissolved Oxygen (m	g/L)	7.7				to a second	
Specific Conductance	e (µS/cm)	63					
pH (s.u.)		7.4			and the second		and the second second
Water Clarity		turbid				Section States	Contraction of the Second
Water Clarity		tarbia		A States		tone Mall	
Habitat Assessment	Scores (max)		1. CT				
Channel Modification	(5)	5		an and a second			Enter and
Instream Habitat (20)	( )	16		- 1- may			A CHARLES
Bottom Substrate (15)	)	12					and the second
Pool Variety (10)		8	100			1 A 1	
Riffle Habitat (16)		10					
Left Bank Stability (7)		6		The second		and all	
Right Bank Stability (7	7)	5			alles -		
Light Penetration (10)		10			NO.	dia total	
Left Riparian Score (5	5)	3				and the second second	

Right Riparian Score (5) **Total Habitat Score (100)** 

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

Substrate

3 78

## **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 an no dischargers directly uspstream 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.

Waterbody			Location		Date	Station ID	Bioclas	sification
AVERY CR		off	SR 3498	(	06/12/07	EF66	Goo	d-Fair
County Subl	basin	8 digit HUC	Latitude	Longitu	ıde	AU Number	Level IV	/ Ecoregion
BUNCOMBE	2	06010105	35.456389	-82.5683		6-60		ad Basins
Stream Classification	Draina	age Area (mi2)	Elevatio	n (ft)	Stream Wi	dth (m)	Average Depth (m)	Reference Site
В		8.1	2080		5		0.3	No
	Farra	sted/Wetland	Link		<b>A</b> -		Other	decerite)
Visible Landuse (%)	Fore	85	Urb 5 (rural re		Ag	riculture 10	Other	describe) 0
				,				
pstream NPDES Discharge	rs (>1MC		d within 1 mile	)		NPDES Nur	mber	Volume (MGD)
		None						
ater Quality Parameters						Site P	hotograph	
emperature (°C)		20.8	1. Jac +		Sec.			
issolved Oxygen (mg/L)		8.3	<b>建建</b> 在1					and the second
pecific Conductance (µS/cm)	)	38	Section 2					144
H (s.u.)		5.9	53		the for	a bard		
Vater Clarity		Clear			ale			1 miles
abitat Assessment Scores	(max)							199
hannel Modification (5)		5		151		and the second	and the second second	
stream Habitat (20)		18	188			-	A STATISTICS	
ottom Substrate (15)		8		a ser la		and the second	Contraction of the second	The second second
ool Variety (10)		4		1.1	100 C	and the	E 7	1. 28 T
iffle Habitat (16)		15			and the second second	Station -	7/1-2	and the second
eft Bank Stability (7)		7		274	and the second	and the second	2 Deniel	
ight Bank Stability (7)		7	7	and the	1	Contraction of the	E . Come	
ght Penetration (10)		10	1000	na 1	1		and the state	the second
eft Riparian Score (5)		4	A. C.	all a	Tree -	THE MARKET		
ight Riparian Score (5)		5						
otal Habitat Score (100)		83	Subs	strate S	and, gravel, a	nd cobble.		
Sample Date		Sample II	)	Specie	es Total	NC	IBI E	Bioclassification
06/12/07		2007-73			23	4	0	Good-Fair
Most Abundant Species		Warpaint Shiner	and River Chub	)	Exotic Spec		Bullhead, Redbreast S fish, and Swamp Darte	
pecies Change Since Last	Cycle	N/A		·				
ata Analysis	•							
his is the first fish community	sample	collected at this s	ite. Watershed	l a small tr	ributary to the	French Broad R	iver, drains the extrem	e south central porti

Inis 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.

Waterbody		-	Location		Date	Station ID		Bioclassification		
BENT CR		of	f NC 191		06/12/07	EF67		Good	k	
County S	ubbasin	8 digit HUC	Latitude	Longitu	ıde	AU Number	1	Level IV Eco	oregion	
BUNCOMBE	2	06010105	35.5006616	-82.5994	464	6-67-(7)		Broad Ba	isins	
Stream Classification	Drain	age Area (mi2)	Elevatio		Stream W	idth (m)	Average Dept	h (m)	Reference Sit	
В		10.7	209	0	9		0.3		Yes	
	Fore	sted/Wetland	Urk	ban	А	griculture		Other (desc	ribe)	
Visible Landuse (%)		100		0	1	0		0		
Jpstream NPDES Dischar	gers (>1M	GD or <1MGD an	d within 1 mile	e)		NPDES Nu	ımber	Volu	ıme (MGD)	
		None								
Vater Quality Parameters						Site	Photograph			
emperature (°C)		20.2					The manual		-/	
Dissolved Oxygen (mg/L)		8.1	5.50	Arrent R		And Ballinstein	V Lange and	No.1		
Specific Conductance (µS/	cm)	21				A LANGE	N. A. A.	A State	lor la	
oH (s.u.)		6.5		and the f						
				A DINALA				1.20		
Water Clarity		Clear		14 A.			A CONTRACTOR OF			
,			1	Ser 1			To The Take	And and		
labitat Assessment Scor	es (max)		15		A AT	and the second second		- August	1 (A) ( ) (A)	
Channel Modification (5)		5	Se la	a the second			£	- Base		
nstream Habitat (20)		19	100	CHEAN		To Your		and the second second	44	
Bottom Substrate (15)		12	See	N.A.						
Pool Variety (10)		4		3		1 Small	1		All to	
Riffle Habitat (16)		14	A REAL PROPERTY AND A REAL	在一次	75	12-11 ×				
eft Bank Stability (7)		7			N.			制制的		
Right Bank Stability (7)		7	A. A	TR						
ight Penetration (10)		10	and the second	and a	1	and the second	a store			
eft Riparian Score (5)		5	1 A A A		State of the		North Contraction			
Right Riparian Score (5)		5								
Total Habitat Score (100)		88	Sub	strate C	obble, bould	er, and gravel.				
Sampla Data		Sample II	<u> </u>	<u> </u>	es Total	NI	CIBI	Picol	accification	
<b>Sample Date</b> 06/12/07		2007-74	)	· ·	22		56	BIOCI	assification Good	
				· · · · · · · · · · · · · · · · · · ·		·				
Most Abundant Species		Mottled Sculpin			Exotic Spe	cies Flat	Bullhead and R	edbreast Su	Infish	
Species Change Since La	st Cycle	N/A								
Data Analysis	-									

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.

Waterbo	dy		Locatio	n	Stat	ion ID	)	Date		Bioclass	ification
HOMINY	' CR	9	SR 112	23	EB	327	0	8/17/07	7	Good	I-Fair
County	Subbas	in 8 digit I	IUC	Latitude	Longitu	ıde	AU Number		Level I	V Ecoregio	'n
BUNCOMBE	2	060101		353204	82421	2	6-76b	southe	ern crystalin	e ridges an	d mountains
Stream Classifica	ation	Drainage Ar	ea (mi2)	Elev	ation (ft)		Stream Width	n (m)	St	ream Dept	h (m)
С		29.9			2131		6			0.2	
		Forested/Wetl	and	Urban		A	griculture		Other	(describe)	
Visible Landuse	(%)	70		30			0			0	
Upstream NPI	DES Discha	argers (>1MGD	or <1MG	D and withir	n 1 mile)		NPDES Nu	mber	N	/olume (M	GD)
		None									
Water Quality Param	eters						Site Pho	otograph			
Temperature (°C)			22.3	-		A STATE		100		-	6
Dissolved Oxygen (mg	g/L)		8.1			de la					
Specific Conductance	(µS/cm)		106	- 2			1.2.2	and the second	2.1		
pH (s.u.)			7		14-14-			AR W			at ise.
Water Clarity		clear									
Habitat Assessment	Scores (m	ax)		Street.						No.	
Channel Modification (	(5)		5	1 1			Part I have a second	The mark	a contraction of		and and
Instream Habitat (20)			16				4				Carpon .
Bottom Substrate (15)	1		11		1	Plan			1	Contra la contra	Store -
Pool Variety (10)			8		and a set	The series					
Riffle Habitat (16)			16			a la	Service and the		-		ALC: NO.
Left Bank Stability (7)			3	5	FR	and the					
Right Bank Stability (7			6	and the second second		See.	and the second				
Light Penetration (10)			10		-		Alter and	* to			1
Left Riparian Score (5			2	1	and the second	1000	Real Property	S. 1. 1	- Contraction	The second	And the second second
Right Riparian Score (	(5)	_	3		_						

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

Mostly gravel and cobble

Substrate

80

## **Taxonomic Analysis**

**Total Habitat Score (100)** 

Intolerant or "sensitive" taxa present at this study location included the mayflies Neoephemera purpurea and Serratella deficiens; the stoneflies Acroneuria abnormis, Paragnetina immarginata, and Pteronarcys biloba; and the caddisflies Brachycentrus spinae, 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 upsteam 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.

Waterbo	odv			Location		Date	Station I	)	Bioclassif	ication
HOMIN				NC 151		06/12/07	7 EF26		Good-	Fair
County	Subb	basin	8 digit HUC	Latitude	Longi	itude	AU Number	l	Level IV E	coregion
BUNCOMBE	2	2	06010105	35.53555556	-82.694	44444	6-76b		Broad E	Basins
Change Classifier	4 <b>.</b>	Ducius	····· • • ····· • ····· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···· • ···	Flowetia		Ctus and M	(;	Augusta Danil	- (ma)	Defenence Cite
Stream Classifica	tion	Draina	<b>ige Area (mi2)</b> 30.2	Elevatio 209			Vidth (m) 7	Average Depth 0.4	n (m)	Reference Site No
Ŭ			50.2	203	5			0.4		No
		Fores	sted/Wetland	Url	ban	/	Agriculture		Other (des	scribe)
Visible Landuse	(%)		40	60 (rual co	ommercial)	1	0		0	
Upstream NPDES Dis	scharge	re (~1MG	Dor <1MGD a	nd within 1 mile			NPDES N	lumber	Vo	lume (MGD)
	scharger		None		-)		NI DES 1	lumber	1	
Water Quality Param	eters						Site	Photograph	246	
Temperature (°C)			17.5		e care	Se de la		- And the	100	
Dissolved Oxygen (mg	- /		8.7		North -	and the	the second second	A Marine	Alexa.	
Specific Conductance	(µS/cm)		91		· Eren		The way is		1	
pH (s.u.)			6.7		- Miles	and the	Carl Carl	- A. 1	<b>山</b> 市市市	41
			<u>.</u>	1			ARTS AND		35 4 3	
Water Clarity			Clear			TTO THE T				
Habitat Assessment	Scores (	(max)		A A	Red H		and the second	aptr a		A STATE OF
Channel Modification		( )	5	1000			The second second	P 15 3		
Instream Habitat (20)	(0)		16	1997			10.00	-		and the second
Bottom Substrate (15)	)		6	10220	1	Contraction of the		a read		2423 代制范
Pool Variety (10)	·		4	- Andrews						The Main
Riffle Habitat (16)			14	x				and a superior	-	- AT ALL THE ALL ALL ALL ALL ALL ALL ALL ALL ALL AL
Left Bank Stability (7)			7				Constant of the	And any service		College Street
Right Bank Stability (7			6			100			- PA-	1.12
Light Penetration (10)			9			1 the second				
Left Riparian Score (5			5	1	and the second		and the second	12000		
Right Riparian Score (	(5)		3							
Total Habitat Score (			75	Sub	strate	Cobble, grave	el, and sand			
Sample Date			Sample		Sno	cies Total		ICIBI	Pio	classification
06/12/07	;		2007-71		Spe	15	г 	46	1	Good-Fair
09/24/02			2002-84			16		40		Good-Fair
09/17/97			97-80			16		50		Good
Most Abundant Spe	ocios	Í	Saffron Shiner	and Mottled Scu	Inin	Exotic Sp		edear Sunfish		
wost Abundant Spe	50163				ipin			Summer		
Species Change Sind	ce Last (	Cycle		- Longnose Dace ast Sunfish.	e and Rede	ear Sunfish. L	.osses Mounta	ain Brook Lampre	y, Brown T	rout, and
Data Analysis										
Watershed a tributa	-						•	•		U U
upstream with a comb										
pools; silts in the pools abundant community,									•	
intolerant species pres			•							
classes increased from	m 56% to	80%. <b>1</b> 9	<b>997 - 200</b> 7 co	nductivity has ra	nged form	78 to 98 µS/c	m; habitat score	s have ranged fro	om 69 to 75	; 18 species are
known from the site, b	out only 2	species	of darters; domi	nant species hav	ve been the	e Saffron Shir	er and the Mottl	ed Sculpin; 2002	was a drou	ight year and in

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.

Waterbo	dy	Locatio	on	Station	ID	Date	Bioclassification
HOMINY	' CR	SR 34	12	EB10	05 08	8/16/07	Fair
County	Subbasiı	n 8 digit HUC	Latitude	Longitude	AU Number	Lev	vel IV Ecoregion
BUNCOMBE	2	06010202	353242	823806	6-76d	1	taline ridges and mountains
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Stream Width	ı (m)	Stream Depth (m)
С		91.1		2070	10		0.4
	1	Forested/Wetland	Urban		Agriculture	0	ther (describe)
Visible Landuse	(%)	80	20		0		0
Upstream NPI	DES Discha	rgers (>1MGD or <1MC	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Param	eters				Site Pho	otograph	
Temperature (°C)		25.9			And the second	1000	State State
Dissolved Oxygen (mg	g/L)	8				and the second	All Contractions of the
Specific Conductance	(µS/cm)	93				and the second	and the second
pH (s.u.)		7.3		and the same	ALC: N	The second s	CONTRACT OF STREET
Water Clarity		slightly turbid		1		es and	TAT MEL
Habitat Assessment	Scores (ma	x)					100 11 15 15
Channel Modification	(5)	5	- Cash	T		and the second	A CALLARD
Instream Habitat (20)		10	100 M	Ser.			A Strateger
Bottom Substrate (15)	)	3		27 Nonte	State -	A DESCRIPTION OF	
Pool Variety (10)		8	1 and the second				
Riffle Habitat (16)		6		A STATE		· · ·	A REAL PROPERTY.
Left Bank Stability (7)		7	-		-		
Right Bank Stability (7	")	7					and the second
Light Penetration (10)		5	104		E.		No China Bar
Left Riparian Score (5	)	5	a second	ALL PARTY	1983		
Right Riparian Score (	(5)	4					

• •				÷		
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

Mostly gravel and cobble

Substrate

## **Taxonomic Analysis**

**Total Habitat Score (100)** 

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.

Water Clarity       Clear         Habitat Assessment Scores (max)       5         Channel Modification (5)       5         Instream Habitat (20)       19         Bottom Substrate (15)       12         Pool Variety (10)       9         Riffle Habitat (16)       16	Waterb	ody			Location		Date	е	Station	n ID	Bi	ioclass	ification
BUNCOMBE         2         06010105         35.5355556         -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           Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         85         15 (rural residential)         0         0           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)         NPDES Number         Volume (MGD)           None              Water Quality Parameters         17.5         9.1            Temperature (*C)         17.5         9.1            Dissolved Oxygen (mg/L)         9.1             Specific Conductance (µS/cm)         3         6.2             Water Clarity         Clear              Habitat Assessment Scores (max)              Channel Modification (5)         12	S HOMIN	NY CI	R	NC <sup>2</sup>	151/SR 344	9	06/12	2/07	EF5	0		Go	od
BUNCOMBE         2         06010105         35.5355556         -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           Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         85         15 (rural residential)         0         0           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	County	Sul	bbasin	8 digit HUC	Latitude	Long	itude		AU Numb	er	Le	evel IV	Ecoregion
C;Tr         38.3         2095         14         0.4         Yes           Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         85         15 (rural residential)         0         0           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)			2	_	35.53555556	_			6-76-5b				-
Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         85         15 (rural residential)         0         0           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	Stream Classifica	ition	Draina	age Area (mi2)	Elevatio	on (ft)	Strea	am Wid	ith (m)	Ave	rage Depth	(m)	Reference Site
Visible Landuse (%)         85         15 (rural residential)         0         0           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	C;Tr			38.3	209	5		14			0.4		Yes
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)       NPDES Number       Volume (MGD)         None           Water Quality Parameters           Temperature (°C)       17.5       9.1          Dissolved Oxygen (mg/L)       9.1           Specific Conductance (µS/cm)       6.2           Water Clarity       Clear           Habitat Assessment Scores (max)       5       19          Channel Modification (5)       5       19       19          Bottom Substrate (15)       12            Pool Variety (10)       9       9            Right Bank Stability (7)       6       6            Left Riparian Score (5)       4			Fore	sted/Wetland	Ur	ban		Agı	riculture		o	ther (d	escribe)
None             Water Quality Parameters         5ite Photograph           Temperature (°C)         17.5         9.1           Dissolved Oxygen (mg/L)         9.1         33           Specific Conductance (µS/cm)         33         6.2           Water Clarity         Clear         Image: Clear           Habitat Assessment Scores (max)         Channel Modification (5)         5           Channel Modification (5)         12         12           Pool Variety (10)         9         12           Right Bank Stability (7)         6         6           Light Penetration (10)         8         8           Left Riparian Score (5)         5         5	Visible Landuse	(%)		85	15 (rural r	esidential)			0			C	)
None             Water Quality Parameters         5ite Photograph           Temperature (°C)         17.5         9.1           Dissolved Oxygen (mg/L)         9.1         33           Specific Conductance (µS/cm)         33         6.2           Water Clarity         Clear         Image: Clear           Habitat Assessment Scores (max)         Channel Modification (5)         5           Channel Modification (5)         12         12           Pool Variety (10)         9         12           Right Bank Stability (7)         6         6           Light Penetration (10)         8         8           Left Riparian Score (5)         5         5	Upstream NPDES Di	ischarg	ers (>1M0	GD or <1MGD a	nd within 1 mile	e)			NPDES	S Numbe	r	v	olume (MGD)
Temperature (°C)17.5Dissolved Oxygen (mg/L)9.1Specific Conductance ( $\mu$ S/cm)9.1pH (s.u.)6.2Water ClarityClearHabitat Assessment Scores (max)Channel Modification (5)5Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Light Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)5		<u></u>				-,					-		
Temperature (°C)17.5Dissolved Oxygen (mg/L)9.1Specific Conductance ( $\mu$ S/cm)9.1pH (s.u.)6.2Water ClarityClearHabitat Assessment Scores (max)Channel Modification (5)5Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Light Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)5	Water Quality Param	neters							S	Site Phot	ograph		
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 Right Bank Stability (7) 6 Right Riparian Score (5) 4 Right Riparian Score (5) 5	-			17 5	1.1		192					100	
Specific Conductance (µS/cm)         33           pH (s.u.)         6.2           Water Clarity         Clear           Habitat Assessment Scores (max)         19           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           Light Penetration (10)         8           Left Riparian Score (5)         4		a/L)			2.1	go et a	- Algeria			fer and	100	63	P. States
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   Light Penetration (10) 8   Left Riparian Score (5) 4   Right Riparian Score (5) 5			n)						Section	and the second			
Habitat Assessment Scores (max)Channel Modification (5)5Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	pH (s.u.)			6.2			Contra la	town.		N. A			Little Con
Channel Modification (5)5Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Water Clarity			Clear								4	
Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Habitat Assessment	Scores	s (max)			and a		-	and and	and the second	10 20		- de de
Instream Habitat (20)19Bottom Substrate (15)12Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Channel Modification	(5)		5	33	199		100				chine All and a	
Pool Variety (10)9Riffle Habitat (16)16Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Instream Habitat (20)	. ,		19	100	1000	See 1	1					
Riffle Habitat (16)16Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Bottom Substrate (15)	)		12			Sel Sta	$\sim 6$	States of the		a la come de la come	and the second	a wet they
Left Bank Stability (7)6Right Bank Stability (7)6Light Penetration (10)8Left Riparian Score (5)4Right Riparian Score (5)5	Pool Variety (10)			9			-	-	Contraction of the second	e fritana	The Vertil		and the second second
Right Bank Stability (7)     6       Light Penetration (10)     8       Left Riparian Score (5)     4       Right Riparian Score (5)     5	Riffle Habitat (16)			16	COLUMN STATE		-			200	AL STREET		
Light Penetration (10)     8       Left Riparian Score (5)     4       Right Riparian Score (5)     5	Left Bank Stability (7)			6					and the				
Left Riparian Score (5)     4       Right Riparian Score (5)     5	Right Bank Stability (7	7)		6	and the second			-	The set of		and the second	No.	Contraction of the
Right Riparian Score (5) 5	Light Penetration (10)			8			No.			-		Sec. 1	Lines and
	Left Riparian Score (5	5)		4	aller a	100	A STA	ABURNE	-	the state			and the second s
Yes       Yes       Substrate       Cobble, gravel, sand, and boulder	Right Riparian Score	(5)		5									
	Total Habitat Score (	(100)		90	Sub	strate	Cobble, g	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 Shi	ner Exotic Spec	ies Rainbow Trout and I	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).

Waterbo	dy		Location Static			on ID	1		Date		Bioclassification	
S HOMIN	Y CR		NC 15	51		EB	135		08	8/17/07	7	Good
County	Subba	isin 8 d	igit HUC	Latituc	de	Longitud	le	AU N	umber		Leve	el IV Ecoregion
BUNCOMBE	2	06	010105	35320	4	824132	2	6-	76-5		E	Broad Basins
Stream Classifica	ation	Drainag	je Area (mi2)	1	Eleva	ation (ft)		Strea	m Width	ı (m)		Stream Depth (m)
C; Tr			39		2	2115			14			0.3
		Forested/	Wetland	U	rban		A	gricult	ure		Ot	her (describe)
Visible Landuse	(%)	70	)		0			30				0
Upstream NPI	DES Disc	hargers (>1I	MGD or <1M	GD and v	vithin	1 mile)		NP	DES Nur	nber		Volume (MGD)
·		Nor				,						
Water Quality Param	eters								Site Pho	otograph		
Temperature (°C)			22.6			1 A.			TYPE -	1	Sec. M	1. AN AL MO
Dissolved Oxygen (mg	g/L)		8.1	1	La far		and the second	Sec.		Mar	Sector 4	States of States
Specific Conductance	e (µS/cm)		40		1	8			the states	Jucidas 1		CONTRACTOR OF
pH (s.u.)			6.9			100 m				A STATES		
Water Clarity		slightly	turbid									
Habitat Assessment	Scores (I	nax)			E.			and a		ALC: NO.		
Channel Modification	(5)		5	- 13					C.S.		Paris .	
Instream Habitat (20)			14		1	1 mil	1	1 Fallen	-		-	
Bottom Substrate (15)	)		8	100		The State		-	Supervised in the local division in the loca		-	
Pool Variety (10)			6	1			-			1.	Color marks	and an and a second
Riffle Habitat (16)			16		Rivers of		-	-			-	Contraction of the second s
Left Bank Stability (7)			7		Not see		-		-	The second	Terter.	
Right Bank Stability (7	7)		7		-	-	SEE.	Lorge	Car Sa	Part Charles		
Light Penetration (10)			5		- En		100	5-5				
Left Riparian Score (5	5)		2	16		and the second s		-	Ser. St.	C. Ka	TEL YA	
Right Riparian Score (	(5)		2	41	100		No. Of Lot			No. of Contraction	CAR C	

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

Substrate

72

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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 fuscula* 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.

Waterbo	ody	Locatio	'n	Station	ID	Date	Bioclassification
SWANNA	NOA R	SR 24	16	EB14	2 0	8/16/07	Good-Fair
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
BUNCOMBE	2	06010105	353629	822641	6-78c	-	staline ridges and mountains
Stream Classifica	ation [	Drainage Area (mi2)	Elev	vation (ft)	Stream Widtl	n (m)	Stream Depth (m)
С		80.7		2115	16		0.2
		rested/Wetland	Urban		Agriculture		Other (describe)
Visible Landuse	(%)	20	20		60		0
Upstream NP	DES Discharge	ers (>1MGD or <1MC	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Param	neters				Site Ph	otograph	
Temperature (°C)		22.4	1.				
Dissolved Oxygen (m	g/L)	6.9		- A			
Specific Conductance	e (µS/cm)	73			Sec. Sec.		Later a start
pH (s.u.)		6.5	195		and the second	A line and	
Water Clarity		clear	y las				aller 10-1
Habitat Assessment	Scores (max)			IN THE OWNER	an is they	Allow - Prover	( Harrison
Channel Modification	(5)	5	100			and the second se	and the second
Instream Habitat (20)		16	1.55		a an		
Bottom Substrate (15)	)	12	-	Sec. 10	and the second	The second	Transa and a start of the
Pool Variety (10)		8				Contraction of the	
Riffle Habitat (16)		7				Sec. and the	The second second
Left Bank Stability (7)		7	1000	1	and the second s	and a strength	
Right Bank Stability (7		7	-			and they	
Light Penetration (10)		7				-	
Left Riparian Score (5	<b>)</b> )	2					

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

3 74

## **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 *Acroneuria 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*, *Plauditus 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 dichargers 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 degredation at SR 2416. However, the exceptional drought of 2007 should have miminized the impact of these stressors. Therefore, it is unclear why the bioclassification of this location is not greater than Good-Fair.

Waterbo	dy		Locat	ion		St	ation I	ID		Date		Bioclassification
SWANNAM	NOA F	2	US 2	25		E	B14	5	08	/15/07	7	Good-Fair
County	Subb	asin	8 digit HUC	Lat	itude	Longi	tude	AU Num	ber		Leve	el IV Ecoregion
BUNCOMBE	2		06010105	35	3406	8232	242	6-780	1			Broad Basins
Stream Classifica	ation	Dr	ainage Area (mi2	2)	e) Elevation (ft)		Stream \	Nidth	(m)	Stream Depth (m)		
С			124	1980			1	4			0.2	
		Fore	sted/Wetland	-		Agriculture		Oth	ner (describe)			
Visible Landuse	(%)		0		100			0				0
Upstream NPI	Upstream NPDES Dischargers (>1M			IGD ai	nd withiı	n 1 mile)		NPDE	S Num	ber		Volume (MGD)
			None									
Water Quality Param	eters							Site	e Phot	ograph		
Temperature (°C)								1				
Dissolved Oxygen (mg	g/L)		8.6									
Specific Conductance	e (µS/cm)		83				A					
pH (s.u.)	. ,		8.1		1	Marine State				114		-
Water Clarity			clear								- da	
Habitat Assessment	Scores	(max)							<b>is</b> (1)	1	21	
Channel Modification	(5)		5				Kel	Ser See	a de la	22000		
Instream Habitat (20)			14		ALC: N		2.2	And	1		an dial	
Bottom Substrate (15)	)		8						and a		Entre	and the state of
Pool Variety (10)			8								C. Low	
Riffle Habitat (16)			16			These	-		100			and the second second
Left Bank Stability (7)			7				54					a state to be a
Right Bank Stability (7	Right Bank Stability (7)								1.90	- Chart	and the	
Light Penetration (10)									1	15 ale	- de	and the second sec
Left Riparian Score (5	5)		1		1	1	1	deres 1	18	1	100	The second second
Right Riparian Score (	(5)		2						Ac			- Patricial Contraction
					<b>•</b> • •							

 73
 Substrate
 Good mix of boulder, rubble, gravel and sand

 Sample ID
 ST
 EPT
 BI
 EPT BI
 Bioclassification

 10322
 82
 30
 5.63
 4.18
 Good-Epir

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**

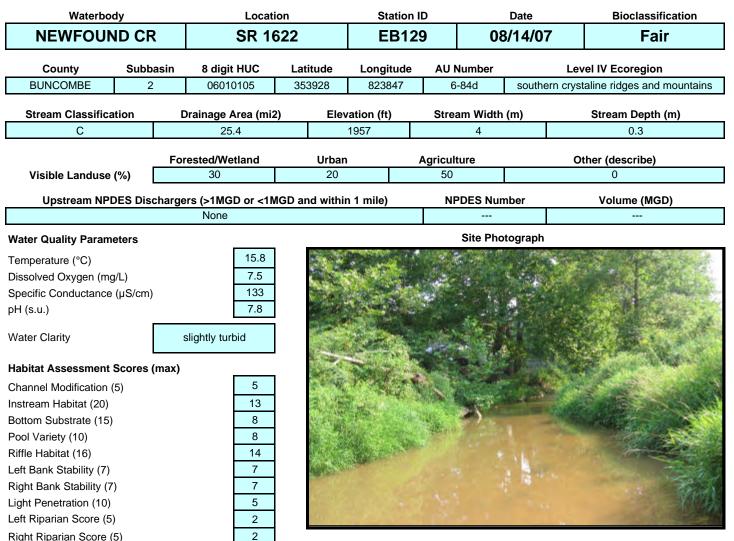
**Total Habitat Score (100)** 

Sample Date

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.



Total Habitat Score (100)	71	Substra	ate 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 occuring in 2007.

Waterbody NEWFOUND CR				Location		Date	е	Station I	D	Bi	oclassif	fication
NEWFOU	ND CF	2	ç	SR 1641		06/11	/07	EF37	,		Goo	bd
County	Subb	asin	8 digit HUC	Latitude	Long	itude		AU Number		Le	vel IV E	coregion
BUNCOMBE	2		06010105	35.66611111	-82.634		6-84e		Broad Basins		-	
Stream Classifica	tion	Draina	ige Area (mi2)	Elevatio		Strea		dth (m)	Ave	rage Depth (	(m)	Reference Site
С			34.2	190	0		7			0.3		No
		Fore	sted/Wetland	l Iri	ban		٨٩	riculture		0	ther (de	scribe)
Visible Landuse	(%)	10163	95		esidential)		<u>– – 9</u>	0				seribej
				0 (	,			-			-	
Upstream NPDES Dis	ischargers	s (>1MG	D or <1MGD a	nd within 1 mile	e)			NPDES I	Number	r	Vo	olume (MGD)
			None						-			
Water Quality Param	neters							Sit	e Photo	ograph		
Temperature (°C)			22.7	1000		20	Seales.		1 A .		1	
Dissolved Oxygen (mg	a/L)		7.9	-	-	Pare last	* Alle					ALC: NEW YORK
Specific Conductance			108	R.A.		Care I		The Party of			1.2	
pH (s.u.)	, (μο/οπι)		7.4	and the second second			2.5			a land		States and
P ()				1000	Sec.		$\pm -2$	Con and and and and and and and and and an			-	
Water Clarity		Sli	ghtly turbid	dia tan	199							
			5 ,			and a		PE- 24	de la			
Habitat Assessment	Scores (r	nax)				31 San		1.12	- ALC	ALC: NOT ALC: NOT		
Channel Modification	(5)		5	and the second				No. Contraction	- Carl			
Instream Habitat (20)	. ,		16	1 1 10		and the state	No.	The second		and the second second	-	REAL DO
Bottom Substrate (15)	)		12	THE R.	11		1	and the second	the second	Preview		CONTRACTOR OF
Pool Variety (10)			4			-	1	flor whit	1. A.	-		State of
Riffle Habitat (16)			14	and the state			1	an inter a rai	-	And the second		AND DESCRIPTION
Left Bank Stability (7)			6	125	1			TAN T			Real	
Right Bank Stability (7	7)		6	112	Carlor and a second		+	and the second	San Pri			The second second
Light Penetration (10)			7	20	200	1.2	ALC: NO	A STAR		1	No.	C TRee
Left Riparian Score (5			5	11-14	The as	155	1		in the	-	TES	
Right Riparian Score (	(5)		4									
Total Habitat Score (			79	Sub	strate	Cobble, g	gravel,	sand, and bo	oulder.			
Sample Date	2		Sample I	D	Sne	cies Tota			NCIBI		Bio	classification
06/11/07	-		2007-70		epe	19	-		48		210	Good
06/17/02			2002-69			14			48			Good

oumple bate	Gample ID	Opecies rotai	NOIDI	Diociassification
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.

Waterbo	ody	Locatio	n	Station	ID	Date	Bioclassification
REEMS	CR	NC 25	51	EB13	B1 0	8/14/07	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 Classific	ation	Drainage Area (mi2)	Elev	vation (ft)	Stream Widt	h (m)	Stream Depth (m)
С		37		1790	5		0.2
	Fo	rested/Wetland	Urban	Urban Agriculture			Other (describe)
Visible Landuse	: (%)	100	0	0			0
Upstream NPDES Dischargers (>1MGD or <1M			GD and withir	n 1 mile)	NPDES Nu	ımber	Volume (MGD)
		None		-7			
Vater Quality Param	neters				Site Ph	otograph	
emperature (°C)		22.7				A CONTRACT	
) issolved Oxygen (m	g/L)	7.9	F . A.	CALCONT.	10 17		Service and the service of the servi
Specific Conductance	e (µS/cm)	104			1160		
H (s.u.)		7.7	1	A State	A.Y.		CARLES F
Vater Clarity		slightly turbid			MA .		No. of the second
labitat Assessment	Scores (max)		法一次	Area a	YIE	12.00	
Channel Modification	(5)	5	1.1	1 1 A 1 4	A DATE		1 Marcha
nstream Habitat (20)	. ,	15		THE REAL	Salar Server		and the second second
Bottom Substrate (15	)	14		and the second second	that shares	and a	
Pool Variety (10)		6				Contraction of the second	
Riffle Habitat (16)		16		Sec.	Taken a		
eft Bank Stability (7)		7	the second		A Se	5.00	a second second
Right Bank Stability (7	7)	7		all the		- Sec	TANKS STREET
ight Penetration (10)		10		A		-	
eft Riparian Score (5	5)	4	and the second s		and the	1000	And and a second second
Right Ringrian Score	(5)	4		and the second		on the s	THE REAL PROPERTY OF THE PROPERTY OF THE REAL PROPE

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

89

#### **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.

Waterbody SANDYMUSH C			Locatio	'n	Sta	ation II	D	Date	Biocla	ssification
SANDYMUS	SH CR		SR 11 <sup>-</sup>	14	E	B137	7 0	8/14/07	Goo	od-Fair
County	Subbas	in 8 digit	HUC	Latitude	Longit	ude	AU Number		Level IV Ecoreg	ion
MADISON	2	06010	105	354405	8241	44	6-92-(9)		Broad Basins	
Stream Classificat	ion	Drainage A	rea (mi2)	Ele	vation (ft)		Stream Widt	h (m)	Stream De	pth (m)
С		47			1860		10		0.2	
		Forested/Wet	land	Urban Agriculture				Other (describ	e)	
Visible Landuse (	%)	95		5 (rural resid	dential)		0		0	
Upstream NPD	Upstream NPDES Dischargers (>1M				n 1 mile)		NPDES Nu	mber	Volume (	MGD)
		None								
Water Quality Parame	ters						Site Ph	otograph		
Temperature (°C)			21	And State			A CARA		The same	
Dissolved Oxygen (mg/	′L)		7.7				Éc.	222		and the second
Specific Conductance (	(µS/cm)		110						and the states	a prime
pH (s.u.)			7.5		agen			1.9.0	and the state	
Water Clarity		slightly turb	id			and and a	- PERC			Fine der
Habitat Assessment S	Scores (m	ax)		100			The state			1
Channel Modification (5	5)		5				Real Providence	States of	1	a sur the
Instream Habitat (20)			16	and the second	1	-	Call Star	- Contraction	The second second	
Bottom Substrate (15)			12	Sec.				and a state		ALC: NO
Pool Variety (10)			6					1	- Martin	a single and the
Riffle Habitat (16)			14					The second		100 202000
Left Bank Stability (7)			7		Real Providence					- Company of
Right Bank Stability (7)			6		R. A.		and the second	aste.		The Part
Light Penetration (10)			7					and the second second	and the second	and the second second
Left Riparian Score (5)			5		e in		- Start	and the		
Right Riparian Score (5	5)		5					allan Alla	1962 0 10	Manufacture and

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

Substrate

83

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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.

Waterb	odv	-	Location		Date	Stat	ion ID	Bioclas	sification
TURKE	*		SR 1629		06/11/0		F59		bod
TORRE					00/11/0	· ·			
County	Subbasin	8 digit HUC	Latitude	Long	itude	AU Nu	mber	Level IV	/ Ecoregion
BUNCOMBE	2	06010105	35.70472222	-82.668		6-92-	-13	1	d Basins
		-			<b>I</b>				
Stream Classifica	tion Drain	age Area (mi2)	Elevatio	on (ft)	Stream	Width (m)	Av	verage Depth (m)	Reference Site
С		27.4	188	5		8		0.4	No
	Fam	ested/Wetland	11-6			A ami a u léu m	-	Other (	deceribe)
Visible Landuse		95	Urk	)		Agriculture accessional		Other (	describe) 0
	(70)	50		5	0 (50	100000101101			0
Upstream NPDES Di	ischargers (>1M	GD or <1MGD a	nd within 1 mile	e)		NP	DES Numb	er	Volume (MGD)
		None							
							Sito Pho	otograph	
Water Quality Param	ieters		52×57 (6)			5	Site Flic	lograph	A CONTRACTOR OF
Temperature (°C)	<i>a</i> )	20.5			Zara a				2
Dissolved Oxygen (m		8.2		-					State March
Specific Conductance	e (µS/cm)	97	1000			And San	Same and	The second second	
pH (s.u.)		7.3	74.52	1. 14					
			the second		The state	maria co			The state
Water Clarity		Turbid	12	i Mak	the free		and the second		Contraction of the
Habitat Assessment	Scores (max)						-	and the second	
Channel Modification	(5)	5	100			- 4		12	Start and
Instream Habitat (20)	( )	18	and the second second		STAN 172		-	and the second	A REPAIR
Bottom Substrate (15		8	- 1 Mar - 1	Carle P	No.		-		a constant
Pool Variety (10)		7		Cing and			1.		
Riffle Habitat (16)		12	and the second					a second	
Left Bank Stability (7)		7					Server S	2	
Right Bank Stability (7	7)	7					SHEER P	and the second se	AL DESCRIPTION
ight Penetration (10)	)	7				A Shall	14	24 Man	and the second
_eft Riparian Score (5	5)	5	100	1		10100	Section 1	一方の方面で	
Right Riparian Score	(5)	4							
Total Habitat Score	(100)	80	Subs	strate	Cobble, boul	der, and sa	and.		
Sample Date	9	Sample	ID	Spe	cies Total		NCIB	EE	lioclassification
06/11/07		2007-6	9		16		52		Good
06/17/02		2002-6	8		14		48		Good
Most Abundant Sp	ecies	Bigeve Chub a	nd Central Stone	roller	Exotic Sp	ecies	Redbre	east Sunfish	
					1				
Species Change Sin	ce Last Cycle	Gains -	- River Chub, Lor	ngnose Da	ace, and Blac	< Redhorse	. Losses	Green Sunfish.	
Data Analysis			to a little a fina da a succ	- 1					
Watershed tributar Habitat riffles with <i>i</i>				-					
water easily silted, se									
drought conditions pro								•	
percentage of toleran									
Bass were present. 2 only two species of da									
cyprinids (River Chub						- NOIDI 300			additional species of
	5	,, , .			•				

Waterbo	ody	Locatio	on	Station	ID	Date	Bioclassification
lvy C	r	SR 21	50	EB20	0 00	8/06/07	Excellent
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
Madison	4	06010105	354728	823219	6-96-(0.5)		Broad Basins
Stream Classifica	ation	Drainage Area (mi2)	) Elev	ation (ft)	Stream Width	n (m)	Stream Depth (m)
WS-II; HQW		60.6		1,972	13		0.3
	Fo	prested/Wetland	Urban A		Agriculture	(	Other (describe)
Visible Landuse	e (%)	40	50		10		0
Upstream NP	DES Discharg	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Param	neters				Site Pho	otograph	
Temperature (°C)		32.4	1 2 4	$de = \frac{1}{2} e^{i \frac{1}{2} \frac{1}{2}}$			
Dissolved Oxygen (m	g/L)	6.8	C.C.	and the			
Specific Conductance	e (µS/cm)	40	Subsector 1		AND AND		and the second
pH (s.u.)		8.3	24	States States		1-5-	A Barris
Water Clarity		Slightly Turbid			ser fo		
Habitat Assessment	Scores (max)		110				
Channel Modification	(5)	4	-12	and the	- Carlona	- Carlos	
Instream Habitat (20)		15	and the second			Charles States	
Bottom Substrate (15)	)	12					
Pool Variety (10)		7		and the second second	1. 1 Mar 199		
Riffle Habitat (16)		14				The states	
Left Bank Stability (7)		6	-	20		and the second	
Right Bank Stability (7		5	are t	The state of the	Contraction .		
Light Penetration (10)		8	Sector Sector		11-25		
Left Riparian Score (5		3		State State	15 - 18	the second	and the second se
Right Riparian Score	(5)	1					

 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

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

Substrate

75

#### **Taxonomic Analysis**

Total Habitat Score (100)

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 *Triaenodes 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 lvy 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.

Waterl	body	Locatio	on	Station	ID	Date	Bioclassification
lvy	Cr	US 25-70	) Bus	EB20	01 0	8/06/07	Good
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	L	evel IV Ecoregion
Madison	4	06010105	354629	823843	6-96-(11.7)		Broad Basins
Stream Classif	ication	Drainage Area (mi2)	Elev	ation (ft)	Stream Widt	h (m)	Stream Depth (m)
С		160.7		1,750	20		0.6
	_						
Visible Lendur		rested/Wetland 90	Urban 10		Agriculture 0		Other (describe)
Visible Landus	se (%)	90	10		0		0
Upstream N	IPDES Discharge	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)
		None					
Water Quality Para	ameters				Site Ph	otograph	
Temperature (°C)		30.9	100		Parente.		Same and a second
Dissolved Oxygen (	ma/L)	7.3			100		
Specific Conductan		87.3				C. Star	
oH (s.u.)	<b>N</b> ,	7.2			1		
				ALC: NOTA-		and the second	
Water Clarity		Turbid					at the state of th
Habitat Assessme	nt Scores (max)		24	Contraction of the local division of the loc			
Channel Modificatio	on (5)	4	A STREET		1000	-	2
nstream Habitat (20	. ,	15		AN REAL	and the second		
Sottom Substrate (1	•	12			- ALL STREET	A REAL PROPERTY.	
Pool Variety (10)		7	Souther a	And and a state of the state of			and the second second
Riffle Habitat (16)		14	the second	Contraction of the local division of the loc			and the second s
_eft Bank Stability (	7)	6		Alter alter	the state	Carlos S. C.	AND THE MARK
Right Bank Stability	r (7)	6	274.18			and the second	
_ight Penetration (1	ght Penetration (10) 7			and the			And the second
eft Riparian Score		and a second of		State of the second			
	(-)	_					

80 Substrate Boulder, rubble, sand, gravel, and silt. **Total Habitat Score (100)** EPT EPT BI Bioclassification Sample Date Sample ID ST BI 08/06/07 10296 85 32 4.76 3.30 Good 06/26/02 8839 30 4.90 80 3.70 Good-Fair 07/07/97 7337 59 28 4.72 Good-Fair 3.54 09/02/93 6406 33 33 3.31 3.31 Good 07/22/92 5930 87 36 4.67 3.63 Good

5

### **Taxonomic Analysis**

Right Riparian Score (5)

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 is slightly improved community metrics relative to 2002 and 1997.

Waterbody			Location		Date	Station ID	В	Bioclassification		
LITTLE IVY C	R	5	SR 1547		06/18/07	EF71		Good	ł	
,	obasin	8 digit HUC	Latitude	Long		AU Number	Le	evel IV Eco	-	
MADISON	4	06010105	35.8085416	-82.51	87343	6-96-10a		Broad Basins		
Stream Classification	Draina	age Area (mi2)	Elevatio	n (ft)	Stream Wi	dth (m)	Average Depth	(m)	Reference Site	
WS-II;HQW		42.1	2065		9		0.4		Yes	
			•							
	Fore	sted/Wetland	Urb		Aç	griculture	0	ther (desc	ribe)	
Visible Landuse (%)		65	5 (rural re	sidential)		30		0		
Upstream NPDES Discharg	ers (>1MO	GD or <1MGD ar	nd within 1 mile	)		NPDES N	umber	Volu	ıme (MGD)	
		None		,						
Water Quality Parameters				No. No. of Concession		Site	Photograph			
Temperature (°C)		24.6		Sec. 1	de la Cora					
Dissolved Oxygen (mg/L)		8.3	and the second	Sec.		1000	A CONTRACTOR	A HAND		
Specific Conductance (µS/cn	ר)	151				A BURNES	a ser any			
pH (s.u.)		8.4	and the second				and the second	1200	CARLES VA	
Water Clarity	Sli	ghtly turbid		Carlo and		and the second s			- Creates	
Habitat Assessment Scores	(max)				and the second s					
Channel Modification (5)	(IIIax)	F					THE STATE		15	
Instream Habitat (20)		5					Max and the same	A second		
Bottom Substrate (15)		8	and a second		1			and the		
Pool Variety (10)		6		1 miles	and the second	and a part of the lot	and the second		- 620	
Riffle Habitat (16)		14	and the second second					and the second second		
Left Bank Stability (7)		6	and the second			the same the same		A state of		
Right Bank Stability (7)		6				-	A LAND TO	and an		
Light Penetration (10)		7		and the		and the second	AN ANTIN AND A		ALC: NO	
Left Riparian Score (5)		3	and p.	A.	Star -	Section 1			the second	
Right Riparian Score (5)		2								
Total Habitat Score (100)		73	Subs	strate	boulder, slick b	edrock				
Sample Date		Sample I	D	Spe	cies Total	N	CIBI	Bioch	assification	
06/18/07		2007-84			14		52		Good	
Most Abundant Species		Whitetail Shine			Exotic Spec	cies Rai	nbow Trout			
Species Change Since Last	Cycle	N/A								
	-									
<b>Data Analysis</b> This is the first fish communit	v sample (	collected at this	site Watershed	I a tribut	ary to by Creel	c and ultimately	the French Broad	River loca	ated almost 3	
miles above its confluence wi										
with slick bedrock and Podos	<i>temum</i> ; th	e elevated cond	uctivity and perip	hyton cov	ered substrates	are consistent	with the non-point	t agricultura	al influences	
within this catchment. <b>2007</b> - species (Fantail Darter); the f										

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.

Waterbo	dy	Locatio	n	Station	ID	D	ate	Bioclassification		
L Ivy (	Cr	SR 16 <sup>4</sup>	10	EB20	)5	08/0	6/07	Good-Fair		
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Nu	AU Number		vel IV Ecoregion		
Madison	4	06010105	354732	823219	6-96-	10b		Broad Basins		
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Stream	width (m	)	Stream Depth (m)		
WS-II; HQW		46.5		1,974		7		0.3		
	Fo	rested/Wetland	Urban		Agricultur	e	c	ther (describe)		
Visible Landuse	(%)	40	30		30			0		
Upstream NPI	DES Discharg	ers (>1MGD or <1M0	GD and withir	n 1 mile)	NPD	ES Numbe	er	Volume (MGD)		
	,	None								
Vater Quality Param	eters				S	ite Photog	jraph			
emperature (°C)		32.1	and the second		THE STR	- v 4	学的人			
Dissolved Oxygen (mg	a/L)	7			1	and the second		and sold states		
Specific Conductance		130	100	112			6 (and 1)			
H (s.u.)		8.3			At					
Vater Clarity		Slightly Turbid				2	e el restado			
labitat Assessment	Scores (max)			a martin			e ante	a start		
Channel Modification	(5)	4		Que dat	- Marcalana	the sector		And a state of the		
nstream Habitat (20)		14		a series and	- inter	120	Mart C			
Bottom Substrate (15)	)	10		and the second	and the second	Jan J		And the second		
Pool Variety (10)		6		2 martin			1	DA T THE A		
Riffle Habitat (16)		14					Section and	and the second second		
eft Bank Stability (7)		6		A ALL		Jac La				
Right Bank Stability (7		6	2. A.	nin -	and the second	1		and the second		
ight Penetration (10)		8					The second second	AND DESCRIPTION		
eft Riparian Score (5		3	10	Service State	and the state	- and the second	CONTRACTOR DATA			
Right Riparian Score (	(5)	3								

Right Riparian Score (5) Total Habitat Score (100)

Bedrock, rubble, boulder, gravel, snad, 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

Substrate

74

#### **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 *Triaenodes 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.

Waterbody		Location	Da	ate	Station ID	Bioclassification			
BULL CR		SR 1574	06/1	9/07	EF13	Good-Fair			
County Subb	asin 8 digit HUC	Latitude	Longitude		AU Number	Level I	V Ecoregion		
MADISON 4	06010105	35.80722222	-82.60916667		6-96-16	Broa	Broad Basins		
	<b>D</b> : <b>A</b> ( :0)	-							
Stream Classification	Drainage Area (mi2)	Elevatio		eam Wid		verage Depth (m)	Reference Sit		
C	20.7	1900	J	7		0.3	No		
	Forested/Wetland	Urb	ban	Agr	iculture	Other	(describe)		
Visible Landuse (%)	80	20 (rural r	esidential)		0		0		
		un al contribution of constitue	、			han			
pstream NPDES Discharger		ind within 1 mile	·)		NPDES Num	iber	Volume (MGD)		
	None								
ater Quality Parameters					Site Ph	otograph			
emperature (°C)	18.7	and the second		al de		1 The loss	all the second second		
issolved Oxygen (mg/L)	8.1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	- Charles	1.2			- Carriel -		
Specific Conductance (µS/cm)	103		and the second	1.20		I and the second	all the second		
H (s.u.)	6.3		and the second			the start			
_			-			and the	Contraction of		
Vater Clarity	Very slightly turbid	25- 1		a series		ST'N			
	, , ,	-	and the second		A Real	2 1 1 1 1			
abitat Assessment Scores (I	nax)		-	10	and the second s	3.14 6	and the second		
hannel Modification (5)	5	4 m - 1		10		- Take	Complex ( Pro		
nstream Habitat (20)	18	and the second		- Ander			The states		
ottom Substrate (15)	12		- met	and a		and the second	100		
ool Variety (10)	6			-	the -	Stand Road			
iffle Habitat (16)	15		The second		and the	CE STAT	1.1		
eft Bank Stability (7)	6		a come	1	the second	the case			
ight Bank Stability (7)	6	and the second		a. a.	and the second		S STA		
ight Penetration (10)	9	an	the second second	2 States	and the second	and the second			
eft Riparian Score (5)	4		- 6 - 3- 3- 3- 3- 3- 3- 3- 3- 3- 3- 3- 3- 3		the state	Contraction of the second	100 A 29		
ight Riparian Score (5)	5								
otal Habitat Score (100)	86	Subs	strate cobble,	boulder,	gravel, sand, silt	t			
Sample Date	Sample		Species To	tal	NCIE	31	Bioclassification		
06/19/07	2007-8		15		44		Good-Fair		
06/19/02	2002-74		14		40		Good-Fair		
Most Abundant Species	Central Stoner	oller	Exot	ic Speci	es Redbi	reast Sunfish and Ra			
pecies Change Since Last C	ycle Gains -	- Rainbow Trout	and Western Blac	knose Da	ace. <b>Losses</b> W	/hite Sucker.			
ata Analysis									

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.

Waterbo	ody			Location		Date Station ID			ID	D Bioclassification			
BIG PIN	ECR	ł	of	f SR 1151		06/19	/07	/07 EF73			Not Rated		
County	Sub	obasin	8 digit HUC	Latitude	Long	itude	AU	Number		Level I	V Ecor	egion	
MADISON		4	06010105	35.8384563	-82.77	724754 6-108			Southern Crystalline Ridges and Mountains				
Stream Classifica	tion	Draina	age Area (mi2)	Elevatio	Elevation (ft) Stre			lth (m)	Av	Average Depth (m) Reference			
С			15.8	170	0		7			0.3		Yes	
	Forested/Wetland			Urt	ban		Agı	riculture		O	ther (de	escribe)	
Visible Landuse	Visible Landuse (%) 80			20 (rural r	esidential)			0			0		
Upstream NPDES Dis	scharg	ers (>1MC	GD or <1MGD a	nd within 1 mile	e)			NPDES	Numb	er	v	olume (MGD)	
		•	None		,			-					
Water Quality Param	eters							Si	te Pho	tograph			
Temperature (°C) Dissolved Oxygen (mo Specific Conductance pH (s.u.)		1)	21.5 8.1 58 6.7				Sul	1-1-		X	P.	3	
Water Clarity		Very	slightly turbid							ist.		1	
Habitat Assessment	Scores	s (max)			al and	-		1	10		144		
Channel Modification ( Instream Habitat (20) Bottom Substrate (15) Pool Variety (10) Riffle Habitat (16) Left Bank Stability (7) Right Bank Stability (7) Light Penetration (10) Left Riparian Score (5) Right Riparian Score (10)	) 7) ;)		5 18 12 6 16 6 6 7 4 3					A start of					
Total Habitat Score (								bedrock					

Sample Date	Sample ID Speci		cies Total	NCIBI	Bioclassification
06/19/07	2007-87		9		Not Rated
Most Abundant Species	River Chub	River Chub		ies 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 loca

Waterbo	Waterbody		Locati	on		St	ation	ID	Date			Bioclassification	
Big Laur	el Cr		SR 15	503		E	B18	4	09	9/18/06	6	Excellent	
County	Subba	asin	8 digit HUC	Lat	itude	Longi	tude	AUN	lumber		Level IV Ecoregion		
Madison	4		06010105	35	5436	8232		6	-112	Souther	Southern Crystalline Ridges and Mountains		
Stream Classifica	ation	Dr	ainage Area (mi2	2)	Elev	ation (ft	)	Strea	am Width	ı (m)		Stream Depth (m)	
C; Tr				,		2,677	, 		4			0.3	
	Forested/Wetland							Agricult	ure		Ot	her (describe)	
Visible Landuse	Visible Landuse (%) 50				Urban 40			10				0	
Upstream NPI	s (>1MGD or <1N	IGD ar	nd withii	n 1 mile)	-	NP	DES Nur	nber		Volume (MGD)			
None							N/A			N/A			
Water Quality Param	Water Quality Parameters Site Photograph												
Temperature (°C)			18.7			1			the de	1.	The .	Contract of the	
Dissolved Oxygen (mg	g/L)		7.7		200	S AN	to a		1	THE	1	A State Party : May	
Specific Conductance			45			2	100		and a second	. ik	1 Aster		
pH (s.u.)			6.1		7		and the second s		-		1-3	A CANADA CANADA	
Water Clarity	[		Clear										
Habitat Assessment	Scores (	max)			-1-	Collina -			5.5 C.				
Channel Modification	(5)		4		al a	To	-		and the second	-	a since	and states and see all	
Instream Habitat (20)			18					and the second				- Contraction	
Bottom Substrate (15)	)		12		T	2		and and	The second second		S.C.	24	
Pool Variety (10)			4		20	The second	-		-				
Riffle Habitat (16)			14				-		-	-		A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER OWNE	
Left Bank Stability (7)			7			CR-	-	-	-	-	and and	S. C. S. Water	
Right Bank Stability (7	7)		7			20	-		and the second	1	Te	the state of the s	
Light Penetration (10)			9		R Sal					Ren -	-		
Left Riparian Score (5	5)		3		the second	-							
Right Riparian Score (	(5)		5										

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

Rubble, gravel, sand, silt, and boulder.

Substrate

83

### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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 fuscula*. 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*, *Plauditus 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)

Waterboo	dy		Locatio	Station	ID		Date	Bioclassification	
Big Laure	el Cr		NC 20	8	EB18	31	09	9/21/06	Excellent
County	Subbas	sin 8 dig	it HUC	Latitude	Longitude	AUI	Number	Le	evel IV Ecoregion
Madison	4	-	10105	355522	824505	6	6-112 So		Metasedimentary Mountains
Stream Classifica	Stream Classification Drainage Area (mi2)				vation (ft)	Stre	am Width	ı (m)	Stream Depth (m)
C; Tr		_	7.5		,640		20		0.4
		_							
Visible Landuse	etland	Urban 0		Agricul 0	ture		Other (describe) 10-Residential		
Visible Landuse	(%)	90		0		0			10-Residential
Upstream NPI	DES Disch	argers (>1M	GD or <1MC	GD and within	n 1 mile)	N	PDES Nu	nber	Volume (MGD)
None							N/A		N/A
Water Quality Param	eters						Site Pho	otograph	
Temperature (°C)			14.6						
Dissolved Oxygen (mg	g/L)		9.49		S. Jacobs				
Specific Conductance	(µS/cm)		78	and the second	Apple A	C. Ore		and the second second	
pH (s.u.)			7						
Water Clarity		Clear		1				16 AV2	
						5	The second		
Habitat Assessment	Scores (m	nax)		14					
Channel Modification (	(5)		4						and and a set
Instream Habitat (20)			16						States - Bridge Bridge
Bottom Substrate (15)	)		8	Contraction of the	and the second	Section 1			
Pool Variety (10)			3			and the second		the next	
Riffle Habitat (16)			12			ALC: NO		1-1-2	
Left Bank Stability (7)			7		Carlos -	The second	Constanting of the		
Right Bank Stability (7	")		6		and the second		ALL AND		
Light Penetration (10)			6	a street	The states	and the second	200	and the second	and the second second
Left Riparian Score (5)	)		5		and a		and the second		and the second
Right Riparian Score (	(5)		2						

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

Rubble, sand, gravel, boulder and silt.

Substrate

69

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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*, *Centrotilum* 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.

		Location Station I											
Waterbo	-			-				I		Date		Bioclassification	
Puncheo	on Fk		SR 15	<b>603</b>		EE	321	7	08	3/01/0	7	Excellent	
County	Subb	asin	8 digit HUC	Lat	titude	Longit	ude	AUN	lumber		Level IV Ecoregion		
Madison	4		06010105	35	5435	82323		6-112-5 South			outhern Crystaline Ridges and Mountains		
Stream Classifica	ation	D	rainage Area (mi2	)	Eleva	ation (ft)	) Stre		am Width	(m)	n) Stream Depth (m)		
C; Tr	C; Tr		7.3		2	2,998			5			0.5	
	Forested/		ested/Wetland		Urban			Agricult	ure		Ot	her (describe)	
Visible Landuse	(%)		40		20			30			10	) (Commercial)	
Upstream NPI	Upstream NPDES Dischargers (>1M			GD ai	nd within	1 mile)		NP	DES Nui	nber		Volume (MGD)	
	None			· · · · · · · · · · · · · · · · · · ·									
Water Quality Param	eters								Site Pho	otograph			
Temperature (°C)			23.3		1.10			A SIGNA	N. CAR				
Dissolved Oxygen (mg	n/L)		7.2			- 10 A	-	C.	Falls Harris		PA 7	the second second	
Specific Conductance			41.4		1	. 2	-		-	a series			
pH (s.u.)	(1)		6.4			. 4	ay	AN			100		
Water Clarity		SI	ightly Turbid		A CONTRACTOR		-		- And		-		
Habitat Assessment	Scores	(max)			1	-				-	Cont.		
Channel Modification	(5)	. ,	4		-	the state			- and	at the second			
Instream Habitat (20)	. ,		15				-	-	A.				
Bottom Substrate (15)	)		14		Alt -	a second		100	4	a Bare	230	Par	
Pool Variety (10)			4		8	1			27	The strength	100	and the second s	
Riffle Habitat (16)			16		1								
Left Bank Stability (7)			6		( Section of the sect							Service of the servic	
Right Bank Stability (7			6			- and							
Light Penetration (10)			7		State C								
Left Riparian Score (5			1		-	-	1.7	-	1000	and the second		一部町	
Right Riparian Score (	. ,		1		Substra	to F	2 1 - 1						
Total Habitat Score (100)     74     Substrate     Boulder, rubble, gravel, and sa					and sand	1.							

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 *Diphetor hageni, Ephemerella subvaria*, and the caddisflies *Diphetor 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.

dy	Locatio	n	Station I	D	Date	Bioclassification
urel Cr	NC 20	8	EB219	9 09	/19/06	Excellent
Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	vel IV Ecoregion
4	06010105	355607	824435	6-112-26	Southern M	etasedimentary Mountains
ntion [	Drainage Area (mi2)	Elev	vation (ft)	Stream Width	(m)	Stream Depth (m)
	54.8	-		10	(,	0.4
_						
						other (describe) 20-Residential
(%)	80	0		0		20-Residentia
DES Discharge	ers (>1MGD or <1MG	D and withir	n 1 mile)	NPDES Num	nber	Volume (MGD)
irel Elementary	School			NC0034207	001	0.005
eters				Site Pho	tograph	
	17.9	All and		1		
a/L)	8.5		AL CON	A Carton Carton		A Second
	49			and the second		The Anna
. , , , , , , , , , , , , , , , , , , ,	5.9	A MARK		an after		part the state
						ALL ALL
	Clear	1000	distance of			- 11. (c ) - 11.
Scores (max)		3.5.7				
(5)	4	TOT PETO	a contraction		and the second	
	18		The states	Contraction -	ALC: LONG TO A	
	15			A state of the second stat	and the second second	AND REAL
	5		112		144	
	14			the second second	and the second	The second
	5			the state	a station	- The state
·)	6	- Contraction				
	7	5. B. E.			1125	A chart
)	1	1992 B			2	the state
	urel Cr Subbasin 4 tion Γ For (%) DES Discharge rel Elementary eters g/L) (μS/cm) Scores (max) (5)	urel Cr         NC 20           Subbasin         8 digit HUC           4         06010105           ttion         Drainage Area (mi2)           54.8         54.8           Forested/Wetland           (%)         80           DES Dischargers (>1MGD or <1MC	urel Cr         NC 208           Subbasin         8 digit HUC         Latitude           4         06010105         355607           ttion         Drainage Area (mi2)         Elev           54.8         1           Forested/Wetland         Urban           (%)         80         0           Dischargers (>1MGD or <1MGD and within rel Elementary School	Urel Cr         NC 208         EB219           Subbasin         8 digit HUC         Latitude         Longitude           4         06010105         355607         824435           ttion         Drainage Area (mi2)         Elevation (ft)         824435           ttion         Drainage Area (mi2)         Elevation (ft)         824435           (%)         54.8         1,712         1           Forested/Wetland         Urban         A           (%)         80         0         0           DES Dischargers (>1MGD or <1MGD and within 1 mile)	urel Cr         NC 208         EB219         09           Subbasin         8 digit HUC         Latitude         Longitude         AU Number           4         06010105         355607         824435         6-112-26           ttion         Drainage Area (mi2)         Elevation (ft)         Stream Width           54.8         1,712         10           Forested/Wetland         Urban         Agriculture           (%)         80         0         0           DES Dischargers (>1MGD or <1MGD and within 1 mile)	Urel Cr         NC 208         EB219         09/19/06           Subbasin         8 digit HUC         Latitude         Longitude         AU Number         Le           4         06010105         355607         824435         6-112-26         Southern M           ttion         Drainage Area (mi2)         Elevation (ft)         Stream Width (m)         1           54.8         1,712         10         10         1         1           Forested/Wetland         Urban         Agriculture         C           (%)         80         0         0         0         0           DES Dischargers (>1MGD or <1MGD and within 1 mile)

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

3

78

## **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 *Eccoptura xanthenes*, *Paragnetina immarginata*, *Pteronarcys proteus*, and the caddislifes *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 sine 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).

Waterbody		Locatio	n	Station	ID		Date	Bioclassification			
Spring	Cr	SR 11	72	EB22	22	1′	1/01/06	Excellent			
County	Subbasin	8 digit HUC	Latitude	Longitude	AUI	Number		Level IV Ecoregion			
Madison	4	06010105	354800	825110	-	18-(1)	Southern	Crystalline Ridges and Mountains			
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Strea	am Width	(m)	Stream Depth (m)			
C; Tr		30.8	2	2,437		6		0.3			
	Fo	rested/Wetland	Urban		Agricul	ture		Other (describe)			
Visible Landuse		50	0		30			20-road			
Upstream NP	DES Discharg	ers (>1MGD or <1M	GD and withir	n 1 mile)	NF	PDES Nui	mber	Volume (MGD)			
None						N/A		N/A			
Water Quality Param	Water Quality Parameters Site Photograph										
Temperature (°C)		10.6	Sect.	and the second							
Dissolved Oxygen (mg	a/L)	10.2		R. Car	50.			- Al			
Specific Conductance		63			and the second		hu				
pH (s.u.)		7.4				and a	X	and the second second			
Water Clarity		Clear					A				
Habitat Assessment	Scores (max)				1.1.24	12200					
Channel Modification	(5)	2	Same in	and the second	and a	14- X-1	A Street	A CALL STREET			
Instream Habitat (20)		18	alter -		105-		-	the states of the			
Bottom Substrate (15)	)	8	1		and a	-					
Pool Variety (10)		2	1		-	- Solar	-				
Riffle Habitat (16)		16		1 a				Frank Contraction			
Left Bank Stability (7)		2	1.40	-	the second		- Aller				
Right Bank Stability (7	7)	3	14 - A.	1917 - A	alt-	No. All	-	Charles Martin			
Light Penetration (10)		2			- sup	2 000	CU C	a second			
Left Riparian Score (5	5)	2	2 all	F-AR		2005-					
Right Ringrian Score	2										

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

57

#### **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 *Agnetina capitata* and *Tallapera* 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 evidnece 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 abundnace have generally been on the increase. Sampling at the historic basinsite at NC 209 will resume in 2012.

Waterb	Waterbody			Location				Date Station I			ID Bioclassification		
MEADO	W FK			NC 209		06/19	/07	EF7	<b>'</b> 2		Goo	bd	
County	Subba	asin	8 digit HUC	Latitude	Long	itude	AU	Number			IV Ecore	-	
MADISON	4		06010105	35.8309149	-82.86	20598	6-′	118-19	Sou	ithern Crystalli	ne Ridge	es and Mountains	
Stream Classifica	ation	Draina	ige Area (mi2)	Elevatio	n (ft)	Strop	am Wic	ith (m)	۵۱	verage Depth	(m)	Reference Site	
C;Tr		Drama	22.7	190			7			0.4	(11)	Yes	
0,11			22.1	190	0		1			0.4		165	
		Fores	sted/Wetland	Urt	ban		Agi	riculture		C	)ther (de	scribe)	
Visible Landuse	(%)		98	2 (rural re	esidential)			0			0		
Upstream NPDES Di	ischarger	e (~1MG	D or <1MCD a	nd within 1 mile				NPDE	S Numt	oor	V	olume (MGD)	
	ischarger:	5 (>11110	None		•)								
			None										
Water Quality Param	neters							9	Site Pho	otograph			
Temperature (°C)			18.8		-56	1400	1	Parts -		1.1			
Dissolved Oxygen (m	ig/L)		8.5		11	a contra	200	and the second	1.1.4	- interest		100 A 2	
Specific Conductance	e (µS/cm)		41	-				Carlos -	1	and the	-		
pH (s.u.)			6.2		The sur	E.		100	and a second	A COM	diana.		
				1		1	100	and the second	1	and the state	A		
Water Clarity			Clear	1.7		10 - S		4-	Series	AN ST	1.10		
				- And	1953	1477.00	35	150			17		
Habitat Assessment	Scores (r	nax)		5.10			-			1			
Channel Modification	(5)		5	19	100	-			the f				
Instream Habitat (20)			20	1				-	-	Carta			
Bottom Substrate (15	5)		15				1.0	1000				1º	
Pool Variety (10)			9	10	- 10-5	Martin .	No. al	-	C. and P.	- The second second	-	A hand a state	
Riffle Habitat (16)			16		Call 1	1 1	1	200					
Left Bank Stability (7)	)		7	de	St. Ma		10	1	- 18		-		
Right Bank Stability (7			7	and the second	Sec.		200	976 TA			-		
Light Penetration (10)			10	Par -	20142	TR.	111	Street 4		Ne -	-	2	
Left Riparian Score (5			5	162		a star	1	Chines	1			Comment No.	
Right Riparian Score	(5)		5										
Total Habitat Score			99	Sub	strate	cobble, b	oulder,	gravel					
Sample Date	•		Sample I		Sno	cies Tota	J		NCIB		Bio	classification	
06/19/07	5		2007-86		Ope	11			48		ЫС	Good	
00/10/01			2007 00						-0			0000	
Most Abundant Sp	ecies		Longnose Dace	N		Exotic	: Speci	es	Rainho	ow Trout and B	Rown Tre	out	
	- 3100								Admbe				
Species Change Sin	ce Last C	ycle	N/A										
Data Analysis													
This is the first fish co													
location is just above													
Supported Trout Wate	ers. Habit	at ver	y high quality in:	stream habitats i	including h	nigh gradie	ent riffle	es and run	s, and fa	ast plunge poo	ols; the st	ream is braided in	

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.

Waterbody			Locat	Location Station			ation I	Date				Bioclassification
Pigeon	R		I-40 at Brow	n's Bi	ridge	E	B25(	0	30	8/08/07	7	Good
County	Subb	asin	8 digit HUC	Lat	itude	Longit	ude	AU N	lumber		Lev	el IV Ecoregion
Cocke Co., Tenn.	5	5	6010106	35	4707	8306	47	5-	·(7)f		E	Broad Basins
Stream Classificat	tion	C	Drainage Area (mi	2)	Eleva	ation (ft)		Strea	m Width	(m)		Stream Depth (m)
С			535		2	,048			40			0.6
		For	ested/Wetland		Urban			Agricult	ure		Ot	her (describe)
Visible Landuse (	(%)		100		0			0				0
Upstream NPD	ES Dis	charge	rs (>1MGD or <1M	/IGD ar	nd within	1 mile)		NP	DES Nur	nber		Volume (MGD)
None		<u></u> j.							N/A			N/A
Water Quality Parame	eters								Site Pho	tograph		
Temperature (°C)			22.6			a de la c		Sec.		100	100	
Dissolved Oxygen (mg	/L)		N/A									and the second second
Specific Conductance			220									
pH (s.u.)	(i )		6.4									
Water Clarity		S	lightly Turbid									A BA
Habitat Assessment S	Scores	(max)								-	-	and any
Channel Modification (	5)		4		-	-	-	-		Carrow and	-	
Instream Habitat (20)			15					and a				
Bottom Substrate (15)			10		-		1	1	Res and		EN-	
Pool Variety (10)			4			Contraction of the second				- Jane -	-	
Riffle Habitat (16)			14			0			and street of the	and the second	- mit	de sole
Left Bank Stability (7)			7			and the second		2	and the	-		
Right Bank Stability (7)	)		5					CHE A L	-	and the	-	
Light Penetration (10)			5		and the second	al the state	-	Contrast of			-	and the second
Left Riparian Score (5)			5			-	talka -	-		AND DO T	- aut	and the state of
Right Riparian Score (5	5)		1									
Total Habitat Score (1	00)		70		Substra	te	Boulde	er, rubble	e, gravel,	and sand	l with a t	race 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).

Waterbody			Location Station			tion ID	D Date				Bioclassification
W Fk Pige	eon R		SR 12	16	EE	3273	;	08	3/08/07	7	Excellent
County	Subba	sin 8 di	git HUC	Latitude	Longit	ude	AU N	lumber		Level IV Ecoregion	
Haywood	5		010106	352346	8256			0 Southern 0			aline Ridges and Mountains
Stream Classifica	Stream Classification Drainage				vation (ft)		Strea	am Width	(m)		Stream Depth (m)
WS-III; Tr		- · · ·	28		2,998			15			0.5
		Forested/\	Vetland	Urba	n	Α	gricult	ure		Ot	her (describe)
Visible Landuse	(%)	90		0			0				10 (SR 1216)
Upstream NPI	DES Discl	hargers (>1M	IGD or <1M	GD and with	in 1 mile)		NP	DES Nur	nber		Volume (MGD)
None								N/A			N/A
Water Quality Param	neters							Site Pho	tograph		
Temperature (°C)			22.3	(C - 5)			1	and the	A Sant		
Dissolved Oxygen (mg	g/L)		10.9	182			1	C E P	No Walky		
Specific Conductance			6	1426			1	1			
pH (s.u.)			6.3				-		101		Contraction of
Water Clarity		Clea	ır	a st	1.1	+ 3					<u>in s</u>
Habitat Assessment	Scores (n	nax)			=7	3		and the second second		2.9	
Channel Modification	(5)		4	-	and the second s			1 - A - A - A - A - A - A - A - A - A -	And and a second second	-	
Instream Habitat (20)			17	Contract of the	-	-			A STATE	and the	A State of the state
Bottom Substrate (15)	)		15	Carrier 1	C. S. Same	Surger and		Leirona d	- and	Sa CRACE	and the second
Pool Variety (10)			5				1775	1	All and a second	A Contraction	
Riffle Habitat (16)			15					1.10	he		A CONTRACTOR OF THE
Left Bank Stability (7)			6		and the	44			States.	199	and the second se
Right Bank Stability (7	7)		6	the state		-	臣 计	1	See.		A Sur and
Light Penetration (10)			7	1000	the states	A STATE	The	Star Store	Landon.		
Left Riparian Score (5			5			Are		Salarad	ALC: N	- might	A State Barries
Right Riparian Score (	(5)		2								

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

Rubble, boulder, gravel, sand.

Substrate

82

### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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.

Waterboo	Waterbody			cation Station			ID	D Date			Bioclassification		
Richland	d Cr		Business	, US	23	E	B26	2	08	8/07/07	7	Good-Fair	
County	Subb	asin	8 digit HUC	it HUC Latitude Longitude			tude	AU Number			Leve	Level IV Ecoregion	
Haywood	5		06010106	35	2752	8300		5-16-	(11.5)b			Broad Basins	
Stream Classifica	Stream Classification Drainage			:)	Elev	ation (ft)	)	Strea	am Width	(m)		Stream Depth (m)	
B; Tr			11		2	2,759			5			0.3	
		For	ested/Wetland		Urban			Agricult	ure		Ot	her (describe)	
Visible Landuse	(%)		10		90			0				0	
Upstream NPD	DES Dis	charge	rs (>1MGD or <1M	IGD aı	າd withir	n 1 mile)		NP	DES Nur	nber		Volume (MGD)	
None			•			,			N/A			N/A	
Water Quality Parame	eters								Site Pho	tograph			
Temperature (°C)			27.9		1	517	10	Carlos A	1.1	Sec. 1		and the second second	
Dissolved Oxygen (mg	n/L )		6.6		12-		$\mathcal{T}_{\mathcal{T}}$		S. See				
Specific Conductance			24.5		12	1.1	San a	Sec. de	No.	S-Level	·		
pH (s.u.)	(µ0,011)		6.8		67	6.9	1 June				10 4		
Water Clarity			Clear							<b>1</b>			
Habitat Assessment	Scores	(max)			the state	1	a passive		all sea				
Channel Modification (	(5)		3		1.00	1	-	100	Contraction of the local division of the loc				
Instream Habitat (20)			14		12.48	1 m -	×	and the	ere -		-		
Bottom Substrate (15)			14		2-1	1-	57. L	The second	-land	-			
Pool Variety (10)			4		-			-200	1000				
Riffle Habitat (16)			14			-	-				Asia	The second second	
Left Bank Stability (7)			6					- 10-	- 24				
Right Bank Stability (7	.)		6				-	the second second	1	100			
Light Penetration (10)			9			-	-	dien.	ter a	and the	- The	and the second second	
Left Riparian Score (5)	)		2		-			100	- Theory				
Right Riparian Score (	5)		1	ļ									
Total Habitat Score (*	100)		73		Substra	ate	Rubb	le, gravel	l, sand, ar	nd boulde	r.		

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.

Waterb	ody			Location		Date Station ID			Bic	Bioclassification		
RICHLAN	ND CR	2	B	oyd Ave		06/15/0	)7	EF44	N	Not Rated		
Country	Ck.k											
County		asin	8 digit HUC	Latitude	Long			AU Number		Level IV Ecoregion		
HAYWOOD	Ę	)	06010106	35.48916667	-82.995	916667		5-16-(11.5)a		Broad Bas	ins	
Stream Classifica	tion	Drain	age Area (mi2)	Elevatio	on (ft)	Stream	Wid	lth (m) A	verage Depth (I	m) F	eference Site	
B;Tr			42.9	266	5		12		0.4		No	
	<b>F</b>	Fore	sted/Wetland	_	ban		Agı	riculture	Ot	her (descr	ibe)	
Visible Landuse	(%)		25	75 (res	idential)			0		0		
Upstream NPDES Di	scharge	rs (>1M(	GD or <1MGD a	nd within 1 mile	<u>.</u> )			NPDES Num	per	Volur	ne (MGD)	
	Jerren ger	• (*	None		- , - ,							
Water Quality Param	eters							Site Ph	otograph		57 A 4850	
Temperature (°C)			16.6	and the second				S 42	10 M	20 - X		
Dissolved Oxygen (mg	g/L)		9.0						- Berger			
Specific Conductance	(µS/cm)		50		the set					Sec. 5		
pH (s.u.)			6.9					Charles on				
				Contraction of the	and share		45	1000	6 M 3 1 1	-		
Water Clarity			Clear	1.5						a sum a	China	
Habitat Assessment	Scores	(max)			2/1				a de tra	-3.	- Allar	
		шах)		& Pack	1. A.		12.40				11 1 2 3	
Channel Modification Instream Habitat (20)	(5)		5 18	2 Enter	-					ANT MARKE		
Bottom Substrate (15)	\		13	a liter	- see	Same Mar		and the second		-	~	
Pool Variety (10)	)		6	1. S.	14	are post		Contraction of the second	and the second	-		
Riffle Habitat (16)			16		P. Marrie		-	and the second sec	-	Contraction of the second		
Left Bank Stability (7)			6			and a second		and the second	the second	And and		
Right Bank Stability (7	7)		6	-	and the second		1	Martin .	the states in			
Light Penetration (10)			8	and the second	1000	-	5	Stand State	See Street	and the second second		
Left Riparian Score (5			2	TRACTOR OF	and the second	To the second		Contraction of the	State - 25			
Right Riparian Score	(5)		3									
Total Habitat Score (	(100)		83	Sub	strate	Cobble and	bou	lder				
Sample Date	•		Sample I	D	Spe	cies Total		NCIE	I	Biocla	ssification	
06/15/07			2007-82			7				No	t Rated	
07/17/01			2001-78			11		28			Poor	
Most Abundant Spe	ecies		Longnose Dace	)		Exotic S	peci	es Rainbo	ow Trout, Brown	Trout, and	Green Sunfish	
Species Change Sin	ce Last (	Cycle		Western Blackr and Black Crap		Losses	Whi	tetail Shiner, Whit	e Sucker, Browr	n Bullhead,	Redbreast	
Data Analysis												
Watershed a tributa corridor. Habitat fa riparian zones. 2007	st, shallo conduc	w riffles tivity slig	and runs; undero phtly elevated; m	cuts and snags; ore than twice a	very clean s many fis	substrate; o	pen cted	canopy near the t	oridge, then shad 001 (n = 410 vs.	ded; reside 200); only	nces 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).

Waterb	ody	Locatio	n	Station I	D	Date	Bioclassification
Richlar	nd Cr	SR 11	84	EB26	0 08	8/07/07	Good
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion
Haywood	5	06010106	353031	825819	0		Broad Basins
Stream Classifi	cation	Drainage Area (mi2)	Elevation (ft) St		Stream Width	(m)	Stream Depth (m)
В				2,586	10	(,	0.3
	_						
Visible Landuse (%)		50	Urban 50		Agriculture		Other (describe)
		50	50		0		0
Upstream N	PDES Discharge	ers (>1MGD or <1MC	GD and within	n 1 mile)	NPDES Nun	nber	Volume (MGD)
lone					N/A		N/A
Vater Quality Para	meters				Site Pho	tograph	
emperature (°C)		N/A	11 19	A		The seal	
Dissolved Oxygen (r	mg/L)	N/A					And States in
Specific Conductance	ce (µS/cm)	N/A	dian.	and the second	a sector and	The state	
oH (s.u.)		7.2	and the second			ALC: NO	
Vater Clarity		Slightly Turbid					and the second second
		enginiy rationa			State State	1000	Torona Marine
labitat Assessmer	nt Scores (max)		a water		Summer and		
Channel Modification	n (5)	4	State Ba	the state of the			THE REAL
nstream Habitat (20	))	15		Anna an Anna			Contraction of the second
Bottom Substrate (1	5)	14	Sec.	a section	Start Charge	a make	
ool Variety (10)		3	200	and the		and the second	
Riffle Habitat (16)		15	195	a state of the	Alexander .		
eft Bank Stability (7	7)	6	-	and and the	THE REAL OF	1. Stylester	
Right Bank Stability	(7)	5		P Berthur			and the start
ight Penetration (10	0)	8	a star	2		S. Day	A de la compañía de la
eft Riparian Score	(5)	5	forest,	a fell a f	and the set	I THE REAL	
Pight Dingrign Score	o (5)	2					

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

### **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 *Triaenodes 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.

RICHLAND CR         SR 1184         06/15/07         EF47         Fair           County         Subbasin         8 digit HUC         Latitude         Longitude         AU Number         Level IV Ecoregion           HAYWOOD         5         06010106         35.5083333         42.97194444         5-16-(11.5)c         Broad Basins           Stream Classification         Drainage Area (mi2)         Elevation (ft)         Stream Width (m)         Average Depth (m)         Reference           B:Tr         48         2590         9         0.4         No           Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)         NDES Number         Volume (MGD           Visible Landuse (%)         16.5	Waterbody			Location		Date	Station	ID	Bioclass	ification	
HAYWOOD         5         06010106         35.50833333         -82.97194444         5-16-(11.5):         Broad Basins           Stream Classification         Drainage Area (mi2)         Elevation (ft)         Stream Width (m)         Average Depth (m)         Reference           B;Tr         48         2590         9         0.4         No           Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	RICHLAND	CR		SR 1184		06/15/07	EF4	7	Fair		
HAYWOOD         5         06010108         35.50833333         -82.97194444         5-16-(11.5):         Broad Basins           Stream Classification         Drainage Area (mi2)         Elevation (ft)         Stream Width (m)         Average Depth (m)         Reference           B;Tr         48         2590         9         0.4         No           Visible Landuse (%)         Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)											
Stream Classification         Drainage Area (mi2)         Elevation (ft)         Stream Width (m)         Average Depth (m)         Reference           B;Tr         48         2590         9         0.4         No           Visible Landuse (%)         Forested/Wetland         Urban         Agriculture         Other (describe)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)		Subbasin	8 digit HUC	Latitude	Long	itude			Level IV Ecoregion		
B;Tr         48         2590         9         0.4         No           Visible Landuse (%)         Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	HAYWOOD	5	06010106	35.50833333	-82.971	194444	5-16-(11.5	)c	Broad	Basins	
B;Tr         48         2590         9         0.4         No           Visible Landuse (%)         Forested/Wetland         Urban         Agriculture         Other (describe)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	Stroom Classification	Droir	aga Araa (mi2)	Elovatio	n (ft)	Stroom W	idth (m)	Average D	onth (m)	Poforonoo Sito	
Forested/Wetland         Urban         Agriculture         Other (describe)           Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Uptream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)		Drain	• • •				ium (m)		• • •		
Visible Landuse (%)         70         5 (residential)         0         25 (industrial)           Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	5,11		-10	200	0	5		0	T		
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)         NPDES Number         Volume (MGD           None              Water Quality Parameters         Site Photograph             Temperature (°C)         16.5         8.3             Dissolved Oxygen (mg/L)         56         6.2              Water Clarity         Clear                Habitat Assessment Scores (max)                Channel Modification (5)         5         12               Pool Variety (10)         12                Right Bank Stability (7)                 Left Riparian Score (5)         5                  Sample Date         Sample ID         Species Total         NCIBI         Bioclassificatio           06/15/07         2007-81         12         36 <td></td> <td>Fore</td> <td>ested/Wetland</td> <td>Urb</td> <td>ban</td> <td>A</td> <td>griculture</td> <td></td> <td>Other (d</td> <td>escribe)</td>		Fore	ested/Wetland	Urb	ban	A	griculture		Other (d	escribe)	
None             Water Quality Parameters         Site Photograph           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 Riparian Score (5)         5           Right Riparian Score (5)         5           Right Riparian Score (5)         5           Right Riparian Score (5)         2           Sample Date         Sample ID         Species Total         NCIBI         Bioclassificatio           06/15/07         2007-81         12         36         Fair	Visible Landuse (%)		70	5 (resid	dential)		0		25 (ind	ustrial)	
None             Water Quality Parameters         Site Photograph           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 Riparian Score (5)         5           Right Riparian Score (5)         5           Right Riparian Score (5)         5           Right Riparian Score (5)         5           Sample Date         Sample ID         Species Total         NCIBI         Bioclassification           06/15/07         2007-81         12         36         Fair	Unstream NDDES Disch	orgoro (> 1M		nd within 1 mile				Number	N	aluma (MCD)	
Water Quality Parameters       Site Photograph         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)       5         Channel Modification (5)       5         Instream Habitat (20)       18         Bottom Substrate (15)       12         Pool Variety (10)       8         Riffle Habitat (16)       16         Left Rank Stability (7)       7         Right Rak Stability (7)       4         Light Penetration (10)       8         Right Riparian Score (5)       2         Total Habitat Score (100)       85         Sample Date       Sample ID       Species Total       NCIBI       Bioclassification         06/15/07       2007-81       12       36       Fair	Opstream NPDES Disch	argers (>nw			;)		NFDE		v		
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)       6.2         Channel Modification (5)       5         Instream Habitat (20)       18         Bottom Substrate (15)       12         Pool Variety (10)       8         Riftle Habitat (16)       16         Left Bank Stability (7)       7         Right Bank Stability (7)       4         Light Penetration (10)       8         Left Riparian Score (5)       2         Total Habitat Score (100)       85         Sample Date       Sample ID       Species Total       NCIBI       Bioclassification         06/15/07       2007-81       12       36       Fair											
Dissolved Oxygen (mg/L) Specific Conductance (µS/cm) PH (s.u.) Water Clarity Habitat Assessment Scores (max) Channel Modification (5) Instream Habitat (20) Bottom Substrate (15) Pool Variety (10) Riffle Habitat (16) Left Bank Stability (7) Right Bank Stability (7) Right Bank Stability (7) Right Riparian Score (5) Right Riparian Score (5) Sample Date Sample Date Sample Date Sample ID Species Total 12 36 Fair	Water Quality Parameter	'S					S	ite Photograph	)		
Specific Conductance (µS/cm)       56         pH (s.u.)       6.2         Water Clarity       Clear         Habitat Assessment Scores (max)       5         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)       2         Total Habitat Score (100)       85         Sample Date       Sample ID       Species Total       NCIBI       Bioclassification         06/15/07       2007-81       12       36       Fair	Temperature (°C)		16.5		~	- Section	-	a state	N THE AL		
pH (s.u.)       6.2         Water Clarity       Clear         Habitat Assessment Scores (max)       5         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         Total Habitat Score (100)       85       Substrate       Cobble         Sample Date       Sample ID       Species Total       NCIBI       Bioclassification         06/15/07       2007-81       12       36       Fair	Dissolved Oxygen (mg/L)		8.3	100	E SA	and the second	A				
Water Clarity       Clear         Habitat Assessment Scores (max)       Filter         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         Total Habitat Score (100)       85         Sample Date       Sample ID       Species Total       NCIBI       Bioclassification         06/15/07       2007-81       12       36       Fair	Specific Conductance (µS	;/cm)		5-2-2-2	And the second	- Alera	- And		Carles .		
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         Sample Date       Sample ID         Sample Date       Sample ID	pH (s.u.)		6.2	16034							
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         Sample Date       Sample ID         Sample Date       Sample ID         Species Total       NCIBI         Bioclassification         06/15/07       2007-81				20.00	1 I I		1.0		and the		
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Channel Modification (5)5Instream Habitat (20)18Bottom Substrate (15)12Pool Variety (10)8Riffle Habitat (16)16Left Bank Stability (7)7Right Bank Stability (7)4Light Penetration (10)8Left Riparian Score (5)5Right Riparian Score (5)2Total Habitat Score (100)85Sample DateSample IDSpecies TotalNCIBIBioclassification06/15/072007-811236Fair	Habitat Assessment Scc	ores (max)		100	1	-					
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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         Sample Date       Sample ID         Sample ID       Species Total         NCIBI       Bioclassification         06/15/07       2007-81       12				24. A. M				PLE C			
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         Sample Date       Sample ID         Sample Date       Sample ID         O6/15/07       2007-81	. ,			Sec.	Also,	an states	and the second	Aller De	-	Part of the local division of the local divi	
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         Sample Date       Sample ID         Sample Date       Sample ID         06/15/07       2007-81			8				de la	CARA LA			
Right Bank Stability (7)     4       Light Penetration (10)     8       Left Riparian Score (5)     5       Right Riparian Score (5)     2       Total Habitat Score (100)     85       Sample Date     Sample ID       Sample ID     Species Total       NCIBI     Bioclassification       06/15/07     2007-81			16	199 N.		-				THE THE	
Light Penetration (10)     8       Left Riparian Score (5)     5       Right Riparian Score (5)     2       Total Habitat Score (100)     85       Sample Date     Sample ID       Sample ID     Species Total       NCIBI     Bioclassification       06/15/07     2007-81	Left Bank Stability (7)		7	AND DESCRIPTION	A A A	C. Com					
Left Riparian Score (5)     5       Right Riparian Score (5)     2       Total Habitat Score (100)     85       Sample Date     Sample ID     Species Total     NCIBI     Bioclassification       06/15/07     2007-81     12     36     Fair	Right Bank Stability (7)		4	The state of	-				22.00		
Right Riparian Score (5)     2       Total Habitat Score (100)     85     Substrate     Cobble       Sample Date     Sample ID     Species Total     NCIBI     Bioclassification       06/15/07     2007-81     12     36     Fair	Light Penetration (10)		8	The state				and the second second	Same -	and an and a	
Sample Date     Sample ID     Species Total     NCIBI     Bioclassification       06/15/07     2007-81     12     36     Fair	Left Riparian Score (5)		5					and the second	Services	Section 1	
Sample DateSample IDSpecies TotalNCIBIBioclassification06/15/072007-811236Fair											
06/15/07 2007-81 12 36 Fair	Total Habitat Score (100)	)	85	Sub	strate	Cobble					
	Sample Date		Sample	ID	Spe	cies Total		NCIBI	Bi	oclassification	
07/17/01 2001-77 9 28 Poor						12				Fair	
	07/17/01		2001-77	7		9		28		Poor	
Most Abundant Species       Central Stoneroller       Exotic Species       Rainbow Trout, Brown Trout, Redbreast S and Green Sunfish	Most Abundant Species	S	Central Stoner	oller		Exotic Spe	cies			, Redbreast Sunfish	
Species Change Since Last Cycle Gains Longnose Dace, Western Blacknose Dace, Smallmouth Bass, and Largemouth Bass. Losses Bluegill.	Species Change Since L	ast Cycle		-	e, Western	Blacknose Da	ce, Smallmo	uth Bass, and La	argemouth B	ass. Losses	
Data Analysis	Data Analysis										
Watershed a tributary to the Pigeon River; drains southwestern Haywood County, including the Waynesville metropolitan area; Hatchery Supported T											
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. 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 nu											

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).

Waterbody			Location		Date		Station ID	Bioclas	sification
RICHLAND C	R	Walı	nut Trail R	d	06/14/0	7	EF48	Goo	d-Fair
	ıbbasin	8 digit HUC	Latitude	Longi			U Number	Level IV Ecoregion	
HAYWOOD	5	06010106	35.53777778	-82.956	638889		5-16-(16)a	Broa	d Basins
Stream Classification	Drain	age Area (mi2)	Elevatio	n (ft)	Stream	Widt	h (m) Л	verage Depth (m)	Reference Site
C	Drain	64.7	251	. ,		13		0.4	No
0		04.7	201	0		10		0.4	NO
	Fore	ested/Wetland	Url	ban		Agrie	culture	Other (e	describe)
Visible Landuse (%)		55	15 (rural r	esidential)			25	5 (N	C 209)
Upstream NPDES Dischar	nore (>1M	GD or <1MGD a	nd within 1 mile				NPDES Numb	bor	Volume (MGD)
		None		=)					
Water Quality Parameters							Site Pho	otograph	
Temperature (°C)		22.7			Same St.	- and	Der Karl		
Dissolved Oxygen (mg/L)		6.4	A subscription	100					一下 计时间
Specific Conductance (µS/c	m)	60		2 1/	Contra la	-		and the state of the	
oH (s.u.)		5.8		1.5	True Con	10	Crist.		
		-	1 - CO.		No.		244		A121
Water Clarity		Clear				-			A Price
Habitat Assessment Score	es (max)				the second	11	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	And Anton	And Sector
Channel Modification (5)	,o (max)	5			al and the	14	- Contraction	10.50	Martinen
nstream Habitat (20)		18	- PEDOTE	-				1.	State State
Bottom Substrate (15)		13			al and	-	and the second		Station St.
Pool Variety (10)		6	7 5 1	-	Contraction of the				and a set
Riffle Habitat (16)		12				-1	and the	ALL STREET	200
eft Bank Stability (7)		5	and the second					Silf of the seals	and some and
Right Bank Stability (7)		5		100			and the second second	and an an	and the state
ight Penetration (10)		9	and the second second	C all de la constant	10 Aug 10			CONTRACTOR OF	
eft Riparian Score (5)		3	and the	The			and the second second	Charles and	1 2 - Bar
Right Riparian Score (5)		3							
otal Habitat Score (100)		79	Sub	strate	Cobble, bou	ilder, a	and gravel		
Sample Date		Sample I	D	Spe	cies Total		NCIB	I B	ioclassification
06/14/07		2007-80			10		40		Good-Fair
09/24/02		2002-83	3		12		32		Poor
10/22/97		97-91			12		38		Fair
Most Abundant Species		Central Stoner	oller		Exotic S	pecie	s Redbre	east Sunfish	
Species Change Since Las	st Cycle	Gains -	Tuckasedee Da	arter. Loss	ses Brown	Bullh	ead and Green S	Sunfish.	
Data Analysis									
Natershed a tributary to t	he Pigeon	River; drains sou	uthwestern Hayw	ood Count	ty, including	the C	ity of Waynesvill	e metropolitan area;	site is ~ 1.5 miles
bove the creek's confluenc									-
vater clear and warmer than								any fish were collect re: only 10 species p	

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 form 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.

Waterboo	Waterbody			Location			Station ID				Bioclassification
Richland	-		SR 15	519	EB26		51	l 08/07/0		7	Fair
County	Subb	asin	8 digit HUC	Latituc	le Long	itude	AU N	lumber	er Lev		el IV Ecoregion
Haywood	5		06010106	35325	2 825	645	0 Broad Basins			Broad Basins	
Stream Classificat	tion	Dra	ninage Area (mi2)	)	Elevation (ft)		Strea	am Width	(m)		Stream Depth (m)
С			67.7		2,493			9			0.6
		Fores	sted/Wetland	U	rban	-	Agricult	ure		Ot	her (describe)
Visible Landuse (%)			50		30		20				0
Upstream NPDES Dischargers (>			(>1MGD or <1M	GD and v	vithin 1 mile)		NF	DES Nur	nber		Volume (MGD)
None			•					N/A			N/A
Water Quality Parame	eters							Site Pho	tograph		
Temperature (°C)			N/A	12		. 199			1 Martin	- A	
Dissolved Oxygen (mg	I/L)		N/A	100		E.		the feet		-	A CHARLES
Specific Conductance			N/A			19		Sec. al			
pH (s.u.)			6.6		Contractor		5.00	a constant		-Engo	In Street In the
Water Clarity		Slig	htly Turbid								
Habitat Assessment S	Scores	(max)			1-1-1-						
Channel Modification (	5)		4		and the second	ie de la	- ·	-	-	and the second	The states of the
Instream Habitat (20)			14			1	R'al	August -		and the	
Bottom Substrate (15)			12	and the second	See -			200	- Por		A DESCRIPTION OF THE OWNER OF THE
Pool Variety (10)			4		and the second		140	Sec.			State of the second
Riffle Habitat (16)			14	-	and the	and a	-	-	Sec.		A AND A AND
Left Bank Stability (7)			6				-		and the second	La contraction	A manufathanta and
Right Bank Stability (7)	)		6	0	5-7	1.00	-		12		The second second
Light Penetration (10)			7			6		-	1000	R	A CARLES AT
Left Riparian Score (5)			4	62	harth	22	23-	The same	the same	-	C. Contraction of the
Right Riparian Score (5	5)		5								
Total Habitat Score (100) 76 Substrate Ru					Rubb	le, sand,	gravel, bo	oulder and	d bedroc	k.	

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 *Triaenodes 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 Heptagennid 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.

Waterbo	dy	Locatio	tion Station ID			Date	Bioclassification		
Johnatha	ns Cr	SR 13	306 EB239		39	08/07/0		Excellent	
County	Subbasin	8 digit HUC	Latitude	Longitude	AUI	Number	Imber Level IV Ecoregion		
Haywood	5	06010106	353107	830607		0	Metasedimentary Mountains		
Stream Classifica	ation	Drainage Area (mi2)	2) Elevation (ft)			am Width	(m)	Stream Depth (m)	
WS-III; Tr, C	WS-III; Tr, CA 1			2,974		6		0.4	
	Fo	prested/Wetland	Urban		Agricul	ture		Other (describe)	
Visible Landuse		70	30		0			0	
Upstream NPI	jers (>1MGD or <1M	GD and withir	n 1 mile)	NF	PDES Nur	nber	Volume (MGD)		
None	•				N/A		N/A		
Water Quality Parameters Site Photograph									
Temperature (°C)		N/A	and the second		and the				
Dissolved Oxygen (mg	g/L)	N/A	1.1	the Carlos S	and the	ALC: No.	A STANDA	A CONTRACTOR	
Specific Conductance		N/A	- W		200	1.	Page 1		
pH (s.u.)		N/A		A Tele -		ac Ri	A allow		
Water Clarity		Slightly Turbid							
Habitat Assessment	Scores (max)	)			-	5.00	and the second	the second second	
Channel Modification	(5)	4				and the second sec		and the second	
Instream Habitat (20)		15	a state	and the state	Read	-	Self 1	a fam and	
Bottom Substrate (15)	)	12						State States	
Pool Variety (10)		4	1000				Time		
Riffle Habitat (16)		16				1	Al and a state of the		
Left Bank Stability (7)		5					Contraction of the	and the second	
Right Bank Stability (7	7)	6				E. The	C.S. P.S.		
Light Penetration (10)		8	2.2		-		20 20	AND THE REAL PROPERTY OF	
Left Riparian Score (5	5)	0	15 - 1-					100 Mar 6	
Right Riparian Score (	(5)	3							

 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

Boulder, rubble, gravel, and sand.

Substrate

73

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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.

Waterbo	ody	Locatio	n	Station I	ID	Date	Bioclassification
Johnatha	ins Cr	SR 132	SR 1322		0 0	8/08/07	Good
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	L	evel IV Ecoregion
Haywood	5	06010106	353433	830107	0		Broad Basins
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Stream Width	n (m)	Stream Depth (m)
C; Tr				2,564	11		0.4
	Fa	reated (Matlend	Linkon		Acriculture		Other (describe)
Visible Landuse		rested/Wetland 30	Urban 50		Agriculture 20		Other (describe)
			DD and with it				
Maggie Valley WWTF		ers (>1MGD or <1MC	SD and within	n 1 mile)	NPDES Nur NC005656		1.0
Water Quality Param						otograph	
•	leter S	21.2		Millionalda	One The		
Temperature (°C)		N/A					
Dissolved Oxygen (m		N/A N/A	-	Mala - 20	Carl States State	1999 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
Specific Conductance	e (µS/cm)		-			and the second	
pH (s.u.)		6					
Water Clarity		Clear	and the second second	A Post		a second	The state of the state
	. Cooree (merr)			and they			
Habitat Assessment	· · ·	3	- Here				
Channel Modification	. ,	15					
Instream Habitat (20) Bottom Substrate (15)		13		- Marine	A DECEMBER OF THE OWNER OW	Contraction of the local distance of the loc	and the second s
Pool Variety (10)	)	3			170	L 130 X3	
Riffle Habitat (16)		15			and the		the second second
Left Bank Stability (7)		6		-	47.00		and the second second
Right Bank Stability (7)		6	and States		Second &	Marine -	
Light Penetration (10)		8	1-	- 20	Demonstra Ba	The same	Annal an art
Left Riparian Score (5		2	EST . STA	and the second	and the second second	1	State The Art
	~)	2		**** *****		ACT TO A	

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

Boulder, rubble, gravel, and sand.

Substrate

2

72

#### **Taxonomic Analysis**

Right Riparian Score (5)

**Total Habitat Score (100)** 

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.

Waterbo	dy	Locatio	tion Station ID			Date		Bioclassification	
Johnatha	ns Cr	SR 13	349 EB241		41	08/08/07		Good	
County	Subbasin	8 digit HUC	Latitude	Longitude	AU I	Number		Level IV Ecoregion	
Haywood	5	06010106	353717	830018		0	Broad Basins		
Stream Classifica	ation	Drainage Area (mi2)	Elev	ation (ft)	Stre	am Width	(m)	Stream Depth (m)	
C; Tr	C; Tr		2	2,410		17		0.5	
Forested/Wetland Urban Agriculture Other (describe)								Other (describe)	
Visible Landuse		90	10		0			0	
Upstream NPDES Dischargers (>1MGD or			GD and withir	n 1 mile)	NF	PDES Nur	nber	Volume (MGD)	
None				,		N/A		N/A	
Water Quality Parameters Site Photograph									
Temperature (°C)		21.9		Ser 1		(And and	- 5-		
Dissolved Oxygen (mg	g/L)	N/A	- Filters	ALC: NOT ALC		and the		THE REAL PROPERTY.	
Specific Conductance	e (µS/cm)	N/A		and the		ALC: NO	and the second		
pH (s.u.)		7.3	T. A.	的开始	F	1			
Water Clarity		Slightly Turbid			F				
Habitat Assessment	Scores (max	x)		1	ALCONT.	-		and the second	
Channel Modification	(5)	4		and the second	1000	and the second			
Instream Habitat (20)		15	Caller .			E.P.	and the second		
Bottom Substrate (15)	)	13		Charles and			Stand Street of	A CONTRACTOR OF CONTRACTOR	
Pool Variety (10)		4	a later			Sam		a state of the second s	
Riffle Habitat (16)		14	1	10		Para			
Left Bank Stability (7)		6	and the second	and the second second	-	1	12 10 1	diaman a	
Right Bank Stability (7	7)	7				in starts		States of the second	
Light Penetration (10)		7	= 19.17						
Left Riparian Score (5	5)	1		1		and the second	A State	Contraction of the local division of the loc	
Right Riparian Score (	(5)	3							

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

Rubble, gravel, sand, boulder, and silt.

Substrate

74

#### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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.

Waterbody		Location	Da	te	Station ID	Biocla	Bioclassification			
CRABTREE C	R	NC 209	06/14	4/07	EF21	Goo	od-Fair			
County Sul	basin 8 digit HUC	Latitude	Longitude		AU Number	Level	V Ecoregion			
HAYWOOD	5 06010106	35.59805556	-82.93388889	5-22		Broad Basins				
Stream Classification	Drainage Area (mi	-		am Widt	h (m) A	verage Depth (m)	Reference Site			
C	19.1	252	0	8		0.3	No			
	Forested/Wetland	ted/Wetland Urban Agriculture Other (des					(describe)			
Visible Landuse (%)	25		D	-	oasture)		ld school)			
pstream NPDES Discharg		and within 1 mile	<del>?</del> )	-	NPDES Num	ber	Volume (MGD)			
	None									
Vater Quality Parameters Site Photograph										
emperature (°C)	17	.1	ALC: NO PORT		Can at	10 M 10 M	Stor Aspens			
issolved Oxygen (mg/L)	8.		- A comment	1	Cont Card		a state			
pecific Conductance (µS/cm	i) 6	5				and a second second				
H (s.u.)	7.	6	States and				and the second			
		1000			and the second second	Contraction and	0.00			
Vater Clarity	Slightly turbid									
		10	States and a state of the state			and the second s				
abitat Assessment Scores	(max)			-	a second	Ar M	AND LEAST OF			
hannel Modification (5)	5		a desta de la	6.950	-	and the state of the				
nstream Habitat (20)	1	State of the local division of the local div		- Part		Milia	A REAL PROPERTY AND			
ottom Substrate (15)	1	Contractory of the local division of the loc	No. of Contraction	-		and a	and the second second			
ool Variety (10)	6						CONTRACTOR -			
iffle Habitat (16)	1.		1	-		and the second				
eft Bank Stability (7)	4						and and a second			
ight Bank Stability (7)	4				and the second					
ght Penetration (10)	5		a.e.,	Constants.	aller and the state	The state of the s				
eft Riparian Score (5)	1		- South St		the state	A States	and the second sec			
ight Riparian Score (5)	1									
otal Habitat Score (100)	6	B Sub	strate Sand, co	obble, bo	ulder, and bedro	ck				
Sample Date	Sampl	e ID	Species Tot	al	NCIE	81	Bioclassification			
06/14/07	2007		13		44		Good-Fair			
09/24/02	2002-		11		40		Good-Fair			
06/03/97	97-5	2	8		28		Poor			
Most Abundant Species	Central Ston	eroller	Exoti	c Specie	s Brown	Trout and Redbrea	st Sunfish			

### 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.

Waterboo	dy	Locatio	n	Station	ID		Date	Bioclassification
Fines (	Cr	SR 13	55	EB23	31	80	8/08/07	Good
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Ni	umber		Level IV Ecoregion
Haywood	5	06010106	354007	825938	1	C		Broad Basins
Stream Classifica	ition	Drainage Area (mi2)		vation (ft)	Stream	m Width 7	(m)	Stream Depth (m)
С		25.6	4	2,295		1		0.6
	Fo	rested/Wetland	Urban		Agricultu	ire		Other (describe)
Visible Landuse		80	10		10			
Linstream NPF	)FS Discharg	ers (>1MGD or <1MG	D and within	1 mile)	NP	DES Nun	her	Volume (MGD)
None						N/A	N/A	
Water Quality Parameters Site Photograph								
Temperature (°C)		21.8			1000	Sec. 1		
Dissolved Oxygen (mg	1/I )	6.2				1	10 100	
Specific Conductance		52.8			100	Sagera	and the second	
pH (s.u.)	. ,	7.3		ALAS!	and the second			and the state
Water Clarity		Slightly Turbid			1000			
Habitat Assessment	Scores (max)			1 24	21			
Channel Modification (		5	244	marti-	C. LOUIS		The second	1 2 2
Instream Habitat (20)	. ,	15	a second	PA	States of	COLUMN T	and the second	
Bottom Substrate (15)		12	100	1		-	Yes.	
Pool Variety (10)		10	Service -		THE LAS	100	A	1
Riffle Habitat (16)		15	-1-	1 miles	-	Contract of	-	
Left Bank Stability (7)		7	1	Topet.	and the	- Series	all the	ALL COMPANY
Right Bank Stability (7	)	7			the a	The second	Xan Car	A particular and
Light Penetration (10)		9			an an	and a	A COMPANY	And Active Man Provide State
Left Riparian Score (5)	)	2		and and		- mit	Ser and	and a state of the second
Dight Dingrigh Coord (	<b>_</b> )	F						

Right Riparian Score (5) Total Habitat Score (100)

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

Substrate

87

## **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.

Waterbody			Location		Date	Statio	on ID	Bioclassification		
FINES CF	2	of	f SR 1355		06/14/0	7 EF	76	Goo	d-Fair	
County S	ubbasin	8 digit HUC	Latitude	Longi	tude	AU Num	ber	Level IV	Ecoregion	
HAYWOOD	5	06010106	35.6669444	-82.99	1111	5-32		Broad Basins		
		•								
Stream Classification	Drain	age Area (mi2)	Elevatio			Width (m)	Avera	ge Depth (m)	Reference Si	
С		25.7	229	3		12		0.4	No	
	Foro	sted/Wetland	l lei	ban		Agriculture		Other (	describe)	
Visible Landuse (%)	Fore	100		0		0			0	
		100	, i i i i i i i i i i i i i i i i i i i	0		U			0	
Jpstream NPDES Discha	rgers (>1M0	GD or <1MGD a	nd within 1 mile	<del>)</del> )		NPDE	ES Number	,	Volume (MGD)	
	-	None								
Nater Quality Parameter							Site Photog	Iraph		
Water Quality Parameters		40.0					one i notog	i april	ALL ALL ALL	
Temperature (°C)		16.0	the second				Ser. Vill			
Dissolved Oxygen (mg/L)	)	9.0					100		and the	
Specific Conductance (µS/	cm)	71								
oH (s.u.)		6.8		a su					and the second	
				and the second			the sta	Stand .	A STATE	
Water Clarity	SI	ightly turbid	41	1.25						
Habitat Assessment Scor	ioc (max)						1995	a car	Sector of T	
	es (max)		and -	Alexandre and	S.S. A.S.	1 12 M			and a	
Channel Modification (5)		5		A PERS	100				- Karan A	
Instream Habitat (20)		20			-	2	Revenue and			
Bottom Substrate (15)		12		and the	all.	States -	2		-	
Pool Variety (10)		10		-	Sec.	-			See Se	
Riffle Habitat (16)		16		1		and the	-	Martin Contraction	A Comment	
_eft Bank Stability (7)		6	Sec. As		a service of the	- APR	1	the second		
Right Bank Stability (7)		6	and the second second	State 1	S. I.S.	1000	Jet -	- Andrew	Ph C	
Light Penetration (10)		7				1	<b>是</b> 人物語			
_eft Riparian Score (5)		5		-	192		11 P	and the second	- Andrew Charles	
Right Riparian Score (5)		2		r						
Total Habitat Score (100)		89	Sub	strate	cobble, bou	lder				
Sample Date		Sample I	D	Spec	cies Total		NCIBI	В	ioclassification	
06/14/07		2007-78	3		16		40		Good-Fair	
09/24/02		2002-85	5		13		38		Fair	
10/22/97		97-93			11		34		Fair	
Most Abundant Species		Central Stoner	bller		Exotic S	pecies		Sunfish, Swamp Brown Trout	Darter, Rainbow	

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.

Waterbody		Locatio	Location				Date	Bioclassification	
Catalooch	nee Cr	SR 13	95	EB22	27	08	3/08/07	Excellent	
County	Subbasi	n 8 digit HUC	Latitude	Longitude	AUN	lumber		Level IV Ecoregion	
Haywood	5	06010106	354002	830422		0	Souther	n Metasedimentary Mountains	
Stream Classifica	ation	Drainage Area (mi2)	Elev	vation (ft)	Strea	am Width	(m)	Stream Depth (m)	
C; Tr, ORW		49.1		2,499	01100	18	()	0.3	
-, , -				,					
		Forested/Wetland	Urban		Agricult	ure	1	Other (describe)	
Visible Landuse	(%)	100	0		0			0	
Upstream NPI	DES Discha	rgers (>1MGD or <1M	GD and withir	n 1 mile)	NP	DES Nur	nber	Volume (MGD)	
None						N/A		N/A	
Water Quality Parameters Site Photograph									
Temperature (°C)		N/A	1.83	C. M. Lak	1 Mar	5 64			
Dissolved Oxygen (mg	g/L)	N/A	and II	ine Alle	1.1.	-	Constant of		
Specific Conductance		N/A	attse.	all so the		TE -			
pH (s.u.)		N/A		Sec. 1				The SAR A Street	
Water Clarity		Clear						A MAN	
Habitat Assessment	Scores (ma	ıx)			letter and	-			
Channel Modification	(5)	4		and the second s			Carlor Prover		
Instream Habitat (20)		20	500	and the second		and the second second	and the	and a share a s	
Bottom Substrate (15)		15	and the second second	Sal Providence	-		Contraction of the	and the second second	
Pool Variety (10)		8		5. 15		Ouna. +		And a state of the second	
Riffle Habitat (16)		15	and and the second			-	and the second		
Left Bank Stability (7)		6		Encore 14			A Lot An	Town Internet	
Right Bank Stability (7	")	6	+ - 7	Service of	SAN.	ALC A			
Light Penetration (10)		8	and the second second		Res al	a design			
Left Riparian Score (5	)	5					121	Provide State	
Right Riparian Score (	(5)	5							

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

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

Substrate

92

### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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 *Helopicus* 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.

Waterbody		Locatio	Location Stat			ation I	D		Date	ate Bioclassification		
NOLICHUC	KY R	2	NC 197 (S	R132	21)	E	B289	9	30	8/14/07	7	GOOD
County	Subba	asin	8 digit HUC	Lati	tude	Longit	ude	AUN	AU Number			el IV Ecoregion
Mitchell	6		06010108	360	)429	8220			7 Southern			alline Ridges and Mountains
Stream Classificat	Stream Classification Drainage				Eleva	ation (ft)		Strea	am Width	(m)		Stream Depth (m)
В			593			1960			30	• •		0.4
		For	ested/Wetland		Urban			Agricul	ture		Ot	her (describe)
Visible Landuse (	%)		60		20			0				20
Unstream NPD	ES Disc	harge	rs (>1MGD or <1M	GD an	d within	1 mile)		NE	DES Nur	nber		Volume (MGD)
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile) NPDE none												
Water Quality Parame	ters								Site Pho	tograph		
Temperature (°C)					16						and the second	and the second second
Dissolved Oxygen (mg/	1)				1000			1		the second		A State And And
Specific Conductance (	,		106					1.0			L Ar	and the second
pH (s.u.)	(µ0/011)		8.5					1		- and		
	ſ											A DECEMBER OF THE OWNER
Water Clarity		S	lightly turbid				- 13					
Habitat Assessment S	Scores (	max)			1	The second			Sec. 1	-	-	
Channel Modification (5	5)		5				Sale -	1	-lyn -	and a start	1	CALL AND A STREET OF A DESCRIPTION OF A
Instream Habitat (20)			18		020	100	Contraction of the second	- 44	Sha who a	Links .		State of the second
Bottom Substrate (15)			14		2	Carlos and	a te	Contrat-		Res anto	ALC: NO.	Constanting of the second second
Pool Variety (10)			7				100		Trans -	RAN		
Riffle Habitat (16)			15			1	Sec. M	and the second	ALC: UNIT	- Aller		
Left Bank Stability (7)			7		1	Say of	to a	1	10.700		-	
Right Bank Stability (7)			7		A.		1	and a	1	and the	- and the	at when the second
Light Penetration (10)			2		and the second	the star	the first	and the	10	and the	A State	
Left Riparian Score (5)			2			Contraction of the	1	13 M	-	The state	and he	And the second s
Right Riparian Score (5	5)		5									
Total Habitat Score (1)	00)		82		Substra	ite			cobbl	e, boulde	r, grave	l, and sand

• •			L			
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 Acroneuria abnormis, Paragnetina ichusa, and Ceratopsyche morosa. Previously collected taxa that were not found in 2007 included the intolerant species, Mystacides sepulchralis, Goera sp., Glossosama sp., Anthopotamus distinctus, Leucrocuta 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 consistantly 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.

Waterbo	ody			Location		Date		Station I	D	В	ioclassi	fication
N TOE	ER		S	SR 1121		06/22/0	)7	EF36	;	Good-Fair		-Fair
		_			_							_
County		basin	8 digit HUC	Latitude			-	Number			IV Ecore	-
AVERY		6	06010108	36.06583333	-82.000	027778	7-2	2-(0.5)	South	hern Crystalli	ne Ridge	es and Mountains
Stream Classifica	tion	Draina	age Area (mi2)	Elevatio	on (ft)	Stream	Wid	th (m)	Δve	erage Depth	(m)	Reference Site
WS-V;Tr		Braint	29.5	326			14			0.4	(,	No
WO V,11			20.0	520	2		17			0.4		No
		Fore	sted/Wetland	Url	ban		Agr	iculture		c	)ther (de	scribe)
Visible Landuse	(%)		70	30 (rural r	esidential)	)		0			0	
											N.	
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)					?)		NPDES Number Volu			olume (MGD)		
			None						-			
Water Quality Param	eters							Sit	te Phot	ograph		
Temperature (°C)			14.0	1000					1	- 4		and and a
Dissolved Oxygen (mg	g/L)		9.3	and the second				A SKOR	ANS.	for a	1	he is .
Specific Conductance		)	64			- ant			10	100 C	1	5 5
pH (s.u.)	. ,		7.0			-71-24	-	1	$\pm 5$	REPORTED IN	- And	Sec. 18
,				4. 5	The second		-		C.d			Contract Sec
Water Clarity			Clear	1000	and the second	Contraction of the second			No.		1	
Water Clarity			0.00	States					1			
Habitat Assessment	Scores	(max)		1 St.	10-4				1	and the second		1914
Channel Modification	(5)		5			An longer	-		-		det :	A COMPANY AND A COMPANY
Instream Habitat (20)			20	- Hall	( second	-						and the second s
Bottom Substrate (15)	)		15			and a	- 0	the state of the s	-	Shan and a		
Pool Variety (10)			6	-				11			- AKI	
Riffle Habitat (16)			16					intellin.			Startes	and the second
Left Bank Stability (7)			5	1000				1				and the second sec
Right Bank Stability (7	7)		4	and the second		Sec. 1		- Con			1	and the second
Light Penetration (10)			4			mather		aller "	1		A STA	to the state
Left Riparian Score (5	5)		4		2.20		- 1	CORN.			E all	12 10 13
Right Riparian Score (	(5)		3									
Total Habitat Score (			82	Sub	strate	cobble, bou	ılder					
Sample Date			Sample I		Sne	cies Total			NCIBI		Bio	classification
06/22/07			2007-93		ope	15			44		Bio	Good-Fair
06/23/97			97-61			18			46			Good-Fair
						•						
Most Abundant Spe	ecies		Mottled Sculpin			Exotic S	peci	es G	Green S	unfish. Raint	oow Trou	it, and Brown Trout
							•			,		
			Coinc	Groop Supfich		Mountain F	Prool	l amprov -	Podbrog	act Supfich	Noctorn	Blacknose Dace,
Species Change Sine	ce Last (	Cycle	and Broo		L03562 -			Campiey, P	Ceublea	ast Surinsii, V	vestern	DIACKINGE DACE,
Data Analysis												
Watershed the hea	dwaters	of the No	rth Toe River Ior	ated in west-ce	ntral Avery	/ County: the	Nor	th Toe River	. eventi	ally joins the	Cane R	iver to form the
Nolichucky River in Ya												

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.

Waterbo	ody	Locatio	on	Station	ID	Date	Bioclassification		
N TOE	ER	US 19	E	EB28	8 0	8/13/07	GOOD		
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Lev	vel IV Ecoregion		
Avery	6	06010108	355852	820058	7-2-(21.5)		talline Ridges and Mountains		
Stream Classific	ation	Drainage Area (mi <sup>2</sup> )	Elev	vation (ft)	Stream Width	) (m)	Stream Depth (m)		
WS-IV; Tr, CA		74		2800	25		0.4		
· · · · ·				•		•			
	-	rested/Wetland	Urban	1	Agriculture		ther (describe)		
Visible Landuse	e (%)	40	40		0	2	0 (campground)		
Upstream NP	DES Discharge	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES Nu	mber	Volume (MGD)		
		none							
Water Quality Param	neters				Site Pho	otograph			
Temperature (°C)		22.6				and the second			
Dissolved Oxygen (m	ia/L)	9.1							
Specific Conductance		58				and the second			
pH (s.u.)	, , , , , , , , , , , , , , , , , , ,	7.7			STATISTICS OF				
				And the second	A Startes	S.P			
Water Clarity		slightly turbid			1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.				
Ushitat Assessment			200				the second second		
Habitat Assessment	· · ·	5	香菇	and the second					
Channel Modification	. ,	14	Contraction in		a a march	-	and the owner water w		
Instream Habitat (20) Bottom Substrate (15		14		Support of the local division of the local d					
Pool Variety (10)	')	8	1	and the second					
Riffle Habitat (16)		14		and a second	- sprane to a set	the second second	Charles Late		
Left Bank Stability (7)	)	5			- And		and and a set		
Right Bank Stability (7)		6		and the	10				
Light Penetration (10)		4			- BA		and and		
Left Riparian Score (5		2				27			
	·			-	and the second s	ALL PROPERTY AND ADDRESS	A REAL PROPERTY AND A REAL		

Total Habitat Score (100)	74	Substra	ate	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		

4

#### **Taxonomic Analysis**

Right Riparian Score (5)

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 spina* e 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 diatomeceous growth on the rocks which may indicate nutrient enrichment. No serious habitat problems were noted.

Waterbo	Waterbody Lo			ion	Station I	D	Date	Bioclassification		
N TOE	R		SR 1	162	EB28	6 (	06/21/06	GOOD		
County	Subb	asin	8 digit HUC	Latitude	Longitude	AU Number	Le	evel IV Ecoregion		
Mitchell	6		06010108	355545	820655	7-2-(27.7)b		stalline Ridges and Mountains		
				2						
Stream Classifica	ation	D	rainage Area (mi		vation (ft)	Stream Wid	th (m)	Stream Depth (m)		
C; Tr			145		2473	30		0.6		
		For	ested/Wetland	and Urban Agriculture Other (describe)						
Visible Landuse	(%)	-	75	25		0		0		
Unstroom NDI		borgo	rs (>1MGD or <1M	CD and within	a 1 milo)	NPDES N	umbor	Volume (MGD)		
Uninem Corp - Quartz			,		,	-	75 / NC000061	3.6 / 2.16		
Feldspar Corp Spru			-		lointy		3 / NC0021423	3.5 / 2.0		
K-T Feldspar Corp Spru				VIF			000400	3.5		
		ine rac	inty					5.5		
Water Quality Param	eters					Site P	notograph			
Temperature (°C)			24.3	036-						
Dissolved Oxygen (mg	g/L)		8.9					the second second		
Specific Conductance	(µS/cm)		98	at some	12	and the set				
pH (s.u.)			6.9	and the	sto . A	at all an				
Water Clarity			lightly turbid				P. State	The second second		
Water Clarity	l	3		and the second	and the state		and -			
Habitat Assessment	Scores (	max)		22			1. A. A.	See All October		
Channel Modification	(5)		5				E SEARCES			
Instream Habitat (20)	(-)		16			-	Training of the local division of the local			
Bottom Substrate (15)	)		10	and the second		- united and the second				
Pool Variety (10)			10	- Law			and the state of the state	and the second second second second		
Riffle Habitat (16)			14			and the second second	The section	State of the local division of the local div		
Left Bank Stability (7)			7	Sec. St.						
Right Bank Stability (7)			7			an and				
Light Penetration (10)			8			100				
Left Riparian Score (5			3	27	1	1.				
Right Riparian Score (	,		3			でも、「「				
Total Habitat Score (	· /		83	Substra	ate	bould	er, cobble, gravel	and sand: silty		
·				]						
Sample Date			Sample ID	<b>ST</b> 116	EPT 40	BI	EPT BI	Bioclassification		
06/21/06			9965 8806	116 60	49 22	4.9 5.9	3.7	Good Fair		
			7348	60 70	34	5.9 4.7				
07/09/97			1340	70	34	4.7	3.7	Good		

### **Taxonomic Analysis**

07/20/92

5922

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 (*Acroneuria 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).

23

5.2

3.1

Good-Fair

78

#### **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.

Waterbo	Waterbody		Location				Date	Bioclassification
N TOE	R	SR 13	14	EB2	87	80	8/27/07	GOOD
County	Subbasin	8 digit HUC	Latitude	Longitude	AU Nu	umber	Lev	vel IV Ecoregion
Yancey	6	06010108	360018	821146	7-2-(	58.5)	Southern Cryst	alline Ridges and Mountains
Stream Classifica	ation	Drainage Area (mi <sup>2</sup> )	Elev	ation (ft)	Strear	m Width	(m)	Stream Depth (m)
B; Tr		322		2278		35		0.4
	F	prested/Wetland	Urban		Agricultu	ıre	O	ther (describe)
Visible Landuse	(%)	80	20		0			0
Upstream NPI	DES Discharg	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPE	DES Nun	nber	Volume (MGD)
n	one (below N	Toe R @ SR1162 dis	chargers)					
Water Quality Parameters Site Photograph								
Temperature (°C)		27.3			1 8 4 B		12 . A.	
Dissolved Oxygen (mg	g/L)	8.0						
Specific Conductance	e (µS/cm)	101	-	11-14 TT		200	THE PER	
pH (s.u.)		8.1		Care 1	Z.B.			
Water Clarity		slightly turbid		Aux		and a		
Habitat Assessment	Scores (max)		11- TO			Calek		And the state of the
Channel Modification	(5)	5			-			
Instream Habitat (20)		16						S STATE OF STATE
Bottom Substrate (15)	)	11			TAR			
Pool Variety (10)		10	1 Table	1	New York		24400	
Riffle Habitat (16)		14					THE P	- all
Left Bank Stability (7)		6	1944 - 1974					Mary Come of
Right Bank Stability (7	7)	7				20 1	Contraction of the second	
Light Penetration (10)		2	, P			and and	1 in the	
Left Riparian Score (5		1		11/10	31.87	1 million	CHER TO T	
Right Riparian Score (	(5)	3						

					, 0			
Sample Date	Sample ID	nple ID ST EP		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		

bedrock, gravel, and sand

Substrate

75

### **Taxonomic Analysis**

**Total Habitat Score (100)** 

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 sensitve 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 endagered mussel, was found near this site in 2002.

Waterb	ody			Location Date			е	Statior	n ID	E	Bioclassification		
BIG CRAB	TREE	CR		SR 1002		06/18	8/07	EF7	7		Exce	llent	
County	Sub	basin	8 digit HUC	Latitude	Long	itude	AU	Number		Level	I IV Ecor	egion	
MITCHELL		6	06010108	35.8875	-82.146	638889	89 7-2-48			thern Crystall	line Ridg	es and Mountains	
Stream Classifica	ation	Draina	age Area (mi2)	Elevati	on (ft)	Strea	am Wic	dth (m)	A	verage Depth	n (m)	Reference Site	
C; Tr			12.3	259	2590				-	0.3		Yes	
	-	Fore	sted/Wetland	U	Urban			Agriculture			Other (de	escribe)	
Visible Landuse	(%)		100		0			0			0		
Upstream NPDES D	ischarge	ers (>1MG	BD or <1MGD a	and within 1 mi	le)			NPDE	S Numb	ber	v	olume (MGD)	
			None										
Water Quality Param	neters							S	Site Pho	otograph			
Temperature (°C)			18.5	5	· .		10	and the		Se Cal	2.49		
Dissolved Oxygen (m	ng/L)		8.3									ALC: NO	
Specific Conductance	e (µS/cm)	)	32			and the state			1		11		
pH (s.u.)			6.1			and the second		Seattle .	1		19.20	1 2 60	
Water Clarity	[		Clear										
Habitat Assessment	t Scores	(max)			-	and the second second			1	No. of the second		and the second second	
Channel Modification	(5)		5	- All Bar		a la com	- 10 👾			ANT DURING			
Instream Habitat (20)	)		18			and the second s	-				-		
Bottom Substrate (15	5)		12						200	and the second		A CAR	
Pool Variety (10)			10		Carlos Al	10	-				-		
Riffle Habitat (16)			15						Hard-		Server 1	ANT - A	
Left Bank Stability (7)			7				1.10		-			- year	
Right Bank Stability (			7		Carlo C	- market		The	1.1	Tunny	100	Re the	
Light Penetration (10)			8		and the second	a der	St.F.	and the second	A - H	and the second	Marrie Contraction	AN ARCAN	
Left Riparian Score (5			5	347	No. of Street	10.00	1000	The Frank	Pres	The set	Jernes	New Contraction	
Right Riparian Score			5										
Total Habitat Score	(100)		92	Sul	ostrate	cobble, b	oulder						
					-								

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 Spec	ies 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.

Waterbo	Waterbody					Sta	tion I	D		Date		Bioclassification	
BIG CRABT	REE (	CR	US 1	9 E		E	3274	4	30	8/15/07	7	EXCELLENT	
County	Subb	basin	8 digit HUC	Lat	itude	Longit	ude	AUN	lumber		Lev	el IV Ecoregion	
Mitchell	6	6	06010108	35	5409	8208	51	7-				alline Ridges and Mountains	
Stream Classifica	ation		Drainage Area (mi	<sup>2</sup> )	Elev	ation (ft)		Strea	am Width	(m)		Stream Depth (m)	
C; Tr			17	2600			7					0.1	
	Forested/				nd Urban			Agriculture			Other (describe)		
Visible Landuse	Visible Landuse (%) 50				50 0			ī			0		
Upstream NP	Upstream NPDES Dischargers (>1M				nd withir	n 1 mile)		NP	DES Nur	nber		Volume (MGD)	
		<u></u>	none										
Water Quality Param	neters								Site Pho	tograph			
Temperature (°C)			18.3	]			5				-10-2		
Dissolved Oxygen (m	a/L)												
Specific Conductance		)	42							1.			
pH (s.u.)		, 	6.7							TEN /		and the second	
Water Clarity			clear										
Habitat Assessment	Scores	(max)				Ch Contract	1.000 Aug		UN TRA		- Tai	trained	
Channel Modification	(5)		5		- 24	- 19		5-1	and a	a later		and the second	
Instream Habitat (20)			14			12 1						IC Mer a Survey	
Bottom Substrate (15)	)		12						-			and the second s	
Pool Variety (10)			10				-	-	Sand 1				
Riffle Habitat (16)			14		1000				1.29	and the		March Hard Street	
Left Bank Stability (7)			7			The second					- Ba	and the second second	
Right Bank Stability (7	,		7							- ANIM		and the second sec	
Light Penetration (10)			10		and the	14 C			C. See	-			
Left Riparian Score (5	5)		3		5 300	1		1.24	1	A COLOR	the state		
Right Riparian Score	. ,		4			F							
Total Habitat Score (	(100)		86	86 Substrate					cobble wit	avel, some sand			

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 mayfily (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 serratoides; 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.

Waterbody			Locatio	n	Stat	ion ID	)	Date	e Bioclassification		
S TOE	R		SR 11	67	EB	294	0	8/13/07	EXCELLE	NT	
County	Subba	sin 8 dig	it HUC	Latitude	Longitu	de	AU Number		Level IV Ecoregion		
Yancey	6	060	10108	354952	82110		7-2-52-(1)	Souther	n Crystalline Ridges and Mo	ountains	
Stream Classifica	ation	Drainage	Area (mi²)	Elev	vation (ft)		Stream Widt	h (m)	Stream Depth (m)		
B; Tr, ORW			43		2800		12		0.25		
	Forested/Wetlan					A	griculture		Other (describe)		
Visible Landuse	: (%)	70		30			0		0		
Upstream NPI	Upstream NPDES Dischargers (>1MGD or <						NPDES Nu	mber	Volume (MGD)		
		none	1								
Water Quality Param	neters						Site Ph	otograph			
Temperature (°C)			25.2								
Dissolved Oxygen (mg	g/L)		6.7		1.00				ALC: NEW YORK		
Specific Conductance	e (µS/cm)		21	Rect St						-	
pH (s.u.)			6.6								
Water Clarity		clear									
Habitat Assessment	Scores (n	nax)		-	-	1.0.0		- sec.et			
Channel Modification	(5)		5	N.Sel					- Charles		
Instream Habitat (20)			14			and?	-	- da	and the state of	and the second s	
Bottom Substrate (15)	)		15			-		1 . A			
Pool Variety (10)			8		ACCESSION NO.	1	the second	the second	and the second		
Riffle Habitat (16)			16	1.57	and the		-A-L	1	The melline	Sec.	
Left Bank Stability (7)			7		No. Sta	-	str.				
Right Bank Stability (7	7)		7	- 172	Seren Store		A STATE	and the second			
Light Penetration (10)	1		2		Alter	2 minut	Contraction of the second s	-	the state of the	Care a	
Left Riparian Score (5	5)		4		1000	autor.	and the second		A TRACK	-45-50	
Right Riparian Score	(5)		4								

Total Habitat Score (100)	82	Substra	ate	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				

92

#### **Taxonomic Analysis**

Very little change occurred in EPT richness from 2002 to 2007. Abundant taxa were mostly intolerant taxa such as Neoephemera 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 diverstiy 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 consistantly 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.

Waterb	ody			Date		Station	ID	Biod	classification			
CANE	CR		:	SR 1211		06/21/	07	EF1	4		Fair	
County	Subba	asin	8 digit HUC	Latitude	Longi	itude	ΔU	Number		l evel IV	Ecoregion	
MITCHELL	6		06010108	36.01166667	-82.1			-2-59	Sou		Ridges and Mountains	
										,	U .	
Stream Classifica	tion	Draina	ge Area (mi2)	Elevatio	n (ft)	Stream	n Wid	lth (m)	Average Depth (m) Referen			
C;Tr			16.3	251	2		8			0.3	No	
		Fores	sted/Wetland	Urt	Urban			riculture		Oth	er (describe)	
Visible Landuse	Visible Landuse (%) 55						U	30			(city park)	
		(										
Upstream NPDES Di	schargers	s (>1MG	D or <1MGD a None	nd within 1 mile	<u>)</u>			NPDES	Numb	ber	Volume (MGD)	
			None									
Water Quality Param	eters							S	ite Pho	otograph		
Temperature (°C)			14.7						1200		100-00	
Dissolved Oxygen (m	g/L)		9.1			1			3			
Specific Conductance	e (µS/cm)		68	(75.E		*	-	No TH		and the second		
pH (s.u.)			6.9		t.	Lin Francis	4.4		- All			
				Sale 1		and a	april 1	ALC: NO	2			
Water Clarity		Slię	ghtly turbid		all -	-		é		San Part	· · · · · ·	
Habitat Assessment	Scores (m	nax)		2.18	AL AND	1 - 1	-	- San	No.	The second	and the	
Channel Modification	(5)		5			-		- 20	-	-	and the second sec	
Instream Habitat (20)	( )		18		- 39 A	the Par	-	200	to a	the start of		
Bottom Substrate (15)	)		8	24		2		- A-	The second	1 ten 3	and the second	
Pool Variety (10)			6		7 6	1			- AL	A States	(-P	
Riffle Habitat (16)			12	the second	-12	the Bring			- Aller		and the second second	
Left Bank Stability (7)			5	Constant of the local division of the local	1	200	Aler -	-	5			
Right Bank Stability (7	7)		5	-02	C. State	States	P.	100		a state	the second	
Light Penetration (10)			7	100	Section 1	123	-	- Call		and the second	the company with	
Left Riparian Score (5			2		in the second	1.86					the second	
Right Riparian Score			2									
Total Habitat Score (	(100)		70	Sub	strate	cobble, bo	oulder,	, bedrock				
Sample Date	)		Sample	ID	Spe	cies Total			NCIB		Bioclassification	
06/21/07			2007-90			13			36		Fair	
06/24/97			97-63			12			34		Fair	
Most Abundant Spe	ecies		Bluehead Chuk	)		Exotic	Speci	es	Redbre Trout	east Sunfish, Blue	ehead Chub, and Brown	

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.

Waterbody	,		Location		Date	Station	ID	ification	
BIG ROCK	CR	l	NC 226		06/20/07	EF10	)	Go	od
County	Subbasin	8 digit HUC	Latitude	Longi	tude Al	J Number	Le	evel IV Ecor	egion
MITCHELL	6	06010108	36.05027778	-82.218		7-2-64	Southern Crystalline Ridges and Mountains		
Stream Classification	n Draina	age Area (mi2)	Elevatio		Stream W		Average De	pth (m)	Reference Site
C;Tr		33.3	2375	5	12	2	0.4		Yes
	Fore	sted/Wetland	Urb	ban	А	griculture		Other (de	escribe)
Visible Landuse (%)		70	C	)		30		1(	
			-				-		
Upstream NPDES Disch	hargers (>1M0		nd within 1 mile	)		NPDES	Number	V	olume (MGD)
		None				-			
Water Quality Paramete	rs					Si	te Photograph		
Temperature (°C)		20.2		12	Sec. 1	· 4	1-1-1-1		and the same of
Dissolved Oxygen (mg/L)		9.0	5 6	1.		74	Server S		100 C
Specific Conductance (µ		65				1	an in		1
pH (s.u.)		6.9	8	-	2 Charles	6			F -
	-	-	N.		With a staff			the sector	in the second
Water Clarity		Turbid				S determine		Ser.	
			<b>6</b> 3	A.		Carlos Trite -	in the	-	and the second
Habitat Assessment Sco	ores (max)		10 Y ==	1		20	and the second second		IN A CAR
Channel Modification (5)		5				1 and a second	100		Rectored States
Instream Habitat (20)		18					- ANTA	2 45 AM	Contraction of the
Bottom Substrate (15)		12	S. A.S.			A REAL PROPERTY	Ser Comme		
Pool Variety (10)		7							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Riffle Habitat (16)		16				Selle -	Service and		60
Left Bank Stability (7)		6							12 1 1 1 Care
Right Bank Stability (7)		6				-		A BRIE	100
Light Penetration (10)		10				-			
Left Riparian Score (5)		4		States	1000	and the second second		12 6	10 10 10 10 10 10 10 10 10 10 10 10 10 1
Right Riparian Score (5)		3							
Total Habitat Score (100	))	87	Subs	strate	cobble, bedro	ck			
Sample Date		Sample II	D	Spee	cies Total		NCIBI	Bie	oclassification
06/20/07		2007-89			15		50		Good
09/30/98		98-78			14		50		Good
Most Abundant Specie	9S	Mottled Sculpin			Exotic Spe	cies	Brown Trout		
	ant Oursta		Dive sill and C	elles e stile 5			da an an d Deba	Travit	

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.

Waterbod	ły		Location Station						Date		Bioclassification
BIG ROCH	K CR		NC 19	7	E	327	5	0	8/14/07	7	EXCELLENT
County	Subbas	in 8 digit	HUC	Latitude	Longit	ude	AU N	lumber		Lev	el IV Ecoregion
Mitchell	6	0601	0108	360128	8215	11	7-	2-64	Southe	rn Cryst	alline Ridges and Mountains
Stream Classificat	tion	Drainage /	Area (mi²)	Elev	vation (ft)		Strea	am Width	ı (m)		Stream Depth (m)
C; Tr		6	3		2135			9			0.3
		Forested/We	tland	Urban			Agricult	ure		Ot	her (describe)
Visible Landuse (	(%)	20		20			60				0
Upstream NPD	ES Disch	argers (>1MG	D or <1MG	D and withir	n 1 mile)		NP	DES Nui	nber		Volume (MGD)
		none									
Water Quality Parame	eters							Site Pho	otograph		
Temperature (°C)			25.5				ent i de	1	Fall and	the state	Stranger State
Dissolved Oxygen (mg	/L)				and a start	C. S.	1.6	and the	1.1		- Altonete Pressent
Specific Conductance	(µS/cm)		66	100			-	and the	Thomas .	Coles.	
pH (s.u.)			8.6		200		7.4-3	C.C.S.	1.00	3. 2	STREET, STREET
Water Clarity		clear			Real Property in						
Habitat Assessment S	Scores (m	ax)		100	1.200						A COLORAD
Channel Modification (	5)		5	S. S. S. S.	AND DE CONTRACTOR	-	1000	Contraction (Sec. )			
Instream Habitat (20)			14	- Sector	Section of		S. AL	-27			
Bottom Substrate (15)			10	and a			-		100		The second will
Pool Variety (10)			10	Se al	and the second		Contraction of the local division of the loc				
Riffle Habitat (16)			15	-	2017	22	1.1	1000	10	-	and the second s
Left Bank Stability (7)			7	and the	1000	-5	3.5	- Aur	Contra a	1 1	
Right Bank Stability (7)	)		6		100	-	1	Sec.	St.K		
Light Penetration (10)			3	St. Che	a Maria		and and and		32		and a series
Left Riparian Score (5)			2	Stor w	and the	All .	A DAY	- The	and the second	1000	and the last
Right Riparian Score (5	5)		1								

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

sand with equal amounts of boulder, cobble and gravel

Substrate

73

#### **Taxonomic Analysis**

Total Habitat Score (100)

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, *Acroneuria abnormis* and *Paragnetina immarginata*, as well as 2 caddisflies, *Brachycentrus spinae* and *Ceratopsyche morosa*. Other intolerant taxa were the mayflies *Epeorus vitreus*, *Heterocloeon anoka*, *Neoephemera 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.

Waterb	ody		Location				e	Station I	on ID Bioclassification			
PIGEONRC	DOST CI	R	SR 1	349/NC 19	7	06/20	/07	EF39		Go	od	
County	Subbas	sin 8	digit HUC	Latitude	Long	itude	AU	Number	Leve	I IV Ecor	egion	
MITCHELL	6		06010108	36.04583333	-82.299			7-2-69		ystalline Ridges and Mountains		
-	-								,	3		
Stream Classifica	tion	Drainage	e Area (mi2)	Elevatio	n (ft)	Strea	ım Wio	dth (m)	Average Depth	n (m)	Reference Site	
C;Tr		1	14.1	2130	)		9		0.4		Yes	
		Foreste	d/Wetland	Urk	an		٨٩	riculture		Other (describe)		
Visible Landuse	(%)		93	5 (rural re			Λy	0		2 (fire s	/	
			00		(oldofildal)			<u> </u>		2 (110 0		
Upstream NPDES Di	ischargers	(>1MGD	or <1MGD a	nd within 1 mile	)			NPDES I	Number	v	olume (MGD)	
			None						-			
Water Quality Param	neters							Sit	e Photograph			
Temperature (°C)			17.4		and the second			Sec. 1				
Dissolved Oxygen (mg	a/L)		9.0			1990			THE STORE	2-	A REAL PROPERTY	
Specific Conductance	• ·		39	5-41-	1	1				1. S.	and the second second	
pH (s.u.)	(1 )		6.8			10						
						ation	A			- 5 h . 1		
Water Clarity		С	lear	a fees				C.		7-2-5	The Castra	
		-			1000		- 44		and and the second	23.00	Section Sectio	
Habitat Assessment	Scores (ma	ax)		Contraction of the second	in the second				and the second se	at las		
Channel Modification	(5)		5		See.	Sec.		1		202		
Instream Habitat (20)			20		and solution				1	Service Service	and a state of the	
Bottom Substrate (15)	)		15		-			-		1. 1.	- T.	
Pool Variety (10)			8	A DAME	-	-	No.	-			- April -	
Riffle Habitat (16)			16	NY LOU	and the second second	and the second	100	and the second	San and and a		a second second	
Left Bank Stability (7)			6	and the second		Section 1	A section	and the	and the second		The second second	
Right Bank Stability (7	7)		6	1	The state				States of the second	200	and the second s	
Light Penetration (10)	)		8	200	1000	and the second				in the	31	
Left Riparian Score (5	5)		4	- Martin	100	1 Contra	- Sector	ALC: NOT	the second	and so the	and the second	
Right Riparian Score	(5)		4									
Total Habitat Score (	(100)		92	Subs	strate	cobble, b	oulder	, gravel				
Sample Date	•		Sample I	D	Spe	cies Tota	I	1	NCIBI	Bi	oclassification	
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.

Waterbody CANE R		Locatio	n		Sta	ation I	ID		Date		Bioclassification	
		US 19	US 19W			EB302		08/14/07		7	EXCELLENT	
County Subbasin 8		3 digit HUC	Latitude Longitude		AUN	AU Number		Level IV Ecoregion				
Yancey	7		06010108	3600	000	8221	26	7-3-	(13.7)a	Southe	rn Crysta	alline Ridges and Mountains
Stream Classification Drainag		nage Area (mi²)		Eleva	ation (ft)		Strea	am Width	( <b>m</b> )		Stream Depth (m)	
C; Tr			145		2	2100			25			0.3
	-	Foreste	ed/Wetland		Urban			Agricult	ture		Ot	her (describe)
Visible Landuse	e (%)		20		80			0				0
Upstream NP	DES Disc	hargers (:	>1MGD or <1MG	SD and	d within	1 mile)		NF	DES Nur	nber		Volume (MGD)
	none											
Water Quality Param	Water Quality Parameters								Site Pho	otograph		
Temperature (°C)			24.7	No.	- SAL	r.p					38	
Dissolved Oxygen (m	ng/L)			1	Har II	he and	and a	in the second		weight.		a Wear Store State
Specific Conductance			68		- 122			Carlos Carlos	C. THERE	and the second		
pH (s.u.)			8.7	1	- Aline	1.40	2. No	- ANINE	AL-SHE			
Water Clarity	[	sligh	tly turbid		-	100	1					
Habitat Assessment	t Scores (	max)					100			- 35 SC		and Thomas and
Channel Modification	(5)		5					-	And And	Jane H	-	
Instream Habitat (20)	. ,		16	WI.				-	-	Contract of	-	
Bottom Substrate (15			12			are de	-	-		- 189-	20-	
Pool Variety (10)			6		and the second	-	-		a starting		-	
Riffle Habitat (16)			14		and the second	1.0		Total States			<. 1i	
Left Bank Stability (7)		7	5			-	Sec.	-	7 36-1	-		
Right Bank Stability (7	7)		7		-	120	-	and the second		And a	-	A State Con 19
Light Penetration (10)	Light Penetration (10)				-	-		100		-	Contraction in the	A CONTRACTOR
Left Riparian Score (5	5)		2		-			Sec. Sec.	-	-	1	the second se
Right Riparian Score	(5)		3			_						
Total Linkitat Coore	(400)		74		Substra	•o [					بمرج محاجا	d anna a d

Total Habitat Score (100)	Substra	ate	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., *Psychomia 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 tributatries is likely partially responsible for maintaining the excellent water of the Cane River.

Waterboo	Locatio	on	Station ID Date			Bioclassification		
BALD MTN CR		SR 14	08	EB29	99	08/14/07	7 EXCELLENT	
County Subbasin		8 digit HUC	Latitude	Longitude	AU Numbe		Level IV Ecoregion	
Yancey	7	06010108	355902	822432	7-3-32		rn Crystalline Ridges and Mountains	
		Drainage Area (mi <sup>2</sup> )		vation (ft)	Stream Wid		Stream Depth (m)	
C; Tr		15		2380	7		0.2	
0,				2000			012	
	Fo	prested/Wetland	Urban		Agriculture		Other (describe)	
Visible Landuse (	(%)	30	70		0		0	
Upstream NPD	ES Discharg	ers (>1MGD or <1M	GD and withir	n 1 mile)	NPDES N	umber	Volume (MGD)	
		none						
Water Quality Parame	eters				Site P	hotograph		
Temperature (°C)		17.1		- And Anna	1	1. 1. 1.		
Dissolved Oxygen (mg	/L)			REAL PROPERTY		1.1.1		
Specific Conductance		44			Non A			
pH (s.u.)	(1 )	6.7	c	10.0	AND TON	A Sec		
,			£.5.					
Water Clarity		clear	1200 AV	1.100	Same I and	9.17		
						Sec.	the second states and states and	
Habitat Assessment S	. ,		1.7. 41	- Aller		1000	and the second second	
Channel Modification (	5)	5	Sec. 4	ANE AL			and the second s	
Instream Habitat (20)		16 12			all and a second		ALL	
Bottom Substrate (15)	Bottom Substrate (15)			Cheft States	The second s			
Pool Variety (10)			and the second se					
Riffle Habitat (16) 16								
Left Bank Stability (7) 7								
Right Bank Stability (7)	)	6		-			and the second s	
Light Penetration (10)		7				COL INC.		
Left Riparian Score (5)		2				Charles In		
Right Rinarian Score (P	5)	0						

Right Riparian Score (5) **Total Habitat Score (100)** 

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

Mostly cobble with gravel. Some boulder and sand.

Substrate

#### **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.

Waterbo		Location		Date	Static	Station ID Bioclassification			
BIG C	R	9,	SR 1444		06/21/0	7 EF	F75 Good		
County	Subbasin	8 digit HUC	Latitude	Long	itude /	U Number			region
YANCEY	7	06010108	36.0154299	-82.35		7-3-40-(2.5)	Southern C	Level IV Ecoregion rn Crystalline Ridges and Mountain	
	-						1		
Stream Classificati	on Drain	age Area (mi2)	Elevatio	n (ft)	Stream V	Width (m)	Average	Depth (m)	Reference Site
C;Tr		8.1	2230	)		5	(	).4	No
	Fora	sted/Wetland	Urb	an		Agriculture		Other (d	oscribo)
%Visible Landuse (		90	10 (rural re						-
	-,			, <b>,</b>					
Upstream NPDES Disc	chargers (>1M0	GD or <1MGD a	nd within 1 mile	·)		NPDE	ES Number	<u> </u>	olume (MGD)
		None							
Water Quality Parame	ters		_				Site Photogra	oh	
Temperature (°C)		18.8	. An	-	E CASE	States in	and a state		
Dissolved Oxygen (mg/	′L)	8.4	and the second				Contract -	-	Start Vice
Specific Conductance (	(µS/cm)	40	1500 3				PR-William	Con L	
pH (s.u.)		6.8	1 20	a series		1 22			
		-		1 and					Contraction -
Water Clarity		Clear		1 May			Station of the		
	(m av)			C AREA		at the -			A A A
Habitat Assessment S		-				A AND A ADDRESS		A STREET	一門的出生
Channel Modification (5	<b>)</b> )	5	- 1 × 1	1200	May 4				1-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2
Instream Habitat (20) Bottom Substrate (15)		19 15	ALC: NO	1	and the second	T TO THE REAL			the states
Pool Variety (10)		6	-				C	- 10	
Riffle Habitat (16)		16		and the second second		and and		- Tr	24.0
Left Bank Stability (7)		5		14.90-		the contention	Same and a state	-	-
Right Bank Stability (7)		6			State of the second	The stand	E. C. Soon		al of
Light Penetration (10)		7		Cardo	12		Element.	Contraction of the second	
Left Riparian Score (5)		4	100	and the	Sector 1		A STATE	FRANK	
Right Riparian Score (5	5)	3					CONTRACTOR OF THE OWNER OF THE		
Total Habitat Score (1		86	Subs	strate	cobble, bould	der			
Sample Date		Sample I		Sno	cies Total		NCIBI	Bi	oclassification
06/21/07		2007-92		Spe	19		56		Good
					1				
Most Abundant Spec	Mottled Sculpin			Exotic Sp	otic Species Rainbow Trout and			out	
Species Change Since	e Last Cycle	N/A							
Data Analysis									
This is the first fish com	nmunity sample	collected at this	site. Watershed	I a tribut	ary to the Ca	ne River (an	d ultimately the	Nolichucky Riv	er) located just

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.

Waterbody		Location		Date	Date Station ID Bioclassification				
HOLLOW POPLAR (	CR	NC 197		06/21/07	EF7	4	ated		
County Subbas		Latitude	Longi	tudo All	Number			agion	
County Subbas	in 8 digit HUC 06010108	36.0875132	-82.336		7-10	Level IV Ecoregion Southern Crystalline Ridges and Mountai			
	00010100	30.0073132	-02.00	59141 7-10 Southe		Southern Cry			
Stream Classification	Drainage Area (mi2)	Elevatio	n (ft)	Stream Wi	dth (m)	Average De	epth (m)	Reference Site	
C;Tr	6	2290	)	4		0.3		Yes	
							011		
Visible Landuse (%)	Forested/Wetland 75	Urb 25 (rural re		Ą	priculture 0	Othe		er (describe)	
	75	25 (Iulai le	esiderillar)		0		0		
Upstream NPDES Dischargers (	>1MGD or <1MGD a	nd within 1 mile	)		NPDES	Number	v	olume (MGD)	
· · · ·	None								
				•			•		
Water Quality Parameters		CORRECT ON A			S	ite Photograph	C. Martin		
Гетреrature (°С)	17.1				Sec. Sec. 1	The Charles		alandi.	
Dissolved Oxygen (mg/L)	8.8				and the second			and the second second	
Specific Conductance (µS/cm)	41	2		- Alexandre		· were the second		A DESCRIPTION OF THE OWNER.	
oH (s.u.)	6.9	T	F	-		and the second			
				E Marker Control	- Alle	LAND I	AL ST	Same	
Water Clarity	Clear	1 13	S. YEAR	A PART		and the state	ALL AL		
			法自治	A. 1. Mar.	N	-	No. of the	Station .	
Habitat Assessment Scores (ma	ix)		ALC: NO	Me we	1-1-Cal		col-sode	and the second	
Channel Modification (5)	5			12 2 12	a they	and the second	A HONT	And a state of the	
nstream Habitat (20)	19	La contra de	Ref 2	C. A.C.	100	-			
Bottom Substrate (15)	15	Ser a		ALC: THE		the state of the	Part in	100 - 10 - C	
Pool Variety (10)	6	88	ME -		Section -				
Riffle Habitat (16)	16		5 20	and the second		- Coule	1		
₋eft Bank Stability (7)	6	- 94	E.C.	Star Co	100	Start.		1.10	
Right Bank Stability (7)	6	1.15	Chill.		12	The Same		See.	
ight Penetration (10)	7	Contraction of the	12	C. P. Marin		Sector of Long	1000		
eft Riparian Score (5)	3	Brasher .	120			Et .	2 Then	Calle Call	
Right Riparian Score (5)	3								
Fotal Habitat Score (100)	86	Subs	strate	cobble, boulde	r				
Sample Date	Sample I	D	Spe	cies Total		NCIBI	Bie	oclassification	
06/21/07	2007-91			2				Not Rated	
Most Abundant Species	Rainbow Trout			Exotic Spec	cies	Rainbow Trout			
					L				
Species Change Since Last Cyc	le N/A								
Data Analysis									
This is the first fish community sa									

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.