

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
TUCKASEGEE R	SR 1140	GB38	08/17/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Jackson	2	06010203	35.200110	-82.991800	2-79-(0.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III,B;Tr,ORW	11	3260	14	0.4

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

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

**Water Quality Parameters**

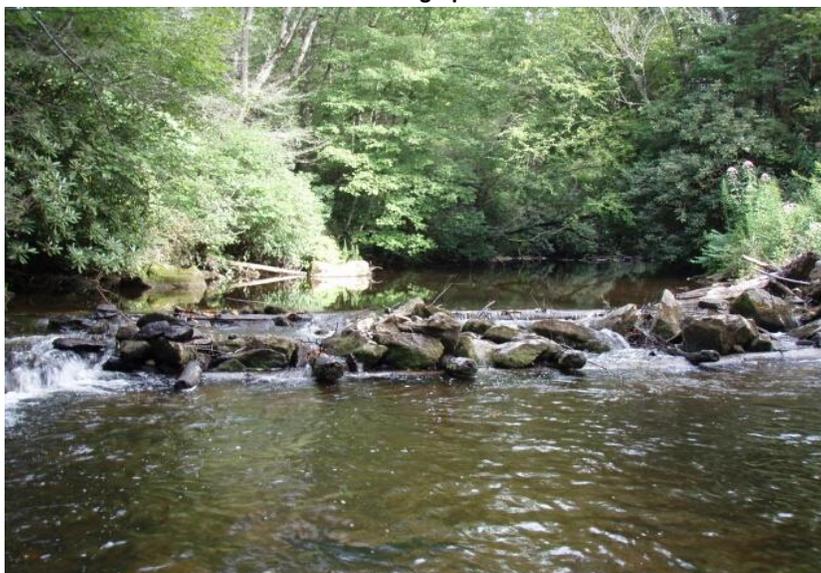
Temperature (°C)	20.2
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	10
pH (s.u.)	5.5

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	8
Riffle Habitat (16)	6
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>79</b>

**Site Photograph**



**Substrate** mostly boulder, cobble, sand; some gravel and silt also present

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/17/09	10818	---	35	---	2.42	Good
08/02/04	9473	---	36	---	1.83	Excellent
07/19/99	7906	---	46	---	1.86	Excellent
09/01/94	6696	---	39	---	2.26	Excellent
09/13/89	5077	101	47	3.50	1.79	Excellent

**Taxonomic Analysis**

Excluding the more intensive Full-Scale sample obtained in 1989, the number of Ephemeroptera collected in 2009 was generally within the range for the other EPT samples. However, both Plecoptera and Trichoptera were reduced in 2009, by 2-3 and 3-4 taxa respectively. The most conspicuous absence from the sample collected in 2009 is *Arctopsyche irrorata*--this stressor-sensitive species was common in each of the four prior samples. Another sensitive species, *Malirekus hastatus*, was also uncollected for the first time in 2009.

**Data Analysis**

This uppermost benthic basinwide site on the river is within five miles of the headwaters and about 15 miles west of Brevard. The site was sampled using Full-Scale methods in 1989, then with EPT methods during each of the following sampling events. If a single additional taxon had been collected at the site in 2009 the classification would have remained at Excellent and therefore, despite the Good bioclassification in 2009, it is evident that water quality in this catchment has remained stable since sampling commenced in 1989.

## BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TUCKASEGEE R	SR 1378	GB19	07/30/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Jackson	2	06010203	35.368889	-83.263333	2-79-(40.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	347.0	1952	50	0.5

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Jackson County WWTP (Tuckasegee Water and Sewer Authority)	NC0039578	3.5

### Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	9.2
Specific Conductance (µS/cm)	27
pH (s.u.)	6.0

Water Clarity	slightly turbid
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### Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	11
Pool Variety (10)	4
Riffle Habitat (16)	12
Bank Erosion (7)	6
Bank Vegetation (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>63</b>

### Site Photograph



Substrate	Cobble and boulder with some bedrock, gravel, sand, and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/09	10770	75	43	4.29	3.52	Good
08/04/04	9484	84	44	4.27	3.44	Excellent
07/21/99	7932	75	40	4.34	3.73	Good
07/14/94	6591	100	47	4.38	3.32	Excellent
08/10/90	5366	86	43	4.10	3.20	Good

### Taxonomic Analysis

A small reduction in both total and EPT richness occurred in 2009. Conspicuously absent in 2009, after being present since 1984, were the mayflies *Maccaffertium modestum* and *Neophemera purpurea*. Only 13 Trichoptera were collected in 2009 as compared to 21 in 2004 although most missing taxa were rare in previous samples. The paucity of midge taxa was largely responsible for the reduction in the total taxa richness.

### Data Analysis

This large river site receives effluent from the municipalities of Sylva, Webster, and Dillsboro and drains almost the entirety of Jackson County. A difficult site to sample in any year, this site was assessed during higher flows and was not completely wadeable. Habitat was typical for a large river and, except for the lack of sufficient riparian vegetation, had no significant deficiencies. Since the inception of sampling in 1984, the Tuckasegee River has improved from Good-Fair (1984) to the current rating of Good. Had sampling produced one more EPT, this site would have rated Excellent in 2009. This suggests that the water quality is not declining despite the slight drop to Good in 2009. This conclusion is further supported by the very stable biotic index and EPTBI measured here since 1990.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>CANEY FK</b>	<b>SR 1740</b>	<b>GB27</b>	<b>08/02/04</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
JACKSON	2	06010203	35.305000	-83.126111	2-79-28-(2.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III; Tr	40	2200	14	0.3

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

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

**Water Quality Parameters**

Temperature (°C)	25.2
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	26
pH (s.u.)	7.5

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	7
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>82</b>

**Site Photograph**



<b>Substrate</b>	good mix of cobble (40), gravel (30), boulder (20), and sand (10)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/02/10	11088	107	52	3.13	2.20	Excellent
08/02/04	9474	107	54	3.39	2.33	Excellent
07/20/99	7912	97	53	3.26	2.50	Excellent
07/15/94	6593	93	56	3.01	2.38	Excellent

**Taxonomic Analysis**

The benthic community in Caney Fork has remained very speciose over the past 20 years. While EPT richness slowly decreases, total richness is trending up, due primarily to an increase in odonate and dipteran richness. These two groups contributed to the increase in the biotic index seen in the last 10 years (relative to the EPT BI), although this is partially offset by fewer Chironomidae larvae in 2010. The EPT fauna has consistently remained, over 4 basinwide cycles, both similar and productive (most likely due to the open canopy). Mayflies were dominated by baetids and included Caney Fork's first record of *Iswaenon anoka* as well as the flat-headed mayfly *Epeorus vitreus*. Intolerant species of hydropsychid net spinners, such as *Ceratopsyche morosa*, dominated, in terms of abundance, the caddisfly community suggesting slight enrichment. Finally, the stoneflies remained amazingly stable with the same 6 taxa recorded over the last 15 years.

**Data Analysis**

Caney Fork, along with its tributary Moses Creek, drains a small portion of east-central Jackson County, a mostly forested landscape, and ultimately feeds into the Tuckasegee River. Caney Fork, for most of its length, is paralleled by roadway and is lined by agricultural fields and residences. It is therefore lacking any significant riparian vegetation and is often denuded on both sides of the stream. However, most of the watershed is forested thereby protecting the Excellent water quality that has persisted in Caney Fork over the last two decades. Other than loss of riparian vegetation (complete loss in some areas), no glaring problems were noted with either physico-chemical parameters or in-stream habitat. Small amounts of silt were recorded but appear to have a minimal effect on the benthos despite the occurrence of some substrate embeddedness.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>MOSES CR</b>	<b>SR 1739</b>	<b>GB26</b>	<b>08/02/10</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
JACKSON	2	06010203	35.314722	-83.125556	2-79-28-8	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III; Tr	8	2280	6	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
	70	20	---	10	---

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

**Water Quality Parameters**

Temperature (°C)	21.5
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	26
pH (s.u.)	5.6

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	5
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
<b>Total Habitat Score (100)</b>	<b>81</b>

**Site Photograph**



<b>Substrate</b>	mostly cobble (50) and boulder (25), with some gravel (10)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/02/10	11089	---	42	---	1.64	Excellent
08/02/04	9475	---	46	---	1.38	Excellent
07/20/99	7913	---	37	---	1.57	Excellent

**Taxonomic Analysis**

The decrease in EPT richness seen in Moses Creek in 2010 from the previous 2004 high was due to the net loss of 4 mayflies taxa largely represented in part by spiny crawlers (*Drunella cornutella*) and flat-headed mayflies (*Leucrocota* spp, *Rhithrogena* spp, and *Stenacron pallidum*). Both stonefly and caddisfly richness remained stable (8 and 18 taxa, respectively). While the stonefly community was similar to the previous 2 samplings (with the addition of *Amphinemura* spp but the loss of *Isoperla holochlora*), a slight shift was seen in the caddisfly community. Filterers, particularly net-spinners such as hydropsychids, became more dominant in both richness (with the addition of *Ceratopsyche alhedra* and *C. morosa*) as well as abundance. Furthermore, brachycentrid caddisflies were much less common with 2 species, *Brachycentrus nigrosoma* and *Micrasema wataga*, disappearing altogether.

**Data Analysis**

Moses Creek is a tributary of Caney Fork which, in turn, drains into the Tuckasegee River. This stream has a catchment that is largely forested with only the lower segment paralleling a rural residential road. Moses Creek is one of the few streams in the LTN that saw a loss of EPT taxa from the previous sampling cycle, although this loss was relatively small. These losses were primarily seen among very intolerant taxa thus affecting the EPT BI which, while low, is the highest yet seen for this stream. While very little silt was seen, it was noted that riparian loss was occurring due to residential lawns, some upstream agriculture, and the nearby road. However, habitat was good overall and the specific conductance, while not exceedingly low like that of an undisturbed stream, was not problematic. Water quality in Moses Creek remains solidly Excellent.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>CULLOWHEE CR</b>	<b>SR 1001</b>	<b>GB29</b>	<b>07/30/09</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Jackson	2	06010203	35.288333	-83.181667	2-79-31a	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	18.9	2123	5	0.2

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

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

**Water Quality Parameters**

Temperature (°C)	19.8
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	32
pH (s.u.)	6.9

Water Clarity slightly turbid

**Site Photograph**



**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	9
Bank Erosion (7)	7
Bank Vegetation (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	3
<b>Total Habitat Score (100)</b>	<b>61</b>

Substrate Cobble and sand with some gravel and boulder, silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/09	10773	---	52	---	3.07	Excellent
08/04/04	9481	---	47	---	2.61	Excellent
07/20/99	7914	---	43	---	2.91	Excellent
08/31/94	6681	---	32	---	2.44	Good

**Taxonomic Analysis**

EPT richness values have steadily increased in Cullowhee Creek to the current levels of 52 taxa since the inception of sampling in 1994. However, the EPT biotic index has also increased leading to the conclusion that as more taxa are collected, a higher proportion of the total taxa are more tolerant to urban stressors. This is seen in both the presence of facultative taxa like the mayfly *Procladius* as well as the absence or rarity of previously occurring intolerant taxa like the mayfly *Serratella carolina* and the caddisfly *Rhyacophila fuscula*. Some taxa recorded for the first time at Cullowhee Creek included the mayflies *Stenacron pallidum* and *Rhithrogena fuscifrons* and the caddisflies *Micrasema bennetti* and *Oligostomis pardalis*. Plecoptera were both taxa rich (8) and abundant. The rare mayfly, *Epeorus subpallidus*, was collected for only the 5th time in the state.

**Data Analysis**

Cullowhee Creek drains a small portion of western Jackson County and eventually drains into the Tuckasegee River. The sampling site lies above Cullowhee and Western Carolina University amid light urban development reflected by the lack of significant riparian vegetation and the high degree of embedded substrate in the stream. High levels of sand (25%) and silt (10%) have removed the interstitial spaces needed for some taxa to persist. High productivity was noted as evidenced by the presence of copious amounts of the macrophyte *Podostemum ceratophyllum* (riverweed), which is known to increase macroinvertebrate abundance (high in this stream at 264) and provide substrate for epiphytic algae and refugia for invertebrates. Although Cullowhee Creek was rated as Excellent in 2009, habitat degradation is a serious issue and may negatively affect the fauna in the future if watershed development continues unabated.



**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
SAVANNAH CR	SR 1367	GB23	07/30/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Jackson	2	06010203	35.345833	-83.237500	2-79-36	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	40.7	2004	12	0.2

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

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

**Water Quality Parameters**

Temperature (°C)	19.0
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	33
pH (s.u.)	6.1

Water Clarity slightly turbid

**Habitat Assessment Scores (max)**

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

**Site Photograph**



Substrate Cobble and sand with some bedrock and gravel, extremely silty

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/09	10772	83	45	3.59	3.06	Excellent
08/04/04	9482	91	40	4.15	3.11	Good
07/21/99	7930	53	32	3.72	3.36	Good
07/26/94	6603	77	40	3.78	3.06	Excellent

**Taxonomic Analysis**

An increase in both mayfly and caddisfly taxa from 2004 levels brought the EPT richness to the highest level seen here. Many species absent in 2004 were collected in 2009 including many sensitive taxa like the mayflies *Brachycercus spp*, *Heterocloeon curiosum*, and *Serratella serrata* as well as the caddisflies *Brachycentrus spinae* and *Setodes spp*. Other sensitive species were collected for the first time such as the burrowing mayfly *Ephemera spp* (indicative of silt pools), and the caddisflies, *Nyctiophylax spp*, *Lype diversa*, and *Fattigia pele*. Fewer beetle and odonate taxa were collected in than in previous samplings which helped to reduce the biotic index.

**Data Analysis**

Savannah Creek, a tributary to the Tuckasegee River, drains a moderately developed landscape. Many segments of the stream are channelized and have had much of the riparian vegetation reduced or completely removed. The lower segment of the stream follows a road and has had most of the woody vegetation removed, consequently limiting habitat and resources for colonizing macroinvertebrates. Sedimentation was evident in the stream as embeddedness of bottom substrate was severe and large pools of silt and bank erosion were present. Slightly turbid water, normal in streams with development in the catchment, was also noted. Despite the habitat and watershed challenges, Savannah Creek rated Excellent for the first time in 10 years as evidenced by increased EPT richness and a significantly lower overall biotic index. This improvement was likely the result of reduced non point inputs of pollution due to drought effects.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>SCOTT CR</b>	<b>UPS SR 1556</b>	<b>GB167</b>	<b>07/30/09</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Jackson	2	06010203	35.368889	-83.249444	2-79-39	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	58.9	1968	9	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Sylva WWTP (Tuckasegee Water and Sewer Authority)	NC0020214	0.5

**Water Quality Parameters**

Temperature (°C)	18.6
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	39
pH (s.u.)	6.1

Water Clarity	slightly turbid
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**Habitat Assessment Scores (max)**

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	6
Pool Variety (10)	4
Riffle Habitat (16)	12
Bank Erosion (7)	6
Bank Vegetation (7)	4
Light Penetration (10)	9
Left Riparian Score (5)	1
Right Riparian Score (5)	1
<b>Total Habitat Score (100)</b>	<b>64</b>

**Site Photograph**



Substrate	Gravel and cobble with some boulder and sand, silty
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/09	10771	98	46	4.12	3.34	Excellent
08/09/07	10309	---	37	---	3.23	Excellent
08/04/04	9483	74	35	4.07	3.23	Good
07/21/99	7931	70	36	4.07	3.09	Good
07/14/94	6592	68	28	5.19	3.65	Good-Fair

**Taxonomic Analysis**

A significant increase in both total taxa and EPT richness has occurred since the last basinwide assessment in 2004. An almost 33% increase in EPT can be accounted for by additional mayflies and caddisflies occurring since 2004. In particular, the number of baetid mayfly species has more than doubled since monitoring began in 1994. Flat-headed mayflies were also abundant as a group with *Rhithrogena exilis* re-occurring for the first time in 15 years. Stonefly richness has remained relatively stable over time, varying between five and eight taxa (seven in 2009). In contrast, the caddisfly community was comprised of 16 taxa, almost double what was collected in 1994. Hydropsychids were the dominant caddisfly group and was represented by four species. Also, both beetle and midge richness increased in 2009, in part responsible for the increased total taxa richness and biotic index.

**Data Analysis**

Lying in northeastern Jackson County, many of Scotts Creek's tributaries drain unimpacted mountain slopes. However, the lower portion of this watershed is largely urbanized and passes through both downtown Sylva and Dillsboro before draining into the Tuckasegee River. Additionally, the stream is followed closely by major roads for much of its length. The sampling site is on a reach that is channelized and stabilized with concrete riprap (see photo) and is next to the Great Smoky Mountain Railroad parking lot. The habitat score reflects the embeddedness and lack of riparian vegetation. Downstream of the Sylva WWTP, the specific conductance was low, although water levels were higher than normal due to recent rains. While the total taxa and EPT

richness increased, the biotic index also increased slightly. However the occurrence of 46 EPT helped Scott Creek attain its first Excellent rating for a basinwide cycle. The water quality has increased steadily since sampling began although high fecal coliform levels and turbidity have historically been problems in this waterbody. The Tuckasegee WSA has recently repaired old and leaking sewer lines within the catchment possibly contributing to the higher water quality seen starting in 2007.

## BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CONNELLY CR	SR 1177	GB13	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010203	35.430556	-83.365278	2-79-52	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	13.4	1869	7	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Smoky Mountain Country Club	NC0084441	0.12

### Water Quality Parameters

Temperature (°C)	20.1
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	26
pH (s.u.)	6.7

Water Clarity	slightly turbid
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### Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	5
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	1
<b>Total Habitat Score (100)</b>	<b>84</b>

### Site Photograph



Substrate	Mostly cobble mixed with gravel and boulder, some bedrock
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10713	---	44	---	2.46	Excellent
08/03/04	9480	---	34	---	2.82	Good
07/21/99	7933	---	44	---	3.06	Excellent
07/14/94	6589	94	42	3.57	3.00	Excellent

### Taxonomic Analysis

An EPT richness of 44 taxa collected in 2009 is the same as that obtained in 1999 but was significantly higher than that observed in 2004. This increase was driven in part by an additional 7 mayfly taxa (22) over 2004 levels (15) and is the same number of mayfly taxa that were collected in 1999. Coupled with this increase in richness is the decrease in the EPT biotic index to the lowest value recorded for this stream since sampling began in 1994. The absence of some tolerant baetid mayflies such as *Baetis flavistriga* and the addition of intolerant ephemereid mayfly taxa, including *Drunella allegheniensis*, *Serratella carolina*, and *Serratella serratoides*, is responsible for the low EPT biotic index. Moreover, all but one taxa of the 7 Plecoptera taxa collected were abundant. The caddisfly community observed was similar to previous years with the first record of *Hydatophylax argus* at this site occurring in 2009.

### Data Analysis

Connelly Creek is a small tributary to the Tuckasegee river and drains a small portion of southeastern Swain County. Only the lower portion of the watershed is developed, consisting mostly of residences and a golf course, leaving the vast majority of the upper watershed in forest. The stream follows a road for much of its length which has reduced or removed the riparian on one side for much of the segment. However, overall habitat was good and the stream banks were stable with little erosion. EPT richness levels rebounded to 1999 levels thereby increasing its bioclassification to Excellent after rating Good in 2004. Although this site was Good in 2004, that sample was only two EPT taxa short of receiving an Excellent bioclassification thus indicating temporally stable water quality in this catchment.



## BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BRADLEY FK	US 441	GB1	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010203	35.563333	-83.309722	2-79-55-12-(11)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr, HQW	19.6	2254	12	0.3

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

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

### Water Quality Parameters

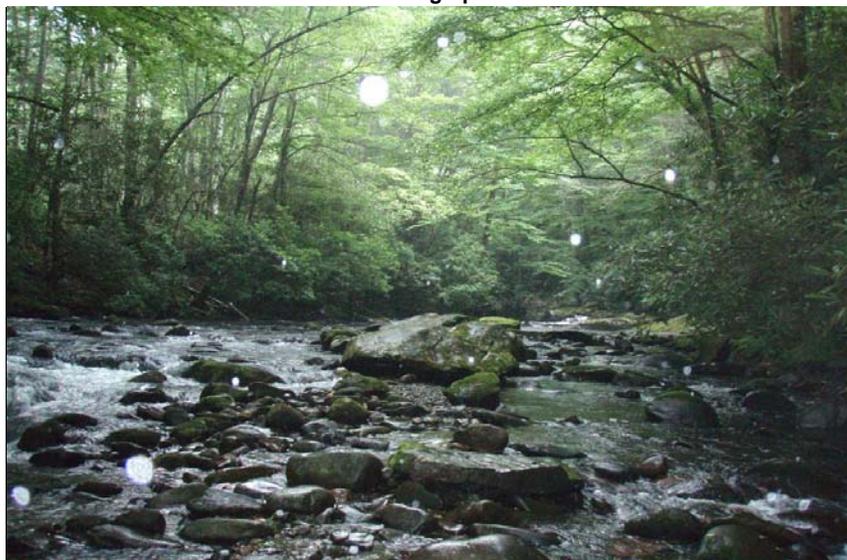
Temperature (°C)	16.8
Dissolved Oxygen (mg/L)	6.1
Specific Conductance (µS/cm)	15
pH (s.u.)	6.0

Water Clarity	clear
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### Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>95</b>

### Site Photograph



**Substrate** a mix of boulder, cobble, and gravel with some bedrock and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10694	86	48	2.50	1.70	Excellent
08/03/04	9479	79	47	2.61	2.02	Excellent
07/22/99	7935	67	39	2.58	1.75	Excellent
10/12/95	6981	69	42	1.95	1.40	Excellent
09/01/94	6682	---	31	---	1.27	Good

### Taxonomic Analysis

The highest EPT richness and total taxa richness (ST) ever measured in this stream occurred in 2009. Increases in Plecoptera and Trichoptera over previous samples were partly responsible for these increases and almost all taxa observed were intolerant or facultative species. One mayfly observed *Epeorus subpallidus*, has never before been identified from this stream and is in fact only the 4th record of this species in NC. Of the EPT collected during this sampling event, the mayfly *Leptophlebia spp*, the uncommon stonefly *Agnatina capitata*, and the caddisflies *Ceraclea flava* and *Fatiggia pele* were also not collected prior to 2009.

### Data Analysis

Bradley Fork, a tributary to the Oconaluftee River, is located within Great Smoky Mountain National Park and as such has a completely undeveloped and forested watershed. This stream has high recreational usage among the public as it lies next to a campground just inside the park border. The 2009 sample produced a very low biotic index of 2.50, which is the lowest biotic index recorded for a basinwide sample at this site since sampling began in 1994. In addition, richness values for both total taxa and EPT have increased in the last ten years. These metrics indicate a stream with very high water quality and is consistent with an all forested and protected watershed. Bradley Fork received an Excellent bioclassification for the third straight basinwide cycle and the fourth straight sampling event.



**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>OCONALUFTEE R</b>	<b>SR 1359</b>	<b>GB11</b>	<b>07/27/09</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010203	35.461389	-83.353611	2-79-55-(16.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	284.0	1842	45	0.4

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

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

**Water Quality Parameters**

Temperature (°C)	23.2
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	21
pH (s.u.)	8.2

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	12
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	4
Left Riparian Score (5)	2
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>73</b>

**Site Photograph**



<b>Substrate</b>	Cobble and gravel with some boulder and sand, silty at times
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/27/09	10695	98	47	4.07	3.11	Excellent
08/05/04	9485	106	51	3.95	2.97	Excellent
07/22/99	7934	104	53	3.93	3.20	Excellent
07/14/94	6590	86	46	4.05	2.99	Excellent
07/26/89	5029	88	47	4.13	3.22	Excellent

**Taxonomic Analysis**

A varied EPT community resides in this river although over the last ten years the fauna has become less rich. The reduction in EPT is exhibited in the loss of some baetid mayfly taxa such as *Acentrella* and *Plauditus* and in the loss of the hydropsychid caddisfly taxa *Diplectrona modesta* and *Hydropsyche morosa* although, overall, hydropsychids were the dominant group in the river. Both the stonefly community composition and richness were maintained from prior years with the exception of the loss of *Agnatina*, which was not found for the first time in 15 years of sampling. Taxa collected in 2009 that have never before been collected from this site included the mayfly *Heterocloeon anoka* and the caddisflies *Micrasema bennetti* and *Glossosoma nigrion*.

**Data Analysis**

The Oconaluftee River, a large tributary to the Tuckasegee River, drains the eastern portion of Great Smoky Mountain National Park. The lower segment of this river is tracked on both sides by roads (including US 19) and receives large amounts of urban runoff from Cherokee. High development pressures have introduced sediments into the river and removed large amounts of riparian vegetation. *Podostemum ceratophyllum* was extremely abundant and retained sand and silt which were subsequently released during sampling resulting in large plumes of turbid water. Substrates were also partially embedded although not completely so. Despite a lower EPT richness relative to prior samplings, EPT abundance (282) was the highest ever recorded

and supports the hypothesis of increased secondary production associated with the high *Podostemum* biomass. The Oconaluftee River has maintained its Excellent rating thanks in large part to the high quality, unimpacted streams (including Bradley Fork) in its upper watershed.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
DEEP CR	W DEEP CR RD	GB5	08/06/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010203	35.466111	-83.431111	2-79-63-(16)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-II, B; Tr, HQW	40	1815	14	0.2

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

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

**Water Quality Parameters**

Temperature (°C)	19.5
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	14
pH (s.u.)	4.8

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Pool Variety (10)	5
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>91</b>

**Site Photograph**



**Substrate** mix of cobble (35), boulder (30), and gravel (25); some sand (10)

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/06/10	11093	---	45	---	2.33	Excellent
08/02/04	9410	---	43	---	1.79	Excellent
08/09/99	7954	---	47	---	2.09	Excellent
07/11/94	6579	---	41	---	1.93	Excellent

**Taxonomic Analysis**

The second highest EPT richness ever measured in this stream occurred in 2010. Increases in Ephemeroptera over previous samples were partly responsible and almost all taxa observed were intolerant or facultative species. One mayfly collected, *Acentrella barbara*, originally described from GSMNP, has been recorded only seven times in NC, almost all of the records from park streams. EPT collected from this stream for the first time included the baetid mayfly *Pseudocloeon propinquum*, the uncommon stone *Agneta capitata*, and *Triadenodes ignitus*, the only long-horned caddisfly found (other leptoцерid taxa previously collected in Deep creek were absent in 2010).

**Data Analysis**

This site on Deep Creek, a tributary to the Little Tennessee River, is located at a campground within Great Smoky Mountain National Park and as such has a mostly forested watershed. This beautiful stream has high recreational usage among the public and is popular as a tubing spot. The very low EPT BI of 2.33, which is the highest yet recorded for a basinwide sample at this site, is indicative of a very intolerant EPT community. Also, EPT richness is second only to that recorded in 1999. Habitat was very good although the lack of large pools is characterized by the presence of one continuous riffle. These metrics indicate a stream with very high water quality. Deep Creek has maintained an Excellent rating for the last 20 years.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
DEEP CR	SR 1340	GB7	08/06/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010203	35.442500	-83.440278	2-79-63-(21)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	43	1750	13	0.4

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

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

**Water Quality Parameters**

Temperature (°C)	20.1
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	15
pH (s.u.)	5.5

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>83</b>

**Site Photograph**



<b>Substrate</b>	mix of cobble (30), boulder (20), gravel (20), sand (20); silty (10)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/06/10	11094	---	49	---	2.26	Excellent
08/02/04	9452	---	38	---	1.73	Excellent
08/09/99	7955	---	45	---	2.36	Excellent
07/11/94	6578	---	50	---	2.11	Excellent

**Taxonomic Analysis**

Gains seen in EPT richness between the 2004 and 2010 basinwide samplings were driven by increases in both mayflies (+7) and caddisflies (+4) while stoneflies remained stable. The increase in mayflies was driven by an surge in baetid richness and included the first Deep Creek record of *Heterocloeon* spp. and *Acentrella nadineae*. The appearance of the mayflies *Baetisca* spp and *Ephemera* spp in 2010 and the absence of both *Epeorus vitreus* and *Rhithrogena exilis*, after 15 years of abundance, may be attributable to additional sediment inputs into the stream. Stoneflies were dominated by perlists and the rare *Agnatina capitata* was collected. The caddisfly community was notable for the absence of *Brachycentrus spinae* which had been abundant in the three previous basinwide samples and the addition of *Hydatophylax argus* (1st Deep Cr. record) and *Oligostomis pardalis* (1st Deep Cr. record), two caddisflies that prefer slower, less turbulent waters.

**Data Analysis**

The SR 1340 sampling site on Deep Creek is approximately 3 miles below the site in GSMNP and drains the east-central portion of the park. EPT levels in 2010 rebounded from a twenty year low to the second highest richness recorded. Additionally, the EPT BI, while not the lowest recorded at this site, indicates a very intolerant EPT community resides here. As evidenced by the specific conductance measured, little impact can be seen from the 3 miles of commercial, agricultural, and residential properties between this reach and the upstream park reach. While less available habitat is present for colonization and more silt occurs in-stream than the park reach (most likely due to the agriculture), the additional sediment input and habitat deficiencies are not severe enough to affect the EPT fauna dramatically. Deep Creek at SR 1340 maintains it's excellent water quality for 2010. It is recommended that this site be dropped from Basinwide rotation as further upstream development seems unlikely.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
NOLAND CR	NR MOUTH	GB6	07/28/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010203	35.454167	-83.527778	2-90	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	20	1780	6	0.2

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

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

**Water Quality Parameters**

Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	12
pH (s.u.)	4.7

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	14
Pool Variety (10)	9
Riffle Habitat (16)	15
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>96</b>

**Site Photograph**



<b>Substrate</b>	mix of cobble (35), boulder (30), and gravel (25), some sand (10)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/10	11092	45	45	1.31	1.31	Excellent
08/03/04	9454	35	35	1.57	1.57	Good
08/11/99	7966	40	40	1.63	1.63	Excellent

**Taxonomic Analysis**

Sampling in 2010 resulted in the highest yet recorded EPT richness in Noland Creek. A dramatic increase was seen in caddisfly richness (+9) over that which was collected in 2004. Also, the EPT BI decreased for the second straight cycle time due in part to the presence of some very intolerant species of caddisflies that were not previously collected, including the uncommon *Rhyacophila acutiloba* and *Neophylax mitchelli*. The highest richness of Plecoptera was observed in 2010 with eight taxa collected with the majority of taxa abundant. New taxa occurring in 2010 included the rarely collected mayflies *Epeorus subpallidus* and *Acentrella barbara*, which was described from GSMNP in 2006. The caddisfly *Molanna* spp was also previously unrecorded from Noland Creek.

**Data Analysis**

Noland Creek lies within the southcentral portion Great Smoky Mountain National Park and drains into Fontana Lake. It is an undeveloped and forested watershed. The habitat of Noland Creek is exceptional and consists of a series of cascades, riffles, and pools. The 2010 EPT BI is the lowest recorded in the entire LTN basin during the current basinwide cycle, even among other GSMNP sites. The EPT richness for 2010 is also the highest yet seen at this site. These metrics, coupled with the low specific conductance, indicate the very stable and intolerant benthic community one would expect from a stream with little to no anthropogenic disturbance. The low pH is partially attributable to the Anakeesta soils that are interspersed throughout the park. Noland Creek rates Excellent for the second time in 11 years.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>FORNEY CR</b>	<b>NR MOUTH</b>	<b>GB4</b>	<b>07/28/09</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010203	35.468611	-83.566111	2-97	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr, ORW	28.0	1788	10	0.5

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

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

**Water Quality Parameters**

Temperature (°C)	18.5
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	10
pH (s.u.)	6.2

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	10
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>95</b>

**Site Photograph**



<b>Substrate</b>	Boulder and cobble with some bedrock and gravel, very little silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10697	81	52	2.47	1.64	Excellent
08/03/04	9455	78	44	2.62	1.80	Excellent
08/11/99	7965	81	46	2.59	1.58	Excellent
07/12/94	6581	79	46	2.43	1.49	Excellent

**Taxonomic Analysis**

Sampling in 2009 resulted in the highest yet recorded EPT richness in Forney Creek. An increase was seen in each EPT order over that which was collected in 2004. In addition, the EPTBI decreased to pre 2004 levels due in part to three species of the intolerant mayfly *Drunella* and four species of the intolerant caddisfly *Rhyacophila*. The highest richness of Plecoptera was observed in 2009 with 10 taxa collected with the majority of taxa either common or abundant, including the rarely collected stonefly *Agnentina capitata*. New taxa occurring in 2009 included only the 3rd NC record of the mayfly *Epeorus subpallidus* and the 4th NC record of mayfly *Acentrella barbaraee*, which was described from Great Smoky Mountain National Park (GSMNP) in 2006. The caddisflies *Hetroplectron americanum*, *Phylocentropus spp*, and *Ceraclea flava* were also previously unrecorded from Forney Creek. Only 14 Chironomidae taxa were collected in 2009.

**Data Analysis**

Forney Creek lies within and drains the south-central portion of GSMNP into Fontana Lake. It is an entirely undeveloped and forested watershed. The habitat of this stream is as expected for a stream in a natural setting and consists of a series of riffles, cascades, and pools with excellent riparian zones. The biotic index and EPTBI has remained low with little variation and total taxa richness has likewise varied little over the last 15 years. These metrics, coupled with a high EPT richness, indicate the very stable benthic community one would expect for a stream whose catchment is completely encompassed within the GSMNP.

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**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
<b>CANEY FK</b>	<b>SR 1738</b>	<b>04/27/09</b>	<b>GF4</b>	<b>Good</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
JACKSON	2	06010203	35.30472222	-83.13777778	2-79-28-(2.5)	Southern Crystalline Ridges & Mtns.

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III,Tr	50.2	2170	14	0.6	No

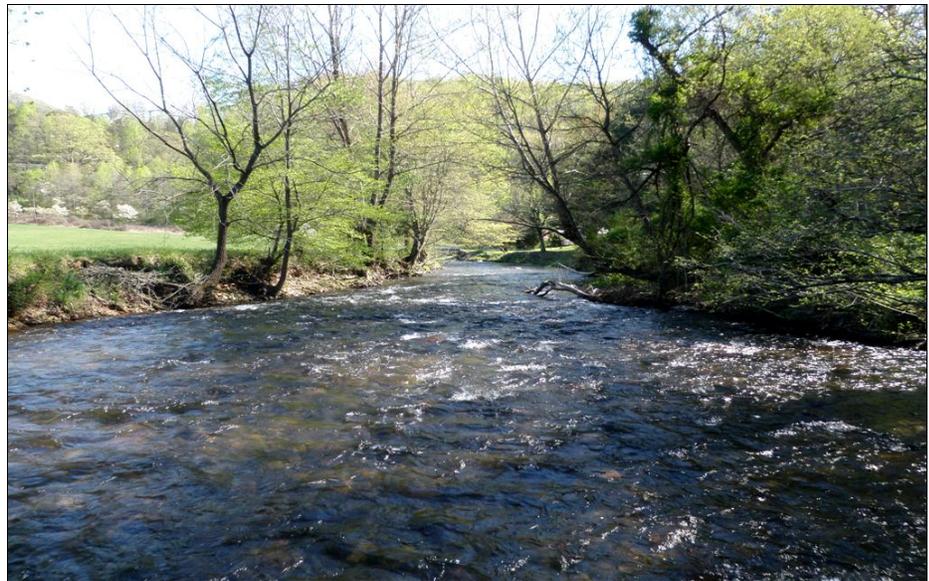
Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	80	0	20	0

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

**Water Quality Parameters**

Temperature (°C)	18.8
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	19
pH (s.u.)	5.9
Water Clarity	Clear

**Site Photograph**



**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	16
Erosion (7)	7
Bank Vegetation (7)	3
Light Penetration (10)	4
Left Riparian Score (5)	3
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>78</b>

Substrate	Cobble, boulder, bedrock
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/09	2009-17	15	52	Good
06/01/04	2004-62	16	56	Good

Most Abundant Species 2009	Mottled Sculpin (53%)	Exotic Species 2009	None
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**Species Change Since Last Cycle**

**Losses** -- Tuckasegee Darter, Black Redhorse, Rainbow Trout. **Gains** -- Mirror Shiner, Western Blacknose Dace. All species gained or lost were represented by 1-4 individuals/species; Rainbow Trout represented only by young-of-year and excluded from the sample.

**Data Analysis**

**Watershed** -- located in east-central Jackson County where it drains the Great Balsam Mountains; tributary to the Tuckasegee River; no municipalities within the watershed. **Habitat** -- lower one-third of the reach has hay field and a road along its right and left shorelines, respectively, but is protected further upstream by a narrow forested buffer; narrow riparian zones provide minimal shading; instream habitats consist of riffles, runs, and chutes with good side pools. **Water Quality** -- pH in 2004 and 2009 slightly less than the water quality standard of 6.0 s.u.; specific conductance in 2004 and 2009 was 21 and 19 µS/cm, respectively. **2009** -- slightly lower total species and darter diversities than expected; all other metric scores were comparable to reference site values (i.e., score = 5). **2004 & 2009** -- 18 species known from the site, including 9 species of cyprinids, 4 intolerant species, but only 3 species of darters, and the Smoky Dace (Special Concern); dominant species is the Mottled Sculpin (37% and 53%); no tolerant species have ever been collected at the site; no evidence of reproducing populations of trout at this lowermost site; no appreciable change in the fish community, instream and riparian habitats, or water quality between assessment periods.

**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
CULLOWHEE CR	SR 1545	04/27/09	GF13	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
JACKSON	2	06010203	35.29666667	-83.18111111	2-79-31a	Southern Crystalline Ridges & Mtns.

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	19.5	2110	10	0.4	No

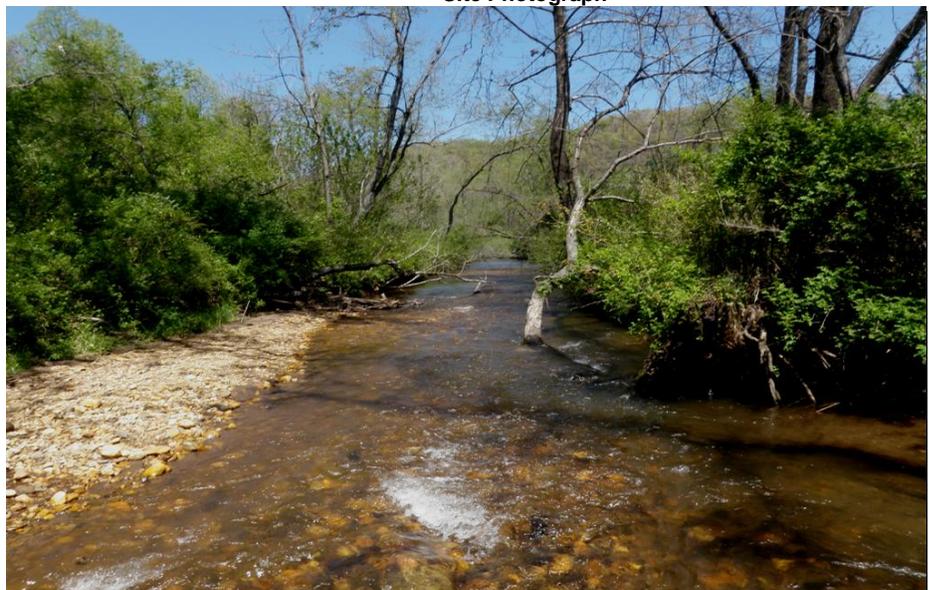
Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	75	0	0	25 (school yard)

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

**Water Quality Parameters**

Temperature (°C)	12.1
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	30
pH (s.u.)	6.2
Water Clarity	Clear

**Site Photograph**



**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	11
Pool Variety (10)	10
Riffle Habitat (16)	16
Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	5
Left Riparian Score (5)	3
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>85</b>

Substrate	Cobble, gravel, silt
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/09	2009-16	17	50	Good
06/02/04	2004-63	16	46	Good-Fair

Most Abundant Species 2009	Mottled Sculpin (60%)	Exotic Species 2009	Brown Trout, Rainbow Trout
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Species Change Since Last Cycle	Losses -- none. Gains -- Tuckasegee Darter, 1 individual.
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**Data Analysis**

**Watershed** -- drains southwestern Jackson County; tributary to the Tuckasegee River; no municipalities in the upstream watershed. **Water Quality** -- specific conductance in 2004 and 2009 was 33 and 30 µS/cm, respectively. **Habitat** -- higher quality riffles than in 2004; increased left bank stability and quality of the riparian zone has improved since 2004 by becoming more stable and densely vegetated; fairly open canopy; debris dams trapping much of the finer sediments in the upper one-third of the reach; instream habitats of riffles, runs, and deep snag pools. **2009** -- ~ 1.7 times more fish collected in 2009 than in 2004 (648 vs. 391), primarily Mottled Sculpin (387 vs. 190); very slight increase in darter diversity and a lower percentage of tolerant fish were the reasons for the slight increase in the NCIBI score and rating; Hatchery Supported Trout waters, one stocked Brook Trout collected (360 mm TL), all other Brown Trout and Rainbow Trout were wild; slightly lower cyprinid and darter diversities and percentage of omnivores+herbivores than expected; all other metric scores were comparable to reference site values (i.e., score = 5). **2004 & 2009** -- 17 species known from the site, including 7 species of cyprinids, but only 2 species of darters; dominant species is the cold-cool water indicator Mottled Sculpin (49% and 60%); stream is supporting its supplemental designation as trout waters (Tr). No appreciable change in fish community or water quality between assessment periods.

**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
SAVANNAH CR	NC 116	04/28/09	GF23	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
JACKSON	2	06010203	35.3375	-83.23694444	2-79-36	Southern Crystalline Ridges & Mtns.

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	36.5	2025	11	0.6	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	50	25	25	0

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

**Water Quality Parameters**

Temperature (°C)	12.1
Dissolved Oxygen (mg/L)	10.2
Specific Conductance (µS/cm)	29
pH (s.u.)	5.4

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

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	15
Erosion (7)	4
Bank Vegetation (7)	3
Light Penetration (10)	4
Left Riparian Score (5)	1
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>68</b>

**Site Photograph**



Substrate	Cobble, boulder, rip/rap
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/09	2009-18	18	58	Excellent
06/02/04	2004-64	15	50	Good

Most Abundant Species 2009	Mottled Sculpin (36%)	Exotic Species 2009	Brown Trout, Rainbow Trout
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Species Change Since Last Cycle	Losses -- none. Gains -- White Sucker, Brown Trout, Smallmouth Bass. All species gained were represented by 1 or 2 individuals/species.
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**Data Analysis**

**Watershed** -- drains northwestern Jackson County, paralleling much of NC 116 and US 23/441 all the way to the creek's headwaters; no municipalities within the watershed; tributary to the Tuckasegee River. **Habitat** -- same as in 2004; minimal canopy; the riparian zones were in pasture, and an attempt had been made to stabilize portions of the banks with rip/rap and concrete slabs; swift & deep riffles, chutes, runs, and plunges. **Water Quality** -- pH in 2009 was less than the water quality standard of 6.0 s.u.; specific conductance in 2004 and 2009 was 28/29 µS/cm. **2009** -- although the creek is not Hatchery Supported Trout Waters in its lower reaches, one stocked Brown Trout (275 mm TL) was collected; all other Brown Trout and Rainbow Trout were wild; increased diversity and a slightly more balanced trophic structure in 2009 accounted for its Excellent rating. **2004 & 2009** -- 18 species known from the site, including 8 species of cyprinids and 4 intolerant species, but only 2 species of darters; dominant species is the Mottled Sculpin (39% and 36%); only one tolerant fish (White Sucker) has ever been collected at the site; no evidence of reproducing populations of trout at this lowermost site.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
<b>TWENTY MILE CR</b>	<b>NC 28</b>	<b>GB2</b>	<b>08/05/10</b>	<b>Excellent</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010204	35.466944	-83.877500	2-178-(4)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; TR, HQW	15	1300	9	0.2

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

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

**Water Quality Parameters**

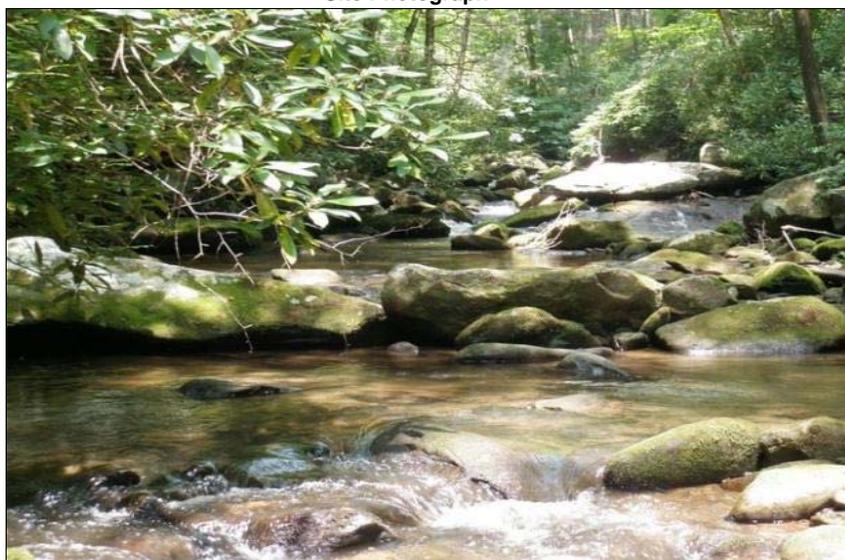
Temperature (°C)	22.5
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	13
pH (s.u.)	5.3

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	14
Pool Variety (10)	9
Riffle Habitat (16)	15
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>96</b>

**Site Photograph**



<b>Substrate</b>	mostly cobble (35), boulder (25) and gravel (25)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/05/10	11091	---	41	---	2.06	Excellent
08/04/04	9459	---	29	---	1.82	Good

**Taxonomic Analysis**

A total increase of 12 EPT was recorded in 2010 over 2004 sampling results. All three orders saw an increase in richness but the caddisflies increased the most (E - 4, P - 2, T - 6). Additions to the caddisflies were 4 net-spinning species and included the relatively uncommon *Ceratopsyche macleodi*. Additional caddisfly taxa recorded included *Ceraclea ancylus*, *Rhyacophila atrata*, and *Goera* spp. Baetid mayflies help contribute to the increase seen in mayfly richness in 2010 and included only the fifth NC record of *Acentrella barbara*, a mayfly originally described from GSMNP. An increase in the number of flat-headed mayflies was also seen with both *Heptagenia marginalis* and *Leucrocuta* spp being collected. The stonefly fauna remained stable from 2009 and included *Perlesta* spp, a stonefly that typically emerges near the end of July.

**Data Analysis**

Twenty Mile Creek lies within and drains North Carolina's western portion of Great Smoky Mountain National Park (GSMNP) and ultimately joins the Little Tennessee River (Cheoah Reservoir) downstream of Fontana Dam. It has an undeveloped (hiking trails aside) and forested catchment. The habitat of this picturesque stream is as expected for a stream in a natural setting and consists of a series of cascades, riffles, and plunge pools. 2010 marks only the second sampling of this stream. Typical of undisturbed mountain streams, the specific conductance was very low. Also, while the EPT biotic index was higher than in 2004, it still indicates a very intolerant EPT community. Species richness was much higher than in 2004 and may be partially attributed to the presence of woody debris and microhabitat which was mostly absent in 2004. With such a high gradient it is likely that rain events would transport woody debris and further lead to increased scour which would reduce benthic populations. Twenty Mile Creek garnered its first Excellent rating.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
CHEOAH R	OFF SR 1138 UPS MOUNTAIN CR	GB133	07/27/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.331944	-83.807778	2-190-(3.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	55.0	1960	12	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Robbinsville WWTP	NC0025879	0.63

**Water Quality Parameters**

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	40
pH (s.u.)	6.3

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	12
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>77</b>

**Site Photograph**



Substrate	mixture of bedrock, boulder, rubble, gravel and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/27/09	10779	93	40	4.18	3.17	Good
07/19/04	9437	84	38	3.96	3.15	Good
08/12/99	7969	89	48	3.43	2.77	Excellent

**Taxonomic Analysis**

Both EPT and overall taxa lists from 1999, 2004 and 2009 were very consistent. Most of the abundant taxa found in 2009 were abundant in previous samples (e.g. the mayflies *Baetis flavistriga*, *B. intercalaris* and *Epeorus vitreus*; the stoneflies *Lecutra* spp and *Paragnetina immarginata*; and the caddisflies *Glossosoma* spp, *Ceratopsyche sparna*, *Cheumatopsyche* spp and *Dolophilodes* spp).

**Data Analysis**

This section of the Cheoah River rated Good in 2009, the same rating as in 2004. This site is located in one of only two free-flowing sections of the Cheoah River. There is little evidence that the WWTP is significantly suppressing benthic macroinvertebrates in this reach as a sample upstream of the WWTP did not differ from a downstream sample in 1994. Moreover, approximately half a mile upstream of the 2009 sampling location are two historical sites spanning five samples. These data originate in 1983 and suggest water quality in this reach (both upstream and downstream of the WWTP) is Good and occasionally Excellent.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
TULULA CR	SR 1275	GB22	07/28/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.320556	-83.802500	2-190-2-(0.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation	Stream Width (m)	Stream Depth (m)
WS-III; Tr	28.6	2000	9	0.2

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
	25	50	25	0	

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

**Water Quality Parameters**

Temperature (°C)	18.5
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	40
pH (s.u.)	6.2

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	4
Instream Habitat (20)	19
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	16
Bank Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
<b>Total Habitat Score (100)</b>	<b>73</b>

**Site Photograph**



Substrate	Boulder, cobble, gravel and sand
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10780	88	39	3.77	2.70	Good
07/19/04	9436	60	31	3.23	2.73	Good
08/12/99	7968	85	40	3.57	2.69	Excellent
07/25/94	6615	78	34	3.81	3.01	Good

**Taxonomic Analysis**

With the exception of the 1999 Excellent bioclassification, the overall trend in the invertebrate data suggest Good water quality in this catchment. Indeed, there are numerous intolerant taxa that have been present from each of the four collections and include the mayflies *Epeorus vitreus*, *Leucrocuta* spp, *Paraleptophlebia* spp, the caddisflies *Brachycentrus spinae*, *Lepidostoma* spp, *Rhyacophila fuscula*, as well as the long-lived stoneflies *Acroneuria abnormis* and *Paragnetina immarginata*.

**Data Analysis**

In general, the benthic macroinvertebrate data suggest stable and Good to Excellent water quality in this catchment since the initial 1994 collection although the 2009 sample was borderline Excellent and produced the second highest EPTs recorded. Indeed had just one more EPT taxa been collected this site would have received an Excellent bioclassification in 2009.

**BENTHIC MACROINVERTEBRATE SAMPLE**

Waterbody	Location	Station ID	Date	Bioclassification
SNOWBIRD CR	SR 1120	GB25	07/28/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.289167	-83.900278	2-190-9-(15.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	16.9	2220	7	0.2

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

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

**Water Quality Parameters**

Temperature (°C)	17.6
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	10
pH (s.u.)	4.9

Water Clarity	clear
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>96</b>

**Site Photograph**



Substrate	mostly boulder and rubble with some gravel and sand
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10781	---	52	---	2.13	Excellent
07/20/04	9442	---	48	---	2.06	Excellent
08/12/99	7970	---	52	---	2.57	Excellent
06/20/90	5320	---	49	---	1.80	Excellent

**Taxonomic Analysis**

A diverse and pollution intolerant EPT community continues to populate Snowbird Creek. Overall there has been little change in the benthic community composition from the first sample collected here, in 1990. However, two noticeable differences in this years sample were the absences of the caddisfly *Ceratopsyche sparna* (abundant in 1990, 1999 and 2004) and the mayfly *Maccaffertium ithaca* (abundant in 1990, common in 1999, 2004). Nevertheless, Snowbird Creek contains several highly pollution sensitive taxa such as the caddisflies *Apatania* spp, *Ceratopsyche alhedra* and the mayflies *Ephmerella crenula* and *Drunella allegheniensis*.

**Data Analysis**

Snowbird Creek rated Excellent in 2009, the same rating it received in each of its three prior samples. The very consistent Excellent bioclassifications are indicative of the minimally disturbed forested watershed present here.

**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
TULULA CR	SR 1260	04/29/09	GF29	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.30722222	-83.79444444	2-190-2-(0.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III,Tr	27.4	2035	11	0.5	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	80	10	10	0

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

**Water Quality Parameters**

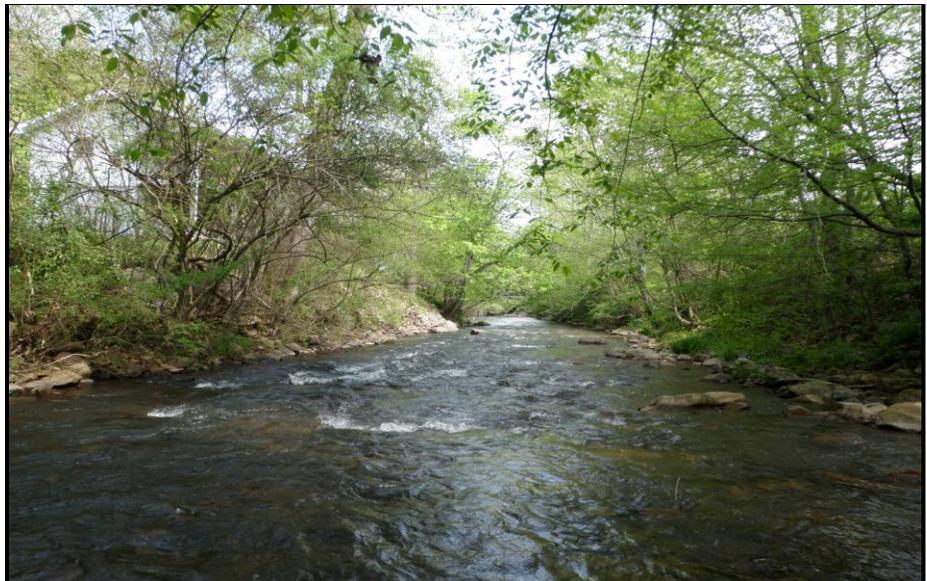
Temperature (°C)	14.5
Dissolved Oxygen (mg/L)	10.1
Specific Conductance (µS/cm)	25
pH (s.u.)	5.6

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

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	8
Riffle Habitat (16)	16
Erosion (7)	4
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	3
<b>Total Habitat Score (100)</b>	<b>85</b>

**Site Photograph**



Substrate	Cobble, boulder, bedrock
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/29/09	2009-22	15	48	Good
06/04/04	2004-69	14	46	Good-Fair

<b>Most Abundant Species 2009</b>	Central Stoneroller (36%)	<b>Exotic Species 2009</b>	Rainbow Trout, Redbreast Sunfish
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<b>Species Change Since Last Cycle</b>	<b>Gains</b> -- Black Redhorse, Redbreast Sunfish, Bluegill. <b>Losses</b> -- Creek Chub, Tangerine Darter. All species gained or lost were represented by 1 or 2 individuals/species.
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**Data Analysis**

**Watershed** -- drains the southeastern corner of Graham County; US 129 and a railroad parallel the creek throughout its length. **Habitats** -- slick rocks, plunge pools in mid-channel, bluegreen algal mats covering many of the rocks; most of the habitats were of high quality, except at the upper reach along the right shoreline where there was no canopy and the riparian zone was a manicured residential lawn. **Water Quality** -- pH less than the water quality standard of 6.0 s.u. in 2004 and 2009. **2009** -- total species richness was slightly lower than expected, especially among darters (n= 2) and minnows (n=6); very slight decline in the percentage of omnivores+herbivores from 51% to 49%) resulted in the very slight increase in NCIBI score and rating; Hatchery Supported Trout Waters, four stocked Brook Trout collected (200-291 mm TL); Rainbow Trout were all wild (n=28). **2004 & 2009** -- the presence of bluegreen algal mats and the percentages of omnivores+herbivores (i.e., Central Stoneroller and River Chub) which were much greater than expected continued to indicate possible upstream straight-piping or nonpoint-source erosion contributions of nutrients; 17 species known from the site including 7 species of minnows and 3 species of darters; dominant species have been Central Stoneroller (31% and 36%) and Mottled Sculpin (24% and 26%); stream is supporting its supplemental designation as trout waters (Tr).

**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
<b>SWEETWATER CR</b>	<b>SR 1214</b>	<b>04/29/09</b>	<b>GF36</b>	<b>Good</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.324966	-83.79335	2-190-3-(0.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III;Tr	13.6	1995	7	0.5	No

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

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

**Water Quality Parameters**

Temperature (°C)	13.4
Dissolved Oxygen (mg/L)	10.0
Specific Conductance (µS/cm)	32
pH (s.u.)	5.8

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

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	10
Pool Variety (10)	8
Riffle Habitat (16)	16
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	4
<b>Total Habitat Score (100)</b>	<b>89</b>

**Site Photograph**



Substrate	Bedrock shelves, cobble, boulder
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/29/09	2009-21	13	52	Good

Most Abundant Species 2009	Mottled Sculpin (34%)	Exotic Species 2009	Rainbow Trout
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Species Change Since Last Cycle	N/A
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**Data Analysis**

This is the first fish community sample collected at this site. **Watershed** -- drains east-central Graham County; NC 143 parallels much of the creek; no municipalities within the watershed; tributary to the Cheoah River. **Habitats** -- ledges and plunge pools, riffles, runs, poor quality riparian zones in terms of invasive plants and trash from the highway; swift flow and slippery rocks. **Water Quality** -- pH less than the water quality standard of 6.0 s.u. **2009** -- total species richness was slightly lower than expected, especially among darters (n=2) and minnows (n=7); other abundant species included River Chub (20%) and Central Stoneroller (16%); very low percentage of tolerant fish (1%); intolerant species included Rainbow Trout, Rock Bass, and Greenfin Darter; stream is supporting its supplemental designation as trout waters (Tr); and water quality is generally Good.

**FISH COMMUNITY SAMPLE**

Waterbody	Location	Date	Station ID	Bioclassification
<b>YELLOW CR</b>	<b>SR 1242</b>	<b>04/28/09</b>	<b>GF37</b>	<b>Not Rated</b>

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	4	06010204	35.417284	-83.874636	2-190-29	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	12.7	1830	6	0.4	No

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

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

**Water Quality Parameters**

Temperature (°C)	16.2
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	19
pH (s.u.)	5.6

Water Clarity	Clear, tannin stained
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**Habitat Assessment Scores (max)**

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	10
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
<b>Total Habitat Score (100)</b>	<b>79</b>

**Site Photograph**



Substrate	Sand, cobble, gravel, bedrock, silt
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/09	2009-20	6	---	Not Rated

Most Abundant Species 2009	Creek Chub (46%)	Exotic Species 2009	Rainbow Trout, Brown Trout
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Species Change Since Last Cycle	N/A
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**Data Analysis**

This is the first fish community sample collected at this site. **Watershed** -- drains northern Graham County; no municipalities within the watershed; tributary to the by-passed reach of the Cheoah River between its confluence with Calderwood Lake and Lake Santeetlah. **Habitats** -- Sand Hills-like with tannin stained water, a substrate primarily of sand, wide forested riparian zones of American Holly and Mountain Laurel, and *Fissidens* common on coarse woody debris; side pools, runs, and riffles; gradient changes dramatically ~ 0.5 miles below the site with steeper gradients and waterfalls. **Water Quality** -- low conductivity; pH less than the water quality standard of 6.0 s.u. **2009** -- naturally depauperate (species diversity and abundance) community; fewest fish collected than at any other site in 2009 (n=186); Mottled Sculpin and darters absent; Hatchery Supported Trout Waters; no reproducing populations of trout were found, but no evidence of water quality impairment.