

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L TENNESSEE R	OFF SR 1629	GB50	08/04/10	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.000000	-83.381667	2-(1)a	Broad Basins

Stream Classification	Stream Width (m)	Stream Depth (m)
C	25	0.6

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

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

Water Quality Parameters

Temperature (°C)	21.4
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	27
pH (s.u.)	5.9

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	7
Bank Erosion (7)	3
Bank Vegetation (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	2
Total Habitat Score (100)	58

Site Photograph



Substrate	Sand, gravel, cobble, silt with a trace of boulder
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/10	11014	72	24	5.72	4.61	Good-Fair
09/11/00	8303	67	15	6.35	4.08	Fair

Taxonomic Analysis

Numerous intolerant EPT taxa were collected in 2010 that were not present in 2000 and include the mayflies *Paraleptophlebia spp.*, *Neophemera purpurea*, the stonefly *Leuctra spp.*, and the caddisflies *Polycentropus spp.*, *Lype diversa*, and *Neophylax consimilis*. In addition, many pollution tolerant chironomids which were abundant in 2000 were completely absent in 2010 and include *Cricotopus bicinctus*, *C. fugax*, *C. infuscatus*. These data suggest more favorable water quality conditions in 2010 relative to 2000.

Data Analysis

This sampling location is below Commissioner Creek. The large improvement in the benthic macroinvertebrate metrics at this location since the 2000 collection strongly suggests improved water quality at this location.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L TENNESSEE R	SR 1113	GB24	08/05/10	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010202	35.326389	-83.523611	2-(26.5)b	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B	375	1800	50	0.4

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Franklin WWTP	NC0021547	1.65

Water Quality Parameters

Temperature (°C)	27.9
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	35
pH (s.u.)	6.5

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	14
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	4
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	80

Site Photograph



Substrate	mostly cobble (50), boulder (20), and bedrock (20); some silt (10)
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/05/10	11090	89	39	4.19	3.36	Good
08/05/04	9461	95	42	4.04	3.03	Good
08/09/99	7957	75	31	4.59	3.44	Good
07/13/94	6587	82	39	4.46	3.81	Good

Taxonomic Analysis

The decrease in EPT richness (15 taxa) occurred as a result of a net loss of baetid mayflies including the intolerant *Baetis pluto* and *Acentrella turbida* as well as the rare *Isonychia davidi*. However, the rarely collected *Heterocloeon petersi* has occurred at this site over the past 11 years. As expected in a large, productive river, flat-headed mayflies were abundant and were represented by 6 taxa and included the first basinwide site record of *Epeorus vitreus*. Caddisflies were rich with 22 taxa, the most this site has seen during basinwide sampling. Hydropsychids dominated and, along with other net-spinning caddisflies, were very abundant. First basinwide records for this site included *Leucotrichia pictipes*, a species typical of warm water, open-canopied rivers, *Ceraclea ancylus*, and two species of *Pycnopsyche*. Stonefly richness was half of that found in 2004 (2 vs. 4 taxa) and consisted entirely of riffle dwelling perlid stoneflies. Perlids are long-lived (2 years) as larvae so their presence over the last 16 years suggests overall stable habitat and water conditions.

Data Analysis

This most downstream site on the Little Tennessee River occurs in southeastern Swain county well below Franklin. The river at this point has two channels. The east channel was sampled in 2004 and the west channel sampled in 2010. These channels are very different as the east channel is primarily bedrock and the west has a good mix of substrates. Overall habitat in the west channel was good, particularly root mats and riffles, although pools were somewhat lacking. The specific conductance was low for a river downstream of a WWTP and the pH was also low for a large productive river. The BI was slightly elevated over the 2004 value (but remained lower than even earlier samples) and the EPT richness decreased, albeit only slightly. Water quality in the Little Tennessee at this site remains Good although it tends to fluctuate slightly, possibly contingent on the flow regime.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L TENNESSEE R	SR 1651	GB10	08/04/10	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.122222	-83.377778	2-(1)b	Broad Basins

Stream Classification	Stream Width (m)	Stream Depth (m)
C	40	0.7

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
	30	10	50	10	

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

Water Quality Parameters

Temperature (°C)	24.1
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	27
pH (s.u.)	6.9

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	7
Bank Erosion (7)	3
Bank Vegetation (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	45

Site Photograph



Substrate	Sand, silt, gravel, cobble, trace of boulder
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/10	11015	93	35	5.03	4.12	Good
07/22/04	9435	93	37	5.30	3.62	Good
10/20/99	7993	62	29	4.16	3.27	Good-Fair
08/05/87	4196	64	20	5.59	4.73	Good-Fair
08/06/85	3536	52	18	5.48	4.66	Fair

Taxonomic Analysis

There were numerous pollution intolerant taxa present in the 2004 and 2010 samples that have not been present from the previous three samples. These taxa include the mayflies *Baetisca carolina*, *Drunella allegheniensis*, *Epeorus vitreus*, *Leucrocota spp.* and the caddisflies *Brachycentrus spinae*, *Hydroptila spp.*, *Rhyacophila fuscula*, and *Neophylax consimilis*. The presence of these taxa suggest improved water quality at this site relative to the 1985-1999 monitoring period.

Data Analysis

Since the 1985 Fair bioclassification and the 1987 and 1999 Good-Fair ratings, invertebrate collections at this site in 2004 and 2010 have resulted in two consecutive Good bioclassifications. Since 2004, the EPT diversity has been stable and much higher than EPT data obtained in the previous three collections. The 2004 and 2010 data suggest improved water quality at this location relative to the 1985, 1987, and 1999 samples.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L TENNESSEE R	NC 28	GB35	08/05/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.235000	-83.395833	2-(26.5)a	Broad Basins

Stream Classification	Stream Width (m)	Stream Depth (m)
B	25	0.5

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

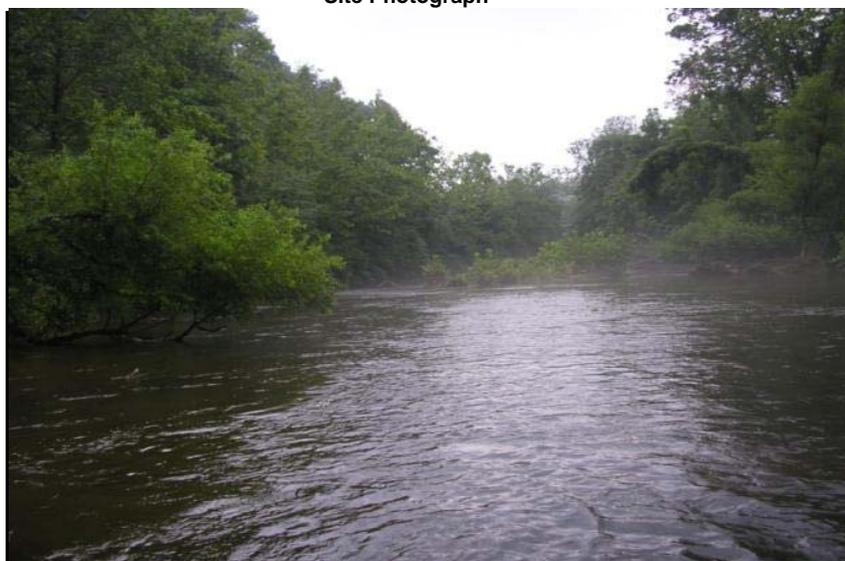
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
none		

Water Quality Parameters

Temperature (°C)	22.5
Dissolved Oxygen (mg/L)	6.1
Specific Conductance (µS/cm)	35
pH (s.u.)	6.4

Water Clarity slightly turbid

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	10
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	58

Substrate bedrock, boulders, sand, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/05/09	10791	85	37	4.66	3.55	Good
07/22/04	9448	71	32	5.07	4.13	Good-Fair
08/24/99	7978	86	32	5.27	3.65	Good-Fair
07/26/94	6621	57	27	4.88	4.07	Good-Fair
08/06/87	4197	75	28	5.37	4.29	Good-Fair

Taxonomic Analysis

Several EPT taxa were present for the first time in 2009 and included the mayflies *Iswaeon anoka*, *Plauditus dubius GR*, and the caddisfly *Brachycentrus spinae*. The addition of these intolerant taxa coupled with the simultaneous reduction of several pollution tolerant taxa (such as the chironomids *Ablabesmyia mallochi*, *Cricotopus bicinctus*, and *Cryptochironomus fulvus*) resulted in a the lowered BI (and EPTBI) in 2009. These trends may indicate improving water quality in this watershed.

Data Analysis

The EPTS, BI, and EPTBI have all been improving since 1987. The 2009 sample resulted in the highest EPTs, the lowest BI and the lowest EPTBI observed at this location and also resulted in an improved bioclassification of Good. The first non Good-Fair rating at this site. The improving invertebrate metrics indicate gradually improving water quality and is supported by the specific conductance data which has also been improving (128 µS/cm in 1999, 37 µS/cm in 2004, and 35 µS/cm in 2009). The 2005 assessment of this site noted that the drastic decline in conductivity from 2005 relative to 1999 may have been related to a reduction in local gem mining activities.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MIDDLE CR	SR 1635	GB49	08/03/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.052222	-83.374444	2-8	Broad Basins

Stream Classification	Elevation	Stream Width (m)	Stream Depth (m)
C; Tr	1930	7	0.3

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

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

Water Quality Parameters

Temperature (°C)	24.9
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	25
pH (s.u.)	6.7

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	11
Pool Variety (10)	8
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	68

Site Photograph



Substrate	rubble, boulder, sand, silt and gravel
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/03/10	11013		38		2.77	Excellent
07/22/04	9427		43		2.37	Excellent
08/24/99	7979		25		3.94	Good-Fair

Taxonomic Analysis

The 1999 sample produced the lowest EPT taxa richness ever recorded at this location. Since the 1999 collection, several new records of intolerant taxa were present in both 2004 and 2010 and include the mayflies *Baetis tricaudatus*, *Serratella serrata*, *Paraleptophlebia spp*, the stonefly *Perlenta spp* and the caddisflies *Ceratopsyche bronta*, *Nectopsyche exquisita*, *Lype diversa*, *Rhyacophila fuscula*, and *Neophylax consimilis*.

Data Analysis

The new records of intolerant invertebrates collected in 2004 and 2010 suggest that water quality improved after the 1999 Good-Fair collection. The relatively stable EPTS and EPTBI from 2004 and 2010 suggest that the water quality is also generally stable.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TESSENTEE CR	SR 1684	GB46	07/30/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.066944	-83.368056	2-9	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
	14.4		7	0.3

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

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

Water Quality Parameters

Temperature (°C)	18.3
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	21
pH (s.u.)	6.1

Water Clarity clear

Site Photograph



Habitat Assessment Scores (max)

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

Substrate Boulder, bedrock, cobble, gravel and sand with a trace of silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/09	10788		52		2.70	Excellent
07/22/04	9430		47		2.36	Excellent

Taxonomic Analysis

There are numerous intolerant taxa that have been present at this location since monitoring commenced in 2004 and included the mayflies *Drunella allegheniensis*, *Serratella serratoidea*, *Epeorus vitreus*, the caddisflies *Micrasema wataga*, *Glossosoma spp.*, *Dolophilodes spp.*, *Nyctiophylax celta* and the long-lived stoneflies *Acroneuria abnormis* and *Paragnetina immarginata*.

Data Analysis

The consistent Excellent bioclassifications and persistent intolerant benthic macroinvertebrate community (and long lived stoneflies) suggests stable and favorable water quality in this catchment. This conclusion is further supported by the specific conductance data which has been low and quite similar through time at 18 µS/cm in 2004 and 21.3 µS/cm in 2010.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
COWEETA CR	SR 1114	GB45	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.062778	-83.400556	2-10	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr	12.1	2100	7	0.2

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

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

Water Quality Parameters

Temperature (°C)	19.1
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	16
pH (s.u.)	5.9

Water Clarity	clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	92

Site Photograph



Substrate	mostly cobble and gravel
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10787	---	41	---	2.73	Excellent
07/22/04	9429	---	45	---	2.62	Excellent
08/21/99	7948	---	39	---	2.88	Excellent
07/27/94	6622	---	39	---	2.75	Excellent

Taxonomic Analysis

A stable, diverse, and pollution intolerant EPT fauna resides in Coweeta Creek. Abundant intolerant taxa collected in 2009 that characterize this site include the mayflies *Epeorus vitreus*, *Paraleptophlebia* spp, the stoneflies *Tallaperla* spp, *Perlesta* spp, and the caddisflies *Ceratopsyche bronta*, *C. sparna*, *Lepidostoma* spp and *Dolophilodes* spp.

Data Analysis

Coweeta Creek has been sampled here on four occasions with each sample producing an Excellent bioclassification. The majority of the watershed is undisturbed forest, in part, associated with Coweeta Creek Hydrological Laboratory. A protected, forested watershed combined with a minimally disturbed riparian zone and instream habitat have resulted in a temporally stable, diverse, and pollution intolerant macrobenthic community.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CARTOOGECHAYE CR	SR 1146	GB40	07/28/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.156389	-83.455556	2-19-(1)	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III;Tr	57.0	2110	17	0.0

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

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

Water Quality Parameters

Temperature (°C)	18.5
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	33
pH (s.u.)	6.0

Water Clarity	clear/turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	12
Bank Erosion (7)	6
Bank Vegetation (7)	2
Light Penetration (10)	5
Left Riparian Score (5)	4
Right Riparian Score (5)	0
Total Habitat Score (100)	68

Site Photograph



Substrate	boulder, cobble, gravle, sand, and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10784		30		3.24	Good
07/21/04	9446		31		3.03	Good
08/24/99	7977		41		2.81	Excellent
07/27/94	6623		30		2.91	Good

Taxonomic Analysis

With the exception of the 1999 sample, the invertebrate composition at this location is remarkably uniform. In fact, 23 common EPT species have been collected at this site in at least three of the four total collection events and include the pollution intolerant mayflies *Drunella allegheniensis*, *Serratella serrata*, *Epeorus vitreus*, the stoneflies *Acroneuria abnormis*, *Leuctra spp.*, and the caddisflies *Brachycentrus appalachia*, *Dolophilodes spp.*, and *Neophylax consimilis*.

Data Analysis

With the exception of the Excellent rating from 1999, the water quality at this site has been very stable. Indeed, the specific conductance has also been very uniform through time with a measurement of 33 µS/cm in 1999, 31 µS/cm in 2004, and 33 µS/cm in 2009. The biological uniformity is further demonstrated in that 40% of all the taxa ever collected at this location have been collected in at least three of the four total collections.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CULLASAJA R	US 64	GB48	08/03/10	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.068889	-83.188889	2-21-(0.5)a	Southern Crystalline Ridges and Mountains

Stream Classification	Stream Width (m)	Stream Depth (m)
WS-III; Tr	5	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
	45	0	0	30	

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

Water Quality Parameters

Temperature (°C)	22.4
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	46
pH (s.u.)	5.4
Water Clarity	clear

Site Photograph



Habitat Assessment Scores (max)

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

Substrate sand, silt, gravel, and cobble with a trace of bedrock and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/03/10	11010	91	29	5.15	3.83	Good-Fair
07/21/04	9433	58	14	5.67	4.73	Fair
07/25/01	8537	41	10	6.67	6.04	Fair
08/28/00	8280	65	18	6.25	5.27	Fair
06/23/99	7869	47	14	5.63	4.88	Fair

Taxonomic Analysis

The EPT diversity at this site has more than doubled since the the most recent sample in 2004 and represents the highest EPT diversity ever observed here. EPT taxa collected here for the first time included the mayfly *Centropilum spp.*, the intolerant and long-lived perlid stoneflies *Acroneuria abnormis*, *Paragnetina immarginata*, and the caddisflies *Micrasema wataga*, *Glossosoma spp.*, *Hydroptila spp.*, *Oxyethira spp.*, *Triaenodes marginatus*, *Neophylax consimilis*, and *N. mitchelli*. The addition of these taxa, and particularly of the long-lived perlid stoneflies, indicates that water quality at this location has improved relative to previous years.

Data Analysis

All four previous samples resulted in Fair bioclassifications. This site improved substantially from earlier samples with every benthic macroinvertebrate metric showing improvement. Of interest is the pH. The 2010 observations were substantially lower than the 2000 (6.7), 2001 (6.7) and 2004 (6.8) measurements and suggests a reduction in non-point pollution inputs which tend to have neutral to high pH characteristics. Indeed, many sites in this basin with minimal non-point pollution have very low pH values. Examples of this can be seen at Snowbird Creek (SR 1120) and Tellico Creek (SR 1367) with 2010 pH measurements of 5.6 and 4.9 respectively.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CULLASAJA R	SR 1678	GB79	08/03/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.125278	-83.285278	2-21-(5.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Stream Width (m)	Stream Depth (m)
B; Tr	12	0.5

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

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

Water Quality Parameters

Temperature (°C)	24.2
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	29
pH (s.u.)	6.3

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)	6
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	81

Site Photograph



Substrate	boulder, cobble, gravel, with a trace of sand and bedrock
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/03/10	11012	103	51	3.26	2.35	Excellent
06/22/99	7862	90	50	3.36	2.29	Excellent
10/15/96	7214	86	45	3.31	2.36	Excellent
07/26/94	6602	85	42	3.60	2.73	Excellent
10/15/91	5749	95	48	3.67	2.90	Excellent

Taxonomic Analysis

There are numerous pollution intolerant taxa that have been present at this location at each of the five collections and include the mayflies *Epeorus vitreus*, *Maccaffertium ithaca*, *M. pudicum*, *Neophemera purpurea*, the stoneflies, *Tallaperla spp.*, *Acroneuria abnormis*, *Paragnetina immarginata*, *Pteronarcys spp.*, and the caddisflies *Ceratopsyche morosa*, and *C. sparna*. In addition, several taxa were collected for the first time at this location in 2010 and included the intolerant mayflies *Heterocloeon curiosum*, *Procloeon spp.*, *Drunella allegheniensis* and the caddisfly *Trienodes perna*. The new intolerant taxa collected in 2010 further support the trend of improving community metrics observed at this station since monitoring commenced in 1991.

Data Analysis

The consistent Excellent bioclassifications, high species diversity and low biotic indices are all indicative of a pollution intolerant invertebrate community typical of a largely undisturbed watershed. These conclusions are further supported by the low specific conductance values observed (20 µS/cm in 1999, 29 µS/cm in 2010). Overall, the benthic invertebrate community metrics (S, EPT, BI and EPTBI) have generally been improving since the first sample in 1991.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CULLASAJA R	SR 1668	GB39	08/03/10	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.164444	-83.325833	2-21-(5.5)	Broad Basins

Stream Classification	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr	2100	20	0.4

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

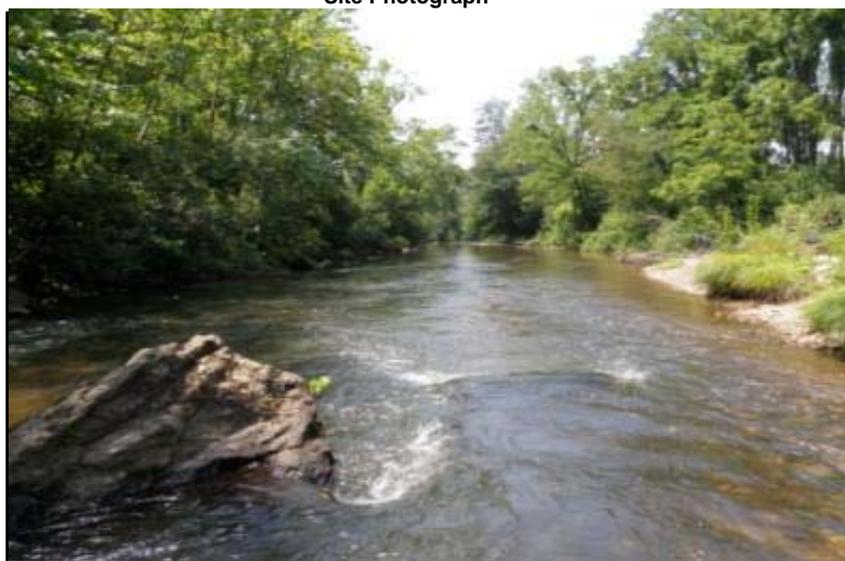
Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
None	N/A	N/AB; Tr

Water Quality Parameters

Temperature (°C)	24.6
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	33
pH (s.u.)	7.1

Water Clarity	clear
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Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	10
Pool Variety (10)	4
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	4
Right Riparian Score (5)	1
Total Habitat Score (100)	63

Substrate	Sand, silt, gravel, cobble and bedrock.
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/03/10	11011	116	50	4.30	3.08	Excellent
08/05/04	9462	86	42	4.27	3.42	Good
08/10/99	7961	99	51	3.74	3.09	Excellent

Data Analysis

The 1999 and 2010 samples were structurally quite similar. The slight decline in bioclassification seen in 2004 was largely due to the lack of certain taxa collected in 1999 and 2010. These taxa included the mayflies *Leucrocuta spp*, *Stenacron pallidum*, and the caddisflies *Micrasema bennetti*, *Hydropsyche venularis*, *Ceraclea ancylus*, *Neureclipsis spp*, *Nyctiophylax spp* and *Polycentropus spp*. With the possible exception of *Hydropsyche venularis* and *Micrasema bennetti*, these taxa are generally restricted to slow pools along the stream margin. Their presence in 1999 and 2010 and absence in 2004 suggests that this habitat type was poorly developed or absent during the 2004 sample. Therefore, the slight decrease in bioclassification seen in 2004 was likely not related to a water quality change but may have been the result of reduced habitat availability, possibly related to low flow conditions. This assertion is supported by the water quality data as specific conductance was 22 µS/cm in 2004 and 33 µS/cm in 2010.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TURTLE POND CR	SR 1620	GB47	08/20/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.075278	-83.260278	2-21-8	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	5.5	3320	10	0.2

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

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

Water Quality Parameters

Temperature (°C)	17.8
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	13
pH (s.u.)	5.7
Water Clarity	clear

Site Photograph



Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	84

Substrate mix of cobble, sand, boulder, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/09	10827	---	46	---	2.24	Excellent
07/23/04	9428	---	49	---	2.10	Excellent
06/22/99	7866	---	42	---	1.90	Excellent

Taxonomic Analysis

Several taxa were collected for the first time at the site in 2009. Most notable was *Micrasema sprulesi*, for which the BAU has fewer than 25 records. Other taxa collected for the first time included the stonefly *Sweltsa spp* and the caddisflies *Goera calcarata*, *Mystacides spp*, *Molanna blenda*, and *Rhyacophila minor*.

Data Analysis

Turtle Pond Creek is approximately three miles northwest of Highlands and about 0.5 stream-miles above the confluence with Cullasaja River. Though the site has a significant amount of sand, a diverse benthic community was supported. All benthic macroinvertebrate metrics have been stable at this location since monitoring commenced in 1999 and all bioclassifications have been Excellent.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
IOTLA CR	SR 1372	GB33	08/04/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.234444	-83.398333	2-27	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
	10.0		5	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	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)	21.2
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	49
pH (s.u.)	6.6

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	0
Riffle Habitat (16)	10
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	0
Total Habitat Score (100)	58

Site Photograph



Substrate	boulder, silt, sand, and cobble
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/09	10790	83	32	4.63	3.92	Good
05/24/07	10188		31		3.62	Good
07/22/04	9449	73	32	4.66	3.86	Good
08/10/99	7960		35		3.50	Good
07/27/94	6624		21		4.28	Good-Fair

Taxonomic Analysis

Several intolerant taxa absent from the 1994 Good-Fair sample but present at each of the four subsequent Good collections included the mayflies *Teloganopsis deficiens*, *Heptagenia marginalis*, the stonefly *Perlesta spp*, and the caddisfly *Triaenodes ignitus*.

Data Analysis

With the exception of the 1994 Good-Fair sample, Iotla Creek at this location has rated Good on four separate occasions. There has been very little shift among the invertebrate community since the 1994 sample and suggests very stable and generally favorable water quality in this catchment. This conclusion is further supported by the stable conductivity at each observation (49 µS/cm in 2009, 39 µS/cm in 2007, 40 µS/cm in 2004, and 42 µS/cm in 1999).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
COWEE CR	NC 28	GB31	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.262500	-83.409444	2-29	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	26.0	1980	6	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)	19.2
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	26
pH (s.u.)	5.9

Water Clarity	turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	16
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	6
Left Riparian Score (5)	0
Right Riparian Score (5)	4
Total Habitat Score (100)	70

Site Photograph



Substrate	Boulder, cobble, gravel
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10786		40		2.94	Excellent
05/23/07	10187		43		2.81	Excellent
07/22/04	9451		38		2.82	Excellent
08/10/99	7962		35		2.37	Good
07/26/94	6620		24		3.31	Good-Fair

Taxonomic Analysis

Several pollution intolerant taxa absent from the 1994 Good-Fair sample have been present in the subsequent samples and include the mayflies *Serratella serrata*, *Heptagenia marginalis*, *Leucrocuta spp.*, *Paraleptophlebia spp.*, the stonefly *Leuctra spp.*, and the caddisflies *Brachycentrus nigrosoma*, *Lepidostoma spp.*, and *Oecetis persimilis*.

Data Analysis

This site improved to Good in 1999 and then improved to Excellent in 2004 and has remained Excellent in both of the subsequent collections. The only small difference in the community noted at this location since 2004 was the very slight increase in the EPTBI. However, the data suggest no significant change in the water quality since 2004.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BURNINGTOWN CR	SR 1371	GB30	08/04/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.266389	-83.473056	2-38	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr	24.8	1950	10	0.2

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

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

Water Quality Parameters

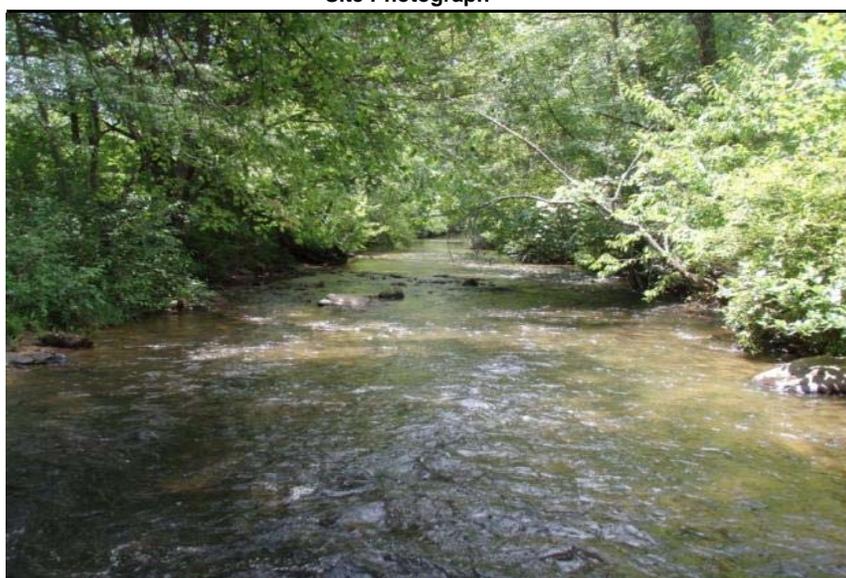
Temperature (°C)	20.5
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	20
pH (s.u.)	6.0

Water Clarity	clear
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	10
Pool Variety (10)	4
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	77

Site Photograph



Substrate	mix of bolder, rubble, gravel and sand
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/09	10789	---	37	---	3.41	Excellent
08/03/04	9477	---	43	---	3.12	Excellent
08/10/99	7959	---	39	---	3.06	Excellent
07/26/94	6619	---	30	---	2.89	Good

Taxonomic Analysis

Few differences existed with the common and abundant EPT taxa between the 2004 and 2009 samples. Although some changes in the benthic community in 2009 included the absence of the caddisfly *Micrasema watauga* (abundant in 2004 and common in 1999) and the stonefly *Pteronarcys* spp (common in 2004 and 1999, and abundant in 1994) but absent in 2009. The rest of the differences between 2004 and 2009 at Burningtown Creek involved the absence/presence of rare taxa. Despite the few differences the EPT community here appears diverse and generally pollution intolerant.

Data Analysis

Burningtown Creek rated Excellent in 2009, the same rating it received in 2004 and 1999. Though EPT diversity remains high here, the Biotic Index has steadily increased since first being sampled in 1994 suggesting that the benthic community is becoming slightly more pollution tolerant over time.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TELLICO CR	SR 1367	GB28	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.281944	-83.507500	2-40	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
	12.0		6	0.2

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

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

Water Quality Parameters

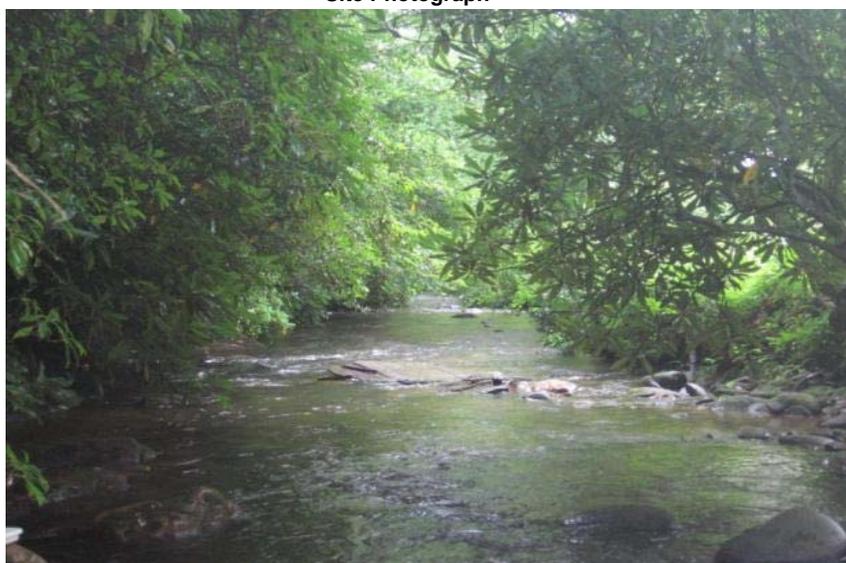
Temperature (°C)	17.7
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	23
pH (s.u.)	5.6

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	3
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	81

Site Photograph



Substrate	Boulder, cobble, gravel, sand and a trace of silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10785	93	40	3.07	2.35	Excellent
08/03/04	9476	93	44	3.29	2.33	Excellent
08/09/99	7958	108	54	3.30	2.24	Excellent
07/14/94	6586	84	43	3.24	2.37	Excellent

Taxonomic Analysis

Although several intolerant taxa were present in 2009 and included the mayflies *Drunella conestee*, *Epeorus vitreus* and the stoneflies *Tallaperla* spp., *Acroneuria abnormis*, *Paragnetina immarginata*, there were several edge-dwelling caddisflies that were absent or reduced in abundance in 2009 relative to previous collections. These taxa included *Brachycentrus spinae*, *Goera* spp and *Pycnopsyche* spp. The absence or reduction in these taxa may be related to a reduction in their favored habitat due to drought induced low flows. However, changes in water chemistry cannot be ruled out.

Data Analysis

Although there is a large trout farm approximately 1.8 miles upstream, there appears to be little impact to the benthic macroinvertebrate community as this site continues to rate Excellent and harbors many intolerant taxa. It is possible that dilution effects of several tributaries located between this location and the trout farm is having a positive influence on the invertebrate community. However, the EPTs in 2009 was the lowest on record and corresponded to a small increase in the specific conductance (23 µS/cm in 2009) which was elevated relative to the 1999 (16 µS/cm) and 2004 (17 µS/cm) observations. A reduction in flow in 2009 relative to earlier samples may support the elevated conductivity data due to a weakening in tributary dilution effects. Further, a reduction in flow also supports the lack of the edge-dwelling caddisfly taxa. Additional monitoring at this location is strongly recommended.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NANTAHALA R	FSR 437	GB42	07/21/04	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	3	06010202	35.126944	-83.619167	2-57-(0.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B; Tr, ORW	52	3065	22	0.4

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
	80	10	0	10	---

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

Water Quality Parameters

Temperature (°C)	21.9
Dissolved Oxygen (mg/L)	9.2
Specific Conductance (µS/cm)	17
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)	15
Pool Variety (10)	4
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph



Substrate	mostly boulder, cobble and gravel with some sand and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/10	11016	108	56	3.01	1.93	Excellent
07/21/04	9445	92	49	2.90	1.60	Excellent
08/24/99	7976	100	49	3.11	2.02	Excellent
07/26/94	6627	77	48	2.40	1.95	Excellent
07/10/91	5655	94	54	2.34	1.48	Excellent

Taxonomic Analysis

Sampling in 2010 yielded the highest EPT richness yet in this upper reach of the Nantahala River. The EPT community at this site included some previously uncollected taxa including the rare mayfly *Litobrancha recurvata* as well as the mayflies *Procladius* spp and *Epeorus subpallidus*. The stonefly community was very similar to that seen in previous samplings. Caddisflies previously uncollected included the silt-loving *Phyloctropus*, the uncommon long-horned *Triaenodes taenius* and the stone casemaker *Psilotreta frontalis*. Non-EPT benthos was rich, particularly in chironomids, but not abundant.

Data Analysis

The Nantahala River at FSR 437 straddles the Macon County-Clay County line and is upstream of Nantahala Lake. It's waters are derived from small mountain streams that reside within Nantahala National Forest, and thus has colder water than many other rivers of similar size. While both total and EPT richness increased, the respective biotic indices also increased over previous values although not dramatically. However, habitat and physico-chemical parameters were very supportive of a diverse macroinvertebrate fauna which was the productive and intolerant community one would expect from a stream supplementally classified as ORW. This site retains an Excellent bioclassification.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NANTAHALA R	OFF US 19-74 BE QUEENS CR	GB8	08/04/09	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	3	06010202	35.286111	-83.667500	2-57-(22.5)b	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr	142.0	1960	20	0.3

Visible Landuse (%)	Forested/Wetland	Urban	Agriculture	Other (describe)
	66	33	0	

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

Water Quality Parameters

Temperature (°C)	12.8
Dissolved Oxygen (mg/L)	9.6
Specific Conductance (µS/cm)	25
pH (s.u.)	6.3

Water Clarity	clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	85

Site Photograph



Substrate	mostly rubble with some boulder and gravel
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/04/09	10782	93	37	3.90	2.42	Good
07/20/04	9438	83	35	4.19	2.26	Good
08/23/99	7953	---	35	---	2.25	Good
07/26/94	6617	71	36	3.64	2.15	Good
11/15/93	6419	65	32	4.07	2.15	Good

Taxonomic Analysis

A diverse EPT community resides in this section of the Nantahala River although there is little difference among the taxa found in 2009 from previous collections. Among the dominant taxa that appear year after year include the mayflies *Serratella deficiens*, *Maccaffertium modestum*, *M. ithaca*, the stoneflies *Leuctra* spp and *Isoperla holochlora*, and the caddisflies *Micrasema watauga* and *Glossosoma* spp. Although more taxa were found in 2009 than any of the previous six collections, very few taxa new to this location were collected.

Data Analysis

This segment of the Nantahala River rated Good in 2009, the same rating it has received since 1993. It was first sampled in 1984, rating Good-Fair, followed by the same rating two years later. This portion of the Nantahala River is highly regulated with daily releases that greatly influence water chemistry, water depth and velocities. Though some edge taxa are limited here, overall, the macroinvertebrate community has adjusted to this artificial hydrologic regime and is currently stable.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
ALARKA CR	SR 1185	GB17	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010202	35.378611	-83.472222	2-69-(2.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	25.0	1952	9	0.2

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

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

Water Quality Parameters

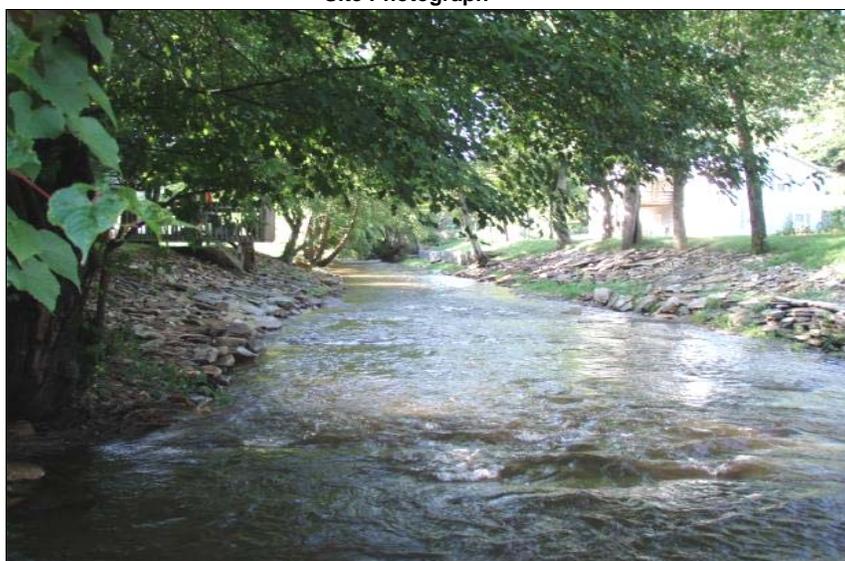
Temperature (°C)	19.6
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	28
pH (s.u.)	6.8

Water Clarity	slightly turbid
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Habitat Assessment Scores (max)

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

Site Photograph



Substrate	Cobble, boulder, and gravel with some bedrock, sand, and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10769	110	53	3.59	2.66	Excellent
08/02/04	9453	101	46	3.88	2.67	Excellent
08/09/99	7956	86	51	3.62	3.03	Excellent
07/11/94	6580	91	48	3.70	2.99	Excellent

Taxonomic Analysis

Sampling resulted in the highest total taxa richness and EPT levels yet seen in this stream since it was added as a basinwide site. Approximately half of the EPT collected were mayflies (26 taxa) of which at least one third were abundant. Two intolerant mayflies (Ephemeroptera) not collected since 1994, *Baetisca spp* and *Brachycercus spp*, were collected in 2009. Stoneflies (Plecoptera) were rich and abundant as a group while the caddisflies were dominated by *Brachycentrus spinae* and hydropsychids. Additionally, five intolerant caddisflies were collected for the first time here and included *Ceraclea spp*, *Mystacides spp*, *Rhyacophila carolina*, and *Neophylax mitchelli*.

Data Analysis

While the watershed is primarily forested, the main stem of Alarka Creek is followed closely by a road resulting in mostly residential development along the stream channel. It was noted that since the last sampling event, native rock was removed from the channel downstream of the site (see photo above) by landowners adjacent to the stream to armor the immediate banks and to construct a gabion. This removed a significant amount of local habitat but did not affect the bioclassification. Sampling in 2009 resulted in the lowest biotic index ever measured in this stream. In fact, Alarka Creek has never rated lower than Excellent and maintains this rating in 2009 indicating that the water quality is very stable.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
WHITEOAK CR	SR 1397	GB36	07/28/09	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	3	06010202	35.221944	-83.615278	2-57-45b	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	7.1	3300	7	0.2

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

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

Water Quality Parameters

Temperature (°C)	18.2
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	28
pH (s.u.)	5.1

Water Clarity	clear
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Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	19
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	5
Bank Vegetation (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	71

Site Photograph



Substrate	mix of boulders, rubble, gravel and silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10783	57	21	4.84	1.73	Good-Fair
07/21/04	9443	63	26	4.53	2.34	Good-Fair
08/09/90	5426	60	20	5.83	2.20	Fair
05/15/90	5278	79	35	4.06	1.96	Good-Fair
01/23/90	5159	83	39	3.91	2.26	Good-Fair

Taxonomic Analysis

Only three EPT, all caddisflies, were abundant at this site on Whiteoak Creek in 2009 and included *Glossosom* spp, *Ceratopsyche sparna*, and *Lepidostoma* spp. Low EPT taxa richness combined with high numbers of pollution tolerant taxa such as oligochaetes, leeches, chironomids, and other dipterans reflect an organically enriched aquatic environment. Large numbers of the filter feeding black fly, *Simulium* sp, were collected in summer 2009 and 2004, an increase from 1990 suggesting that additional organic particulates are entering Whiteoak Creek. This is the only site in the Little Tennessee Basin where the dipeteran *Limnophora* spp was collected in 2009. This taxa resides in the aquatic mosses that dominate the benthos in this enriched aquatic environment.

Data Analysis

Whiteoak Creek rated Good-Fair in 2009, the same rating it received in 2004. Since first being sampled in 1988, this waterbody has rated Fair twice and Good-Fair four times. This segment is located downstream of a trout farm, which appears to be adversely affecting the benthic community. Previous BAU investigations (B-, 881209, B-900220, B-900720, B-050218) clearly documented the effects of untreated wastewater here. Abnormally large and thick mats of aquatic plants have been a historic issue in Whiteoak Creek from 1998 to present. These mats consisted mostly of *Hylothecha mucosa* with some *Vaucheria* spp intermixed. *Hyloceca mucosa* is a widespread green alga usually occurring in acidic, oligotrophic aquatic environs. The degraded condition of this waterbody persists 1.5 miles downstream to Whiteoak Dam.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PANTHER CR	SR 1233	GB16	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Graham	2	06010202	35.390833	-83.624444	2-115	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	9.2	1739	8	0.2

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

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

Water Quality Parameters

Temperature (°C)	17.9
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	24
pH (s.u.)	6.6

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)	4
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	86

Site Photograph



Substrate	Cobble, gravel, and boulder with some bedrock
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10701	---	45	---	2.13	Excellent
08/04/04	9457	---	35	---	2.07	Good
08/10/99	7963	---	39	---	2.15	Excellent
07/13/94	6585	---	37	---	1.93	Excellent

Taxonomic Analysis

The EPT richness in Panther Creek increased by more than 25% over 2004 levels to reach the highest richness yet measured in this waterbody. Although increases were seen in all three insect orders, it was primarily driven by increases in caddisfly taxa. Many taxa were new records for this stream and included the mayflies *Dipheter hageni* and *Epeorus dispar*, the stonefly *Beloneuria spp* and the caddisflies *Mystacides spp* and *Triaenodes perna/helo*.

Data Analysis

This site on Panther Creek is about 0.25 miles upstream of Fontana Lake. The high gradient stream follows a road and is impacted mostly by residential development and runoff, although the watershed is only lightly developed. In-stream habitat and physico-chemical parameters were good and no sediment problems or riparian issues (except for a road corridor) were noted. Previous observations of high periphyton biomass were not seen during 2009 sampling. The only non Excellent bioclassification observed at this site was in 2004 and that assessment was short of Excellent by just one EPT taxon. Overall, the water quality at this location has been quite stable through time.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
STECOAH CR	SR 1237	GB14	07/29/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Graham	2	06010202	35.395556	-83.679167	2-130	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; Tr	8.9	1801	5	0.3

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

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

Water Quality Parameters

Temperature (°C)	18.6
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	54
pH (s.u.)	6.8

Water Clarity	turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	6
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	79

Site Photograph



Substrate	Cobble and gravel with some boulder and gravel
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/29/09	10700	---	41	---	3.18	Excellent
08/04/04	9458	---	30	---	2.94	Good
08/11/99	7964	---	39	---	2.94	Excellent
07/13/94	6584	---	29	---	3.51	Good

Taxonomic Analysis

EPT richness increased by more than 33% from that measured in 2004 and was the highest observed here since sampling commenced. In addition, the stonefly community was the richest ever measured in Stecoah Creek with eight taxa collected while only five were collected in 2004.

Data Analysis

Stecoah Creek is a tributary to Fontana Lake and drains the northeastern portion of Graham County. Almost the entire stream corridor is developed for both residential and agricultural use leaving the forested landscape mostly around small tributaries to Stecoah Creek. At the time of sampling, flows were high and water was turbid making sampling difficult. Although benthic substrate was good, riparian vegetation was narrow or absent and some erosional areas were noted. Stecoah Creek has cycled between Good and Excellent since 1994 suggesting that water quality in this stream, though relatively stable, may be adversely affected by non-point source runoff during high flow years and positively affected during times of drought when non point pollution inputs are lower. This was likely the case in 2009.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HAZEL CR	NR MOUTH	GB3	07/28/09	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Swain	2	06010202	35.473611	-83.722778	2-146-(19)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV; Tr, ORW, CA	44.8	1720	22	0.4

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

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	12
pH (s.u.)	6.4

Water Clarity	clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	16
Bank Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	90

Site Photograph



Substrate	Cobble and boulder with gravel and sand, some silt
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Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/28/09	10696	118	61	3.17	2.13	Excellent
08/03/05	9682	108	60	3.00	2.14	Excellent
08/03/04	9456	96	46	3.29	2.17	Excellent
08/11/99	7967	106	56	2.89	1.87	Excellent
07/12/94	6583	95	47	2.81	1.85	Excellent

Taxonomic Analysis

A very high total of 61 EPT were recorded in Hazel creek in 2009, similar to the 2005 EPT richness. The benthic community composition was very similar to previous years and was composed of many pollution sensitive taxa. While most of these taxa were previously collected, a few were collected for the first time in Hazel Creek including only the second NC record of the flatheaded mayfly *Epeorus subpallidus* and the third NC record of the baetid *Acentrella barbara* which was described from Great Smoky Mountain National Park in 2006. Other newly collected taxa included the caddisflies *Phylocentropus spp*, *Molanna spp*, and *Oligostomis pardalis*.

Data Analysis

Hazel Creek drains a southeastern portion of Great Smoky Mountain National Park into Fontana Lake. Hazel Creek is paralleled by a gravel road for much of its length but otherwise has a completely forested watershed. While the sampling site is near the historic town of Proctor which was flooded to create Fontana Lake in 1944, very little evidence of the urbanization of Hazel Creek remains. Habitat was excellent and flows were normal creating a succession of riffles and pools for macroinvertebrate colonization. Historically high total taxa, EPT richness and EPT abundance (332) values were obtained in 2009. Although the biotic index did increase slightly in 2009, this was largely due to the collection of 11 beetle taxa (most of which are pollution tolerant species). Overall, the benthic macroinvertebrate metrics have remained remarkably stable at this location and is the result of the entirely protected and forested nature of the watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MIDDLE CR	SR 1635	04/30/09	GF19	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.05194444	-83.36361111	2-8	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	12.2	2115	7	0.4	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	85	15	0	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)	9.1
Specific Conductance (µS/cm)	23
pH (s.u.)	5.8

Water Clarity	Clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	7
Erosion (7)	4
Bank Vegetation (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	65

Site Photograph



Substrate	Cobble, gravel, sand, silt
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/30/09	2009-24	19	58	Excellent
05/17/04	2004-44	16	56	Good

Most Abundant Species 2009	Mottled Sculpin (36%)
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Exotic Species 2009	Yellowfin Shiner, Mountain Redbelly Dace, Brown Trout, Redbreast Sunfish
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Species Change Since Last Cycle

Gains -- Whitetail Shiner, Mountain Redbelly Dace, Western Blacknose Dace, Brown Trout, Greenfin Darter
Losses -- Rainbow Trout, Largemouth Bass. All species gained or lost were represented by 1-3 individuals/species; Rainbow Trout represented only by young-of-year and excluded from the sample.

Data Analysis

Watershed -- drains southern Macon County and a small portion of northern Rabun County, GA; tributary to the Little Tennessee River; site is ~ 1.1 miles above the creek's confluence with the river; no municipalities within the watershed. **Habitats** -- primarily runs, plunge pools, snags, narrow riparian zone along the right bank in residential use. **Water Quality** -- pH less than the water quality standard of 6.0 s.u. in 2004 and 2009. **2009** -- the collection of one individual of Greenfin Darter improved the rating from Good to Excellent; except for the darter metric, all other metric scores were comparable to reference site values (i.e., score = 5). **2004 & 2009** -- 21 species are known from the site, including 11 species of cyprinids, 5 exotic species, 4 intolerant species, 2 species of darters, and the Smoky Dace (Special Concern); dominant species has been the Mottled Sculpin (38% and 36%); no reproducing trout populations found at this lowermost site.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TESSENTEE CR	SR 1636	04/30/09	GF28	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.06527778	-83.37777778	2-9	Southern Crystalline Ridges & Mtns.

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	14.8	2040	7	0.4	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	60	15	0	25 (feedlot & cattle pasture)

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

Water Quality Parameters

Temperature (°C)	13.5
Dissolved Oxygen (mg/L)	9.4
Specific Conductance (µS/cm)	18
pH (s.u.)	6.1

Water Clarity	Clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	2
Erosion (7)	4
Bank Vegetation (7)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	70

Site Photograph



Substrate	Cobble, gravel, sand, silt
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/30/09	2009-25	19	52	Good
05/18/04	2004-46	16	52	Good
05/03/95	95-38	16	56	Good

Most Abundant Species 2009	Mottled Sculpin (40%)
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Exotic Species 2009	Snail Bullhead, Green Sunfish, Redbreast Sunfish
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Species Change Since Last Cycle

Gains -- Fatlips Minnow, Creek Chub, Snail Bullhead, Green Sunfish, **Losses** -- Golden Redhorse. All species gained or lost were represented by 1 individual/species, except for Creek Chub (n = 13) and Golden Redhorse (n = 10).

Data Analysis

Watershed -- drains southern Macon County; no municipalities within the watershed; tributary to the Little Tennessee River; site is ~ 0.6 miles above the creeks' confluence with the river. **Habitats** -- riffles, runs, silty shorelines, side snags, deep chutes; narrow riparian zone along the right shoreline in residential land use; unstable banks. **Water Quality** -- low specific conductance in 2004 and 2009. **2009** -- more fish collected than at any other site in 2009; 2.6 times more fish collected in 2009 than in 2004 (1,476 vs. 578), especially in the numbers of Mottled Sculpin (40%), Central Stoneroller (18%), River Chub (11%), Tennessee Shiner (7%), and Yellowfin Shiner (7%); Hatchery Supported Trout Waters, no trout collected except young-of-year Brown Trout. **1995-2009** -- 23 species known from the site, including 9 species of cyprinids, 6 exotic species, 4 intolerant species, 2 species of darters, and the Smoky Dace (Special Concern); dominant species has been the Mottled Sculpin (20, 39, and 40%); no reproducing trout populations found at this lowermost site; no substantial changes in this community among the three monitoring periods.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ELLIJAY CR	SR 1524	04/30/09	GF14	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.16611111	-83.3075	2-21-23	Southern Crystalline Ridges & Mtns.

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	20	2070	8	0.5	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	45	15	40	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)	31
pH (s.u.)	6.9

Water Clarity	Clear
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Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	10
Pool Variety (10)	9
Riffle Habitat (16)	16
Erosion (7)	7
Bank Vegetation (7)	4
Light Penetration (10)	5
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	77

Site Photograph



Substrate	Cobble, bedrock, boulder, gravel, silt, sand
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/30/09	2009-26	19	50	Good
05/20/04	2004-51	20	56	Good

Most Abundant Species 2009	Central Stoneroller (31%), Mottled Sculpin (29%)	Exotic Species 2009	Rainbow Trout, Redbreast Sunfish
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Species Change Since Last Cycle	Gains -- Fatlips Minnow and Gilt Darter. Losses -- Green Sunfish, Greenfin Darter, Tuckasegee Darter. All species gained or lost were represented by 1 or 2 individuals/species.
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Data Analysis

Watershed -- drains the east-northeast region of Macon County; tributary to the Cullasaja River; site is ~ 0.6 mile above the creek's confluence with the river. **Habitats** -- swift flow; riffles, runs, plunge pools, side snags, narrow riparian zones (road and pasture) contributing to a fairly open canopy. **2009** -- almost twice as many fish collected in 2009 than in 2004 (1,132 vs. 590), especially the numbers of Central Stoneroller and Mottled Sculpin, but only one individual of one darter species; increase in the abundance of Central Stoneroller and River Chub are indicative of upstream nonpoint nutrient runoff and enrichment. **2004 & 2009** -- 22 species known from the site, including 10 species of cyprinids, 5 intolerant species, 3 species of darters, but all darter species represented only by one individual per species, and the Smoky Dace (Special Concern); Mottled Sculpin is the dominant species (44% and 29%); stream is supporting its supplemental designation as trout waters (Tr). Possible upstream nonpoint nutrient runoff and decline in the NCIBI score warrant continued monitoring in 2014.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
IOTLA CR	off SR 1378	05/01/09	GF15	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MACON	1	06010202	35.23444444	-83.39805556	2-27	Broad Basins

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	10	1995	5	0.4	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	40	40	20	0

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

Water Quality Parameters

Temperature (°C)	15.3
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	41
pH (s.u.)	5.7

Water Clarity	Slightly turbid
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	6
Pool Variety (10)	8
Riffle Habitat (16)	10
Erosion (7)	4
Bank Vegetation (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	2
Total Habitat Score (100)	69

Site Photograph



Substrate	Cobble, boulder, sand, silt
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/01/09	2009-27	22	48	Good
05/19/04	2004-48	18	44	Good-Fair

Most Abundant Species 2009	River Chub (26%)
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Exotic Species 2009	Yellowfin Shiner, Brown Trout, Redbreast Sunfish, Green Sunfish
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Species Change Since Last Cycle

Gains -- Spotfin Chub, Telescope Shiner, Fatlips Minnow, Creek Chub, Black Redhorse, Brown Trout, Tuckasegee Darter. **Losses** -- Mountain Brook Lamprey, White Sucker, Bluegill. All species gained or loss were represented by 1-34 individuals/species, except for Telescope Shiner (n = 16).

Data Analysis

Watershed -- drains north-central Macon County, including the area around the Macon County airport; tributary to the Little Tennessee River; site is ~ 0.2 miles above the creek's confluence with the river. **Habitats** -- heterogeneous habitats (riffles, runs, sandy bottom pools, and snags, undercut, boulder crevices, rip/rap); lower one-third of the reach had a higher gradient and better habitats than did the upper two-thirds of the reach. **Water Quality** -- in 2004 and 2009 pH less than the water quality standard of 6.0 s.u and conductivity elevated for a mountain stream. **2009** -- one specimen of the Federally Endangered Spotfin Chub was collected; site's proximity to the river may increase the diversity metrics and rate the community higher (Good) than what it should be (Good-Fair) more fish, total species, species of darters and cyprinids collected in 2009 than in 2004; abundance of River Chub and Central Stoneroller are indicative of upstream nonpoint nutrient runoff and enrichment. **2004 & 2009** -- 25 species known from the site, including 10 species of cyprinids and 4 species of darters; dominant species is the River Chub (23% and 26%).

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BRUSH CR	off SR 1129	04/29/09	GF2	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SWAIN	2	06010202	35.31777778	-83.51555556	2-46	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	7.5	1830	6	0.3	Yes

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)	16.7
Dissolved Oxygen (mg/L)	9.9
Specific Conductance (µS/cm)	29
pH (s.u.)	6.6

Water Clarity	Clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	14
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	87

Site Photograph



Substrate	Cobble, boulder, silt, gravel, sand
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/29/09	2009-23	15	52	Good
05/19/04	2004-50	16	50	Good

Most Abundant Species 2009	Whitetail Shiner (18%), Warpaint Shiner (18%)	Exotic Species 2009	Rainbow Trout
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Species Change Since Last Cycle	Gains -- Spotfin Chub, Telescope Shiner, Black Redhorse, Rainbow Trout. Losses -- Smoky Dace, Western Blacknose Dace, Redbreast Sunfish, Green Sunfish, Smallmouth Bass. All species gained or lost were represented by 1-4 individuals/species, except for Spotfin Chub (n = 38) and Telescope Shiner (n = 12).
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Data Analysis

Watershed -- drains southern Swain County; tributary to the Little Tennessee River; site is ~ 0.2 miles above the creek's confluence with the river and within the state-owned Needmore Tract; no municipalities within the watershed. **Habitats** -- riffles, runs, plunge pools; wide riparian zones providing excellent canopy over the stream; silt-covered rocks contributing to the very turbid conditions when walking in the stream. **2009** -- total species richness and diversities of cyprinids and darters were slightly lower than expected, all other metric scores were comparable to reference site values (i.e., score = 5); 38 specimens of the Federally Endangered Spotfin Chub were collected. **2004 & 2009** -- 20 species known from the site, including 9 species of cyprinids, 6 intolerant species, and 2 species of darters; seasonal migrants from the river include Whitetail Shiner, Telescope Shiner, and Spotfin Chub; dominant species in 2004 were Mottled Sculpin (25%) and Warpaint Shiner (16%). Upstream nonpoint sediment runoff sources should be investigated.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
STECOAH CR	SR 1237	04/28/09	GF26	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRAHAM	2	06010202	35.39527778	-83.67805556	2-130	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	9	1810	5	0.4	No

Visible Landuse (%)	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
	45	30	25	0

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

Water Quality Parameters

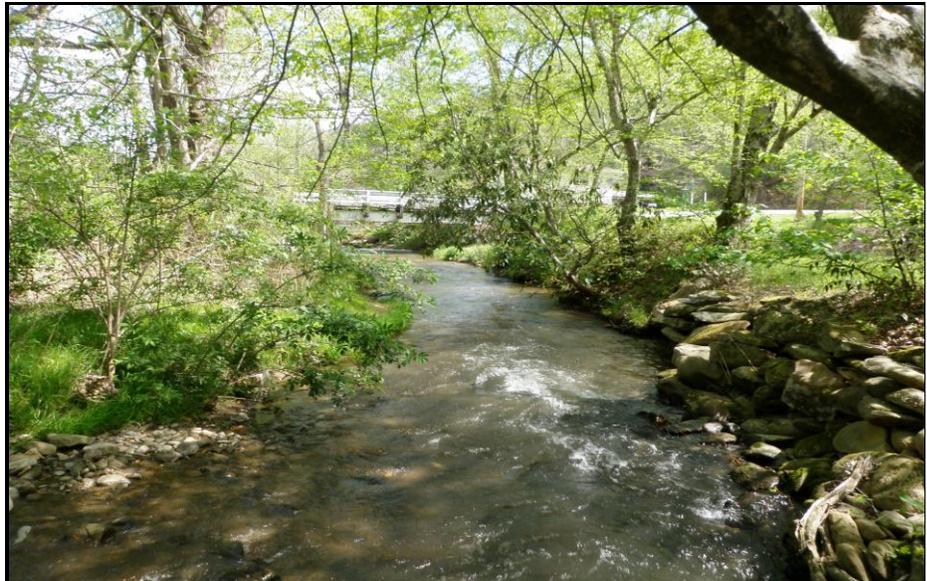
Temperature (°C)	15.4
Dissolved Oxygen (mg/L)	10.0
Specific Conductance (µS/cm)	39
pH (s.u.)	5.8

Water Clarity	Clear
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Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	16
Erosion (7)	2
Bank Vegetation (7)	4
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	79

Site Photograph



Substrate	Cobble, boulder
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Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/09	2009-19	12	---	Not Rated
06/03/04	2004-68	10	---	Not Rated

Most Abundant Species 2009	River Chub (33%)	Exotic Species 2009	Rainbow Trout, Green Sunfish
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Species Change Since Last Cycle	Gains -- Green Sunfish (n = 8), Smallmouth Bass (n = 1). Losses -- none.
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Data Analysis

Watershed -- drains northeastern Graham County; tributary to Fontana Reservoir; site is ~ 1.5 miles above its mouth; no municipalities within the watershed. **Habitats** -- extensive riffles, chutes, plunge pools; degraded riparian zones and unstable banks; livestock with access to stream above the reach; more upstream development (i.e., campground and mobile homes) than in 2004. **Water Quality** -- conductivity elevated for a mountain stream in 2004 and 2009; pH less than the water quality standard of 6.0 s.u. in 2009. **2009** -- community is dominated by omnivores+herbivores (Central Stoneroller and River Chub); Mottled Sculpin, an indicator of cold-cool water, constituted only 3% of the fish; darters absent; Hatchery Supported Trout Waters, three stocked Brown Trout collected (236-313 mm TL). **2004 & 2009** -- 12 species known from the site, but no darters; site appeared to be degraded by straight-piping or nonpoint-source runoff which may be contributing nutrients to this stream; dominant species are River Chub (36% and 33%) and Central Stoneroller (14% and 19%). Stream is supporting its supplemental designation as trout waters (Tr), but the dominance by River Chub and Central Stoneroller, the silt on the substrate, and the widening of NC 28 in the Stecoah Valley warrants continued monitoring of this site in 2014.