Appendix 1B

Biological Assessment
Macroinvertebrate and Fish Site Sample Results

Tar River Headwaters Subbasin
HUC 03020101

The full report is available on the DWQ Environmental Sciences Section website:
http://portal.ncdenr.org/web/wq/ess/reports.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TAR R	**US 158**	**04/09/07**	**OF44**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.33333333	-78.76833333	28-(1)	Carolina Slate Belt

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	26	470	11	0.4	Yes

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

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

Water Quality Parameters

Temperature (°C)	8.5
Dissolved Oxygen (mg/L)	10.4
Specific Conductance (µS/cm)	72
pH (s.u.)	6.9

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**85**

Site Photograph

Substrate cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/09/07	2007-07	16	46	Good
10/14/99	99-63	18	54	Excellent
06/24/99	99-53	18	54	Excellent
04/27/99	99-25	17	52	Good

Most Abundant Species Highfin Shiner

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- Pirate Perch, Creek Chubsucker, Carolina Darter, and Highfin Shiner. **Losses** -- Roanoke Bass, Brown Bullhead, White Sucker, Eastern Mosquitofish, Largemouth Bass, and Chainback Darter.

Data Analysis

Watershed -- the extreme headwaters of the Tar River basin; drains the eastern edge of Person County and part of Granville County; includes no major municipalities. **Habitat** -- high quality Carolina Slate Belt type habitats with an abundance of rocky pools, undercut banks, root mats, and lots of *Podostemum* on the rocky substrates; good bank stabilities and extensive riparian zones. **2007** -- a relatively diverse assemblage of fish including 3 intolerant species and the first collection of Carlina Darter or Pirate Perch at this site. **1999 - 2007** -- the drop in NCIBI score and bioclassification since 1999 is mostly related to a slight shift in trophic structure towards more insectivores and fewer piscivores, including Roanoke Bass and Largemouth Bass. Twenty six fish species are known from this site, including 4 species of suckers, 4 species of darters, and 6 species of minnows. This site continues to exhibit good water quality, with no apparent issues.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TAR R	**SR 1150**	**OB25**	**06/25/07**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	361738	784221	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;NSW	51.4	400	8	0.1

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

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

Water Quality Parameters

Temperature (°C)	23.7
Dissolved Oxygen (mg/L)	5.1
Specific Conductance (µS/cm)	90
pH (s.u.)	6.5
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	16
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	81

Site Photograph

Substrate Mixture of gravel, cobble, and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/25/07	10193	17	17	5.4	5.4	Good-Fair
07/21/97	7374	14	14	5.6	5.6	Good-Fair
09/09/92	6013	65	12	6.5	4.9	Fair

Taxonomic Analysis

Several new mayflies, stoneflies, and caddisflies were added to the taxa list for this location in 2007. Mayflies included *Plauditus dubius* group, *Baetis intercalaris*, *Baetis pluto*, and *Tricorythodes* sp. Caddisflies included *Chimarra* sp. and *Dolophilodes* sp., both of which are sensitive to pollution as well as the more tolerant *Nectopsyche exquisita*. No stoneflies were collected at this location during the current sampling event.

Data Analysis

The bioclassification of this study location has improved from Fair in 1992 to Good-Fair in both 1997 and 2007. It was not sampled in 2002 because access was restricted to protect a federally endangered mussel. There are no upstream NPDES dischargers and the habitat received a high score. The number of EPT taxa has increased slightly over the 15 years of sampling at this site. The current bioclassification may have been negatively affected by the severity of drought conditions in 2007. This suggestion is supported by the low levels of dissolved oxygen at this site at the time of sampling; many pollution sensitive taxa (i.e. some EPT) are affected by physico-chemical stress.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TAR R	**SR 1609**	**OB27**	**06/27/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	355805	781320	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-V;NSW	633.1	200	18	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oxford WWTP	NC0025054	3.5
Franklin County WWTP	NC0069311	3.0
Tar River WRF	NC0020231	1.37

Water Quality Parameters

Temperature (°C)	27.9
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	120
pH (s.u.)	7.3
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Mostly gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/27/07	10199	68	25	4.9	3.9	Good
07/23/02	8917	68	26	5.2	4.6	Good
08/27/97	7462	73	23	5.2	4.6	Good

Taxonomic Analysis

Several pollution sensitive taxa were collecting during the 2007 sampling event; these included the mayflies *Isonychia* sp., *Heptagenia pulla*; the stoneflies *Acroneuria abnormis*, *Neoperla* sp. *Paragnetina fumosa*, and *Pteronarcys dorsata*; and the caddisflies *Chimarra* sp., and *Micrasema rusticum*. New EPT taxa included *Pseudocloeon propinquum*, *Maccaffertium lenati*, *Perlesta* sp., and *Micrasema rusticum*.

Data Analysis

This study location has rated Good all three times that it has been sampled between 1997 and 2007. There are three major NPDES dischargers upstream of the study site contributing to the high conductivity measured during the current sampling event. The habitat at this study location was fairly high quality except for the marginal instream habitat for invertebrate colonization and the homogeneous streambed substrata consisting of mostly sand and gravel.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TAR R	**NC 97**	**OB58**	**06/27/07**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	355719	774716	0	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;NSW	867.4	75	40	0.2

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	20	70	0	10 (Industrial)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oxford WWTP	NC0025054	3.5
Franklin County WWTP	NC0069311	3.0
Tar River WRF	NC0020231	1.37
Sunset Avenue WWTP	NC0072133	not limited

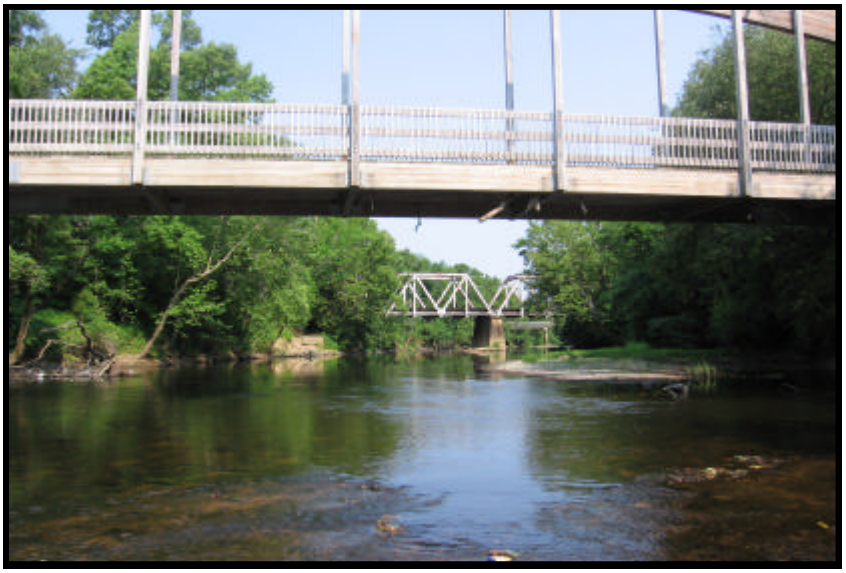
Water Quality Parameters

Temperature (°C)	28
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	110
pH (s.u.)	6.9
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	2
Instream Habitat (20)	11
Bottom Substrate (15)	9
Pool Variety (10)	9
Riffle Habitat (16)	3
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	51

Site Photograph



Substrate Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/27/07	10201	72	21	6.0	5.0	Good-Fair
07/24/02	8916	89	24	6.0	5.0	Good-Fair
07/22/97	7381	71	26	5.9	5.0	Good
07/23/92	5913	79	24	5.9	4.8	Good-Fair
07/12/90	5359	77	23	5.6	4.7	Good

Taxonomic Analysis

Stoneflies have not been collected at this location since 1990. EPT Taxa not previously collected at NC 97 were limited to the mayflies *Pseudocloeon dardanum* and *Maccaffertium terminatum*. Most of the EPT taxa collected are considered relatively pollution tolerant; exceptions included the sensitive mayfly *Leucrocuta* sp. and the caddisflies *Oecetis morsei* and *Chimarra* sp.

Data Analysis

This location has been given the bioclassification of either Good or Good-Fair during the last five sampling events. Likely contributiing to the current rating of Good-Fair are the presence of four major upstream dischargers. In addition to these point source pollutants, this study location is within the City of Rocky Mount, and therefore likely receives significant nonpoint source pollution as well. In addition to the chemical stressors at this site, the habitat was also degraded. Contributing to this score was a combination of stream channelization, a lack of quality colonizable habitats, infrequent riffles, and an open stream canopy.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
TAR R	**SR 1252**	**OB63**	**06/27/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03010107	355622	773926	0	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;NSW	1006.8	39	30	0.1

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oxford WWTP	NC0025054	3.5
Franklin County WWTP	NC0069311	3.0
Tar River WRF	NC0020231	1.37
Tar River Regional WWTP	NC0030317	21

Water Quality Parameters

Temperature (°C)	30.7
Dissolved Oxygen (mg/L)	9
Specific Conductance (µS/cm)	153
pH (s.u.)	7.8
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	2
Instream Habitat (20)	15
Bottom Substrate (15)	6
Pool Variety (10)	10
Riffle Habitat (16)	7
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	57

Site Photograph

Substrate Mostly gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/27/07	10203	63	23	5.7	4.8	Good
08/01/02	8897	79	19	5.8	4.8	Good-Fair
07/22/97	7379	68	26	5.4	4.4	Good
03/02/88	4499	66	14	6.9	5.1	Fair

Taxonomic Analysis

Several pollution sensitive taxa were collected during this sampling event including the mayfly *Isonychia* sp., the stoneflies *Acroneuria abnormis* and *Neoperla* sp., and the caddisflies *Chimarra* sp., *Oecetis morsei* , and *Oxyethira* sp. However, most of the EPT taxa collected are considered facultative.

Data Analysis

The bioclassification of this location has steadily improved from Fair in 1988 to Good in 2007. There are several major NPDES dischargers upstream of SR 1252. The drought that occured in 2007 may have concentrated the various effluents, and the high conductivity reported here seems to support this assertion. In addition to chemical stressors the habitat received a low score because it lacked quality streambed substrate and riffle habitats, and a stream canopy. Although a combination of stressors is likely at work at this location, a trend of increasing bioclassification still persists.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SHELTON CR	**US 158**	**05/17/06**	**OF38**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.31305556	-78.72111111	28-4	Carolina Slate Belt

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV,NSW	23.8	0	12	0.4	Yes

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	75	10 (rural residential)	15	0

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

Water Quality Parameters

Temperature (°C)	14.2
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	73
pH (s.u.)	6.0

Water Clarity	Turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate cobble, gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/17/06	2006-49	18	50	Good
04/06/99	99-01	20	56	Excellent
04/14/97	97-20	24	58	Excellent
04/07/92	92-04	19	54	Excellent

Most Abundant Species Bluehead Chub

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- White Sucker, Eastern Mosquitofish, Largemouth Bass, and Creek Chub. **Losses** -- Warmouth, Notchlip Redhorse, Golden Shiner, Highfin Shiner, and Chainback Darter.

Data Analysis

Sampled in 2006 as part of an EEP Local Watershed study (BAU Memo 20060728). **Watershed** -- a headwater tributary to the Tar River located in west-central Granville County; this catchment lies between the Tar River headwaters and the North Fork Tar River watersheds. **Habitat** -- pools, runs with snags, riffles, *Valisneria* , and deadfalls crossing the stream; good riparian zone widths. **2006** -- fewer total species than expected, but still a diverse and abundant fish community present; the change in NCIBI score and rating comes from a slight shift in the trophic structure including the loss of the intolerant Chainback Darter. **1992 - 2006** -- there are a total of 29 known species from this watershed including 4 species of suckers, 8 species of minnows, 6 species of sunfish, 3 species of darters, and 2 species of catfish. Even with the slight decline in NCIBI score and rating, water quality remains high in this watershed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N FK TAR R	**US 158**	**OB19**	**06/25/07**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	361856	784143	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV; NSW	276.8	407	8	0.3

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

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

Water Quality Parameters

Temperature (°C)	20.7
Dissolved Oxygen (mg/L)	3.4
Specific Conductance (µS/cm)	113
pH (s.u.)	6.8
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	12
Bottom Substrate (15)	14
Pool Variety (10)	8
Riffle Habitat (16)	3
Left Bank Stability (7)	4
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	68

Site Photograph

Substrate Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/25/07	10192	12	12	5.3	5.3	Fair
07/21/97	7375	17	17	5.3	5.3	Good-Fair
07/27/92	5915	8	8	6.3	6.3	Fair

Taxonomic Analysis

Several taxa occurred in the 2007 sample that have not been previously collected at this location; including the mayflies *Baetis flavistriga* and *B. intercalaris*; the stonefly *Perlesta* sp.; and the caddisfly *Mystacides sepulchralis*. Most of the species collected are relatively tolerant of pollution, but a few, incuding the mayflies *Isonychia* sp. and *Leucrocuta* sp. are sensitive.

Data Analysis

This study site has been given Fair and Good-Fair bioclassifications for the years 1992 and 1997, and the current sample was given a Fair rating. The habitat at this site received a correspondingly low score that was largely affected by a lack of colonizable habitats such as rootmats and woody debris and the infrequency of riffles. In addition, the remains of a beaver dam upstream suggested that flow may have been severely interrupted in the recent past. The majority of pollution coming into this stream originates from nonpoint sources in this agricultural watershed. Since 2007 was a year of extreme drought, it seems unlikely that these were a major factor affecting water quality.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N FK TAR RIVER	**SR 1151**	**04/09/07**	**OF60**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.299579	-78.7007895	28-5	Carolina Slate Belt

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	21.2	400	10	0.5	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	70	5 (rural residential)	0	25 (logged a few years ago)

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

Water Quality Parameters

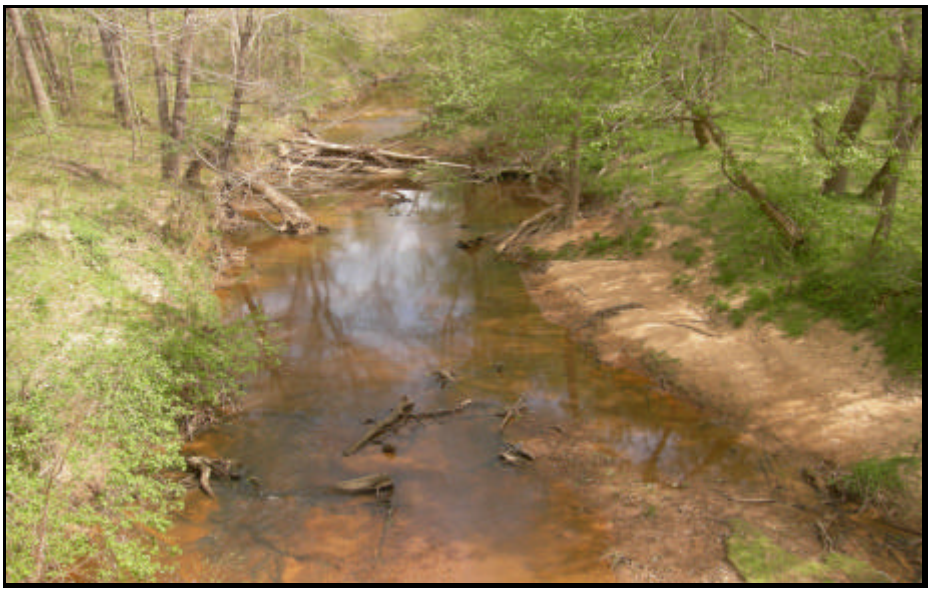
Temperature (°C)	8.8
Dissolved Oxygen (mg/L)	11.1
Specific Conductance (µS/cm)	87
pH (s.u.)	7.0

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	4
Pool Variety (10)	10
Riffle Habitat (16)	5
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**63**

Site Photograph



Substrate Gravel, sand, clay banks

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/09/07	2007-08	18	58	Excellent
10/14/99	99-64	15	46	Good
06/24/99	99-54	20	48	Good
04/06/99	99-02	18	48	Good
04/14/97	97-21	23	54	Excellent
04/07/92	92-05	16	46	Good

Most Abundant Species Swallowtail Shiner

Exotic Species None

Species Change Since Last Cycle

Gains -- Roanoke Bass, Satinfin Shiner, Chain Pickerel, Northern Hogsucker, Largemouth Bass, Highfin Shiner, Margined Madtom, and Roanoke Darter (intolerant). **Losses --** Green Sunfish, Warmouth, Redear Sunfish, V-lip Redhorse, and Creek Chub.

Data Analysis

Sampled this location as a 2007 Random Ambient Monitoring site, but will also serve as the new basinwide site; formerly sampled at US 158 (one bridge and 1.9 miles upstream). **Watershed --** a transitional site with its catchment in both the Carolina Slate Belt and the Northern Outer Piedmont ecoregions; drains the north-central part of Granville County, west of Oxford. Land use is largely forest and agriculture. **Habitats** -- lots of coarse woody debris including snags and large deadfalls (some creating riffles accross the channel), and gravel riffles; low flow. **2007** -- a diverse and trophically balanced assemblage of fish including 18 species, three of which are considered intolerant to pollution. This sample represents the highest NCIBI score to date for this stream. **1992 - 2007** -- good water quality continues to be displayed in this watershed, with a total of 34 known fish species, including 5 suckers, 10 minnows, 6 sunfish, 3 catfish, and 3 darters.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
FISHING CR	**SR 1643**	**OB10**	**06/25/07**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	361326	783430	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;NSW	76.9	310	20	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oxford WWTP	NC0025054	3.5

Water Quality Parameters

Temperature (°C)	24.3
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	339
pH (s.u.)	7.7
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	9
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	80

Site Photograph

Substrate Mixture of gravel, cobble, and boulders

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/25/07	10194	59	19	5.9	5.5	Good-Fair
03/23/06	9820	79	23	5.5	4.2	Good
07/22/02	8812	62	16	5.7	5.1	Good-Fair
05/18/99	7855	11	11	5.6	5.6	Fair
07/21/97	7376	61	18	5.8	5.3	Good-Fair

Taxonomic Analysis

While the number of EPT taxa declined from 23 in 2006 to 19 in 2007, there is an overall trend of increasing diversity for these orders since 1997. There were more Ephemeroptera collected in 2007 (12) than in 2006 (9), including the sensitive taxa *Isonychia* sp., *Leucrocuta* sp., and *Stenacron pallidum*. There were no Plecoptera collected in 2007, whereas 6 species were recorded in 2006. However, seasonal differences were likely important in this and other taxonomic disimilarities between the 2006 and 2007 data.

Data Analysis

Bioclassifications at SR 1643 have fluctuated between Fair and Good since 1997. For the 2007 sampling event, riffles were infrequent along the study reach, but the overall habitat at this study site was still good and received a score of 80. Interestingly, of the five years of data compared here, all but those of 2007 had stoneflies. The absence of these animals negatively affected the bioclassification of this site. Although the severe drought of 2007 may have affected the benthic community directly (i.e. stoneflies require flowing water) the specific conductance was 339, indicating that wastewater effluent may have also been concentrated and an additional stressor to aquatic life.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FISHING CR	**SR 1643**	**05/18/06**	**OF17**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.22277778	-78.57638889	28-11e	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	44.1	0	12	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oxford Waste Water Treatment Plant (~5.25 miles upstream)	NC0025054	3.5

Water Quality Parameters

Temperature (°C)	15.6
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	186
pH (s.u.)	6.1

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**96**

Site Photograph

Substrate cobble, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/18/06	2006-52	22	56	Excellent
04/08/02	2002-02	20	50	Good
04/14/97	97-22	18	52	Good
04/07/92	92-06	18	42	Good-Fair

Most Abundant Species Swallowtail Shiner

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- Roanoke Bass, Eastern Mosquitofish, Bull Chub, Chainback Darter, and Blacktip Jumprock. **Losses** -- Rosyside Dace, Largemouth Bass, and Creek Chub.

Data Analysis

Sampled in 2006 as part of an EEP Local Watershed study (BAU Memo 20060728). **Watershed** -- a tributary to the Tar River, located about 3 miles above its confluence; drains part of central Granville County, including the Town of Oxford. **Habitat** -- high quality Carolina Slate Belt type habitats; runs, riffles, and boulder pools; great forested riparian zones including bluffs with mountain laurel. **2006** -- high abundance (n = 621) and diversity of the fish community, including 3 intolerant species, over 400 more fish than in 2002, and the highest rating ever at this site. **1992 - 2006** -- high diversity site; 27 species of fish are known from this watershed, including 4 species of suckers, 5 species of sunfish, 10 species of minnows, and 4 species of darters. Despite a slightly higher conductivity (9% higher than 2002), the additional effluent flow from the Oxford WWTP (increased from 2.17 to 3.5 MGD in early 2004) appears to be benefiting the fish community through consistant flows in this part of the watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
COON CR	SR 1609	05/18/06	OF11	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GRANVILLE	1	03020101	36.26805556	-78.56777778	28-11-5	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C,NSW	25.2	0	10	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	14.6
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	125
pH (s.u.)	6.1

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	0
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**65**

Site Photograph

Substrate sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/18/06	2006-51	20	46	Good
04/08/02	2002-03	18	54	Excellent

Most Abundant Species Johnny Darter

Exotic Species Green Sunfish and Redear Sunfish

Species Change Since Last Cycle

Gains -- Redfin Pickerel, Eastern Mosquitofish, Green Sunfish, and Redear Sunfish. **Losses** -- Rosyside Dace and Chainback Darter.

Data Analysis

Sampled in 2006 as part of an EEP Local Watershed study (BAU Memo 20060728). **Watershed** -- a tributary to Fishing Creek located in east-central Granville County; drains the northern and eastern portions of the Town of Oxford. **Habitat** -- shallow runs with snags, undercuts, coarse woody debris, and no riffles; good canopy and riparian zone widths; moderately elevated conductivity due to the urban drainage. **2006** -- a diverse and abundant (n = 426) fish community present; although the NCIBI score and rating fell in 2006, the changes within the trophic structure causing the decline were not substantial. **2002 - 2006** -- a total of 22 fish species are known from this stream including 2 sucker species, 7 minnow species, and 4 darter species; despite the non point urban runoff from Oxford, water quality remains pretty good in this catchment.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MIDDLE CR	**SR 1203**	**04/09/07**	**OF28**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.17194444	-78.4875	28-15	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	8.8	295	7	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	9.8
Dissolved Oxygen (mg/L)	11.1
Specific Conductance (µS/cm)	83
pH (s.u.)	7.3

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	0
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**54**

Site Photograph

Substrate sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/09/07	2007-09	25	56	Excellent
04/08/02	2002-01	19	50	Good

Most Abundant Species Pinewoods Shiner

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- White Sucker, Redfin Pickerel, Eastern Silvery Minnow, Pumkinseed, Warmouth, Bluegill, Largemouth Bass, and Blacktip Jumprock. **Losses** -- Yellow Bullhead and Rosyside Dace.

Data Analysis

Watershed -- a small tributary to the Tar River; drains a forested area along the Granville and Franklin county line. **Habitat** -- deep pools and runs (influenced by beaver activity), side snags, undercuts, and no riffles; the habitat score was low primarily because of the sandy substrates and the lack of riffle habitats; bank stabilities also suffer in places because of sandy soils; good canopy and riparian zones. **2007** -- very diverse and trophically balanced fish population including two intolerant darters (Chainback Darter and Roanoke Darter) and one intolerant minnow species (Pinewoods Shiner). **2002 - 2007** -- the bioclass improvement to Excellent is primarily due to an increase in the species richness and composition metrics; an additional 3 sunfish species and 2 sucker species were collected in 2007. Twenty seven fish species are now known from this site, including 4 species of suckers, 9 species of minnows, and 4 species of darters.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TABBS CR	**SR 1100**	**04/10/07**	**OF41**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
VANCE	1	03020101	36.18222222	-78.45583333	28-17-(0.5)b	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	70.8	270	11	0.5	No

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

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

Water Quality Parameters

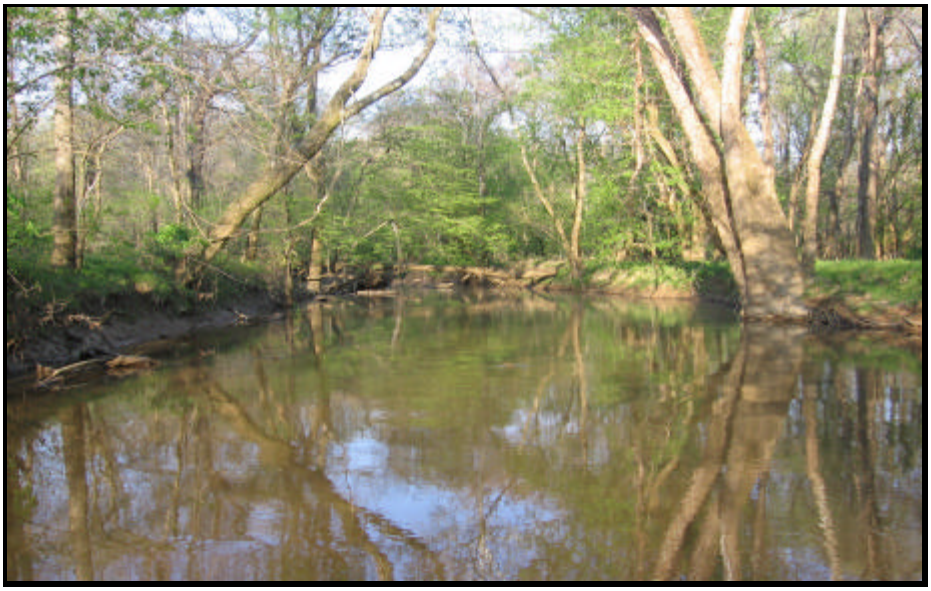
Temperature (°C)	8.2
Dissolved Oxygen (mg/L)	10.3
Specific Conductance (µS/cm)	101
pH (s.u.)	6.3

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	4
Pool Variety (10)	10
Riffle Habitat (16)	0
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**56**

Site Photograph



Substrate gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/10/07	2007-10	19	48	Good
10/14/99	99-65	21	46	Good
06/24/99	99-55	21	48	Good
04/09/99	99-05	21	50	Good
04/15/97	97-23	25	56	Excellent
04/08/92	92-07	24	56	Excellent

Most Abundant Species Redbreast Sunfish

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- Yellow Bullhead, Redfin Pickerel, Northern Hogsucker, and Largemouth Bass. **Losses** -- Pirate Perch, Warmouth, Bluehead Chub, Bull Chub, Mimic Shiner, and Blacktip Jumprock.

Data Analysis

Watershed -- a large tributary to the Tar River located about 1.5 miles above its confluence; drains the rural southwest area of Vance County, the southern edge of Henderson County, and part of western Granville County. **Habitat** -- mostly run habitats with good woody snags and deadfalls, and no true riffles; fairly straight channel. **2007** -- diverse community of fish present, including 5 species of suckers and 4 species of darters. **1992 - 2007** -- stable NCIBI metrics and bioclassifications across sampling years; the fish community remains dominated by insectivores. A total of 36 species are known from this site including 6 species of suckers, 10 species of minnows, and 4 species of darters.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LYNCH CR	SR 1235	04/10/07	OF27	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.14861111	-78.34166667	28-21-(0.7)	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	23.9	220	9	0.5	No

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

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

Water Quality Parameters

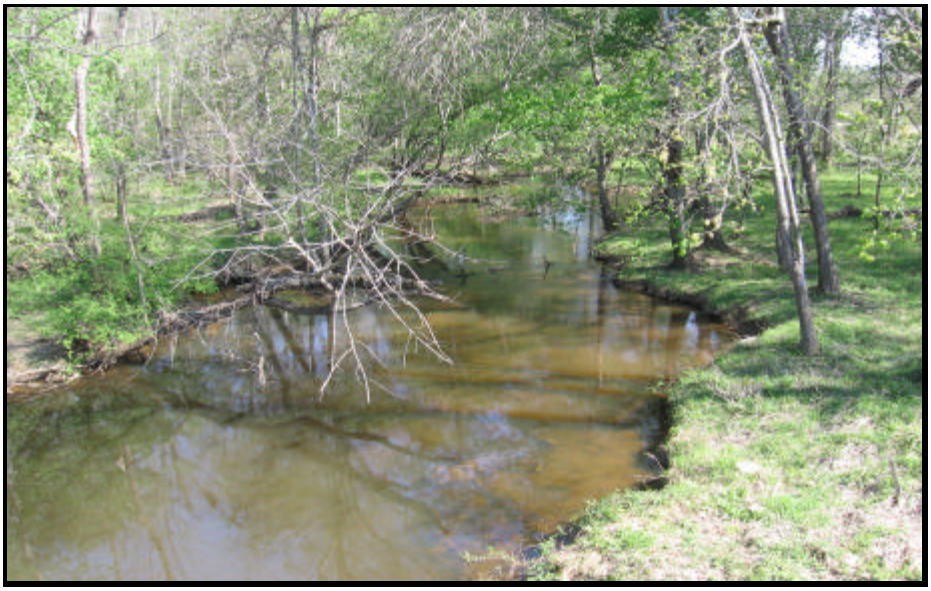
Temperature (°C)	8.1
Dissolved Oxygen (mg/L)	10.4
Specific Conductance (µS/cm)	70
pH (s.u.)	6.8

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	5
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**72**

Site Photograph



Substrate clay, silt, sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/10/07	2007-11	25	50	Good
05/24/99	99-35	19	46	Good
04/15/97	97-25	24	48	Good
06/18/92	92-20	15	38	Fair

Most Abundant Species Satinfin Shiner

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- Chain Pickerel, Tessellated Darter, Eastern Mosquitofish, Eastern Silvery Minnow, Northern Hogsucker, Warmouth, Bluegill, and Notchlip Redhorse. **Losses** -- American Eel and Bluehead Chub.

Data Analysis

Watershed -- a tributary to the Tar River located about one mile above its confluence; drains parts of northwest Franklin County and southeast Vance County. **Habitat** -- although well within the Northern Outer Piedmont, this site exhibits habitat types that resemble a bottom lands stream of the Rolling Coastal Plain; slightly stained runs and pools with coarse woody debris, snags, and deadfalls; good riparian zone widths. **2007** -- very diverse fish community present with the highest NCIBI score yet at this site. **1992 - 2007** -- this site continues to maintain an abundant and highly diverse fish community, with relativley stable metric scores and no apparent water quality issues. Thirty three species are known from this site including 5 species of suckers, 5 species of darters, and 9 species of minnows.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CEDAR CR	**SR 1105**	**06/10/04**	**OF6**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020101	36.07166667	-78.40916667	28-29-(2)b	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C, NSW	31.5	240	6	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Franklin County WWTP	NC0069311	1.0 (prior to 12/2002)
Franklin County WWTP	NC0069311	3.0 (since 12/2002)

Water Quality Parameters

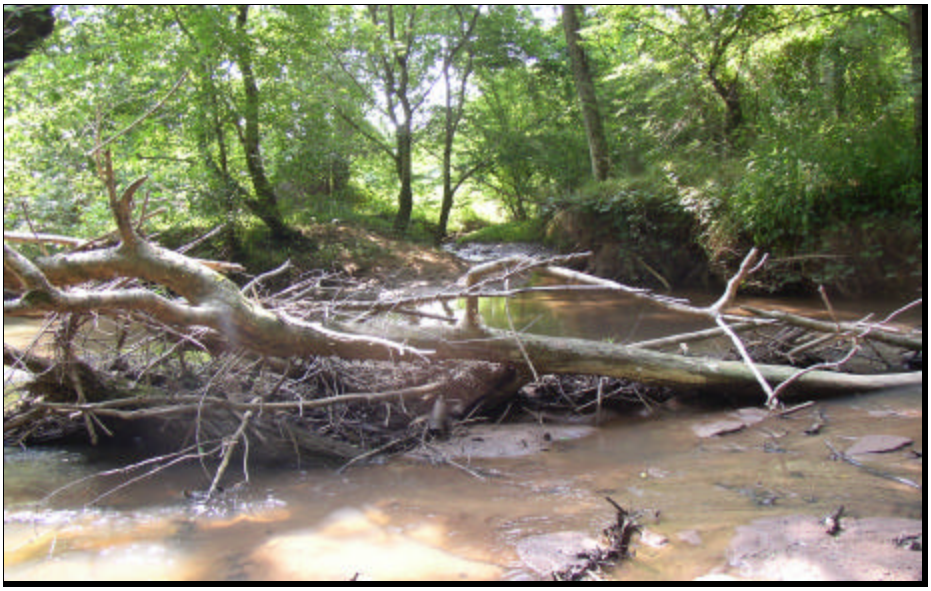
Temperature (°C)	27.0
Dissolved Oxygen (mg/L)	6.6
Specific Conductance (µS/cm)	180
pH (s.u.)	6.2

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	4
Pool Variety (10)	6
Riffle Habitat (16)	2
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**57**

Site Photograph



Substrate Sand and coarse woody debris

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/10/04	2004-80	21	56	Excellent
04/10/02	2002-09	22	54	Excellent
04/16/97	97-26	17	50	Good
04/08/92	92-08	19	48	Good

Most Abundant Species Bluehead Chub and Green Sunfish **Exotic Species** Green Sunfish

Species Change Since Last Cycle **Gains** -- Yellow Bullhead, Brown Bullhead, and Green Sunfish. **Losses** -- Pinewoods Shiner, Golden Shiner, Blacktip Jumprock, and Redear Sunfish.

Data Analysis

Watershed -- drains central Franklin County, including the southwest part of the Town of Franklin; site is ~1.1 miles below WWTP; site is ~ 4.2 miles above the basinwide site sampled from 1992-2002 and the difference in the drainage area was 8.7 sq. miles; treated as the same site (Station ID 0F6 and OF7). **Habitat** -- sandy runs, coarse woody debris on current; snag pools; gravelly riffles; good riparian zones. **2004** -- almost twice as many fish collected in 2004 than in 2002 5 species of darters were present; Creek Chub represented only by young-of-year. **1992 - 2004** -- conductivity has steadily increased from 74 µS/cm in 1992 to 180 µS/cm in 2004; 26 species known from the site, including 5 species of darters, 4 species of suckers, and 3 intolerant species; NCIBI Score has gradually increased from 48 (Good) in 1992 to 56 (Excellent) in 2004; 2004 data were also used as part of a NCSU Urban Fish Study.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CEDAR CR	**SR 1109**	**OB4**	**06/26/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FRANKLIN	1	03020201	360337	782114	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;NSW	633.1	229	5	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Franklin County WWTP	NC0069311	3.0

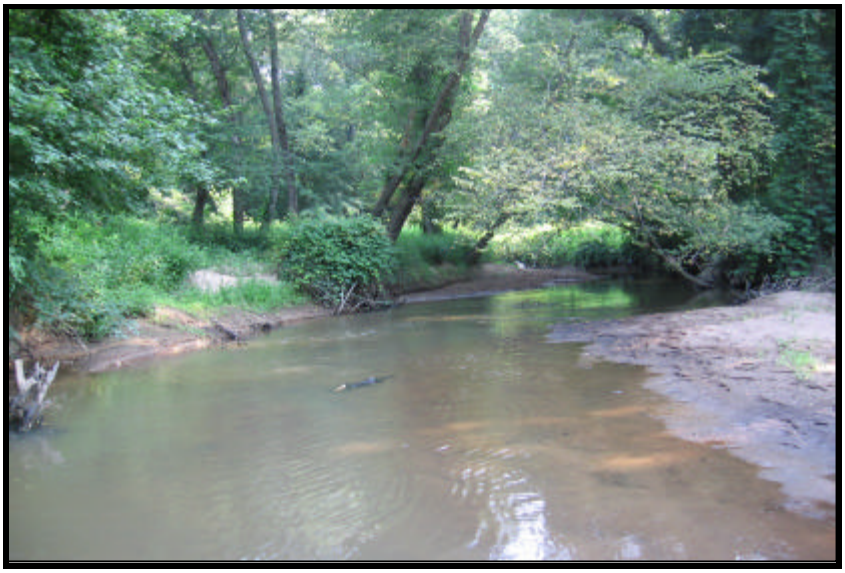
Water Quality Parameters

Temperature (°C)	23.9
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	282
pH (s.u.)	7.1
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	3
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	55

Site Photograph



Substrate Predominantly sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/26/07	10195	21	21	5.2	5.2	Good
07/22/02	8863	15	15	5.0	5.0	Good-Fair
07/28/97	7384	14	14	4.4	4.4	Good-Fair

Taxonomic Analysis

The number of Ephemeroptera or mayfly taxa increased from 4 and 6 in 1997 and 2002 respectively to 9 in 2007. New taxa included *Paracloeodes minutus, Procloeon* sp., and *Tricorythodes* sp.. In addition, the number of Plecoptera or stonefly taxa increased from 3 in 1997 and 2002 to 5 in 2007; new species included *Perlesta* sp. and the pollution sensitive taxon *Pteronarcys dorsata*. Of the 7 Trichoptera taxa collected in 2007, only *Brachycentrus nigrosoma* is considered pollution sensitive.

Data Analysis

The streambed substrata was mostly sand, which is a poor habitat for many EPT taxa. In addition, few colonizable habitats were noted, and many of those present were no longer viable due to the severe drought conditions of 2007. Further, riffle habitats were considered rare and of poor quality due to a lack of larger streambed substrata that many macroinvertebrates prefer. The high conductivity measured at SR 1109 may indicate that the upstream Franklin County WWTP is negatively affecting water quality. Despite the effects of poor habitat, drought, and possibly water quality, the bioclassification at this site improved slightly from Good-Fair in 1997-2002, to Good in 2007.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MAPLE CR	**SR 1713**	**05/08/07**	**OF50**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	35.943983	-77.835555	28-66	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV,NSW	10.5	100	8	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	13.7
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	116
pH (s.u.)	6.8

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (15)	15
Instream Habitat (20)	8
Bottom Substrate (15)	7
Pool Variety (10)	8
Left Bank Stability (10)	4
Right Bank Stability (10)	4
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	**65**

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/07	2007-43	10	---	Not Rated

Most Abundant Species Eastern Mosquitofish and American Eel **Exotic Species** Green Sunfish

Species Change Since Last Cycle **N/A**

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Tar River; drains eastern Nash County; urban/suburban watershed. **Habitat** -- natural channel with bends; an urban stream; shallow, slow moving runs; a few snags and undercuts; bottomland forest; low quality instream habitats; very low flow. **2007** -- low abundance and diversity (fewest species and fish of any site in 2007); 6 of 10 species represented by only 1 or 2 fish/species; dominant species accounted for 63 percent of all the fish; percentage of tolerant fish high (50 percent); intolerant species absent. This site is not rated because the appropriate NCIBI metrics and criteria have yet to be developed for coastal plain streams.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
PIG BASKET CR	**SR 1433**	**04/10/07**	**OF32**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	35.99861111	-77.94388889	28-68-3-(2)	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	19	50	6	0.5	No

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

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

Water Quality Parameters

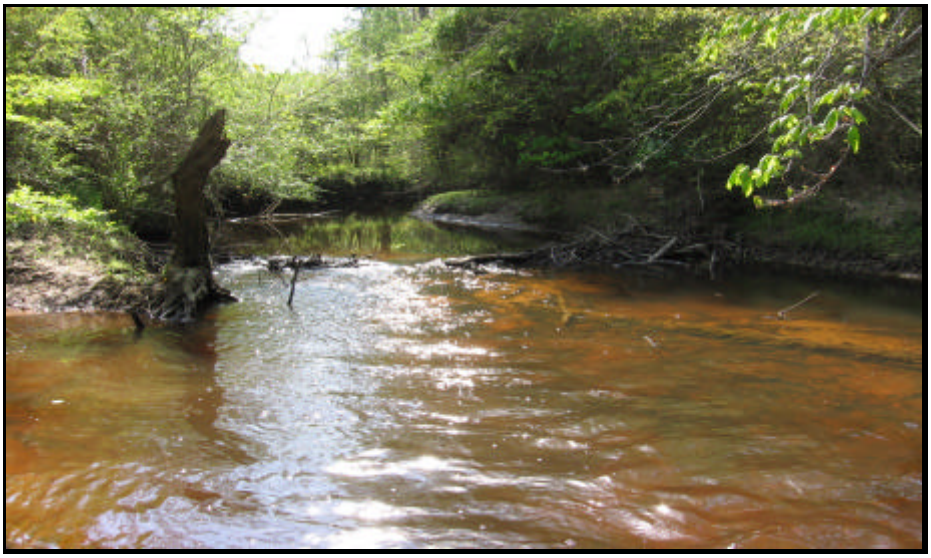
Temperature (°C)	13.4
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	99
pH (s.u.)	6.7

Water Clarity	Slightly turbid, tannin stained

Habitat Assessment Scores (max)

Channel Modification (15)	15
Instream Habitat (20)	15
Bottom Substrate (15)	4
Pool Variety (10)	10
Left Bank Stability (10)	9
Right Bank Stability (10)	9
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**82**

Site Photograph



Substrate clay, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/10/07	2007-12	14	--	Not Rated
04/18/02	2002-23	20	--	Not Rated

Most Abundant Species Eastern Mosquitofish

Exotic Species None

Species Change Since Last Cycle

Gains -- None. **Losses** -- Mud Sunfish, Flier, Pumpkinseed, Redear Sunfish, Golden Shiner, and Margined Madtom.

Data Analysis

Watershed -- a tributary to Stony Creek located just west of the Town of Red Oak, approximately three miles above its confluence; a coastal plain stream that drains part of the Northern Outer Piedmont ecoregion. **Habitat** -- coastal plain habitat types with lots of coarse woody debris (snags and deadfalls), and undercut banks; the extensive riparian zones are primarily privet and briar. **2007** -- a fairly typical coastal plain fish community was collected, but with no minnow species; the total abundance of collected fish was about 50% when compared to the previous sample (n = 85 vs.162 in 2002). **2002 - 2007** -- a total of 20 fish species are known from this site including 1 species of sucker, 8 species of sunfish, 1 minnow species, and 2 species of darter; although not rateable, water quality appears to be good in this watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
COMPASS CR	**NC 97**	**05/08/07**	**OF51**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	35.977145	-77.766907	28-72	SE Floodplains & Low Terraces

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C,NSW	10.4	45	5	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	45	0	40	15 (utility switch yard)

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

Water Quality Parameters

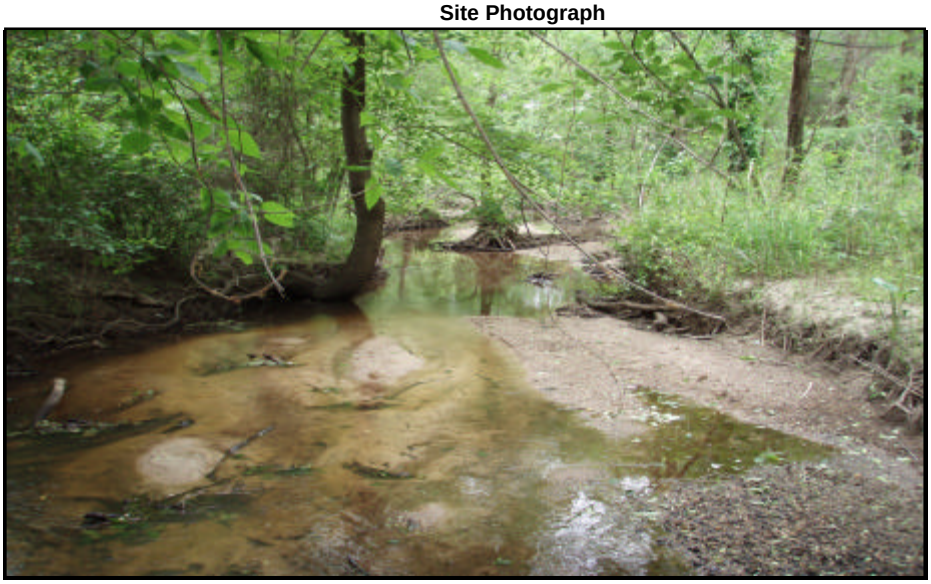
Temperature (°C)	15.2
Dissolved Oxygen (mg/L)	6.7
Specific Conductance (µS/cm)	132
pH (s.u.)	6.3

Water Clarity	Clear, slightly stained

Habitat Assessment Scores (max)

Channel Modification (15)	15
Instream Habitat (20)	17
Bottom Substrate (15)	7
Pool Variety (10)	10
Left Bank Stability (10)	6
Right Bank Stability (10)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**81**

Site Photograph



Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/07	2007-44	22	---	Not Rated

Most Abundant Species	Satinfin Shiner, Swallowtail Shiner, and Bluegill	**Exotic Species**	Green Sunfish, Redear Sunfish

Species Change Since Last Cycle **N/A**

Data Analysis

This if the first fish community sample collected at this site. **Watershed** -- site is ~ 1 mile above the confluence with the Tar River; drains eastern Nash County, including the US 301 corridor and the northern area of the City of Rocky Mount. **Habitat** -- natural channel; very shallow, sandy runs; good snags and roots; wide riparian zones along both banks; very low flow. **2007** -- primarily coastal plain species; abundant and diverse, 22 species, including 8 species of sunfish (most species of sunfish at any site in 2007); tolerant species abundant (Satinfin Shiner, Redbreast Sunfish, and Eastern Mosquitofish); one intolerant species (Pinewoods Shiner) present. This site is not rated because the appropriate NCIBI metrics and criteria have yet to be developed for coastal plain streams.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BEECH BR	**NC 97**	**05/08/07**	**OF3**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	35.96472222	-77.67527778	28-75-(4)	SE Floodplains & Low Terraces

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;NSW	21.8	45	5	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	9.4
Specific Conductance (µS/cm)	171
pH (s.u.)	6.9

Water Clarity	Clear, tannin stained

Habitat Assessment Scores (max)

Channel Modification (15)	10
Instream Habitat (20)	15
Bottom Substrate (15)	13
Pool Variety (10)	6
Left Bank Stability (10)	9
Right Bank Stability (10)	9
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**77**

Site Photograph

Substrate Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/07	2007-45	28 (including 1 hybrid)	---	Not Rated
04/17/02	2002-22	20	---	Not Rated

Most Abundant Species Bluegill **Exotic Species** Redear Sunfish

Species Change Since Last Cycle

Losses -- Bowfin and Green Sunfish. **Gains** -- White Shiner, Bull Chub, Golden Shiner, Notchlip Redhorse, White Perch, Mud Sunfish, Largemouth Bass, Johnny Darter, and Chainback Darter.

Data Analysis

Watershed -- site is ~ 0.5 mile from the confluence with the Tar River; drains the northeast portion of the City of Rocky Mount, a portion of the Town of Battleboro, and northwestern Edgecombe County. **Habitat** -- channelized and logged a long time ago; open canopy; cane brakes along both shorelines; thick filamentous algae (*Vaucheria*); macrophytes; very shallow with pools; conductivity elevated; very low flow. **2007** -- 27 species, most species of any site in the basin in 2007, including 7 species of sunfish, 4 species of darters, and 2 species of suckers; 3 species migrants from the Tar River (Bull Chub, Notchlip Redhorse, and White Perch). **2002 & 2007** -- extremely diverse and abundant, 29 species, including 9 species of sunfish; dominant species were Bluegill, Eastern Mosquitofish, Tessellated Darter, and Satinfin Shiner; ~ twice as many fish collected in 2007 than in 2002, primarily due to low flow in 2007; Bluegill increased 7-fold, represented by Age 1 and 2 year old fish; conductivity elevated (181 and 171 µS/cm, respectively in 2002 and 2007). This site is not rated because the appropriate NCIBI metrics and criteria have yet to be developed for coastal plain streams.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SWIFT CR	**SR 1310**	**OB56**	**06/26/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	360642	775511	0	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;ORW;NSW	153.9	147	15	0.2

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

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

Water Quality Parameters

Temperature (°C)	24.6
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	86
pH (s.u.)	6.7
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/26/07	10197	65	22	5.0	4.1	Good
04/24/03	9113	89	30	4.8	4.0	Excellent
07/23/97	7382	62	20	5.3	4.2	Good
11/12/96	7234	20	20	4.1	4.1	Good-Fair
03/05/96	7016	87	33	4.7	2.9	Excellent

Taxonomic Analysis

The mayfly taxa list generated in 2007 matched that of 1997 relatively closely with the additions of *Pseudocloeon ephippiatum* and *Maccaffertium terminatum*. The stonefly list was also similar between these years, but *Perlesta* sp. was added in 2007. Pollution sensitive taxa collected in the current sample included the mayfly *Isonychia* sp., the stoneflies *Paragnetina fumosa* and *Pteronarcys dorsata*, and the caddisflies *Brachycentrus nigrosoma*, *B. numerosus*, *Micrasema wataga*, and *Pycnopsyche* sp.

Data Analysis

This study location was given a bioclassification of Excellent and Good-Fair during separate collections in 1996, it rated Good in 1997, Excellent in 2003, and Good during the current sampling event. The benthic community at this location likely benefits from having no upstream NPDES dischargers and from habitats such as mixed streambed substrata and abundant riffles. These two habitat features are known to promote colonization for many sensitive (i.e. EPT) invertebrate groups. The bioclassification at this study location may have been adversely affected by the severe drought occurring during 2007, which could explain in part the decline in rating from 2003 to 2007.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SWIFT CR	**SR 1253**	**OB55**	**06/27/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	355757	773510	0	SE Floodplains and Low Terraces

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;NSW	254.3	39	15	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
North Edgecombe High School	NC0050431	0.02

Water Quality Parameters

Temperature (°C)	27.3
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	100
pH (s.u.)	6.6
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (15)	15
Instream Habitat (20)	17
Bottom Substrate (15)	12
Pool Variety (10)	9
Left Bank Stability (10)	9
Right Bank Stability (10)	9
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph

Substrate Mostly gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/27/07	10202	87	28	5.5	4.0	Good
06/24/04	9392	95	30	5.5	4.1	Excellent
07/25/02	8914	86	24	5.7	4.2	Good
07/22/97	7380	73	24	5.0	3.8	Excellent
02/01/89	4819	74	29	5.2	3.8	Excellent

Taxonomic Analysis

Although the taxanomic richness of the EPT decreased slightly from the last sampling in 2004, there were several species present that had not been previously collected. These included the mayflies *Maccaffertium terminatum* , *Pseudocloeon dardanum* , and *P. ephippiatum* ; and the caddisflies *Hydropsyche rossi* and *Oxyethira* sp. (an uncommon and sensitive taxon). Four stonefly taxa were also collected during sampling, including the "sensitive", or pollution intolerant taxa *Acroneuria abnormis* , *Paragnetina fumosa* , and *Pteronarcys dorsata* .

Data Analysis

The water quality at this study location has either rated Good or Excellent during five sampling events spanning 18 years. The only two years in which the bioclassification was lowered to good were during two years of severe drought (2002, 2007). This trend has also been observed at other locations (Sandy Creek, SR 1405) for these two years and within this basin and HUC. Edgecombe High School is the only NPDES discharger (minor) located upstream. The good habitat score at this site was positively affected by a lack of channelization, bank stability, and great riparian habitat.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SANDY CR	**SR 1405**	**OB35**	**06/26/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	360738	780130	0	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;NSW;+	121.5	192	6	0.2

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	30	0	70	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)	6.7
Specific Conductance (µS/cm)	83
pH (s.u.)	7.1
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	11
Pool Variety (10)	9
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	80

Site Photograph

Substrate Mostly gravel and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/26/07	10196	71	22	5.0	3.9	Good
03/23/06	9819	89	36	4.9	3.5	Excellent
04/21/03	9109	84	32	5.2	4.5	Excellent
06/10/02	8788	61	21	5.3	4.2	Good

Taxonomic Analysis

Considerably fewer EPT taxa were collected in 2007 than in 2006. Of these, only the mayfly *Isonychia* sp., and the stoneflies *Acroneuria abnormis* and *Pteronarcys dorsata* are considered sensitive to poor water quality. Sensitive caddisflies were more common, and included *Brachycentrus nigrosoma* , *B. numerosus* , *Neophylax fuscus* , and *N. oligius* . The mayflies *Maccaffertium terminatum* , and *Tricorythodes* sp. were collected for the first time in 2007 at this location.

Data Analysis

There are no NPDES dischargers upstream of this study location, and the historic and current bioclassifications reflect the good water quality. This study site was rated Good in 2002, Excellent in 2003 and 2006, and again Good during the current sampling event. The habitat in 2007 was also given a relatively high score. The ratings of Good instead of Excellent given to this location in 2002 and 2007 may be in part attributable to the severe drought that occurred during both years. The number of EPT taxa collected was considerably lower during these years, but this was likely a seasonal effect as many of these species emerge as adults during spring months.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RED BUD CR	**SR 1407**	**04/11/07**	**OF33**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
NASH	2	03020101	36.11611111	-78.02111111	28-78-1-17	Northern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW:+	18.9	190	7	0.4	Yes

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

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

Water Quality Parameters

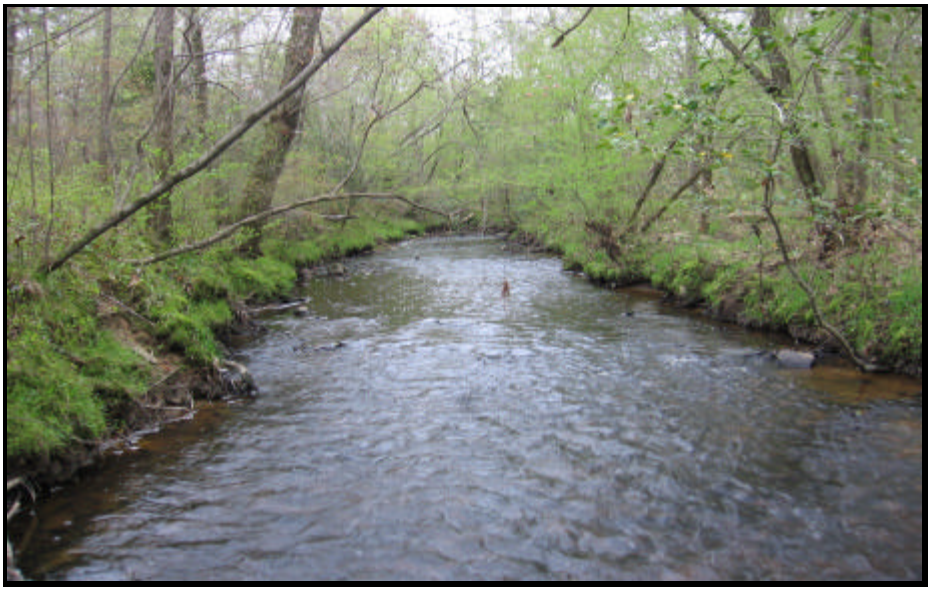
Temperature (°C)	10.8
Dissolved Oxygen (mg/L)	10.1
Specific Conductance (µS/cm)	80
pH (s.u.)	6.1

Water Clarity: Slightly tannin stained

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**88**

Site Photograph



Substrate: cobble, gravel, flat bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/11/07	2007-13	22	50	Good
04/09/02	2002-06	16	50	Good

Most Abundant Species: Pinewoods Shiner

Exotic Species: Green Sunfish

Species Change Since Last Cycle

Gains -- Flat Bullhead, Satinfin Shiner, Redfin Pickerel, Warmouth, Largemouth Bass, Highfin Shiner, and Swallowtail Shiner. **Losses** -- Notchlip Redhorse.

Data Analysis

Watershed -- a tributary to Sandy Creek, and ultimately Swift Creek; drains northeastern Franklin and northwestern Nash counties. **Habitat** -- much like a Carolina Slate Belt stream with good riffles, runs, and undercuts; good forested riparian. **2007** -- good diversity and abundance for a stream of this size. **2002 - 2007** -- nearly identical NCIBI metrics between sample years; the most notable difference was the increase in total abundance (n = 277 vs. 191 in 2002) and diversity (n = 22 species vs. 16 in 2002) of the fish population in 2007; a total of 23 species are known from this regional reference site including 3 species of darters, 6 species of minnows, and 3 species of suckers; this watershed continues to support a diverse community of fish with good water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
WHITE OAK SWP	**SR 1428**	**0**	**02/05/07**	**Moderate**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	360016	773713	0	Rolling Coastal Plain

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;NSW	47.7	49	5	0.3

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

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

Water Quality Parameters

Temperature (°C)	4
Dissolved Oxygen (mg/L)	11.5
Specific Conductance (µS/cm)	76
pH (s.u.)	5.7
Water Clarity	clear/tannic

Habitat Assessment Scores (max)

Channel Modification (10)	5
Instream Habitat (20)	10
Bottom Substrate (15)	7
Pool Variety (10)	6
Left Bank Stability (10)	7
Right Bank Stability (10)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	61

Site Photograph

Substrate Nearly all sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
02/05/07	10133	50	8	6.6	5.6	Moderate
02/11/02	8670	40	7	6.5	5.6	Moderate
05/03/88	4540	11	11	5.2	5.2	Not Rated

Taxonomic Analysis

The total number of taxa (ST), and the number of EPT taxa collected at this study site has increased from 2002 to 2007. Additions to this sites taxa list include the stonefly *Perlesta* sp., and the caddisfly *Ptilostomis* sp.. The Odonata increased substantially from two taxa in 2002 to 10 in 2007. New additions to the taxa list from this group included dragonflies such as *Basiaeschna janata* , *Gomphus* sp., *Macromia* sp. and *Pachydiplax longipennis* ; and damselflies included *Argia* sp., *Enallagma* sp., and *Ischnura* sp..

Data Analysis

This basinwide study location was not rated in 1988, while in both 2002 and for the current sampling event, a bioclassification of Moderate was assigned. This rating implies that there is moderate environmental stress at SR 1428. However, there are no NPDES dischargers upstream of this study site and water chemistry parameters are typical for the region. Therefore, the poor habitat quality at this site may instead be the dominant stressor affecting the benthic community. Indeed, White Oak Swamp at this location is a channelized and deeply incised ditch with few colonizable instream structures, and a homogeneous bottom substrate composed of sand.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
WHITE OAK SWP	**SR 1428**	**05/09/07**	**OF48**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
EDGECOMBE	2	03020101	36.00388889	-77.62	28-78-7-(2)	SE Floodplains & Low Terraces

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;NSW	19.1	45	5	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	15.7
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	113
pH (s.u.)	5.9

Water Clarity	Clear, tannin stained

Habitat Assessment Scores (max)

Channel Modification (15)	13
Instream Habitat (20)	12
Bottom Substrate (15)	7
Pool Variety (10)	4
Left Bank Stability (10)	6
Right Bank Stability (10)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**68**

Site Photograph

Substrate Sand and organic matter

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/09/07	2007-46	17	---	Not Rated
04/17/02	2002-21	18	---	Not Rated

Most Abundant Species Satinfin Shiner

Exotic Species None

Species Change Since Last Cycle

Losses -- White Shiner, Creek Chubsucker, Margined Madtom, and Mud Sunfish. **Gains** -- American Eel, Silvery Minnow, and Chainback Darter.

Data Analysis

Watershed -- tributary to Swift Creek; drains rural north-central Edgecombe County; headwaters originate within the Town of Whitakers. **Habitat** -- channelized a long time ago; mature trees along both banks providing the canopy; white sand covered with organic matter; shallow, sandy runs; very low flow. **2007** -- coastal plain species; abundant and diverse, including 2 intolerant species (Pinewoods Shiner and Chainback Darter). **2002 & 2007** -- 21 species known from the site; no exotics have been collected from the site; dominant species have been Satinfin Shiner, Bluespotted Sunfish, and Tessellated Darter; percentage of tolerant fish, primarily Satinfin Shiner, increased from 28% in 2002 to 47% in 2007; sunfish decreased from 39% to 20% due to loss of snags and pools. This site is not rated because the appropriate NCIBI metrics and criteria have yet to be developed for coastal plain streams.