BASINWIDE ASSESSMENT REPORT

YADKIN RIVER BASIN

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
Division of Water Resources
Environmental Sciences Section
Bioassessment Branch

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INTRODUCTIONS TO PRGRAM METHODS

The Environmental Sciences Section collects a variety of biological, chemical, and physical data that can be used in many ways to assist the basinwide planning program. This report addresses the results of benthic macroinvertebrate, fish community and fish tissue monitoring in the Yadkin River basin. The basin has been sampled by the Biological Assessment Branch (BAR) four times for basinwide monitoring: 1996, 2001, 2006 and 2011.

Information on Standard Operating Procedures used in BARôs three program areas can be found at this link: http://portal.ncdenr.org/web/wq/ess/bau. A comprehensive list of all benthic macroinvertebrate samples taken from this basin can be found here: http://portal.ncdenr.org/web/wq/benthosdata, while a list of all fish community samples can be found at http://portal.ncdenr.org/web/wq/ess/bau/ncibi-scores. A definitive list of all fish tissue data can be found here: http://portal.ncdenr.org/web/wq/ess/bau/fish-tissue-data. In addition, taxonomic data for all benthic macroinvertebrate and fish community samples obtained from the Yadkin River Basin can be accessed from EPAôs Storet database by following the instructions here: http://portal.ncdenr.org/web/wq/storethome.

This document is structured with physical, geographical, and biological data discussions presented in hydrologic units (HUs). Lakes data, ambient chemistry data and aquatic toxicity data, with summaries, are presented in separate reports.

BASIN DESCRIPTION

The Yadkin River basin is the second largest river basin in North Carolina and covers approximately 7,213 square miles and spans 21 counties (Figure 1). As would be expected for such a large river basin, there are numerous subecoregions encountered here (Griffith ***et al***. 2002).

Much of this basin includes areas of extensive urbanization associated with the counties of Forsyth, Rowan, southern and central Iredell, Cabarrus, and Davidson. Other areas of the basin are predominately forested and include the headwaters of the basin in northern Wilkes counties, as well as portions of western Surry and areas of Montgomery County specifically associated with Uwharrie National Forest. In fact, of the 51 total ORW (Outstanding Resource Waters) classified streams and rivers in the Yadkin River basin, 72.6% are restricted to subbasin 01 (northern) Wilkes, 19.6% in subbasin 02 (Surry), and 7.8% in subbasin 09 (Montgomery).

There are six HUCs in the Yadkin River Basin: 03040101 (Yadkin River Headwaters), 03040102 (South Yadkin River), 03040103 (Yadkin River), 03040105 (Rocky River), 03040104 (Lake Tillery-Pee Dee River), and 03040201 (Pee Dee River). There were 50 benthic macroinvertebrate samples collected in this basin in 2011 and 61 fish community samples. For detailed data interpretation and trend analysis of all the benthic macroinvertebrate and fish community sites assessed in the Yadkin River Basin during the 2011 assessment period please refer to Appendix 3.

Figure 1. Geographical Relationships of the Yadkin River Basin.

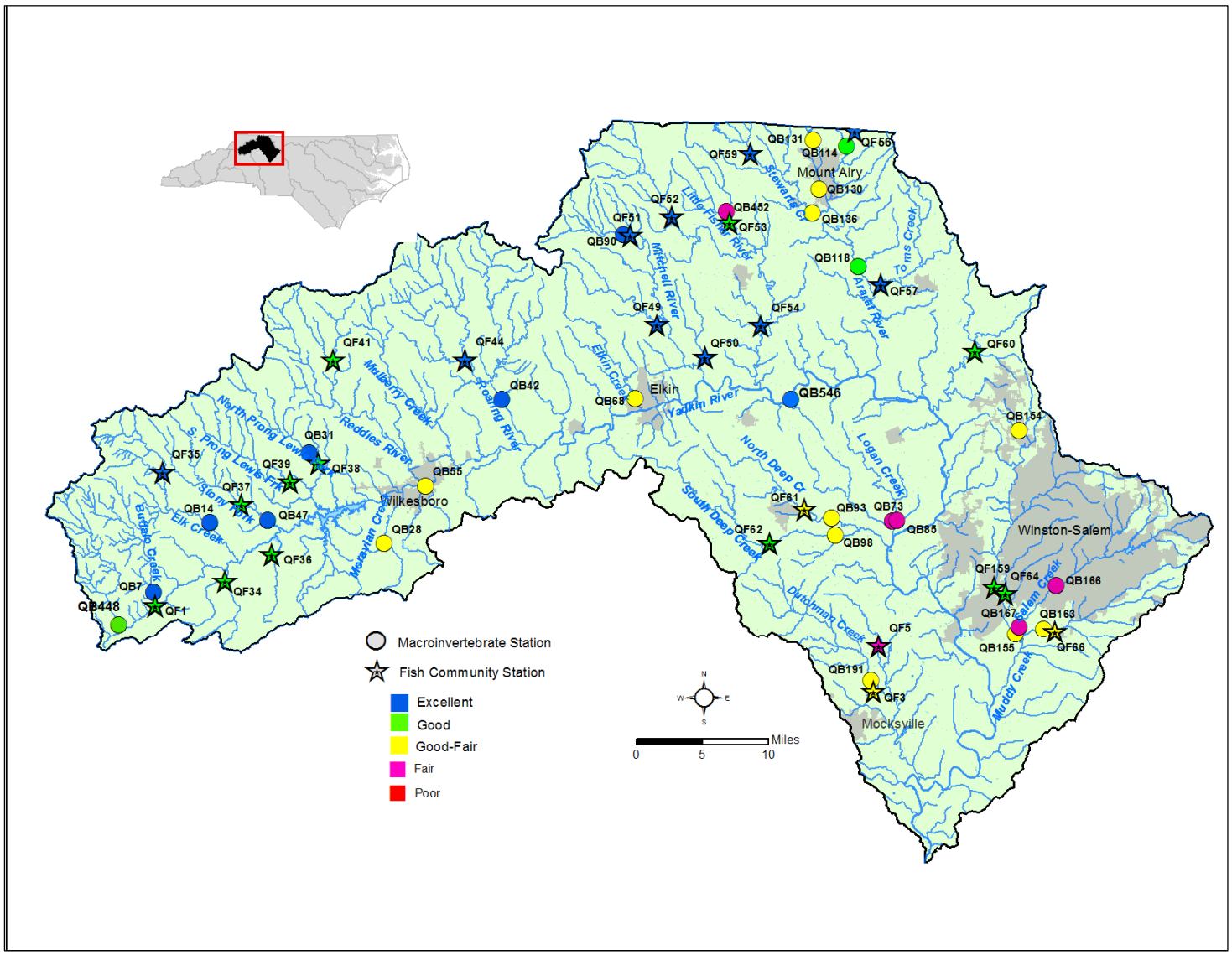

Figure 2. Sampling Sites in HUC 03040101: 2011. Monitoring Sites are Listed in Table 1.

River and Stream Assessment

In 2011, 14 long-term benthic macroinvertebrate sites were unsampled in this HUC. Specifically, due to staffing reductions, seven benthic macroinvertebrate sites were not sampled while another seven sites were not sampled due to persistently high flows (Table 1). In total, 25 sites were sampled for benthic macroinvertebrates which resulted in six Excellent bioclassifications, two Good bioclassifications, 12 Good-Fair ratings, and five Fair bioclassifications (Figure 2). For data interpretation and trend analysis of the 25 benthic macroinvertebrate basinwide sampling events, please refer to the individual station summaries in Appendix 3.

In terms of fish community, there were 25 collections in HUC 03040101 which produced ten Excellent bioclassifications, 11 Good ratings, three Good-Fair ratings, and one Fair bioclassification (Table 1, Figure 2). For data interpretation and trend analysis for the 25 fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 1. Waterbodies Monitored in HUC 03040101: 2001-2011.

Site ID	Waterbody	County	Location	2001	2006	2011
QB448	Yadkin R	Caldwell	NR SR 1516	Good-Fair	Good-Fair	Good
QB60	Yadkin R	Caldwell	SR 1372	Good	Excellent	Not Sampled[1]
QB55	Yadkin R	Wilkes	NC 18/268	Good-Fair	Excellent	Good-Fair
QB112	Yadkin R	Yadkin	US 21	Good	Good	Not Sampled[2]
QB110	Yadkin R	Surry	SR 1003	Good	Good-Fair	Not Sampled[2]
QB 546	Yadkin R	Surry	SR 2221	Good	Good-Fair	Good
QB185	Yadkin R	Davidson	SR 1447	Good	Good	Not Sampled[2]
QB7	Buffalo Cr	Caldwell	SR 1505	Excellent	Excellent	Excellent
QB20	Kings Cr	Caldwell	SR 1552	---	Good	Not Sampled[1]
QB14	Elk Cr	Wilkes	SR 1175	Good	Excellent	Excellent
QB24	Laurel Cr	Watauga	SR 1508	---	Excellent	Not Sampled[1]
QB47	Stony Fk	Wilkes	SR 1135	Excellent (2002)	Excellent	Excellent
QB31	N Pr Lewis Fk	Wilkes	Near SR 1300	Excellent (2002)	Excellent	Excellent
QB28	Moravian Cr	Wilkes	NC 18	Good-Fair	Good-Fair	Good-Fair
QB29	Mulberry Cr	Wilkes	NC 268	Excellent	Excellent	Not Sampled[2]
QB42	Roaring R	Wilkes	SR 1990	Good	Excellent	Excellent
QB68	Elkin Cr	Surry	NC 268	Good-Fair	Good-Fair	Good-Fair
QB90	Mitchell R	Surry	SR 1330	Good	Good	Excellent
QB88	Mitchell R	Surry	SR 1001	Excellent	Good	Not Sampled[1]
QB105	Snow Cr	Surry	SR 1121	Good-Fair	Good-Fair	Not Sampled[2]
QB72	Fisher R	Surry	US 601	Good	Good-Fair	Not Sampled[1]
QB71	Fisher R	Surry	NC 268	Good	Good-Fair	Not Sampled[2]
QB452	L Fisher R	Surry	SR 1480	Good-Fair	Good-Fair	Fair
QB114	Ararat R	Surry	NC 104	Good-Fair	Good	Good
QB118	Ararat R	Surry	SR 2019	Good-Fair	Good	Good
QB131	Lovills Cr	Surry	SR 1700	Good-Fair	Good-Fair	Good-Fair
QB130	Lovills Cr	Surry	SR 1371	Fair	Fair	Good-Fair
QB136	Stewarts Cr	Surry	SR 2258	Good	Good	Good-Fair
QB125	Flat Shoal Cr	Surry	SR 2017	---	Good-Fair	Not Sampled[1]
QB80	L Yadkin R	Stokes	SR 1102	---	Good-Fair	Not Sampled[1]
QB73	Forbush Cr	Yadkin	SR 1570	Good-Fair	Good-Fair	Fair
QB85	Logan Cr	Yadkin	SR 1571	Good	Good-Fair	Fair
QB93	N Deep	Yadkin	SR 1510	Good-Fair	Good-Fair	Good-Fair
QB98	S Deep Cr	Yadkin	SR 1733	Good-Fair	Good-Fair	Good-Fair
QB154	Muddy Cr	Forsyth	SR 1898	Good-Fair	Fair	Good-Fair
QB155	Muddy Cr	Forsyth	SR 2995	Good-Fair	Fair	Good-Fair
QB166	Salem Cr	Forsyth	SR 2902	Fair	Fair	Fair
QB167	Salem Cr	Forsyth	SR 2991	Fair	Fair	Fair
QB163	S Fk Muddy Cr	Forsyth	SR 2902	Good-Fair	Good-Fair	Good-Fair
QB191	Dutchmans Cr	Davie	US 158	Good-Fair	Good-Fair	Good-Fair
QB190	Dutchmans Cr	Davie	NC 801	Fair	Good-Fair	Not Sampled[2]
QF1	Yadkin R	Caldwell	NC 268	Good	Good	Good
QF34	Kings Cr	Caldwell	SR 1552	---	Excellent	Good
QF35	Laurel Cr	Watauga	SR 1508	Good (1999)	Good	Excellent
QF36	Beaver Cr	Wilkes	SR 1131	Good	Good	Good
QF37	Stony Fk	Wilkes	SR 1170	---	Excellent	Good
QF38	N Prong Lewis Fk	Wilkes	SR 1304	Excellent	Excellent	Good
QF39	S Prong Lewis Fk	Wilkes	SR 1154	Good	Excellent	Good
QF41	N Fk Reddies R	Wilkes	SR 1567	Excellent	Good	Good
QF44	M Prong Roaring R	Wilkes	SR 1002	Excellent	Excellent	Excellent
QF51	Mitchell R	Surry	SR 1330	Good (1999)	Excellent	Excellent
QF49	S Fk Mitchell R	Surry	SR 1301	---	Excellent	Excellent
QF50	Snow Cr	Surry	SR 1121	---	Excellent	Excellent
QF52	Fisher R	Surry	SR 1331	Excellent	Excellent	Excellent
QF53	Little Fisher R	Surry	SR 1480	Good	Good	Good

QF54	Cody Cr	Surry	US 268	Good (1996)	Excellent	Excellent
QF5	Ararat R	Surry	NC 104	---	Excellent	Excellent
QF59	Stewarts Cr	Surry	SR 1622	Excellent	Excellent	Excellent
QF57	Toms Cr	Surry	SR 2024	Excellent	Excellent	Excellent
QF60	Little Yadkin R	Stokes	SR 1236	Excellent	Excellent	Good
QF61	N Deep Cr	Yadkin	SR 1605	Good-Fair	Good-Fair	Good-Fair
QF62	S Deep Cr	Yadkin	SR 1152	Good	Good	Good
QF64	Silas Cr	Forsyth	SR 1137	Good-Fair (2002)2	Good-Fair	Good
QF66	S Fk Muddy Cr	Forsyth	SR 2902	Good-Fair	Good	Good-Fair
QF3	Dutchmans Cr	Davie	US 158	Good-Fair	Good-Fair	Good-Fair
QF5	Cedar Cr	Davie	SR 1437	---	Good (2001)	Fair

[1] Site was not sampled in 2011 due to staffing reductions. [2]Site was not sampled due to adverse flow condition.

SPECIAL STUDIES: Benthic Macroinvertebrates

Assessment of Dry Poultry Litter Effects on Streams and Rivers in Surry County. Surry County. January 4, 2011.
Several stations were sampled as part of this study to examine the effects of dry poultry litter land application on numerous streams in Surry County. The results of this examination indicated some adverse effects on the benthic macroinvertebrate communities in the smaller tributary streams of the Mitchell and Fisher Rivers as a result of runoff from dry litter application.

Upper Yadkin River and Buffalo Creek Reclassification Study. Caldwell and Watauga Counties. September 5, 2007 and Upper Yadkin River and Buffalo Creek Reclassification Study--Addendum. Caldwell and Watauga Counties. December 17, 2007.
Numerous samples on the Yadkin River, Buffalo Creek and area tributaries resulted in Excellent bioclassifications. Results of this study indicated all waterbodies qualified for reclassification to High Quality Waters (HQW) while the Yadkin River and its tributaries upstream of its confluence with Jackson Camp Creek qualified for reclassification to Outstanding Resource Waters (ORW) as did Buffalo Creek and its tributaries below its confluence with Joes Creek.

Long Creek 303d List Re-sample. Wilkes County. June 9, 2006.
This site was resampled using newly developed assessment criteria for small streams with drainage areas </= 3.0 mi^2. The June 9, 2006 sample was obtained using these newly developed sampling criteria and resulted in a Good-Fair bioclassification making this stream a potential candidate for removal from the 303d list.

Random Ambient Monitoring System
Fishing Creek (SR 2318, Wilkes County), King Creek (SR 1109, Surry County), Lovills Creek (SR 1371, Surry), and Pauls Creek (SR 1625, Surry County) were sampled for benthic macroinvertebrates as part of the Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

SPECIAL STUDIES: Fish Community

Random Ambient Monitoring System
Forbush Creek at SR 1597 in Yadkin County, Fishing Creek at SR 2318 in Wilkes County, and Pauls Creek at SR 1625 in Surry Country were sampled for fish community assessments as part of the 2007-2008 and 2009-2010 Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found here (http://portal.ncdenr.org/web/wq/ess/reports).

Upper Yadkin River and Buffalo Creek Reclassification Study. 2007.
In BAR Memorandum F-20070905, a recommendation was made to reclassify the upper Yadkin River, and all its tributaries, from just above its confluence with Jackson Camp Creek to its confluence with

Preston Creek to HQW. This recommendation was contingent upon the collection of additional data during the fall of 2007 that would determine if the communities in the lower part of the watershed were rated Excellent. In November 2007 an additional benthic macroinvertebrate and fish community assessment was made at the exit point for the watershed (Yadkin River off US 321) in Caldwell County. The benthic macroinvertebrate community was rated Excellent and the fish community Good. The study concluded that the Yadkin River, and all its tributaries, from its source to just above its confluence with Jackson Camp Creek qualify for supplemental ORW reclassification and the Yadkin River, and all its tributaries, from just above its confluence with Jackson Camp Creek to its confluence with Preston Creek qualify for supplemental HQW reclassification of HQW (Biological Assessment Branch Memorandum 20071217).

North Prong Lewis Fork Watershed Reclassification Study (Wilkes County). 2009.
A reclassification study was conducted to provide biological data for the support of potential supplemental classifications of the North Prong Lewis Fork watershed to Trout Waters, and/or High Quality Waters or Outstanding Resource Waters following preliminary reclassification recommendations from an earlier Biological Assessment Unit Memorandum (20071113). Based on benthos data, Excellent bioclassifications were attained at all three sites on North Prong Lewis Fork as well as Jones Creek and Coal Creek. In addition, an Excellent bioclassification based on fish data was also documented at North Prong Lewis Fork at SR 1300. As a result of these Excellent bioclassifications the entirety of North Prong Lewis Fork, Jones Creek and Coal Creek qualify for supplemental classification to HQW. Based on data obtained from the NC Wildlife Resource Commission, a reach of Little Fork Creek also qualified for reclassification to Trout waters (Biological Assessment Branch Memorandum (20100730).

Upper Yadkin River and Buffalo Creek Reclassification Study. 2010 & 2011.
An additional four fish community and seven benthic macroinvertebrate sample sites were assessed to complete the Outstanding Resource Waters/High Quality Waters (ORW/HQW) Reclassification Study for the upper Yadkin River and Buffalo Creek watersheds. The additional samples were obtained in order to reduce longitudinal or tributary data gaps, to re-sample tributary or mainstem sites that previously did not rate Excellent, and to provide current data to supplement data that were decades old. Please refer to BAR Memorandum 07162013 for specific findings.

SPECIAL STUDIES: Fish Tissue

W. Kerr Scott Reservoir Fish Mercury Assessment. 2010.
W. Kerr Scott Reservoirôs striped and hybrid ñBodieò bass were assessed for mercury levels in collaboration with North Carolina Wildlife Resources Commission (NCWRC) in a data gap filing study of commonly harvested species. NCWRC was responsible for fish collections and DWR was responsible for sample processing and analysis. Low mercury levels (<0.4ppm wet weight) were found in the fillet tissues of all striped bass collected and mercury levels above the North Carolina Department of Human Health Services (NCDHHS) action level (>0.4ppm) were found in about half of the hybrid bass collected.

YADKIN RIVER HUC 03040102 – SOUTH YADKIN RIVER

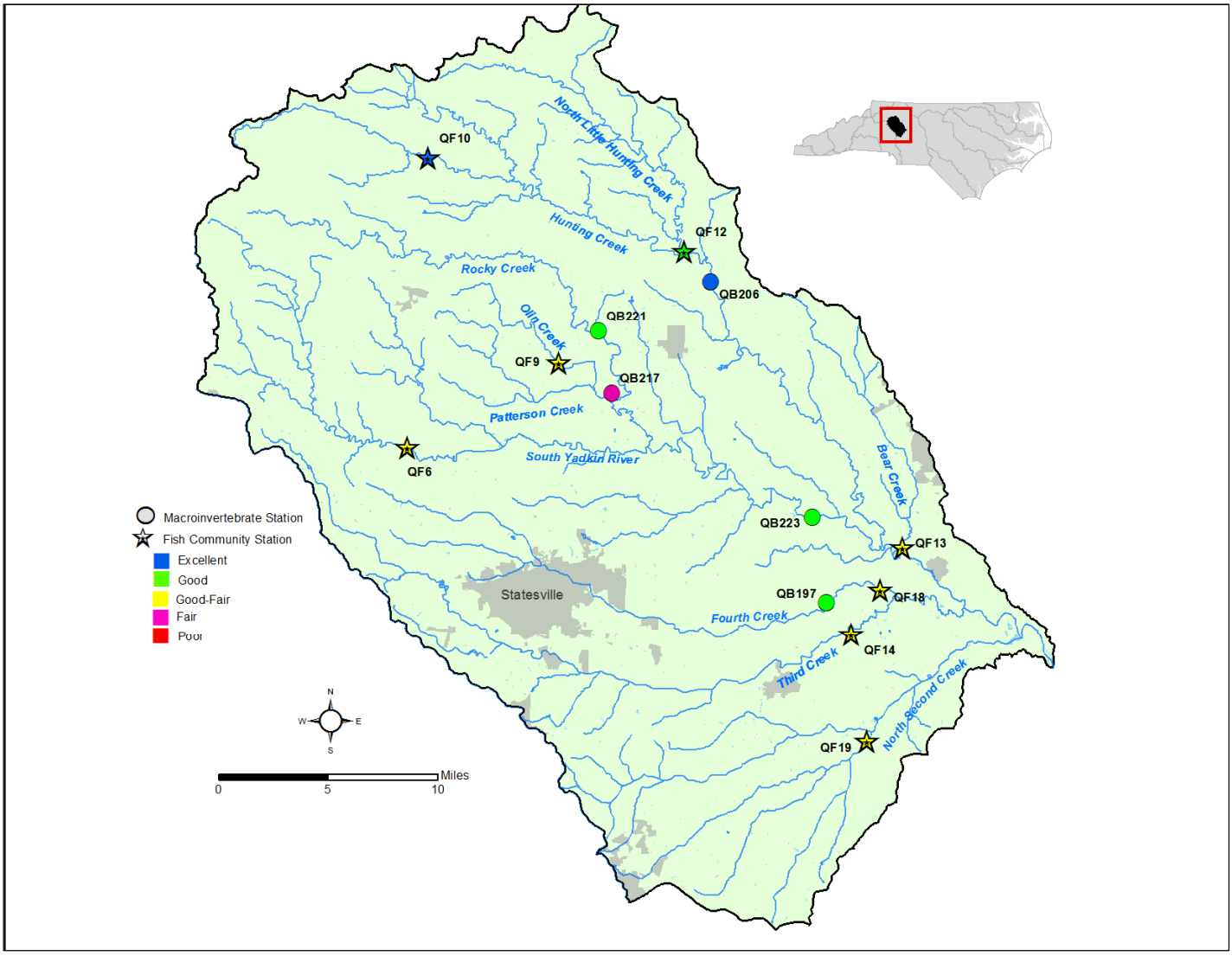

Figure 3. Sampling Sites in HUC 03040102: 2011. Monitoring Sites are Listed in Table 2.

River and Stream Assessment

In 2011, seven long-term benthic macroinvertebrate sites were unable to be sampled in HUC 03040102. Specifically, as a result of staffing reductions, two sites were not sampled while another five sites were not sampled due to persistently high flows (Table 2). In total, five benthic macroinvertebrate stations were sampled in 2011 resulting in one Excellent bioclassification, three Good bioclassifications and one Fair rating (Figure 3). For data interpretation and trend analysis of the five benthic macroinvertebrate basinwide sampling events, please refer to the individual station summaries in Appendix 3.

In terms of fish community, there were eight collections in HUC 03040102 resulting in one Excellent bioclassification, one Good rating, and six Good-Fair bioclassifications (Table 2, Figure 3). For data interpretation and trend analysis for the eight fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 2. Waterbodies Monitored in HUC 03040102: 2001-2011.

Site ID	Waterbody	County	Location	2001	2006	2011
QB224	South Yadkin R	Iredell	SR 1561	Good	Good	Not Sampled[2]
QB223	South Yadkin R	Davie	SR 1159	Excellent	Excellent	Good
QB221	Rocky Cr	Iredell	SR 1884	Excellent	Excellent	Good
QB217	Patterson Cr	Iredell	SR 1890	Good	Excellent	Fair
QB205	Hunting Cr	Wilkes	NC 115	Excellent	Excellent	Not Sampled[1]
QB206	Hunting Cr	Iredell	SR 2115	Excellent	Good	Excellent
QB213	North Little Hunting Cr	Iredell	SR 1829	Excellent	Good	Not Sampled[1]
QB197	Fourth Cr	Rowan	SR 1003	Good	Excellent	Good
QB226	Third Cr	Rowan	SR 1970	Good	Good	Not Sampled[2]
QB214	North Second Cr	Rowan	SR 1526	Fair	Good-Fair	Not Sampled[2]
QB215	North Second Cr	Rowan	US 70	Fair	Good-Fair	Not Sampled[2]
QB230	Withrow Cr	Rowan	SR 1547	Good-Fair	Good-Fair	Not Sampled[2]
QF6	S Yadkin R	Iredell	SR 1561	Good-Fair	Good-Fair	Good-Fair
QF9	Olin Cr	Iredell	SR 1892	Fair (1996)	Good-Fair	Good-Fair
QF10	Hunting Cr	Wilkes	NC 115	Excellent	Good	Excellent
QF12	N Little Hunting Cr	Iredell	SR 1829	Good	Good-Fair	Good
QF13	Bear Cr	Davie	SR 1116	---	Fair (2004)[2]	Good-Fair
QF18	Fourth Cr	Iredell	SR 1985	Poor	Poor (2003)	Good-Fair
QF14	Third Cr	Rowan	SR 1970	Poor	Poor	Good-Fair
QF19	N Second Cr	Rowan	SR 1526	Good-Fair	Good-Fair	Good-Fair

[1] Site was not sampled in 2011 due to staffing reductions. [2]Site was not sampled due to adverse flow condition.

SPECIAL STUDIES: Benthic Macroinvertebrates

Random Ambient Monitoring System

Fourth Creek (SR 1985, Rowan County) and Gregory Creek (Off NC 115, Iredell County) were sampled for benthic macroinvertebrates as part of the Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

SPECIAL STUDIES: Fish Community

Random Ambient Monitoring System

Fourth Creek at SR 1985 in Iredell County was sampled for fish community assessments as part of the 2009-2010 Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

YADKIN RIVER HUC 03040103 – YADKIN RIVER

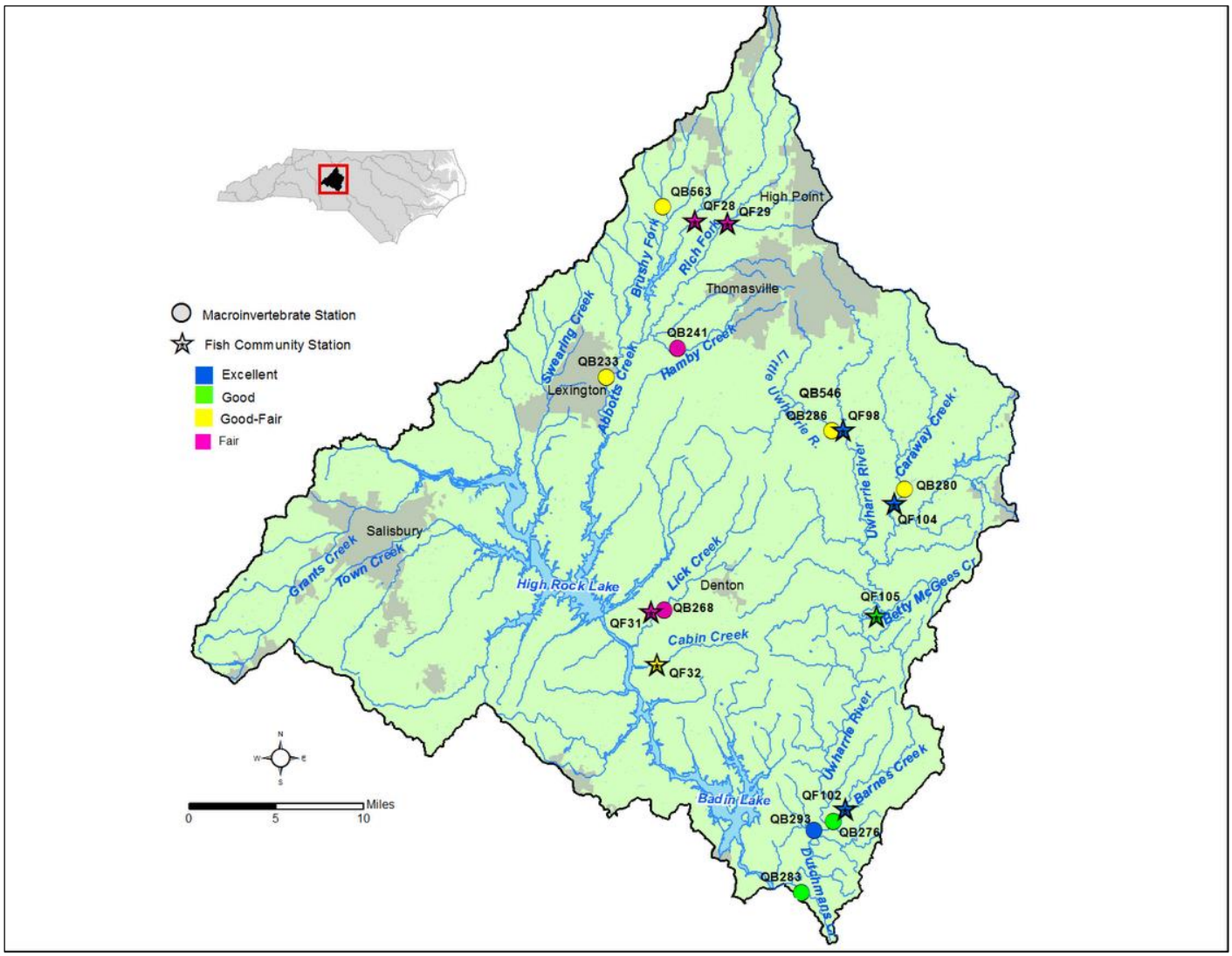

Figure 4. Sampling Sites in HUC 03040103: 2011. Sites are Listed in Table 3.

River and Stream Assessment

In 2011, five long-term benthic macroinvertebrate sites were unable to be sampled in this HUC. As a result of staffing reductions, one station was not sampled while four sites were not sampled due to persistently high flows (Table 3). In total, nine benthic macroinvertebrate stations were sampled in 2011 resulting in one Excellent bioclassification, two Good bioclassifications four Good-Fair ratings, and two Fair ratings (Figure 4). For data interpretation and trend analysis of the nine benthic macroinvertebrate basinwide sampling events, please refer to the individual station summaries in Appendix 3.

In terms of fish community, there were eight collections in HUC 03040103 resulting in three Excellent bioclassifications, one Good rating, one Good-Fair bioclassification, and three Fair ratings (Table 3, Figure 4). For data interpretation and trend analysis for the eight fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 3. Waterbodies Monitored in HUC 03040103: 2001-2011.

Map #[1]	Waterbody	County	Location	2001	2006	2011
QB145	Grants Cr	Rowan	SR 1912	Fair	Good-Fair	Not Sampled[2]
QB259	Swearing Cr	Davidson	NC 47	Fair	Good-Fair	Not Sampled[2]
QB235	Abbotts Cr	Davidson	SR 1755	Good-Fair	Good-Fair	Not Sampled[2]
QB233	Abbotts Cr	Davidson	SR 1243	Fair	Fair	Good-Fair
QB563	Brushy Fk	Davidson	SR 1810	Good-Fair	Good-Fair	Good-Fair[3]
QB241	Hamby Cr	Davidson	SR 2017	Fair	Fair	Fair
QB268	Lick Cr	Davidson	NC 8	Good-Fair	Fair	Fair
QB295	Uwharrie R	Randolph	SR 1406	Good-Fair	Good	Not Sampled[1]
OB294	Uwharrie R	Randolph	SR 1143	Good	Good-Fair	Not Sampled[2]
QB293	Uwharrie R	Montgomery	NC 109	Excellent	Excellent	Excellent
QB286	L Uwharrie R	Randolph	SR 1405	Good-Fair	Good	Good-Fair
QB280	Caraway Cr	Randolph	SR 1331	Good-Fair	Good-Fair	Good-Fair (2009)
QB276	Barnes Cr	Montgomery	SR 1303	Excellent	Excellent	Good
QB283	Dutchmans Cr	Montgomery	SR 1150	Not Rated	Excellent	Good
QF28	Abbotts Cr	Davidson	SR 1800	Good-Fair	Fair	Fair
QF29	Rich Fk	Davidson	NC 109	Fair	Poor	Fair
QF31	Lick Cr	Davidson	NC 8	Good-Fair	Good-Fair	Fair
QF32	Cabin Cr	Davidson	SR 2536	Good	Fair	Good-Fair
QF98	Uwharrie R	Randolph	SR 1406	Excellent (1999)	Excellent	Excellent
QF104	Caraway Cr	Randolph	SR 1331	---	Excellent	Excellent
QF105	Betty McGees Cr	Randolph	SR 1107	Good	Good	Good
QF102	Barnes Cr	Montgomery	SR 1303	Excellent	Excellent	Excellent

[1] Site was not sampled in 2011 due to staffing reductions. [2]Site was not sampled due to adverse flow condition. [3] Site moved to SR 1802, Davidson County in 2011.

SPECIAL STUDIES: Benthic Macroinvertebrates

Alchem, Inc.: UT Second Creek Study. Rowan County. May 8, 2007.
Two samples on UT Second Creek were sampledð one station upstream of the Alchem facility and one downstream of the facility in order to determine what effects the discharge is having on the benthic macroinvertebrate community. The station below the facility produced a Not Rated bioclassification whereas the site above the plant received a Not Impaired bioclassification. These results indicated that the facility was having an adverse impact on the benthic macroinvertebrate community in UT Second Creek.

Random Ambient Monitoring System
Caraway Creek (SR 1331, Randolph County) and Frost Creek (SR 1163, Davidson County) were sampled for benthic macroinvertebrates as part of the Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

SPECIAL STUDIES: Fish Community

Random Ambient Monitoring System
Caraway Creek at SR 1331 in Randolph County was sampled for fish community assessments as part of the 2009-2010 Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

SPECIAL STUDIES: Fish Community

High Rock Lake Fish and Sediment PCB Assessment. 2011.
Following the 2009 fish PCB advisory posting for Badin Lake, multiple trophic levels of fish were collected throughout High Rock Lake as part of a joint basinwide PCB risk assessment effort involving the North Carolina Division of Waste Management (NCDWM), NCDWR, NCDHHS, and the United States Environmental Protection Agency (USEPA). NCDWR was responsible for collection and preparation of fish fillets for 209 congener analysis through a contracted lab. All of the sunfish and bass species had total PCB levels below the stateôs 0.05ppm wet weight action level, but 23% of the catfish sampled from High Rock Lake (including channel and blue catfish) exceeded this action level, resulting in a lake-wide PCB advisory for all catfish over 18ò in length (NCDHHS advisory posted March of 2013).

Tuckertown Reservoir Mercury Assessment. 2007.
Black crappie from Tuckertown Reservoir was assessed for mercury levels in collaboration with NCWRC in a statewide data gap study of commonly harvested species. NCWRC was responsible for fish collections and DWR was responsible for sample processing and analysis. As expected for this mid trophic species, low concentrations of heavy metal (including mercury - <0.4 ppm wet weight) were found in their fillet tissues.

Badin Lake Fish and Sediment PCB Assessment. 2008.
Following a request from NCDHHS, three areas of Badin Lake were sampled for fish PCBs among multiple trophic levels of fish. NCDWR was responsible for collection and preparation of fish fillets for 209 congener analysis through a contracted lab. Results showed elevated levels of PCBs (>0.05ppm wet weight) in catfish (bottom dwellers) and Largemouth bass (top predators) which resulted in a lake-wide fish consumption advisory for these two species (NCDHHS advisory posted February 2009). All other species from Badin Lake had low PCB levels (<0.05ppm wet weight).

Falls Reservoir Fish PCB assessment. 2012.
DWR sampled Falls Reservoir (run of river impoundment between Badin Lake and Lake Tillery) for multiple trophic levels resulting in a fish consumption advisory for catfish over 18ò in length. As in High Rock Lake and Lake Tillery, all other species (sunfish and bass) showed low levels of PCBs (<0.05 ppm wet weight).

YADKIN RIVER HUC 03040104 – LAKE TILLERY- PEE DEE RIVER

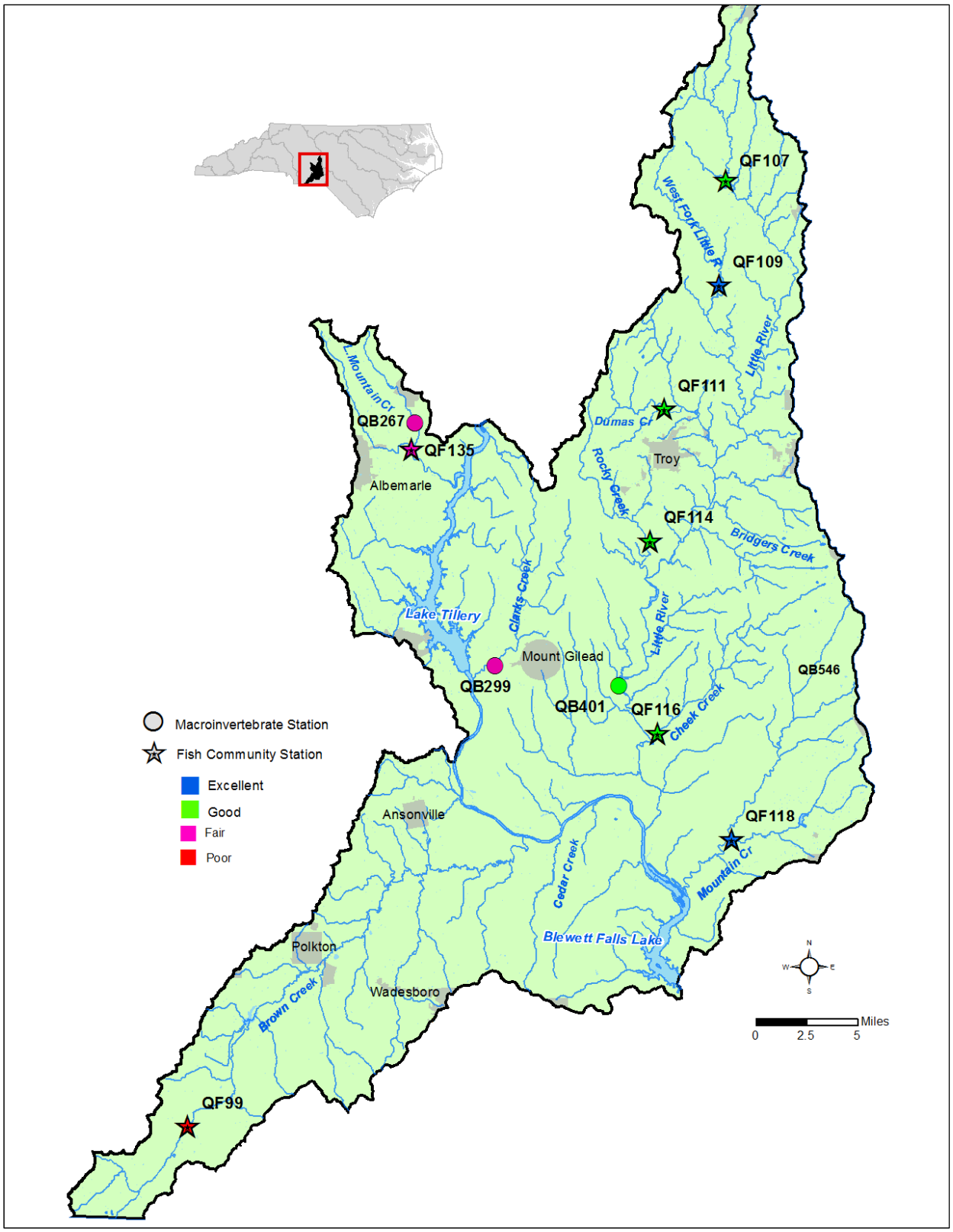

Figure 5. Sampling sites in HUC 03040104: 2011. Monitoring sites are listed in Table 4.

River and Stream Assessment

In 2011, three long-term benthic macroinvertebrate sites were unable to be sampled in HUC 03040104. Specifically, as a result of staffing reductions, one station was not sampled while two other sites were not sampled due to persistently` high flows (Table 4). In total, three benthic macroinvertebrate stations were sampled in 2011 resulting in one Good bioclassification and two Fair ratings (Figure 5). For data interpretation and trend analysis of the three benthic macroinvertebrate basinwide sampling events, please refer to the individual station summaries in Appendix 3.

In terms of fish community, there were seven collections in this HUC resulting in two Excellent bioclassifications, three Good ratings, and one Fair and Poor bioclassification respectively (Table 4, Figure 5). For data interpretation and trend analysis for the eight fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 4. Waterbodies Monitored in HUC 03040104: 2001-2011.

Map #[1]	Waterbody	County	Location	2001	2006	2011
QB267	Little Mountain Cr	Stanly	SR 1720	Fair	Fair	Fair
QB299	Clarks Cr	Montgomery	SR 1110	Good-Fair	Good	Fair
QB403	Little R	Montgomery	SR 1340	Excellent	Excellent	Not Sampled[2]
QB412	West Fk Little R	Montgomery	SR 1311	Excellent	Good	Not Sampled[1]
QB401	Little R	Montgomery	NC 731	Good	Excellent	Good
QB302	Mountain Cr	Richmond	SR 1150	Good	Excellent	Not Sampled[2]
QF135	Mountain Cr	Stanly	SR 1720	Good-Fair	Good (2004)	Fair
QF99	Brown Cr	Anson	SR 1230	Good	Good-Fair	Poor
QF107	Little R	Randolph	SR 1127	Good	Excellent	Good
QF111	Dumas Cr	Montgomery	SR 1310	---	Excellent	Good
QF109	W Fk Little R	Montgomery	SR 1311	Good	Good	Excellent
QF114	Rocky Cr	Montgomery	SR 1549	Excellent	Excellent	Good
QF116	Cheek Cr	Montgomery	SR 1541	Excellent	Good	Good
QF118	Mountain Cr	Richmond	SR 1150	Good	Excellent	Excellent

[1] Site was not sampled in 2011 due to staffing reductions. [2]Site was not sampled due to adverse flow condition.

SPECIAL STUDIES: Fish Community

Lake Tillery Fish and Sediment PCB assessment. 2011.
Following the 2009 fish PCB advisory posting for Badin Lake, multiple trophic levels of fish were collected throughout Lake Tillery (along with High Rock Lake PCB assessments discussed above) as part of the joint basinwide PCB risk assessment effort (NCDWM and NCDWR, NCDHHS, and USEPA). Results for Lake Tillery were similar to those in High Rock Lake; all species of sunfish and bass had low PCB levels (<0.05ppm wet weight) and 21% of catfish (all channel catfish) showed elevated PCBs (>0.05 ppm action level). As was the case for High Rock Lake, a fish consumption advisory was posted for catfish over 18ò in length for Lake Tillery (NCDHHS advisory posted March 2013). Please refer to http://epi.publichealth.nc.gov/oee/fish/advisories.html for a list of current site specific fish consumption advisories in North Carolina.

YADKIN RIVER HUC 03040105 – ROCKY RIVER

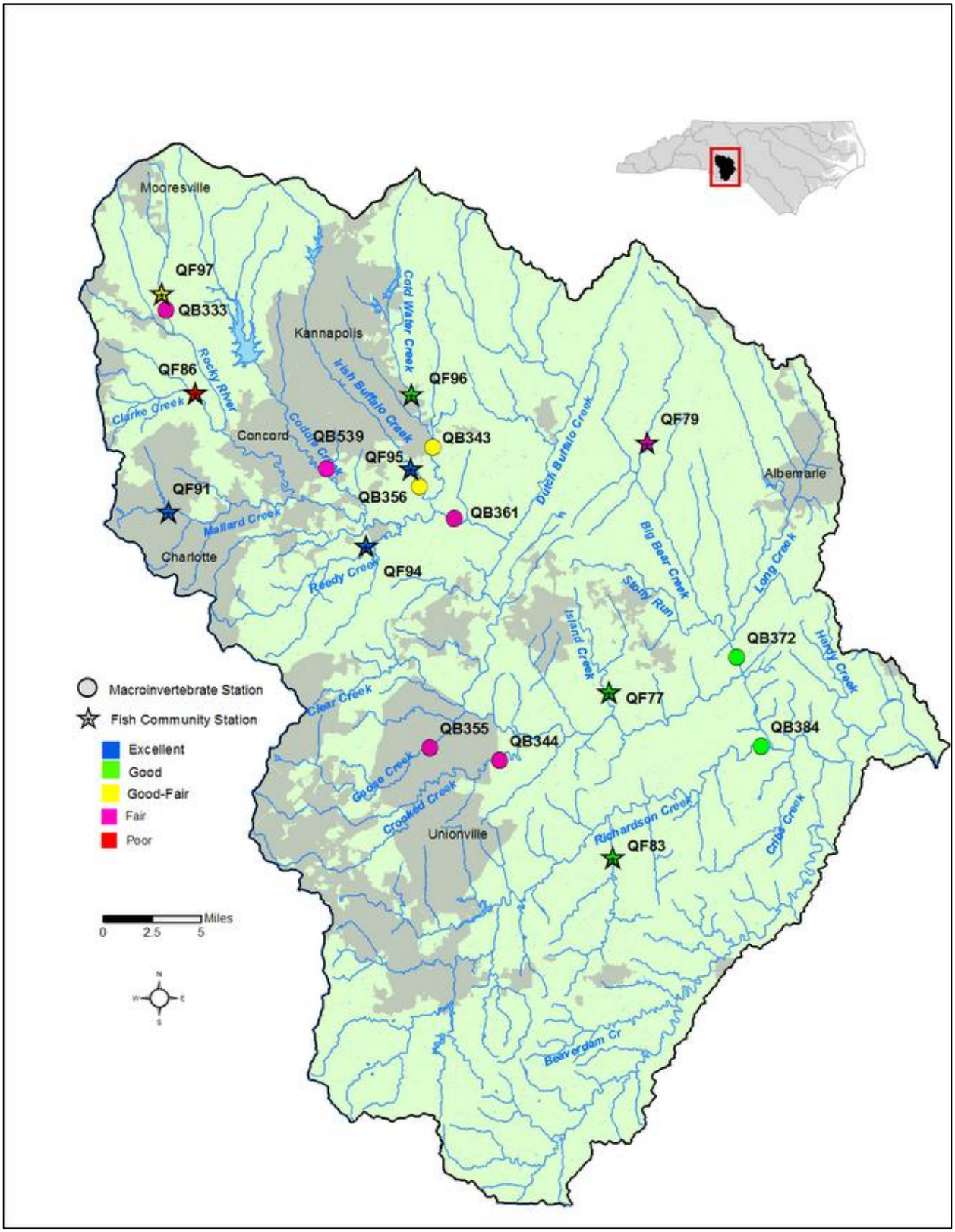

Figure 6. Sampling Sites in HUC 03040105: 2011. Monitoring Sites are Listed in Table 5.

River and Stream Assessment

In 2011, several long-term benthic macroinvertebrate sites were unable to be sampled in HUC 03040105. As a result of staffing reductions, four stations were not sampled while one additional site was not sampled due to persistently high flows (Table 5). In total, eight benthic macroinvertebrate stations were sampled in 2011 resulting in two Good bioclassifications, two Good-Fair ratings, and four Fair ratings (Figure 6). For data interpretation and trend analysis of the five benthic macroinvertebrate basinwide sampling events, please refer to the individual station summaries in Appendix 3.

In terms of fish community, there were nine collections in HUC 03040105 resulting in three Excellent bioclassification, three Good ratings, and one Good-Fair, Fair, and Poor bioclassification respectively (Table 5, Figure 6). For data interpretation and trend analysis for the eight fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 5. Waterbodies Monitored in HUC 03040105: 2001-2011.

Map #[1]	Waterbody	County	Location	2001	2006	2011
QB333	Rocky R	Mecklenburg	SR 2420	Fair	Fair	Fair
QB361	Rocky R	Cabarrus	US 601	Fair	Good-Fair	Fair
QB390	Rocky R	Stanly	SR 1943	Good	Good	Not Sampled[1]
QB539	Coddle Cr	Cabarrus	NC 49	Fair	Fair	Fair[2]
QB356	Irish Buffalo Cr	Cabarrus	SR 1132	Good-Fair	Fair	Good-Fair
QB343	Coldwater Cr	Cabarrus	NC 49	Good-Fair	Fair	Good-Fair
QB355	Goose Cr	Union	US 601	Poor	Fair	Fair
QB344	Crooked Cr	Union	SR 1547	Good-Fair	Good-Fair	Fair
QB371	Long Cr	Stanly	SR 1401	Good-Fair	Good-Fair	Not Sampled[1]
QB372	Long Cr	Stanly	SR 1917	Good-Fair	Good	Good
QB367	Big Bear Cr	Stanly	SR 1225	Good	Good	Not Sampled[1]
QB385	Richardson Cr	Union	SR 1649	Fair	Good-Fair	Not Sampled[1]
QB384	Richardson Cr	Anson	SR 1600	Good	Good	Good
QF97	Rocky R	Cabarrus	SR 1608	Poor (1999)	Good	Good-Fair
QF86	Clarke Cr	Cabarrus	SR 1449	---	Poor	Poor
QF91	Mallard Cr	Mecklenburg	SR 2467	Excellent	Good-Fair	Excellent
QF94	Reedy Cr	Cabarrus	SR 1136	Good-Fair	Good-Fair	Excellent
QF95	Irish Buffalo Cr	Cabarrus	SR 1132	Good	Excellent	Excellent
QF96	Coldwater Cr	Cabarrus	NC 73	Good-Fair	Fair	Good
QF77	Island Cr	Stanly	SR 1118	Excellent	Excellent	Good
QF79	Big Bear Cr	Stanly	NC 73 (SR 1134)	Good	Good-Fair (2004)[2]	Fair
QF 83	Salem Cr	Union	SR 1006	Good	Good-Fair	Good

[1] Site was not sampled in 2011 due to staffing reductions. [2]Site moved to SR 1304, Cabarrus County in 2011.

SPECIAL STUDIES: Benthic Macroinvertebrates

Little Long Creek 303d List Re-sample. Stanly County. April 7, 2011.
This site was resampled to determine if listing on the 303d list is still warranted. The August 24, 2006 sample produced a Fair bioclassification and a 303d list designation. The April 7, 2011 re-sample resulted in a Good-Fair bioclassification. Therefore, this stream segment is now eligible to be delisted from the 303d list.

Ecosystem Enhancement Program (EEP): Goose and Crooked Creek Local Watershed Plan (LWP). Union County. December 1, 2009.
Ten benthic macroinvertebrate samples were collected on Goose and Crooked Creek. The results of the data were used to develop a LWP. All Crooked and Goose Creek samples resulted in either a Poor or Fair bioclassification.

Fairfield Plantation Wastewater Treatment Plant (WWTP) Study: Goose Creek. Union County. September 27, 2010.

Two samples on Goose Creek were sampled in order to determine the potential impact of the Fairfield Plantation WWTP on Goose Creek. One sample was obtained upstream of the WWTP and one was taken downstream. Both samples resulted in Fair bioclassifications.

Random Ambient Monitoring System
Reedy Creek (SR 2826, Mecklenburg County) was sampled as part of the Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program can be found at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

SPECIAL STUDIES: Fish Community

Random Ambient Monitoring System
Reedy Creek at SR 2826 in Mecklenburg County was sampled for fish community assessments as part of the 2009-2010 Random Ambient Monitoring System program (http://portal.ncdenr.org/web/wq/ess/eco/rams). A report summarizing the first two cycles of the program and can be accessed at the following link: (http://portal.ncdenr.org/web/wq/ess/reports).

YADKIN RIVER HUC 03040201 – Pee Dee River

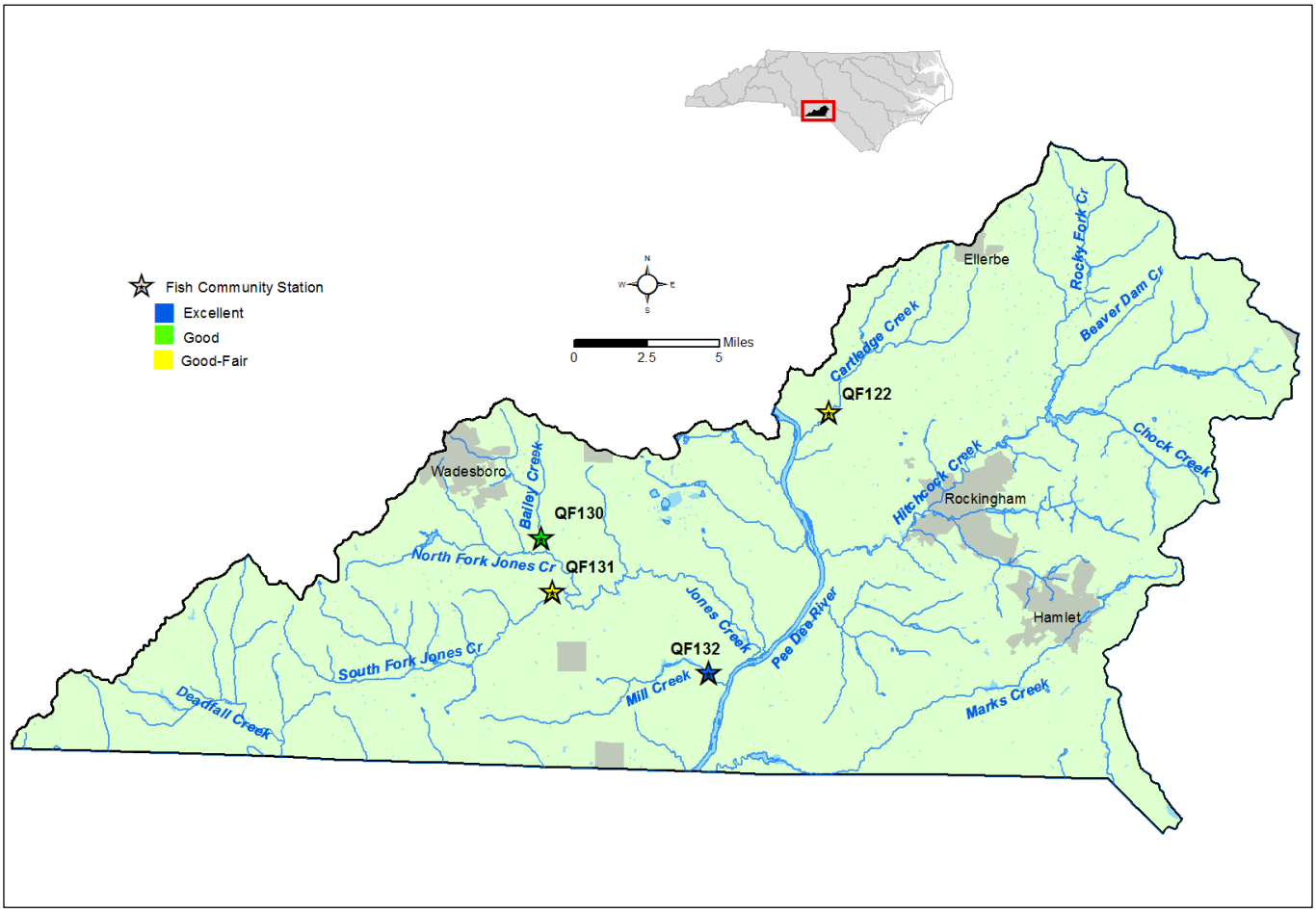

Figure 7. Sampling Sites in HUC 03040201: 2011. Monitoring Sites are Listed in Table 6.

River and Stream Assessment

In 2011, all four of the long-term benthic macroinvertebrate sites in this HUC were not sampled due to staffing reductions (Table 6).

In terms of fish community, there were four collections in HUC 03040102 resulting in one Excellent bioclassification, one Good rating, and two Good-Fair bioclassifications (Table 6, Figure 7). For data interpretation and trend analysis for the four fish community stations sampled in 2011, please refer to the individual stations summaries in Appendix 3.

Table 6. Waterbodies Monitored in HUC 03040201: 2001-2011.

Map #[1]	Waterbody	County	Location	2001	2006	2011
QB420	Hitchcock Creek	Richmond	SR 1486	Good	Good	Not Sampled[1]
QB419	Hitchcock Creek	Richmond	SR 1109	Good-Fair	Good	Not Sampled[1]
QB428	Jones Creek	Anson	NC 145	Good-Fair	Good	Not Sampled[1]
QB432	N Fork Jones Creek	Anson	SR 1121	Good-Fair	Good-Fair	Not Sampled[1]
QF122	Carteledge Cr	Richmond	SR 1142	Good	Good	Good-Fair
QF130	Bailey Cr	Anson	SR 1811	Good	Good-Fair	Good-Fair
QF131	S Fk Jones Cr	Anson	SR 1821	Excellent	Good-Fair	Good
QF132	Mill Cr	Anson	SR 1826	---	Excellent	Excellent

[1] Site was not sampled in 2011 due to staffing reductions.

GLOSSARY

Assessment Unit	A stream or a segment of a stream. Assessment Unit designations are used to uniquely identify streams or stream segments for the purpose of classifying waters for protection by use (such as for drinking water supply or trout waters).
BI or NCBI	North Carolina Biotic Index. This is one of two metrics used extensively to evaluate the results of benthic sampling, and is the weighted sum of tolerance values for taxa found in the sample relative to their abundance.
Bioclassification	A classification assigned to a stream site following biological sampling of either fish or macroinvertebrates. Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each sample. For invertebrates the bioclassification is based on the number of taxa present in the intolerant groups (EPT) and the North Carolina Biotic Index (BI or NCBI) value. For fish the classification is based on abundance, condition of specimens, species richness, composition, pollution-tolerance, trophic composition, and reproductive function.
Ecoregion	An area of relatively homogeneous environmental conditions, usually defined by elevation, geology, vegetation, and soil type. Examples include Mountains, Piedmont, Coastal Plain, Sand Hills, and Carolina Slate Belt.
EPT	The insect orders Ephemeroptera, Plecoptera, and Trichoptera. As a whole, these are the most intolerant insects present in the benthic community. EPT also refers to taxa richness within the three insect orders, a metric used extensively to derive bioclassifications. Higher EPT taxa richness values are associated with better water quality.
EPT BI	North Carolina Biotic Index for the EPT portion of the benthic community. This is the weighted sum of the tolerance values of taxa in the insect orders Ephemeroptera, Plecoptera, and Trichoptera found in the sample, relative to their abundance.
HQW	High Quality Waters. Such waters are rated Excellent based on biological and physical/chemical characteristics through Division monitoring or special studies and have been approved for such designation by the state Environmental Management Commission; also, primary nursery areas designated by the Marine Fisheries Commission and all Class SA waters.
MGD	Million gallons per day. This is generally the unit in which effluent discharge flow is measured.
NPDES	National Pollutant Discharge Elimination System.
NCIBI	North Carolina Index of Biotic Integrity (NCIBI); a summary measure of the effects of factors influencing the fish community.
ORW	Outstanding Resource Waters. These are unique and special waters of exceptional state or national recreational or ecological significance that require special protection to maintain existing uses and have been approved for such designation by the Environmental Management Commission.

Specific Conductance	The measure of the resistance of a solution to electrical flow. Resistance is reduced with increasing content of ionized salts. Reported in the units of εmhos/cm at 25 ^{o}C.
ST	Total invertebrate richness. The total number of different taxa present in a Full Scale benthic macroinvertebrate sample.
UT	Unnamed tributary.
WTP	Water treatment plant.
WWTP	Wastewater treatment plant

Appendix 1. Summary of Benthic Macroinvertebrate Assessment Data: 1996-2011.

Based on a trend analysis of the benthic macroinvertebrate sites sampled in the Yadkin river basin from 1996, 2001, 2006, and 2011 (Figure 8), there has been a clear and consistent reduction in the number of Poor bioclassifications (from 1996 to 2001) although there has been an increase in the number of Fair bioclassifications over the same time period. Other than a brief increase in Excellent bioclassifications in 2006, sites with Excellent ratings have been stable from 2001 to 2011. A similar trend can be observed for monitoring stations receiving Good bioclassifications. Benthic macroinvertebrate monitoring stations receiving Good-Fair ratings have overall been declining from the 1996-2001 period of record although Good-Fair ratings increased in 2011 relative to the lowest levels observed for these stations in 2006. However, caution should be exercised in making definitive conclusions based on the data presented in Figure 8 since stations that were not sampled due to adverse flows and personnel constraints in 2011 were not included in this analysis. Please refer to Appendix 3 for site-specific information of each benthic macroinvertebrate station monitored in 2011.

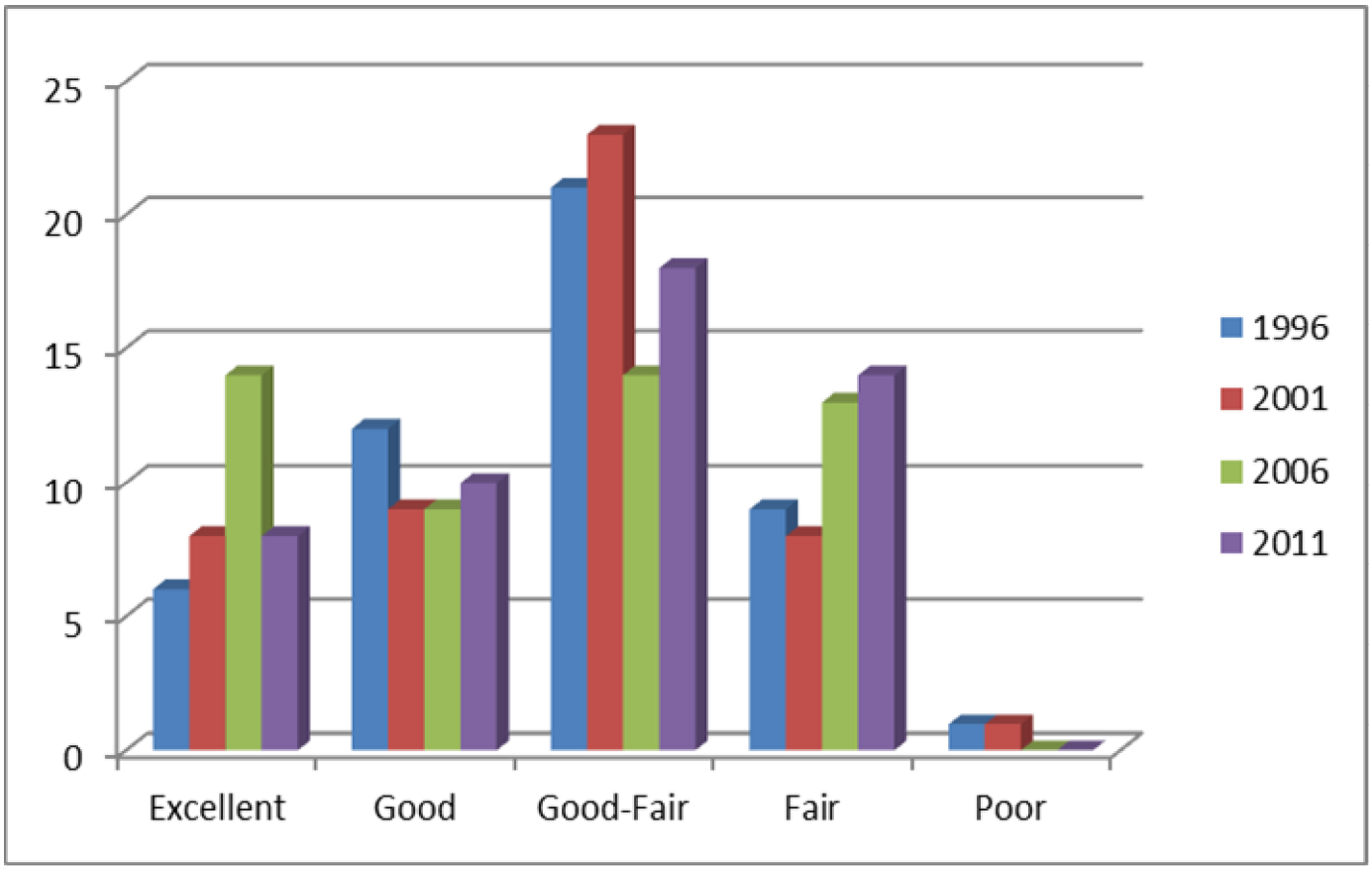

Figure 8. Benthic Macroinvertebrate Bioclassification Trends: 1996-2011.

Appendix 2. Summary of Fish Community Assessment Data: 1996-2011.

In terms of fish community data, the most widely distributed species was the Redbreast Sunfish and the Bluehead Chub. The Bluehead Chub was the most abundant species, representing 24 percent of all the fish collected. Other abundant species included the Redlip Shiner, Redbreast Sunfish, and Bluegill, at 15%, 10%, and 5%, respectively. All streams were evaluated and rated using the North Carolina Index of Biotic Integrity (NCIBI). Please refer to this link for all Fish Community Standard Operating Procedures: http://portal.ncdenr.org/web/wq/ess/bau/ncibi-scores. The NCIBI scores ranged from 24 to 60 and the NCIBI ratings ranged from Poor to Excellent; 67% of the sites rated Good or Excellent and 13% rated Fair or Poor (Figures 9 and 10).

In 2006, 64% of the sites rated Good or Excellent; in 2011, 71% of the sites rated Good or Excellent (Figure 11). By contrast, 11% rated Fair or Poor in 2006 vs. 9% in 2011. Overall, based solely on the ratings, the biological integrity of the fish communities improved between 2006 and 2011. However, 75% of the sites (n=42) did not have any actual rating change (> ± 6 point NCIBI score change). Actual rating declines or increase were documented at 6 sites (decline) and 8 sites (increase). Please refer to Appendix 3 for station specific data summaries.

Twenty nine sites had been sampled during each monitoring cycle since 1996. Approximately two-thirds of the sites rated Good or Excellent over this 15 year period. The exception was during 2006 when about one-half of the sites rated Good or Excellent; the decline was most pronounced in the sites rated Good. In 3 of the 4 cycles Good sites constituted approximately 45% of all the sites, however in 2006 they constituted one-fourth of the sites. It is believed that the fish community in 2006 was still recovering from the persistent droughts between late 2001 and 2003 (NCDENR 2007). During the last two cycles with this dataset, Fair or Poor sites have made up by approximately 15% of all the sites. Of these 29 sites (Figure 13), ratings at only four sites seemed to have substantially changed.

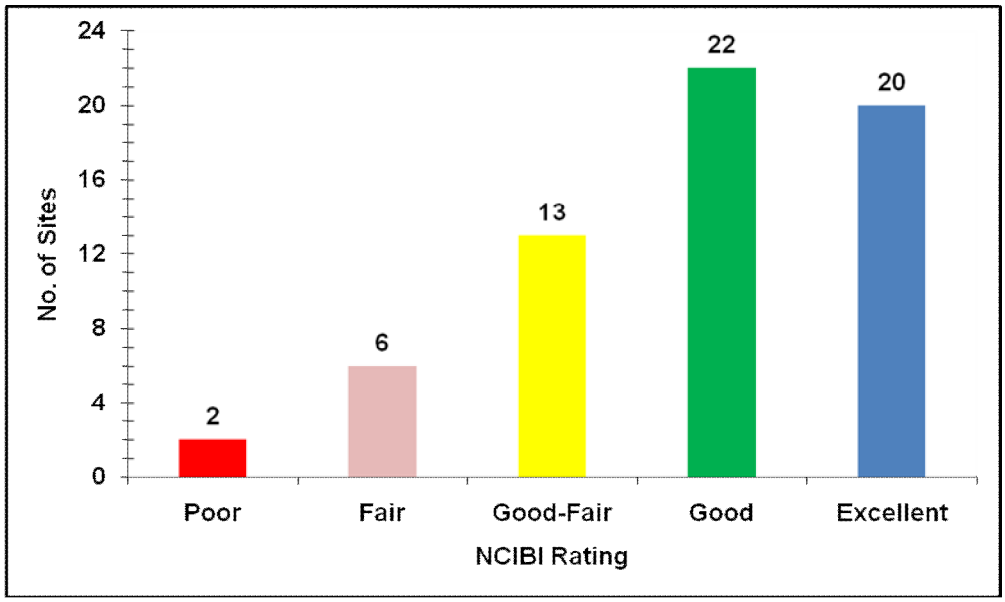

Figure 9. Distribution of NCIBI Ratings: 2011.

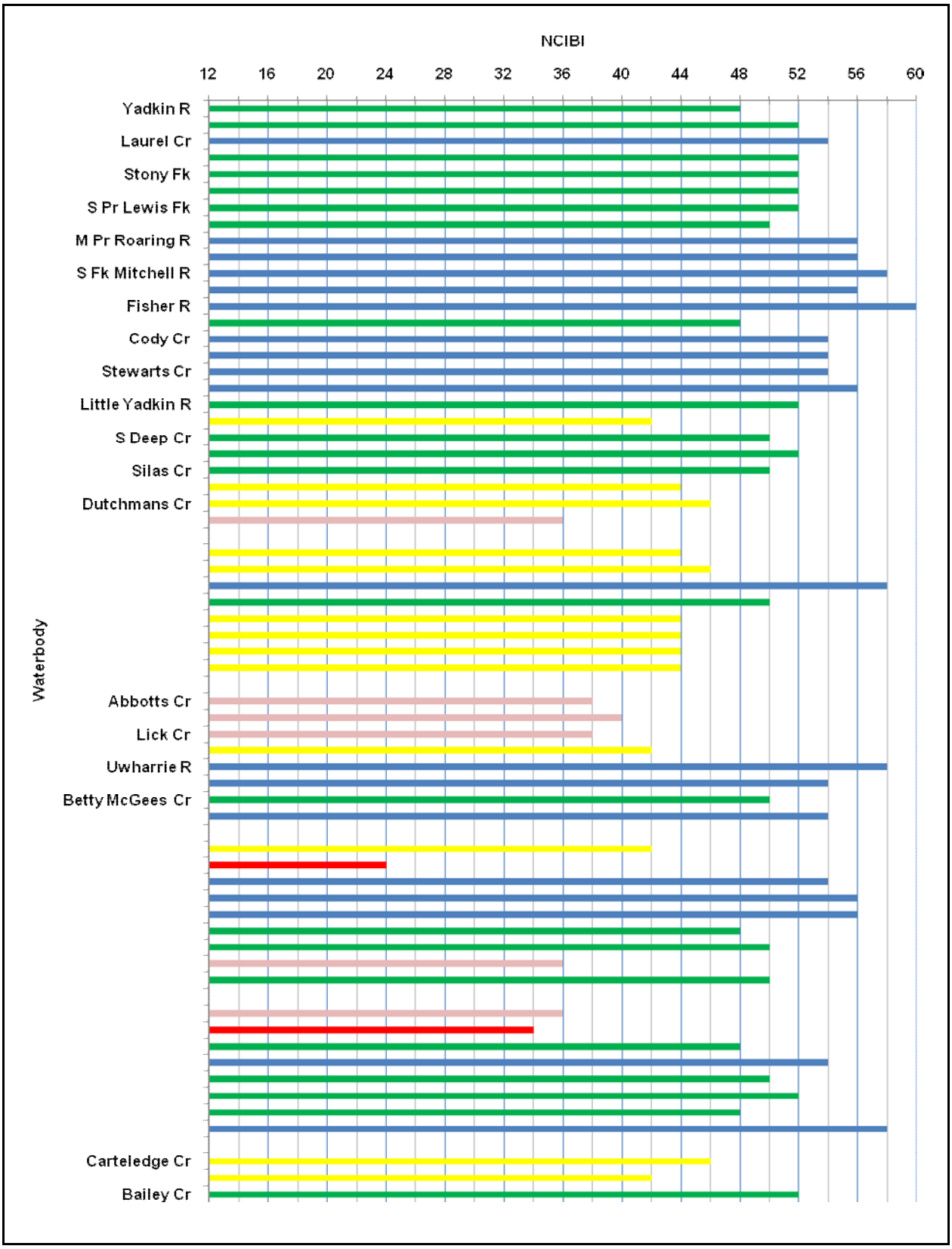

Figure 10. **NCIBI Scores and Ratings by Site: 2011. Blue = Excellent, Green = Good, Yellow = Good-Fair, and Pink = Fair Sites.**

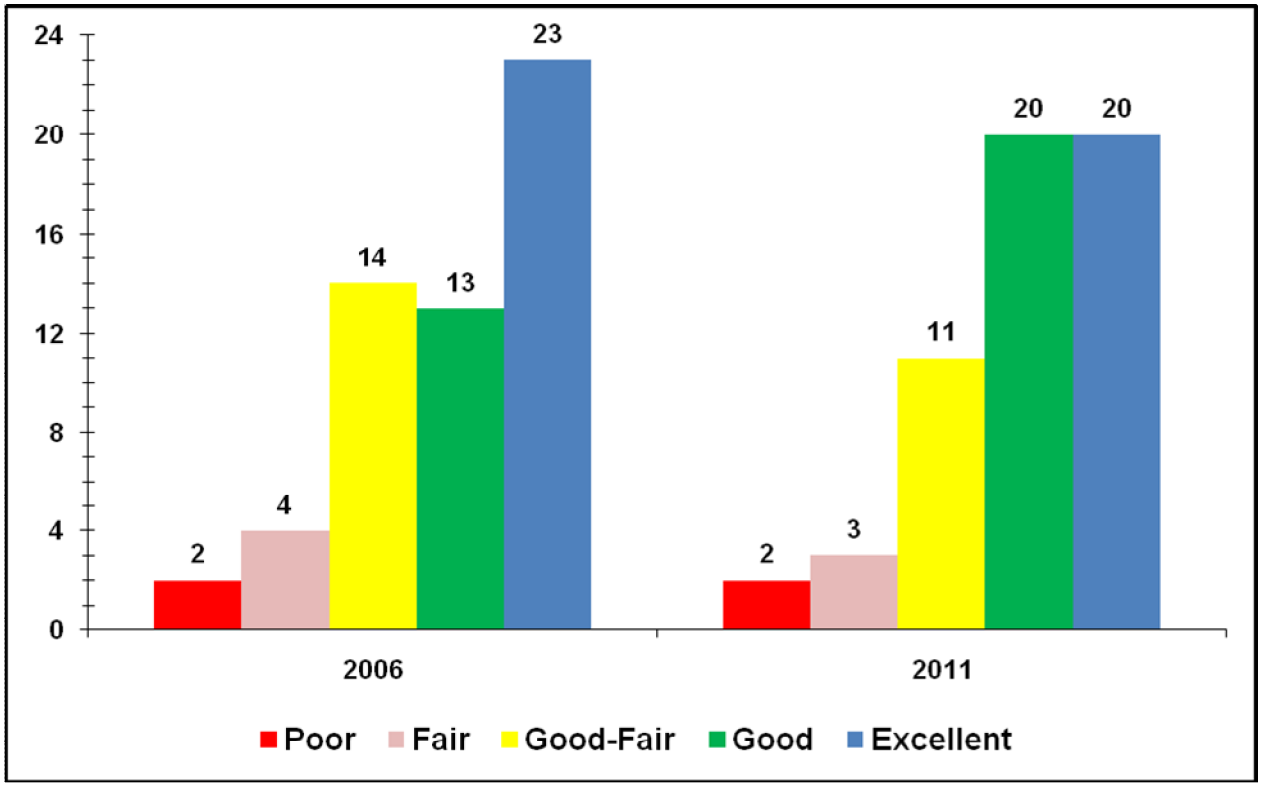

Figure 11. NCIBI Ratings: 2006-2011.

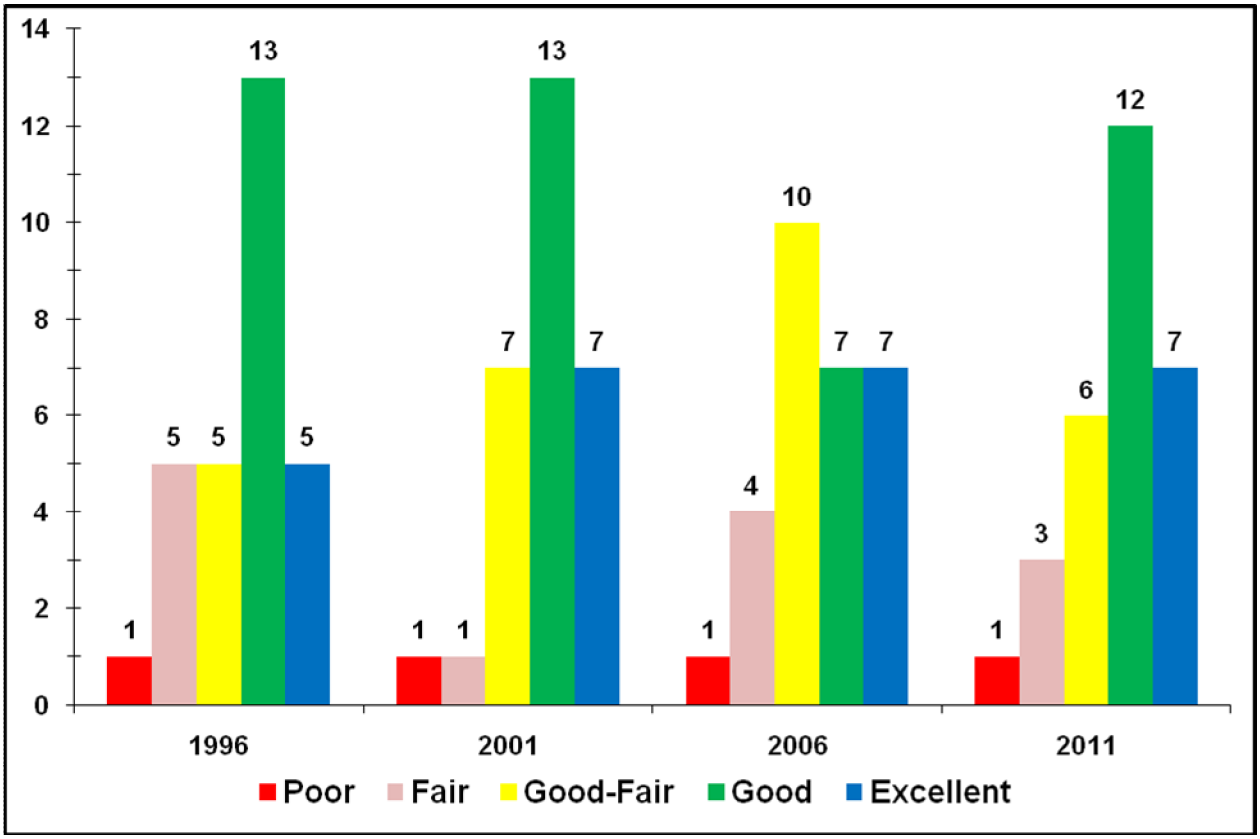

Figure 12. **NCIBI Ratings: 1996-2011.**

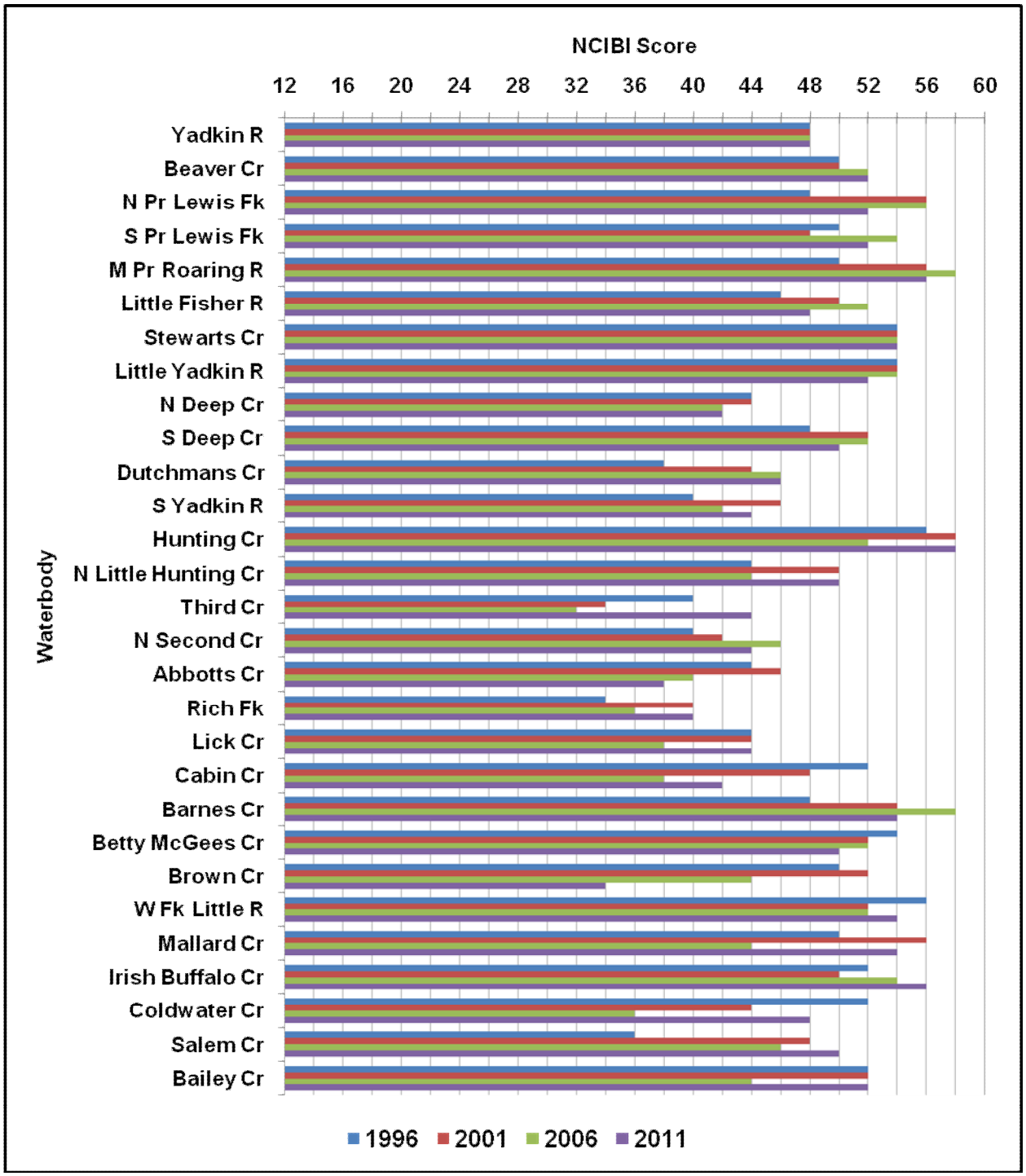

Figure 13. NCIBI Scores by Site: 1996-2011.

Blackspot and Other Diseases

Blackspot and yellow grub diseases are naturally occurring, common infections of fish by an immature stage of flukes. The life cycle involves fish, snails, and piscivorous birds. Heavy, acute infections can be fatal, especially to small fish. However, fish can carry amazingly high worm burdens without any apparent ill effects (Noga 1996). The infections may often be disfiguring and render the fish aesthetically unpleasing (Figure 14).

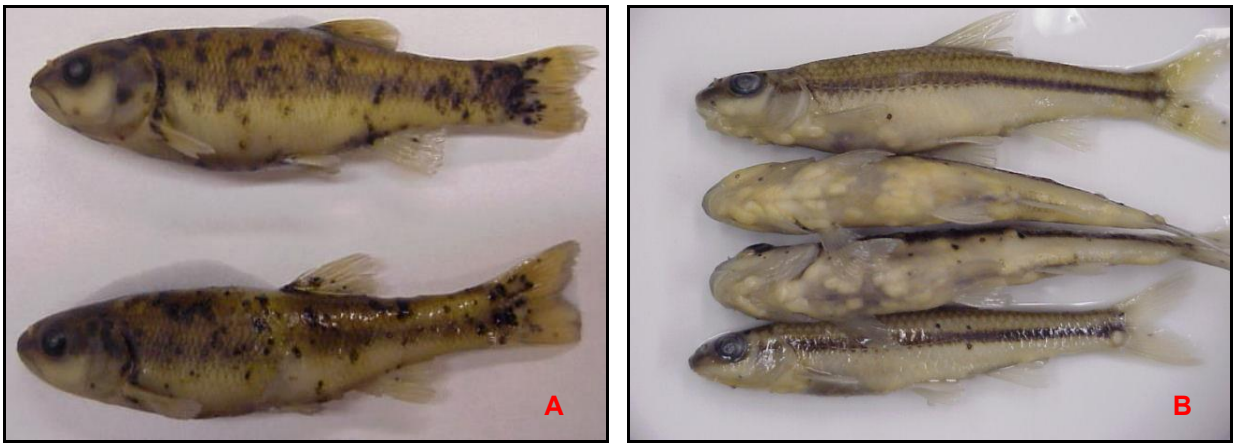

Figure 14. Heavy Infestation of Blackspot Disease in Creek Chub (A) and Yellow Grub in Bigeye Chub (B).

Although some researchers incorporate the incidence of black spot and yellow grub into indices of biotic integrity (Steedman 1991), others, because of a lack of a consistent, inverse relationship to environmental quality, do not (Sanders *et al.* 1999). The diseases are not considered in the NCIBI because it is widespread, affecting fish in all types of streams. Other diseases observed in 2011 included abdominal ñtumorsò in Rosyside Dace, fungal infection on Redlip Shiner, Spottail Shiner, and Creek Chub; caudal peduncle deformity in Redbreast Sunfish; scoliosus in Mountain Redbelly Dace, Notchlip Redhorse; and Tessellated Darter; and incidences of ñpopeyeò or exopthalmos in Bluegill caused by bacterial, viral, and nematode infections (Figure 15).

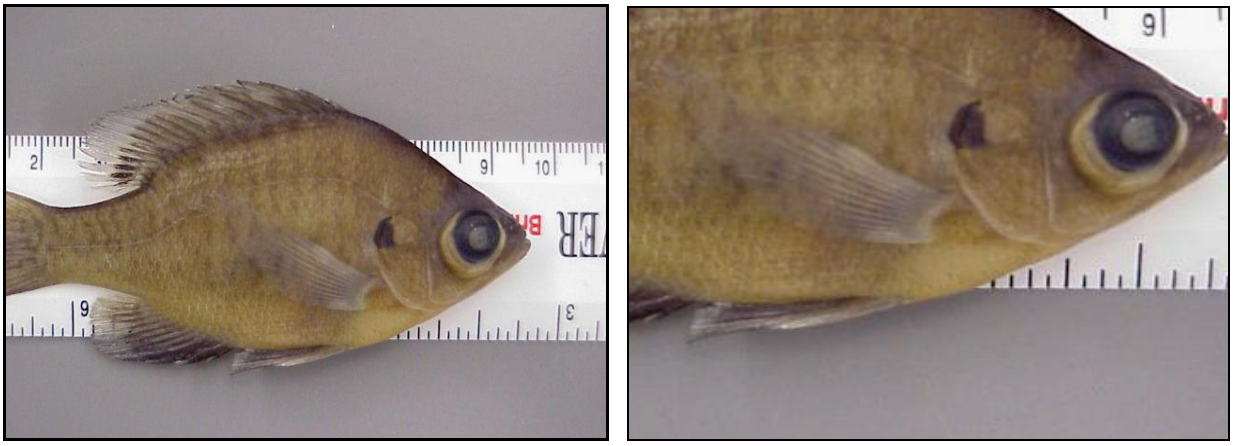

Figure 15. Popeye Caused by Nematode Infection in Bluegill.

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Appendix 3. BENTHIC AND FISH COMMUNITY MONITORING STATION SUMMARIES

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
YADKIN R	NR SR 1516	QB448	08/08/11	Good

County	Subbasin	8 digit HUC	Latitude	Longitude
CALDWELL	1	03040101	35.991667	-81.558056

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Eastern Blue Ridge Foothills	29	11	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Blue Ridge Tissue Corporation, Patterson Mill	NC0006254	0.45
Caldwell County Schools, Happy Valley Elementary School	NC0041181	0.008

Water Quality Parameters

Temperature (℃)	25.6
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	74
pH (s.u.)	6.9

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	4
Riffle Habitat (16)	7
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	6
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	62

Site Photograph

Substrate: mostly sand/boulder, some silt, cobble, and bedrock

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/08/11	11269	Full Scale	96	42	4.54	3.88	Good
06/06/06	9940	Full Scale	112	33	4.70	2.96	Good-Fair
08/30/01	8619	Full Scale	69	24	5.39	4.48	Good-Fair
07/22/96	7107	Full Scale	102	41	4.31	3.34	Good
07/10/90	5373	Full Scale	87	38	4.63	3.48	Good
08/04/87	4181	Full Scale	87	37	5.02	4.08	Good
08/06/85	3544	Full Scale	76	24	5.85	3.84	Good-Fair

Data Analysis

The site is 8.7 kilometers north of downtown Lenoir. The river originates along the Blue Ridge Parkway and US 321 near Blowing Rock. The catchment is about 90 percent forested with the remainder split primarily between development and cultivation. Note that this site was identified as "Yadkin R/NC 268, Patterson" in the prior basinwide report.

The site has received a classification of either Good-Fair or Good for each benthic sampling event. Between the sampling events in 1985 and 1996, EPT Richness increased and BI values decreased, indicative of improving water quality over that period. In 2001 EPT Richness was depressed to the level observed in 1985, and the BI value increased markedly, indicating a decline in water quality between the sampling events in 1996 and 2001. Results from 2006 and 2011 show improvements in EPT Richness and BI values, indicating a recovery in water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
YADKIN R	NC 18-268	QB55	08/09/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.152500	-81.145833

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	500	40	1.0

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

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

Water Quality Parameters

Temperature (℃)	26.9
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	49
pH (s.u.)	5.9

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	12
Bank Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	2
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	71

Site Photograph

Substrate cobble dominant, some sand, boulder, gravel, and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/09/11	11275	Full Scale	84	33	4.97	4.16	Good-Fair
06/08/06	9950	Full Scale	114	46	4.45	3.43	Excellent
07/25/01	8516	Full Scale	94	32	5.07	3.97	Good-Fair
07/24/96	7116	Full Scale	72	39	5.01	3.98	Good
06/07/93	6181	Full Scale	73	34	5.31	4.30	Good-Fair
08/10/89	5047	Full Scale	75	35	4.75	4.21	Good
08/06/87	4187	Full Scale	67	26	5.41	4.45	Good-Fair
08/05/86	3896	Full Scale	67	27	5.47	4.30	Good-Fair
09/09/85	3671	Full Scale	66	21	5.60	4.75	Fair
08/28/84	3317	Full Scale	58	29	4.68	4.14	Good-Fair

Data Analysis

The site is at the Wilkesboro/North Wilkesboro city line. The catchment above this point is about 80 percent forest,10 percent in cultivation, and five percent developed. The only major municipal area with a significant portion contained within the catchment is Wilkesboro/North Wilkesboro.

The site has been sampled 11 times since 1984 (one sample from July 1987 using EPT collection methods, which resulted in a bioclassification of Good-Fair, is not shown above). For most of the benthic sampling history, the site has received bioclassifications of either Good or Good-Fair. Overall, considering all Full Scale benthic sampling events, there are slight trends towards increased EPT Richness and lower BI values, both of which are indicators of improving water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
YADKIN R	SR 2221	QB546	08/10/11	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	2	03040101	36.255950	-80.649460

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	1190	120	0.6

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Wilkesboro, Cub Creek WWTP	NC0021717	6.6
Town of North Wilkesboro, Thurman Street WWTP	NC0020761	2
Louisiana Pacific Corporation, LP Roaring River WWTP	NC0005266	2
True Textiles Inc, 561 Main Street Plant	NC0005312	4
Yadkin Valley Sewer Authority WWTP	NC0020567	1.8

Water Quality Parameters

Temperature (℃)	28.5
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	57
pH (s.u.)	7.1

Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	5
Riffle Habitat (16)	7
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	1
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	54

Site Photograph

Substrate mostly bedrock/sand, with some boulder, cobble, and silt

Yadkin River SR 2221 Surry County

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/10/11	11277	Full Scale	97	39	4.67	3.96	Good

Yadkin River SR 1003 Surry County (former basinwide site)

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/09/06	10013	Full Scale	78	29	4.87	3.80	Good-Fair
08/07/01	8569	Full Scale	65	30	4.41	3.86	Good
07/23/96	7078	Full Scale	62	30	5.31	4.49	Good-Fair
08/27/84	3316	Full Scale	45	19	5.34	4.53	Fair

Data Analysis

The site is 13.5 kilometers north of downtown Yadkinville. The catchment above the site is about 70 percent forested and 20 percent in cultivation, with most of the remainder developed. Wilkesboro/North Wilkesboro and Elkin/Jonesville are the largest municipal areas in the catchment. This relatively wide and shallow site is intended as a replacement for the former Yadkin River basinwide site in Surry County at SR 1003 (12 stream-kilometers downstream), which was difficult both to access and to sample. There are no major NPDES dischargers contributing to the waters between the new and former sites, and the three named tributaries between the sites are small (between three and 11 square miles).

The 39 EPT taxa identified from the new basinwide site is greater than for any of the four collections from the former site. The BI value for the new site is within the range of values for the former site. It is possible that the greater EPT Richness at the new site is due to habitat or ease-of-sampling differences between the sites rather than a reflection of water quality. If so, this further justifies the use of the new site as a replacement for the old site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BUFFALO CR	**SR 1505**	**QB7**	**08/08/11**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude
CALDWELL	1	03040101	36.028611	-81.512500

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Crystalline Ridges and Mountains	32	13	0.3

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

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

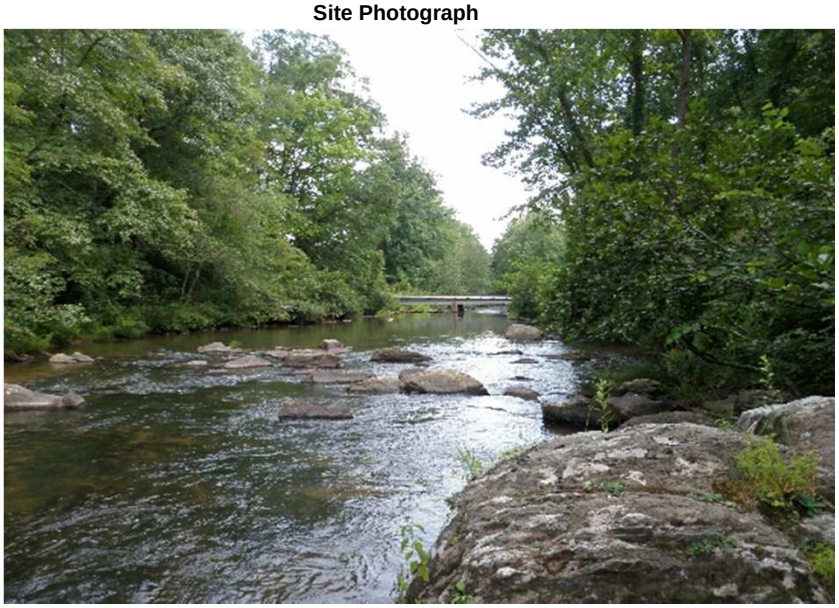
Water Quality Parameters

Temperature (℃)	26.6
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	32
pH (s.u.)	7.1
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	9
Riffle Habitat (16)	14
Bank Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	75

Site Photograph



Substrate mostly bedrock/boulder, with some sand, cobble, and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/08/11	11270	EPT	---	38	---	3.20	Excellent
06/06/06	9942	EPT	---	48	---	2.67	Excellent
08/30/01	8620	EPT	---	43	---	3.46	Excellent
07/22/96	7108	EPT	---	40	---	3.30	Excellent

Data Analysis

The site is directly downstream of a small dam 13 kilometers north of downtown Lenoir and about 1.7 stream-kilometers from the confluence with Yadkin River. The headwaters of the stream are near the Blue Ridge Parkway in Watauga County. The catchment is over 90 percent forested with small amounts of cultivation and development.

The site has consistently received classifications of Excellent following each benthic sampling event. However, EPT Richness for 2011 is lower than for any prior sampling event, and markedly lower than 2006.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
ELK CR	**SR 1175**	**QB14**	**08/09/11**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.106389	-81.438056

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Crystalline Ridges and Mountains	43	15	0.3

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

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

Water Quality Parameters

Temperature (℃)	23.8
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	44
pH (s.u.)	6.4

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	13
Pool Variety (10)	8
Riffle Habitat (16)	14
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	6
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	80

Site Photograph

Substrate even mix of boulder, cobble, sand and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/09/11	11271	Full Scale	115	54	3.84	2.88	Excellent
06/07/06	9948	Full Scale	136	62	3.92	3.01	Excellent
08/29/01	8618	Full Scale	100	43	4.50	3.43	Good
07/22/96	7109	Full Scale	85	42	4.45	3.50	Good
07/29/88	4643	Full Scale	96	47	4.40	3.41	Excellent
12/14/87	4462	Full Scale	100	49	3.68	2.45	Excellent
08/06/85	3545	Full Scale	107	44	4.61	3.55	Good

Data Analysis

The site is about midway between Blowing Rock and Wilkesboro, and seven stream-kilometers from the confluence with Yadkin River. The headwaters are at the Blue Ridge Parkway in Watauga County. The catchment is greater than 90 percent forested, with most of the remainder in cultivation and development.

The site has received classifications of either Good or Excellent following each sampling event. EPT Richness was high again in 2011, though not to the level observed in 2006. Half of the loss in EPT richness between 2006 and 2011 is due to fewer mayfly taxa in the family Ephemerellidae, which show a seasonal occurrence with higher richness in spring and early summer. The BI value in 2001 was near the low end of values observed for the site over all sampling events. Lower BI values suggest better water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
STONY FK	**SR 1135**	**QB47**	**08/08/11**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.110556	-81.360000

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	34	18	0.3

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

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

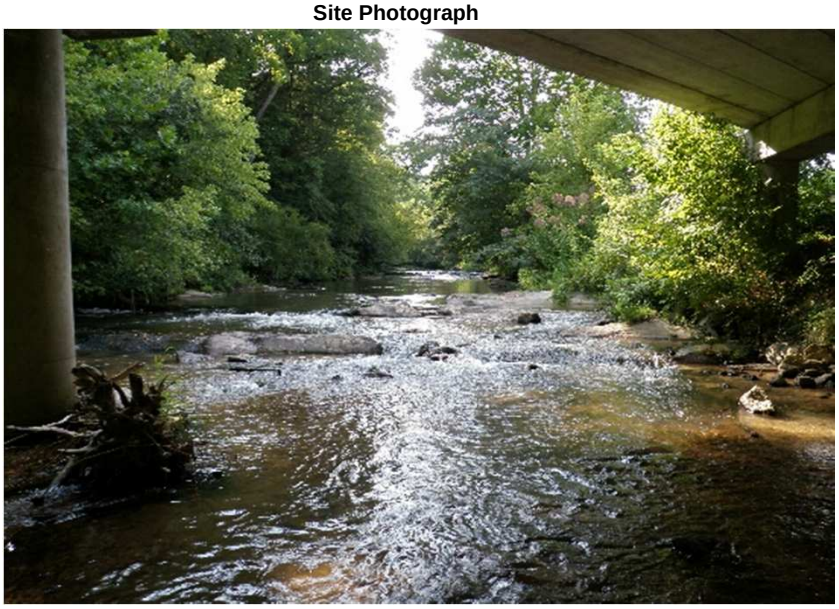
Water Quality Parameters

Temperature (℃)	26.1
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	35
pH (s.u.)	6.1
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	9
Pool Variety (10)	5
Riffle Habitat (16)	7
Bank Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	6
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	66

Site Photograph



Substrate sandy, with some boulder, cobble, and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/08/11	11272	EPT	---	39	---	2.92	Excellent
06/06/06	9944	EPT	---	42	---	2.93	Excellent
06/11/02	8776	EPT	---	41	---	3.05	Excellent
07/26/01	8523	EPT	---	43	---	3.16	Excellent
07/22/96	7110	EPT	---	37	---	3.32	Excellent

Data Analysis

The site is 12 kilometers west of the W. Kerr Scott Reservoir dam and about 2.8 stream-kilometers from the confluence with Yadkin River. The headwaters of the stream are near the Blue Ridge Parkway in Watauga County. The catchment is greater than 80 percent forested with much of the remainder in cultivation.

The site has consistently resulted in bioclassifications of Excellent following each benthic sampling event, with relatively consistent results with respect to EPT Richness and EPT BI values.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N PRONG LEWIS FORK	NR SR 1300	QB31	08/09/11	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.186111	-81.305000

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	24	8	0.4

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

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

Water Quality Parameters

Temperature (℃)	22.2
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	27
pH (s.u.)	6.6

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	15
Bank Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph

Substrate mostly boulder/bedrock, with some sand and gravel

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/09/11	11273	EPT	---	39	---	2.73	Excellent
07/25/06	9986	EPT	---	42	---	3.21	Excellent
06/06/06	9943	EPT	---	38	---	2.60	Excellent
06/10/02	8772	EPT	---	42	---	3.08	Excellent
07/25/01	8518	EPT	---	35	---	3.25	Good
07/23/96	7114	EPT	---	33	---	3.19	Good

Data Analysis

The site is nine kilometers northwest of the W. Kerr Scott Reservoir dam. The stream originates near the Blue Ridge Parkway along the Ashe/Wilkes county line. Waters from the stream flow directly into W. Kerr Scott Reservoir (as Lewis Fork). The catchment is greater than 80 percent forested, with the remainder mostly in cultivation, development, and shrubland.

Since 2002 EPT Richness at the site has been relatively high and consistent, resulting in bioclassifications of Excellent for benthos following each sampling event.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MORAVIAN CR	**NC 18**	**QB28**	**09/08/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.088056	-81.200278

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	18	11	0.2

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

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

Water Quality Parameters

Temperature (℃)	27.6
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	55
pH (s.u.)	6.7

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	14
Pool Variety (10)	3
Riffle Habitat (16)	7
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	67

Site Photograph

Substrate mostly sand/gravel with some cobble and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/08/11	11274	EPT	---	23	---	4.38	Good-Fair
06/05/06	9937	EPT	---	24	---	3.90	Good-Fair
07/26/01	8522	EPT	---	25	---	4.48	Good-Fair
07/23/96	7115	EPT	---	27	---	4.18	Good-Fair

Data Analysis

The site is about six kilometers south of the W. Kerr Scott Reservoir dam, and nine stream-kilometers from the confluence with Yadkin River. Headwaters of the stream are at the Wilkes/Alexander county line, between W. Kerr Scott Reservoir and Taylorsville. The catchment is about three-quarters forested, with about half of the remainder in cultivation. Other significant landcover categories are development, grassland, and shrubland.

The site has consistently produced bioclassifications of Good-Fair following each benthic sampling event. Though a decrease in EPT Richness has been observed with each successive sampling event, the late-season sampling in 2011 is in part responsible for the lowest EPT Richness value for the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
ROARING R	SR 1990	QB42	08/10/11	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude
WILKES	1	03040101	36.249722	-81.044167

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	128	28	0.2

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	70	10	0	20	0

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

Water Quality Parameters

Temperature (℃)	22.5
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	40
pH (s.u.)	6.5
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate a closely even mix of all substrate classes, including bedrock

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/10/11	11276	Full Scale	117	54	4.07	3.05	Excellent
06/08/06	9951	Full Scale	121	50	3.93	2.94	Excellent
07/25/01	8513	Full Scale	89	42	4.22	3.27	Good
07/24/96	7118	Full Scale	98	48	4.56	3.35	Excellent
07/29/88	4644	Full Scale	92	43	4.53	3.36	Good
08/08/85	3549	Full Scale	87	36	4.62	3.11	Good
08/10/83	3134	Full Scale	66	35	3.88	3.26	Good

Data Analysis

The site is about 13 kilometers north east of downtown North Wilkesboro and seven stream-kilometers from the confluence with Yadkin River. The stream originates at the Blue Ridge Parkway near the Wilkes/Alleghany county line, south of Sparta. The catchment is greater than three-quarters forested with most of the remainder in cultivation.

Bioclassifications of either Good or Excellent have resulted from each sampling event at the site. The trend of increasing EPT Richness is indicative of improving water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
ELKIN CR	**NC 268**	**QB68**	**08/22/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	2	03040101	36.253333	-80.862778

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	35.9	9	0.3

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

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

Water Quality Parameters

Temperature (℃)	22.2
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	52
pH (s.u.)	6.5

Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	17
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	12
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	78

Site Photograph

Substrate Mix of boulder, cobble, gravel, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/22/11	11256	EPT	---	19	---	3.89	Good-Fair
08/07/06	10007	EPT	---	24	---	3.81	Good-Fair
08/06/01	8561	EPT	---	20	---	3.65	Good-Fair
07/22/96	7081	EPT	---	24	---	3.55	Good-Fair

Data Analysis

Located adjacent to the Elkin water treatment plant and with hiking trails along the right bank, this site drains a mostly rural area. As noted during historical sampling, silt, sand, and gravel substrates were again observed at the time of sampling in 2011. Water quality has remained farily consistent even though EPT richness has fluctuated up and down since sampling began in 1996. Two taxa that had not been previously collected, the mayfly Acentrella turbida and the caddisfly Ceraclea ancylus, were collected in 2011.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
MITCHELL R	R 1330 UPS BUTLER C	QB90	07/26/11	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	2	03040101	36.434722	-80.882778

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	19.8	12	0.4

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

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

Water Quality Parameters

Temperature (℃)	21.9
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	27
pH (s.u.)	6.5

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	7
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	80

Site Photograph

Substrate: Mix of bedrock, boulder, cobble, gravel, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/26/11	11249	Full Scale	97	41	3.44	2.77	Excellent
08/08/06	10009	Full Scale	103	33	4.23	3.09	Good
08/06/01	8563	Full Scale	90	40	4.00	2.98	Good
07/23/96	7091	Full Scale	79	38	3.67	2.94	Good
06/30/87	4110	Full Scale	73	32	4.52	3.36	Good

Data Analysis

The Mitchell River at SR 1330 is located downstream of Devotion and the undeveloped Reynolds property. Water quality has consistently rated Good since the site was first sampled in 1987. In 2011, however, the bioclassification increased to Excellent mainly due to a sharp decline (from 37 taxa in 2006 to 17 taxa in 2011) in the number of pollution-tolerant Chironomidae taxa collected. Taxa collected for the first time at this location include the mayflies *Baetisca* spp., *Eurylophella aestiva* and *Stenacron carolina*; the stoneflies *Suwallia marginata* and *Acroneuria frisoni*; and the caddisflies *Micrasema wataga*, *Anisocentropus pyraloides* and *Molanna* spp.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
L FISHER R	SR 1480	QB452	07/26/11	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	2	03040101	36.462222	-80.742778

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	0.0	12	0.3

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	25.5
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	58
pH (s.u.)	6.6

Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	11
Pool Variety (10)	4
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	77

Site Photograph

Substrate Mix of boulder, cobble, gravel, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/26/11	11250	EPT	---	14	---	4.59	Fair
08/08/06	10010	EPT	---	25	---	4.40	Good-Fair
08/07/01	8566	EPT	---	22	---	4.57	Good-Fair
07/23/96	7093	EPT	---	29	---	4.30	Good

Data Analysis

Little Fisher River flows from Virginia into North Carolina and through north-central Surry County before discharging into the Fisher River. The surrounding watershed is mostly agricultural and residential. In 2011, this location rated Fair, declining from the Good-Fair bioclassifications received in 2006 and 2001 which were down from the 1996 Good bioclassification. Active fields (corn and pasture) were present on both sides of the stream and the high steep banks along this reach are eroding at bends in the stream contributing to the silt deposits. This area received over an inch of rain less than 24 hours prior to sampling which may have contributed to the lower taxa richness recorded for 2011 due to scour effects. If assets allow, a follow-up sample should be completed in 2014 to verify the 2011 sample.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
ARARAT R	NC 104	QB114	07/27/11	Good

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	3	03040101	36.553611	-80.568889

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	18.6	15	0.2

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

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

Water Quality Parameters

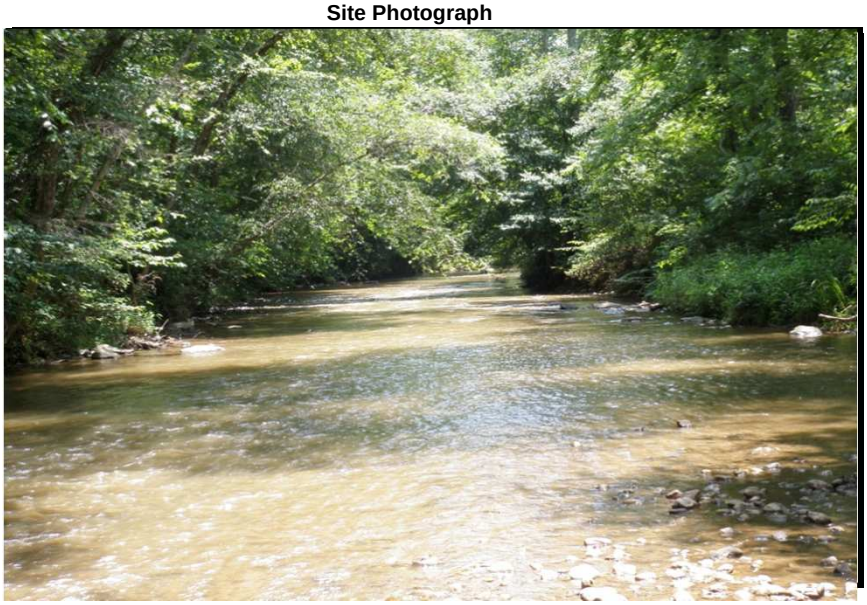
Temperature (℃)	24.9
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	52
pH (s.u.)	6.8

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	11
Pool Variety (10)	4
Riffle Habitat (16)	10
Bank Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	75

Site Photograph



Substrate: Mostly cobble, gravel and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/27/11	11253	EPT	---	30	---	3.76	Good
07/24/06	10025	EPT	---	29	---	3.20	Good
07/23/01	8507	EPT	---	25	---	3.78	Good-Fair
07/25/96	7123	EPT	---	26	---	4.00	Good-Fair

Data Analysis

This site is located about 4 miles NNE of Mount Airy, NC and approximately 1000 feet south of the Virginia border with almost the entire drainage area located in Virginia. Although there was a decline in the number of Plecoptera taxa from 6 taxa in 2006 to 2 taxa in 2011 and an increase in Trichoptera taxa from 7 in 2006 to 12 in 2011, total EPT richness only increased by one taxa, from 29 taxa in 2006 to 30 taxa in 2011. Despite the increase this site retained a Good bioclassification. New taxa records for this site in 2011 were *Nectopsyche exquisita* , *Rhyacophila fuscula* , *Ceratopsyche morosa* and *Hydropsyche venularis* .

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
ARARAT R	**SR 2019**	**QB118**	**07/28/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	3	03040101	36.404444	-80.561944

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	0.0	32	0.5

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Mount Airy WWTP	NC0021121	7.0

Water Quality Parameters

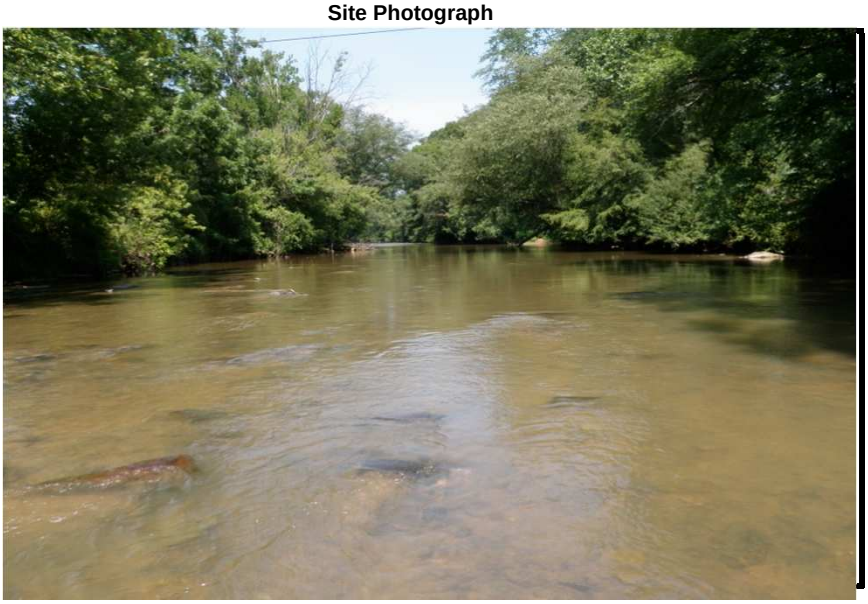
Temperature (℃)	27.7
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	86
pH (s.u.)	7.7

Water Clarity: turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	6
Riffle Habitat (16)	7
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	71

Site Photograph



Substrate: Mostly cobble, sand and gravel with some boulder and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/28/11	11255	Full Scale	87	31	4.77	3.90	Good
07/25/06	10031	Full Scale	95	41	4.71	3.89	Good
07/23/01	8506	Full Scale	77	28	5.45	4.31	Good-Fair
08/28/96	7181	Full Scale	69	20	5.82	4.74	Fair
07/12/90	5378	Full Scale	59	17	6.07	5.09	Fair
07/26/88	4661	Full Scale	62	16	6.29	5.63	Fair
09/24/86	3919	Full Scale	50	11	6.63	5.48	Fair
08/04/86	3894	Full Scale	65	21	6.13	4.80	Fair
08/15/84	3273	Full Scale	66	24	6.04	4.82	Fair

Data Analysis

Since sampling began at this location in 1984 the benthic community data have shown improvements in water quality. Accordingly, the resultant bioclassification has improved from Fair in 1984-1996 to Good-Fair in 2001 to Good in 2006 and 2011. From 1997 to 2006 a reduction in the amount of discharge from the Mount Airy WWTP occurred due to a loss of textile production in the area. In 2006, water quality continued to improve and received another Good bioclassification due to an increase in EPT richness and a decrease in the NCBI. In 2011, this site again received a Good rating. Although total and EPT diversity in 2011 was slightly lower than in the 2006 sample it is likely that lowered flows noted at the time of the 2011 sample resulted in slightly less habitat available for colonization and thus the lowered diversity.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
LOVILLS CR	**SR 1700**	**QB131**	**07/27/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	3	03040101	36.542500	-80.626389

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	26.8	11	0.4

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

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

Water Quality Parameters

Temperature (℃)	25.5
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	36
pH (s.u.)	0.0

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	10
Bank Erosion (7)	7
Bank Vegetation (7)	2
Light Penetration (10)	5
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	62

Site Photograph

Substrate Mostly sand, gravel and cobble.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/27/11	11252	EPT	---	26	---	3.95	Good-Fair
07/24/06	10027	EPT	---	23	---	4.10	Good-Fair
07/24/01	8508	EPT	---	26	---	4.00	Good-Fair
07/25/96	7122	EPT	---	22	---	4.84	Good-Fair

Data Analysis

This site has continually rated Good-Fair since it was first sampled in 1996. Despite flowing through a golf course and that there is no riparian downstream of the bridge, water quality conditions at this site are stable and no major changes in the benthic community have occurred since monitoring first initiated here in 1996.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
LOVILLS CR	**SR 1371**	**QB130**	**07/27/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	3	03040101	36.488611	-80.616944

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	35.0	12	0.3

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	20	70	0	0	10

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

Water Quality Parameters

Temperature (℃)	24.4
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	66
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	6
Riffle Habitat (16)	5
Bank Erosion (7)	6
Bank Vegetation (7)	2
Light Penetration (10)	2
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	53

Site Photograph

Substrate: Mix of cobble, gravel, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/27/11	11251	Full Scale	71	27	5.73	5.13	Good-Fair
07/24/06	10026	Full Scale	73	19	5.42	4.68	Fair
07/24/01	8509	Full Scale	67	14	6.36	4.82	Fair
07/25/96	7121	Full Scale	63	16	6.43	4.79	Fair
02/19/86	3710	Full Scale	39	12	5.28	3.67	Fair

Data Analysis

This site flows through downtown Mount Airy and has several commercial and industrial facilities including a concrete plant upstream. Cement groins are present to slow water flow and the stream banks are armored to prevent bank erosion. In addition to urban runoff, this site has many habitat issues and has rated Fair since it was first sampled in 1986. Despite these issues and no improvement in habitat from 2006, EPT taxa richness increased from 19 in 2006 to 27 in 2011 resulting in a Good-Fair rating. Taxa collected for the first time at this location include *Procloeon* spp., *Leucrocuta* spp., *Ceraclean enodis* and *Polycentropus* spp.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
STEWARTS CR	SR 2258	QB136	07/28/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
Surry	3	03040101	36.462222	-80.625278

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	0.0	20	0.3

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	60	30	0	0	

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

Water Quality Parameters

Temperature (℃)	24.6
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	72
pH (s.u.)	6.6

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	6
Riffle Habitat (16)	7
Bank Erosion (7)	7
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	65

Site Photograph

Substrate: Mix of gravel, cobble, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
07/28/11	11254	Full Scale	88	32	5.06	4.21	Good-Fair
07/25/06	10028	Full Scale	110	37	5.02	4.03	Good
07/24/01	8511	Full Scale	78	34	5.14	4.17	Good
07/25/96	7120	Full Scale	81	27	5.51	4.49	Good-Fair

Data Analysis

This site is approximately 3 miles SSW of downtown Mount Airy and 2.3 stream miles from the confluence with Ararat River. Although the 2011 sample declined to Good-Fair from two previous Good ratings, the invertebrate community is generally pollution intolerant. The decline in rating was mostly due to an absence of rare EPT taxa collected in 2006 which include Plauditus cestus, Procloen spp., Serratella serrata, Serratella seratoides, Malirekus hastatus and Nyctiophylas spp. It is possible that lowered flows noted at the time of sampling resulted in slightly less habitat available for colonization and thus the lowered rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
FORBUSH CR	**SR 1570**	**QB73**	**08/24/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
YADKIN	2	03040101	36.123611	-80.509444

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	26.9	6	0.3

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

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

Water Quality Parameters

Temperature (℃)	21.7
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	80
pH (s.u.)	6.6

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	4
Riffle Habitat (16)	4
Bank Erosion (7)	2
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	58

Site Photograph

Substrate: Predominantly sand with areas of boulder and rubble.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/24/11	11284	EPT	16	16	4.95	4.95	Fair
08/10/06	10017	EPT	22	22	4.52	4.52	Good-Fair
08/08/01	8573	EPT	22	22	4.21	4.21	Good-Fair
07/24/96	7099	EPT	23	23	4.05	4.05	Good-Fair

Data Analysis

Since first sampled in 1996, this site has shown a steady decline in Biotic Index values. While taxa richness was fairly even through 2006, the absence of stoneflies in 2011 dropped the bioclass to Fair. These data suggest that water quality conditions in this catchment are gradually declining.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
LOGAN CR	**SR 1571**	**QB85**	**08/25/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
YADKIN	2	03040101	36.123889	-80.504167

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	26.3	10	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)

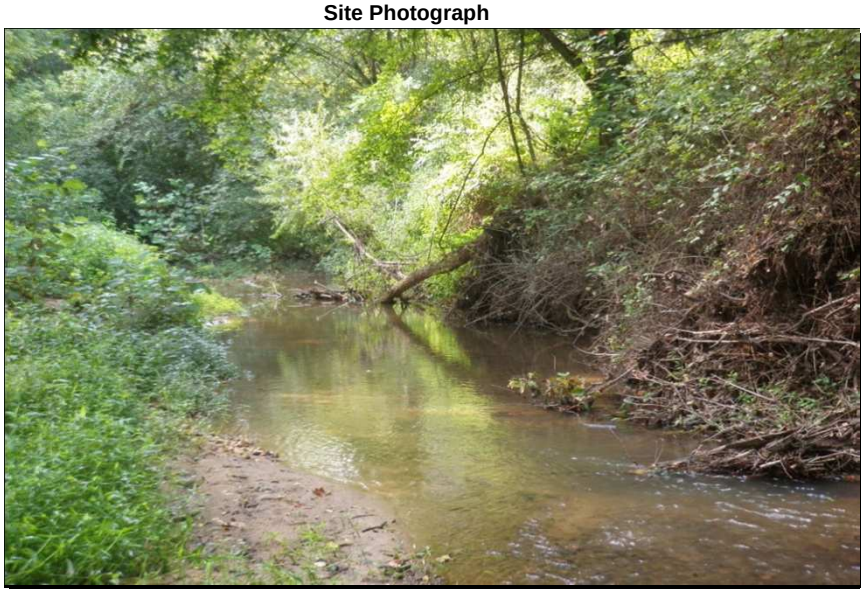
Water Quality Parameters

Temperature (℃)	21.6
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	92
pH (s.u.)	7.0
Water Clarity	clear

Habitat Assessment Scores (max)

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

Site Photograph



Substrate Mostly gravel with a little rubble and sand.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/25/11	11285	EPT	18	18	5.17	5.17	Fair
08/11/06	10018	EPT	21	21	4.72	4.72	Good-Fair
08/07/06	10041	EPT	18	18	4.46	4.46	Fair
08/09/01	8576	EPT	31	31	4.60	4.60	Good
07/24/96	7098	EPT	27	27	4.84	4.84	Good-Fair

Data Analysis

Logan Creek was first sampled in 1996 and demonstrated some improvement in a subsequent sample in 2001, pushing the bioclass to Good. The long-lived stonefly *Acroneuria abnormis* went from common to abundant in this time period. However, a steep decline in EPT in 2006 dropped the bioclass to Fair although a subsequent sample later in 2006 produced a Good-Fair rating. In 2011, the decline first documented with the earlier 2006 sample continued and the rating again dropped to Fair. If assets are available, this site should be monitored in 2014 to confirm the 2011 Fair rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
N DEEP CR	**SR 1510**	**QB93**	**08/22/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
YADKIN	2	03040101	36.125833	-80.592222

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	42.0	9	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Yadkinville WWTP	NC0020338	1.0

Water Quality Parameters

Temperature (℃)	24.4
Dissolved Oxygen (mg/L)	6.3
Specific Conductance (µS/cm)	105
pH (s.u.)	7.6

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: A mix of boulder, rubble, sand and silt. Exposed bedrock upstream.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/22/11	11267	Full Scale	51	23	5.17	4.53	Good-Fair
08/11/06	10015	Full Scale	75	26	5.09	4.48	Good-Fair
08/09/01	8575	Full Scale	76	26	5.27	4.52	Good-Fair
07/25/96	7100	Full Scale	57	24	5.31	4.76	Good-Fair
04/12/93	6155	Full Scale	53	25	4.84	4.48	Good-Fair

Data Analysis

EPT taxa richness has remained steady at this location since it was first sampled in 1993. As a result, BI and EPT BI have varied only slightly and it has received the smae GOod-Fair rating on every assessment since 1993. Total taxa richness declined from 2006 to 2011 mainly due to a loss in Diptera. Only 6 dipteran taxa were found in the latest sampling effort, compared to 29 in 2006.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
S DEEP CR	SR 1733	QB98	08/22/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
YADKIN	2	03040101	36.106667	-80.587500

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	63.5	10	0.3

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	24.6
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	79
pH (s.u.)	6.8

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	3
Bank Erosion (7)	2
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	61

Site Photograph

Substrate: All sand with minimal amounts of gravel and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/22/11	11268	Full Scale	54	20	4.68	4.45	Good-Fair
08/10/06	10016	Full Scale	74	24	4.80	3.91	Good-Fair
08/09/01	8574	Full Scale	65	19	5.12	4.34	Good-Fair
07/26/96	7101	Full Scale	56	26	4.80	4.26	Good-Fair

Data Analysis

The instream habitat is compromised here by a lack of riffles and an almost pure sand substrate. In addition there was mud and silt along the margins. Sediment in the stream is due in part by the steep eroding banks. Total taxa richness declined in 2011 largely due to a loss of diptera. Only nine Chironomid midges were found in 2011 compared to 23 in 2006. Six EPT taxa that were rare in 2006 were not found in 2011. Even with the losses, the BI actually improved slightly and this site retains a Good-Fair rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
MUDDY CR	**SR 2995**	**QB155**	**08/24/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Forsyth	4	03040101	36.000278	-80.340278

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	224.2	15	0.4

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

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

Water Quality Parameters

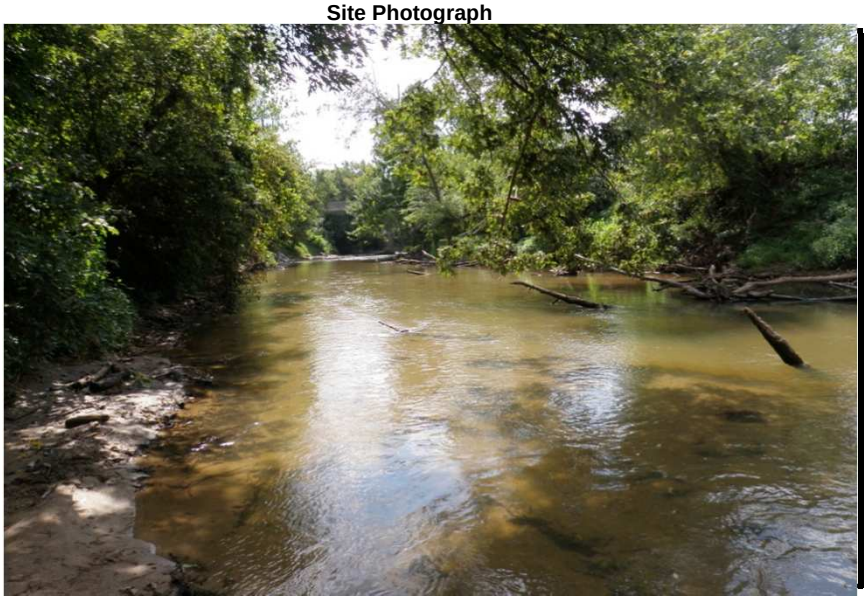
Temperature (℃)	23.4
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	383
pH (s.u.)	7.1

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	5
Bank Erosion (7)	3
Bank Vegetation (7)	4
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	52

Site Photograph



Substrate Mostly sand with some gravel and cobble.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/24/11	11278	Full Scale	55	19	6.17	5.40	Good-Fair
09/28/06	10071	Full Scale	58	12	6.21	5.27	Fair
08/07/01	8462	Full Scale	50	14	6.40	5.64	Fair
08/06/96	7125	Full Scale	51	18	6.35	5.38	Good-Fair
07/31/85	3572	Full Scale	53	17	6.51	5.02	Fair

Data Analysis

This site is the most downstream site on Muddy Creek and is located below the confluence with Salem Creek. Muddy Creek receives urban runoff from southwestern Winston-Salem and effluent from the W-S Archie-Elledge WWTP which discharges into Salem Creek. In 2006, this site missed a Good-Fair rating by one abundance value which was most likely due to drought conditions and the concentration of effluent from the W-S Archie-Elledge WWTP. Measured specific conductance values have declined since 2001. In 2001, the specific conductance was 663 mS/cm. It decreased to 420 mS/cm in 2006 and again to 383 mS/cm in 2011. EPT taxa richness increased from 12 taxa collected in 2006 to 19 taxa in 2011, the most ever recorded for this site. In addition, the NCBI decreased from 6.21 in 2006 to 6.17 in 2011. With declining specific conductance values and an overall trend of increasing EPT richness and decreasing Biotic Index values, water quality in Muddy Creek seems to be improving. Taxa collected for the first time include Acentrella turbida, Paracloeodes fleeki, Paracloeodes minutus, Procloen spp., Chimarra spp. and Basiaeschna janata.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
SALEM CR	SR 2902	QB166	08/24/11	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
Forsyth	4	03040101	36.055000	-80.285556

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	59.4	12	0.2

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

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

Water Quality Parameters

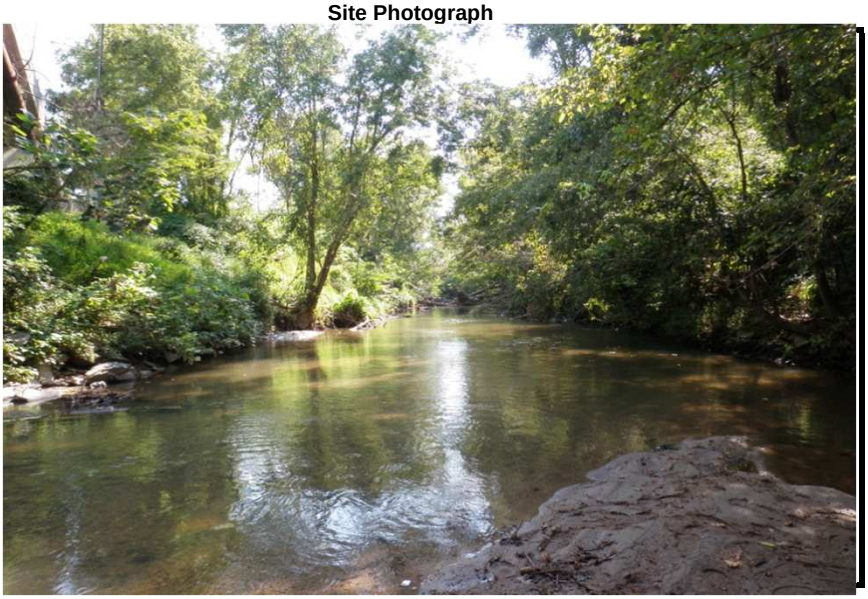
Temperature (℃)	25.7
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	168
pH (s.u.)	6.7

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	3
Bank Erosion (7)	3
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	51

Site Photograph



Substrate: Mostly sand with a small amount of gravel and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/24/11	11280	Full Scale	52	15	6.80	6.03	Fair
08/08/06	10042	Full Scale	58	16	6.71	6.02	Fair
08/06/01	8501	Full Scale	45	9	6.91	6.36	Fair
08/05/96	7104	Full Scale	53	11	7.26	6.37	Fair
09/27/82	2870	Full Scale	31	4	7.95	7.05	Poor

Data Analysis

Salem Creek is a tributary to Muddy Creek and drains much of Winston-Salem. The benthic community is comprised primarily of pollution tolerant taxa typically found in urban streams. These taxa include the mayflies *Baetis intercalaris* , *Baetis flavistriga* , *Maccaffertium modestum and the caddisflies Cheumatopsyche* spp. and *Hydropsyche betteni* . This stream has maintained a Fair bioclassification every year except 1982 when it was rated Poor.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Deirdre Black

Waterbody	Location	Station ID	Date	Bioclassification
S FK MUDDY CR	**SR 2902**	**QB163**	**08/24/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Forsyth	4	03040101	36.006389	-80.302778

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	42.3	7	0.3

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

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

Water Quality Parameters

Temperature (℃)	20.6
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	122
pH (s.u.)	7.0

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	12
Bottom Substrate (15)	5
Pool Variety (10)	8
Riffle Habitat (16)	3
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	58

Site Photograph

Substrate: Mostly sand with some gravel and rip rap.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/24/11	11279	EPT	---	16	---	5.26	Good-Fair
08/08/06	10043	Full Scale	61	17	5.94	5.02	Good-Fair
08/06/01	8545	EPT	---	17	---	5.24	Good-Fair
08/05/96	7124	EPT	---	14	---	4.95	Good-Fair

Data Analysis

South Fork Muddy Creek drains the southeastern portion of Winston-Salem and is a major tributary to Muddy Creek. This site has continually rated Good-Fair since it was first sampled in 1996. Water quality conditions at this site are stable and no major changes in the benthic community have occured during the monitoring period.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
DUTCHMANS CR	US 158	QB191	08/23/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
DAVIE	5	03040101	35.946667	-80.535833

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	57.6	8	0.1

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

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

Water Quality Parameters

Temperature (℃)	21.9
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	120
pH (s.u.)	7.1

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	7
Bank Erosion (7)	0
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	67

Site Photograph

Substrate: Nearly all sand with small amounts of silt along the margins.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/23/11	11283	Full Scale	61	14	5.93	5.29	Good-Fair
08/10/06	10019	Full Scale	77	19	5.84	5.32	Good-Fair
08/07/01	8568	Full Scale	72	20	5.21	6.15	Good-Fair
07/24/96	7096	Full Scale	69	24	5.84	4.66	Good

Data Analysis

Total taxa richness declined in 2011 due to lower numbers of Chironomidae. The twenty-five midge species found in 2006 dropped to just eleven in 2011, six of which were rare. Mayflies also declined, with three rare species collected in 2006 but which were all absent in 2011. Despite these decreases, odonates and beetles were well represented with ten species each. Severe bank erosion and a nearly pure sand substrate indicate a flashy stream which may scour out the benthic community during periods of high flow. Despite the decline in total taxa richness, and EPT richness, the bioclassification remained Good-Fair in 2011 which was the same rating obtained within the last three sampling events.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
YADKIN R	NC 268	04/29/10	QF1	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	1	03040101	36.014431	-81.5086203	12-(1)	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	42.3	1150	12	0.5	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
The Patterson School (~0.9 mile above site)	NC0043125	0.025

Water Quality Parameters

Temperature (℃)	23.5
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	67
pH (s.u.)	6.2
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	6
Riffle Habitat (16)	12
Pool Variety (10)	10
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	78

Site Photograph

Substrate Gravel, cobble, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/29/11	2011-56	19	48	Good
08/02/06	2006-106	22	48	Good
06/18/01	2001-60	20	48	Good
05/23/96	96-61	22	48	Good

Most Abundant Species, 2011 Bluehead Chub (n=105; 35%)

Exotic Species Central Stoneroller, Warpaint Shiner, Striped Jumprock, Rainbow Trout (n=15, 4, 1, and 1, respectively)

Species Change Since Last Cycle **Gained** -- First collection ever for Rainbow Trout (n=1). **Lost** -- Gizzard Shad (n=1), Satinfin Shiner (n=4), Whitefin Shiner (n=1), Fieryblack Shiner (n=2), Creek Chub (n=2).

Data Analysis

Watershed -- headwaters of the Yadkin River; drains northeast Caldwell County, including the communities of Patterson and Legerwood and the US 321 corridor; two additional dischargers (NC0006254 and NC0041181, Total Q_w=0.458 MGD) located approximately 5.5 miles upstream. **Habitat** -- same habitats as in 2006 with deep side snags and runs; gravel riffles; tree nurseries beyond both riparian zones; cars used for historic bank stabilization; total habitat score gradually improving from 59 in 2001 to 78 in 2011. **Water Quality** -- specific conductance range 44-67 µS/cm with last three measurements between 60 and 67 µS/cm. **2011** -- slight increase in the number of fish collected and the collection of a wild Rainbow Trout were offset by the slight change in percentage of insectivores and species with multiple age classes, no change in NCIBI score or rating. **1996-2011** -- 27 species known from the site including 4 exotics, 5 intolerants, 3 darters, and 5 sucker species; dominant species are Bluehead Chub (2001-2011) and Redlip Shiner (1996); no change in NCIBI scores or ratings in 15 years. **Recommendation** -- continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
KINGS CR	SR 1552	04/29/10	QF34	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	1	03040101	36.04305556	-81.41472222	12-23	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	27.6	1130	10	0.4	No

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

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

Water Quality Parameters

Temperature (℃)	20.2
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	56
pH (s.u.)	5.9

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	4
Riffle Habitat (16)	5
Pool Variety (10)	6
Erosion (7)	2
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	53

Site Photograph

Substrate Sand, gravel, boulders at end of reach

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/29/11	2011-55	17	52	Good
06/23/06	2006-95	21	54	Excellent

Most Abundant Species, 2011 Bluehead Chub (n=177, 36%)

Exotic Species Striped Jumprock, Warpaint Shiner, and Central Stoneroller (n=21, 7, and 3, respectively)

Species Change Since Last Cycle **Gained** -- None. **Lost** -- Spottail Shiner (n=1), Flat Bullhead (n=1), Brown Trout (n=1), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains northeast Caldwell County; one small discharger (NC0041190; Q_w=0.006) located in the headwaters; no municipalities in the watershed; borders the Eastern Blue Ridge Foothills; tributary to the Yadkin River. **Habitat** -- gravel riffles, snags, rip/rap along the left bank at the lower end of the reach; runs and chutes; eroded left and right banks; row crops planted beyond riparian zones; total habitat scores 53 and 65. **Water Quality** -- specific conductance generally low for a Piedmont stream, 56 and 58 µS/cm. **2011** -- slight decline in NCIBI score and rating due to absence of bass and other piscivores, but not a significant change in water quality. **2006 & 2011** -- 21 species known from the site including 4 exotics, 2 intolerants, 3 darters, and 3 sucker species; dominant species is the Bluehead Chub (41 and 36%) **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LAUREL CR	**SR 1508**	**04/29/10**	**QF35**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	03040101	36.16166667	-81.50333333	12-24-(1)	Southern Crystaline Ridges & Mtns.

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,ORW	7.8	1430	11	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	95	5	0	0

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

Water Quality Parameters

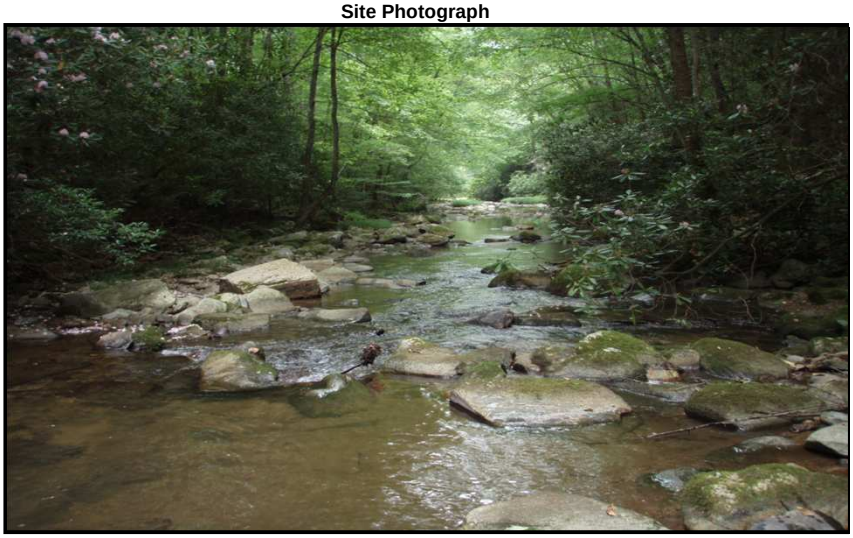
Temperature (℃)	21.6
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	29
pH (s.u.)	5.8

Water Clarity: Clear, became very turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	92

Site Photograph



Substrate: Cobble, gravel, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/14/11	2011-69	15	54	Excellent
08/03/06	2006-109	13	48	Good
05/05/99	99-31	13	52	Good
10/01/98	98-80	14	54	Excellent
05/23/96	96-62	14	54	Excellent

Most Abundant Species, 2011: Bluehead Chub and Warpaint Shiner (n=50 (20%) and 47 (19%)), respectively)

Exotic Species: Warpaint Shiner, Central Stoneroller, Rock Bass, Smallmouth Bass, Striped Jumprock, and Brown Trout (n=47, 21, 10, 4, 4, and 4, respectively)

Species Change Since Last Cycle: **Gained --** First collection ever for Brook Trout (n=1); White Sucker (n=1), Striped Jumprock (n=4). **Lost --** Notchlip Redhorse (n=1).

Data Analysis

Watershed -- drains eastern-central Watauga County, including the Powderhorn Development; three small impoundments located upstream have no minimum flow requirements which may reduce flow in this stream during periods of drought; no NPDES dischargers in the watershed; tributary to Elk Creek. **Habitat** -- same high quality habitats as in previous cycles with deep pools; short cobble/boulder riffles, side snags and plunge pools; wide riparian zones vegetated with *Rhododendron* and Eastern Hemlock; silt covering the rocks and the stream become very turbid with disturbance; total habitat score range 87-92. **Water Quality** -- very low specific conductance, range 14-30 µS/cm. **2011** -- almost twice as many fish collected in 2011 than in 2006 (247 vs. 128), but still lower than expected and percentage of tolerant fish (13%) slightly greater than expected for a Mountain stream; Central Stoneroller abundance peaked in 1999 and has declined from 37% to 22% to 9%; Redlip Shiner abundance continued to be very low (6% in 2011, 4% in 2006, and 18% in 1999 vs. 35% and 45% in 1998 and 1996); as in the previous cycles, large specimens were collected of Smallmouth Bass, Rock Bass, and Brown Trout. **1996-2011** -- high species diversity for a small stream; 19 species known from the site including 7 exotics (37% of total fauna), 4 intolerants, 1 darter, and 4 sucker species; dominant species are variable, including Redlip Shiner (1996, 1998), Central Stoneroller (1999, 2006), Bluehead Chub (2011), and Warpaint Shiner (2011). **Recommendation** -- continued basinwide assessment of this fish community regional reference and ORW site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BEAVER CR	**SR 1131**	**04/29/10**	**QF36**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.07444444	-81.35277778	12-25	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	17.4	1075	7	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	30	5	65	0

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

Water Quality Parameters

Temperature (℃)	19.8
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	54
pH (s.u.)	6.6

Water Clarity: Turbid, very silty

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	2
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	55

Site Photograph

Substrate: Sand, gravel, bedrock shelves

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/29/11	2011-54	19	52	Good
06/22/06	2006-94	18	52	Good
06/18/01	2001-61	19	50	Good
05/21/96	96-56	14	50	Good

Most Abundant Species, 2011: Bluehead Chub (n=138, 32%)

Exotic Species: Central Stoneroller, Striped Jumprock, Warpaint Shiner, and Green Sunfish (n=24, 13, 1, and 1, respectively)

Species Change Since Last Cycle: **Gained** -- First collection ever for Warpaint Shiner, Golden Shiner, and Green Sunfish, one specimen each. **Lost** -- Satinfin Shiner (n=2), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains southwest Wilkes and a small section of northeast Caldwell counties; no NPDES dischargers or municipalities in the watershed; tributary to W. Scott Kerr Reservoir (Yadkin River). **Habitat** -- lower quality habitats; pools were primarily snags and undercut banks; gravel riffles and bedrock shelves; deadfalls; row crops planted beyond the riparian zone on the left bank which has severe bank erosion; poor riparian land management; stream is classified as C;Tr, but not a trout-quality stream; total habitat score range 49-55. **Water Quality** -- specific conductance surprisingly low for an agricultural region, range 42-57 µS/cm. **2011** -- abundance of Bluehead Chub continued to indicate nutrient enrichment; no change in any metric scores. **1996-2011** -- 23 species known from the site including 6 exotics, 1 intolerant, 2 darters, and 3 sucker species; dominant species are Redlip Shiner (1996) and Bluehead Chub (2001-2011); piscivores (Brown Trout and Largemouth Bass) rare at this site, only three specimens have been collected since 1996; no appreciable change in scores or ratings over 15 years. **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
STONY FK	**SR 1170**	**04/29/10**	**QF37**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.12805556	-81.39527778	12-26-(7)	Southern Crystaline Ridges & Mtns.

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	25.8	1150	11	0.4	No

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

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

Water Quality Parameters

Temperature (℃)	21.2
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	38
pH (s.u.)	6.2

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Riffle Habitat (16)	14
Pool Variety (10)	6
Erosion (7)	3
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	1
Total Habitat Score (100)	71

Site Photograph

Substrate Cobble, gravel, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/14/11	2011-68	15	52	Good
06/23/06	2006-96	18	54	Excellent

Most Abundant Species, 2011 Bluehead Chub (n=116, 30%)

Exotic Species Central Stoneroller, Striped Jumprock, and Smallmouth Bass (n=49, 25, and 4, respectively)

Species Change Since Last Cycle **Gained** -- Highback Chub (n=2). **Lost** -- Rosyside Dace (n=3), Flat Bullhead (n=2), Brown Trout (n=2), Rock Bass (n=3).

Data Analysis

Watershed -- drains northwest Wilkes and southeast Watauga counties; no NPDES dischargers or municipalities in the watershed; tributary to W. Kerr Scott Reservoir (Yadkin River). **Habitat** -- embedded substrate; silt atop the rocks; riffles, deep runs and chutes; cattle with access to the creek causing severe bank erosion; active pastures throughout the watershed with narrow riparian zones and open canopy; total habitat scores of 66 and 71. **Water Quality** -- specific conductance surprisingly low (37 and 38 µS/cm). **2011** -- abundance of Bluehead Chub continued to suggest nutrient enrichment; loss of Brown Trout lowered the NCIBI score and rating, but likely no appreciable change in water quality **2006 & 2011** -- 19 species known from the site including 5 exotics, 5 intolerants, 2 darters, and 3 sucker species; dominant species is the Bluehead Chub (37% and 30%). **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N PR LEWIS FK	**SR 1304**	**04/29/10**	**QF38**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.184163	-81.303892	12-31-1-(4)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	23.7	1190	11	0.4	Yes

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

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

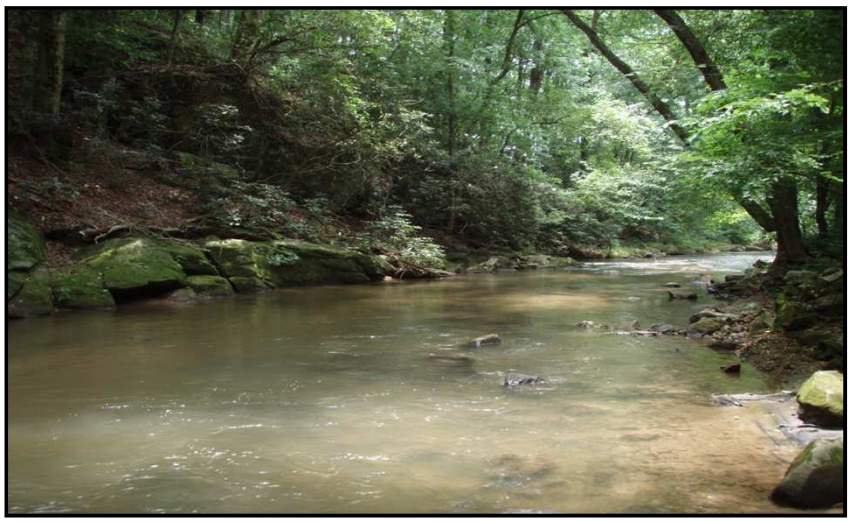
Water Quality Parameters

Temperature (℃)	21.1
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	26
pH (s.u.)	5.9
Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	8
Riffle Habitat	14
Pool Variety (10)	10
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	84

Site Photograph



Substrate Bedrock, sand, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/28/11	2011-53	15	52	Good
08/03/06	2006-110	15	56	Excellent
06/19/01	2001-64	17	56	Excellent
05/21/96	96-55	15	48	Good

Most Abundant Species, 2011 Bluehead Chub and Margined Madtom (n=107 (33%) and 102 (32%)), respectively)

Exotic Species Striped Jumprock and Central Stoneroller (n=7 and 4, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for V-lip Redhorse (n=2); Brassy Jumprock (n=2), Redbreast Sunfish (n=5), Bluegill (n=3). **Lost** -- White Sucker (n=8), Notchlip Redhorse (n=1), Brown Trout (n=1), Smallmouth Bass (n=3).

Data Analysis

Watershed -- drains northwest Wilkes County; no NPDES or municipalities in the watershed; tributary to W. Kerr Scott Reservoir (Yadkin River). **Habitat** -- same moderately high quality habitats as in 2006; total habitat score range 70-84. **Water Quality** -- lowest specific conductance of any fish site in the Yadkin 2011 and very low for a Piedmont stream, range 20-30 µS/cm. **2011** -- absence of the intolerant Smallmouth Bass and Brown Trout, both piscivores, led to the slight decline in NCIBI rating and score; although likely no appreciable change in water quality. **1996-2011** -- 20 species known from the site including 4 exotics, 3 intolerants, 3 darters, and 5 sucker species; dominant species are variable, including Margined Madtom (1996, 2011), Bluehead Chub (2001, 2011), and Redlip Shiner (2006); piscivores (e.g., Smallmouth Bass and Brown Trout) are rare at this site, perhaps because it is a popular fishing site with ease of access; watershed was petitioned for Tr and HQW reclassification (BAU Memorandum 20100720). **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S PR LEWIS FK	**SR 1154**	**04/29/10**	**QF39**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.154711	-81.329614	12-31-2-(6)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	32.3	1150	13	0.5	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 (℃)	20.0
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	30
pH (s.u.)	6.1

Water Clarity	Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	10
Riffle Habitat (16)	16
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph

Substrate Cobble, bedrock shelves, boulders

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/28/11	2011-52	18	52	Good
08/04/06	2006-111	22	54	Excellent
06/19/01	2001-63	17	48	Good
05/21/96	96-54	16	50	Good

Most Abundant Species, 2011 Bluehead Chub (n=161, 33%)

Exotic Species Striped Jumprock and Central Stoneroller (n=21 and 10, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for V-lip Redhorse (n=1). **Lost** -- Spottail Shiner (n=3), White Sucker (n=2), Snail Bullhead (n=2), Flat Bullhead (n=2), Smallmouth Bass (n=1).

Data Analysis

Watershed -- drains northwest Wilkes County, including the recently widened US 421 corridor; no NPDES dischargers or municipalities in the watershed; tributary to W. Scott Kerr Reservoir (Yadkin River). **Habitat** -- same moderately high quality habitats as in 2006 with *Podostemum* in the riffles; silt atop the rocks on the edge of the stream; swift and deep riffles and chutes; total habitat score range 71-92; scores have improved since 2001 upon completion of widening the US 421 corridor and concurrent reduction in sediment runoff. **Water Quality** -- very low for a Piedmont stream, range 22-35 µS/cm. **2011** -- 1 of 2 sites where just one species of sunfish (Redbreast Sunfish) was collected; absence of the intolerant and piscivorous Smallmouth Bass led to the very slight decline in NCIBI rating and score although no probable change in water quality. **1996-2011** -- number of fish collected since 2001 has decreased from 1,009 to 734 to 494; 23 species known from the site including 3 exotics, 5 intolerants, 3 darters, and 5 sucker species; dominant species are Bluehead Chub (1996-2011), Redlip Shiner (1996, 2006), and Margined Madtom (1996); since 2006 the trophic structure (percentages of insectivores and omnivores+herbivores) has shifted to a more balanced community, however, piscivores (e.g., Smallmouth Bass) are exceedingly rare at this site, of the 2,489 fish collected since 1996, only one specimen was a Smallmouth Bass. **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N FK REDDIES R	**SR 1567**	**04/29/10**	**QF41**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.28972222	-81.27527778	12-40-4	Southern Crystaline Ridges & Mtns.

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-II;Tr,HQW	12.7	1290	9	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	45	15	40	0

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

Water Quality Parameters

Temperature (℃)	16.6
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	31
pH (s.u.)	6.0

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	16
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	91

Site Photograph

Substrate Cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/30/11	2011-57	13	50	Good
08/04/06	2006-112	11	50	Good
06/19/01	2001-65	17	56	Excellent
05/05/99	99-33	14	58	Excellent

Most Abundant Species, 2011 Redlip Shiner and Bluehead Chub (n=159 (31%) and 147 (29%), respectively)

Exotic Species Central Stoneroller, Rainbow Trout, Rock Bass (n=16, 1, and 1, respectively)

Species Change Since Last Cycle **Gained** -- Highback Chub (n=3), Western Blacknose Dace (n=2), Rainbow Trout (n=1). **Lost** -- Smallmouth Bass (n=1).

Data Analysis

Watershed -- drains northwest and north-central Wilkes County; no NPDES or municipalities in the watershed; tributary to the Reddies River. **Habitat** -- same high quality habitats same as in 2006 with riffles, runs, root mats, undercut banks, and snags; swift bedrock and boulder chutes; total habitat score range 82-91. **Water Quality** -- low and stable specific conductance, range 28-33 µS/cm. **2011** -- collection of two additional species, but no change in NCIBI score or rating. **1999-2011** -- 18 species known from the site including 6 exotics, 6 intolerants, 2 darters, and 2 sucker species; dominant species are Redlip Shiner (1999-2011) and Bluehead Chub (2001-2011); the intolerant Piedmont Darter has not been collected since 1999; trophic metrics have been stable since 2001 (percent insectivores 33-35% and percent omnivores +herbivores 62-67%). **Recommendation** -- continued basinwide assessment of this fish community regional reference and HQW site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
M PR ROARING R	**SR 1002**	**04/29/10**	**QF44**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	1	03040101	36.29333333	-81.095	12-46-2-(6)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	57.3	1070	14	0.5	Yes

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

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

Water Quality Parameters

Temperature (℃)	19.1
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	32
pH (s.u.)	6.4

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Riffle Habitat (16)	14
Pool Variety (10)	8
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	87

Site Photograph

Substrate Cobble, boulder, gravel, sand, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/30/11	2011-58	20	56	Excellent
08/04/06	2006-113	19	58	Excellent
06/20/01	2001-66	20	56	Excellent
05/22/96	96-60	15	50	Good

Most Abundant Species, 2011 Bluehead Chub (n=93, 34%)

Exotic Species Striped Jumprock, Rock Bass, Smallmouth Bass, and Green Sunfish (n=4, 3, 2, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Green Sunfish (n=1); Creek Chub (n=1), V-lip Redhorse (n=1), Brassy Jumprock (n=2). **Lost** -- Flat Bullhead (n=1), Satinfin Shiner (n=5), Fieryblack Shiner (n=4).

Data Analysis

Watershed -- drains northeast Wilkes County; no NPDES dischargers or municipalities in the watershed; tributary to the Roaring River. **Habitat** -- same high quality habitats as in 2006 with riffles, fast and deep boulder chutes, coarse woody debris and an open canopy at confluence with the W Pr Roaring River; total habitat score range 71-87. **Water Quality** -- low and stable specific conductance, range 21-37 µS/cm. **2011** -- most intolerant species (n=5) and lowest percentage of tolerant fish (1%) collected at any fish community site in 2011; slight decrease in the number of fish collected (277 vs. 340) between 2011 and 2006, but no significant change in the NCIBI score or rating. **1996-2011 --** 24 species known from the site including 4 exotics, 6 intolerants, 3 darters, and 5 sucker species; dominant species are Redlip Shiner (1996, 2006) and Bluehead Chub 2011, 2011). **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016; qualifies for HQW if so petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MITCHELL R	**SR 1330**	**04/29/10**	**QF51**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.43527778	-80.872674	12-62-8	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B;Tr,ORW	29.1	1230	15	0.5	Yes

	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 (℃)	22.7
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	31
pH (s.u.)	6.0
Water Clarity	Clear, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	81

Site Photograph

Substrate Cobble, boulder, gravel, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/12/11	2011-64	18	56	Excellent
06/21/06	2006-89	18	60	Excellent
05/26/99	99-38	15	52	Good
05/16/96	96-51	15	46	Good-Fair

Most Abundant Species, 2011 Bluehead Chub (n=82, 27%)

Exotic Species Rock Bass (n=2) and Goldfish (n=1)

Species Change Since Last Cycle

Gained -- First collection ever for Goldfish (n=1) and Sandbar Shiner (n=5); Pumpkinseed (n=1). **Lost** -- Brown Trout (n=5), Smallmouth Bass (n=2), Largemouth Bass (n=2).

Data Analysis

Watershed -- drains northwest Surry and southeast Alleghany counties; one small discharger located in the headwaters (NC NC0038997, Q_w=0.013 MGD); no municipalities in the watershed; tributary to the Yadkin River. **Habitat** -- same moderate quality as in 2006 with silty pools at the beginning and end of the reach and boulder riffles with *Podostemum* in between; narrow riparian zone on the left; corn being grown in the watershed; total habitat score range 74-87. **Water Quality** -- low and stable specific conductance for a Piedmont stream, range 24-31 µS/cm. **2011** -- slight decrease in the abundance of piscivores and lower than expected percentage of species with multiple age classes, seven species, primarily the sunfish and suckers, were represented by only 1 or 2 fish/species; these slight changes decreased the NCIBI score, but not the rating. **1996-2011** -- 22 species known from the site, including 5 intolerants, 5 exotics, 3 darters, and 2 sucker species; dominant species are Redlip Shiner (1996-2006) and Bluehead Chub (2011). **Recommendation** -- continued basinwide assessment of this fish community regional reference and ORW site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK MITCHELL R	**SR 1301**	**04/29/10**	**QF49**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.33666667	-80.83472222	12-62-13	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	24.2	1050	13	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	55	10	35	0

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

Water Quality Parameters

Temperature (℃)	22.3
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	40
pH (s.u.)	6.1

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Riffle Habitat (16)	5
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	58

Site Photograph

Substrate Bedrock shelves, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/12/11	2011-63	18	58	Excellent
06/21/06	2006-90	19	60	Excellent

Most Abundant Species, 2011 Bluehead Chub (n=52, 21%)

Exotic Species Striped Jumprock (n=5) and Smallmouth Bass (n=4)

Species Change Since Last Cycle

Gained -- Spottail Shiner (n=1), Sandbar Shiner (n=4), Flat Bullhead (n=2), Warmouth(n=1). **Lost** -- Satinfin Shiner (n=1), Striped Jumprock (n=1), Green Sunfish (n=1), Bluegill (n=3), Largemouth Bass (n=1), Piedmont darter (n=2).

Data Analysis

Watershed -- drains northwest and north central Surry County; one small discharger located approximately 3.9 miles upstream (NC0041866, Q_w=0.0035); tributary to the Mitchell River. **Habitat** -- lower quality habitats of silty and sandy runs; slick bedrock riffle shelves with *Podostemum*; side undercuts and snags. **Water Quality** -- specific conductance stable, 37 and 40 µS/cm. **2011** -- except for the loss of one species of darter, the metric scores and NCIBI rating were the same in 2011 as in 2006; all three trophic metrics were essentially the same between 2011 and 2006 (insectivores 73% vs. 71%; omnivores+herbivores 26% vs. 27%, and piscivores 1.59% vs. 1.98%). 2**006 & 2011** -- 24 species known from the site including 4 exotics, 4 intolerants, 3 darters, and 4 sucker species; dominant species are Rosyside Dace (2006) and Bluehead Chub (2011). **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016; qualifies for HQW if so petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SNOW CR	**SR 1121**	**04/29/10**	**QF50**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.30138889	-80.76805556	12-62-15	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	17.2	910	11	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	75	15	10	0

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

Water Quality Parameters

Temperature (℃)	23.1
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	65
pH (s.u.)	6.4

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	4
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	69

Site Photograph

Substrate Sand, bedrock, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/13/11	2011-66	16	56	Excellent
06/07/06	2006-81	19	56	Excellent

Most Abundant Species, 2011 Bluehead Chub (n=146, 36%)

Exotic Species Central Stoneroller (n=5)

Species Change Since Last Cycle

Gained -- Central Stoneroller (n=5), Sandbar Shiner (n=5). **Lost** -- Golden Shiner (n=9), Notchlip Redhorse (n=2). Striped Jumprock (n=2), Flat Bullhead (n=1), Smallmouth Bass (n=1).

Data Analysis

Watershed -- drains southwestern Surry County, including the I-77 corridor; no NPDES dischargers or municipalities in the watershed; tributary to the Mitchell River. **Habitat** -- boulder and bedrock shelves; deadfalls; old mill dam site (Joel Lane Mill); evidence of recent high water; and although normal flow stream was turbid during the sample; rocks very silty; total habitat scores of 69 and 79. **Water Quality** -- normal specific conductance for a Piedmont stream, 57 and 65 µS/cm. **2011** -- almost one-half as many fish collected in 2011 as in 2006 (411 vs. 722), but the overall components of the community did not change drastically; the abundance of the omnivorous Bluehead Chub did indicate a moderate level of nutrient enrichment. **2006 & 2011** -- 21 species known from the site including 3 exotics, 3 intolerants, 3 darters, and 4 sucker species; dominant species is the Bluehead Chub (41% and 36%); no change in the NCIBI scores or rating. **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016; qualifies for HQW if so petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FISHER R	**SR 1331**	**04/29/10**	**QF52**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.45611111	-80.81666667	12-63-(7)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-II,Tr,HQW	36.9	1150	18	0.5	Yes

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

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

Water Quality Parameters

Temperature (℃)	21.0
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	36
pH (s.u.)	6.2

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Riffle Habitat (16)	3
Pool Variety (10)	8
Erosion (7)	3
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	65

Site Photograph

Substrate Cobble, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/11	2011-51	21	60	Excellent
06/21/06	2006-88	23	56	Excellent
06/20/01	2001-68	18	60	Excellent

Most Abundant Species, 2011 Redlip Shiner (n=90, 29%)

Exotic Species Central Stoneroller, Striped Jumprock, Smallmouth Bass, Mountain Redbelly Dace (n=8, 4, 3, and 1, respectively)

Species Change Since Last Cycle **Gained** -- First collection ever for Central Stoneroller (n=8) and Striped Jumprock (n=4). **Lost** -- Flat Bulhead (n=1), Rock Bass (n=1), Pumpkinseed (n=2), Spotted Bass (n=1).

Data Analysis

Watershed -- drains northwestern Surry County and a small portion of Grayson County, VA; no NPDES dischargers or municipalities in the watershed; tributary to the Yadkin River; site is within the section managed by the NCWRC as Hatchery Supported Trout Waters. **Habitat** -- overall decline in instream habitats; all rocks covered with silt; new deadfalls, blowouts and bank sloughing along the left bank; mid-channel pool at the end of the reach; primarily runs with no well-defined riffles; riparian zones surrounded by row crops (corn and cabbage) and fields (fallow and with hay); total habitat score range 65-83. **Water Quality** -- specific conductance low and stable for a Piedmont stream, range 36-39 µS/cm. **2011** -- a "perfect" NCIBI score, the highest NCIBI score of any fish community site; a 440 mm TL Smallmouth Bass was collected along with one stocked Rainbow Trout and one stocked Brown Trout (235 and 188 mm TL, respectively). **2001-2011** -- 27 species known from the site including 5 exotics, 6 intolerants, and 4 sucker species; dominant species are Bluehead Chub (2001) and Redlip Shiner (2006, 2011); two intolerant species, Fieryblack Shiner and Thicklip Chub, have not been collected since 2001 although site has consistently rated Excellent since 2011. **Recommendation** -- continued basinwide assessment of this fish community regional reference HQW site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE FISHER R	**SR 1480**	**04/29/10**	**QF53**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.4622274	-80.7424605	12-63-10-(2)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	21.3	1090	9	0.4	No

	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 (℃)	20.3
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	50
pH (s.u.)	6.2

Water Clarity	Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Riffle Habitat (16)	10
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	70

Site Photograph

Substrate Cobble, gravel, some bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/11	2011-50	18	48	Good
06/20/06	2006-87	17	52	Good
06/20/01	2001-67	19	50	Good
05/16/96	96-50	15	46	Good-Fair

Most Abundant Species, 2011 Bluehead Chub (n=239, 44%)

Exotic Species Mountain Redbelly Dace, Striped Jumprock, and Central Stoneroller (n=6, 5, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Central Stoneroller, Spottail Shiner, and Bluegill (n=1, each); Satinfin Shiner (n=14), Brassy Jumprock (n=3). **Lost** -- Notchlip Redhorse (n=1), Rainbow Trout (n=1), Smallmouth Bass (n=1), Piedmont Darter (n=4).

Data Analysis

Watershed -- drains north-central Surry County and a small portion of Carroll County, VA, including the I-77 corridor; no municipalities in the watershed; two small dischargers located approximately 2.3 miles upstream (NC0044211 and NC0061808, Total Q_w=0.042 MGD); tributary to the Fisher River. **Habitat** -- steep banks in places (especially along the right bank); bar development and channel filled with sand; side undercuts with pools; row crops and fallow field in the riparian zones; total habitat score range 60-70. **Water Quality** -- specific conductance normal for a Piedmont stream, range 38-66 µS/cm. **2011** -- 25% fewer fish collected in 2011 than in 2006 (541 vs. 735), especially for Redlip Shiner and Carolina Fantail Darter; only one intolerant species collected in 2011 contrasted to four in 2006; more Redbreast Sunfish collected in 2011 than in all previous cycles (n=47 vs. 13 between 1996 and 2006), loss of the intolerant Piedmont Darter, Rainbow Trout, and Smallmouth Bass. **1996-2011** -- 25 species known from the site including 5 exotics, 6 intolerants, 3 darters, and 4 sucker species; intolerant fish are uncommon at this site; dominant species is the Bluehead Chub (36-46%); the continued abundance of the omnivorous Bluehead Chub did indicate, however, a moderate level of nutrient enrichment. **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CODY CR	US 268	04/29/10	QF54	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	2	03040101	36.33803	-80.69273	12-63-14	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	10.8	915	8	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	45	0	55	0

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

Water Quality Parameters

Temperature (℃)	23.0
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	67
pH (s.u.)	6.2
Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	12
Bottom Substrate (15)	3
Riffle Habitat (16)	7
Pool Variety (10)	6
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	62

Site Photograph

Substrate Sand, silt, clay, gravel, bedrock shelves

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/13/11	2011-65	20	54	Excellent
06/07/06	2006-80	19	56	Excellent
05/16/96	96-49	18	52	Good

Most Abundant Species, 2011 Bluehead Chub (n=99, 25%)

Exotic Species Central Stoneroller and Mountain Redbelly Dace (n=38 and 10, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Mountain Redbelly Dace (n=10) and Spottail Shiner (n=9); Brassy Jumprock (n=5). **Lost** -- Golden Shiner (n=3), Fathead Minnow (n=1).

Data Analysis

Watershed -- drains central Surry County, including the southern portion of the Town of Dobson; the town's WWTP (NC0021326, Q_w=0.35 MGD) is located approximately 4.8 miles upstream and a smaller discharger (NC0088617, Q_w=0.00252) is located approximately 1.9 miles upstream; tributary to the Fisher River. **Habitat** -- upper one-half of reach with riffles, bedrock shelves, and forested riparian zones; lower one-half of reach silty with narrow riparian bordered by corn, rocks very silty, total habitat score range 62-71. **Water Quality** -- even with the WWTP discharge, the specific conductance was typical for a Piedmont stream, range 38-67 µS/cm with last two measurements of 62 and 67 µS/cm. **2011** -- high diversity for a stream of its size, but 25% fewer fish collected in 2011 than in 2006 (392 vs. 518); large specimens of White Sucker were collected; no change in the NCIBI rating. **1996-2011** -- 24 species known from the site including 4 exotics, 2 intolerants, 3 darters, and 3 sucker species; dominant species is the Bluehead Chub (25-39%); the abundance of the omnivorous Bluehead Chub did indicate a moderate level of nutrient enrichment. **Recommendation** -- continued basinwide assessment of this site in 2016 to determine any impacts from the WWTP discharge.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ARARAT R	NC 104	04/29/10	QF56	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	3	03040101	36.55361111	-80.56888889	12-72-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;Tr	36.2	1090	13	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	25	10	65	0

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

Water Quality Parameters

Temperature (℃)	22.5
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	52
pH (s.u.)	7.0
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Riffle Habitat (16)	14
Pool Variety (10)	8
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	6
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Site Photograph

Substrate Cobble, bedrock shelves, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/11	2011-48	18	54	Excellent
06/20/06	2006-85	19	54	Excellent

Most Abundant Species, 2011 Bluehead Chub and Redlip Shiner (n=102 (22%) and 101 (22%), respectively)

Exotic Species Mountain Redbelly Dace (n=3) and Central Stoneroller (n=2)

Species Change Since Last Cycle **Gained** -- Central Stoneroller (n=2), Flat Bullhead (n=2), Bluegill (n=1). **Lost**-- Satinfin Shiner (n=1), Western Blacknose Dace (n=1), Notchlip Redhorse (n=1), Green Sunfish (n=6).

Data Analysis

Watershed -- most of the site's watershed is in southern Patrick County, VA with a small portion in northeast Surry County; no NPDES dischargers or municipalities are contained within the watershed; site is approximately 0.2 miles below the state line; tributary to the Yadkin River. **Habitat** -- good instream habitats with riffles, runs, snags, side pools, narrow riparian zones; total habitat scores of 73 and 78. **Water Quality** -- specific conductance typical for a Piedmont stream, 52 and 53 µS/cm; water clear, did not become silty like many Piedmont streams; stream classified as Tr waters. **2011** -- 50% fewer fish collected in 2011 than in 2006, but still abundant (462 vs. 899), declines especially noted for Redlip Shiner, Bluehead Chub, and Carolina Fantail Darter; no change in NCIBI score or rating. **2006 & 2011** -- 22 species known from the site including 3 exotics, 2 intolerants, 3 darters, and 3 sucker species; dominant species are Bluehead Chub (22-30%) and Redlip Shiner (22-29%). **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016; rated Excellent during past two cycles, qualifies for HQW if so petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
STEWARTS CR	**SR 1622**	**04/29/10**	**QF59**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	3	03040101	36.52722222	-80.71083333	12-72-9-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV;Tr	24.2	1110	10	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	20	10	70	0

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

Water Quality Parameters

Temperature (℃)	20.5
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	44
pH (s.u.)	6.1

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Riffle Habitat (16)	16
Pool Variety (10)	8
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)	94

Site Photograph

Substrate Cobble, boulder, bedrock shelves, gravel, some sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/11	2011-49	17	54	Excellent
06/20/06	2006-86	20	54	Excellent
06/21/01	2001-69	17	54	Excellent
05/17/96	96-52	19	54	Excellent

Most Abundant Species, 2011 Redlip Shiner (n=277, 41%)

Exotic Species Roanoke Hog Sucker (n=8) and Mountain Redbelly Dace (n=3)

Species Change Since Last Cycle **Gained** -- First collection ever for Roanoke Hog Sucker (n=8). **Lost** -- Central Stoneroller (n=4), Spottail Shiner (n=5), Sandbar Shiner (n=1), Flat Bullhead (n=2).

Data Analysis

Watershed -- drains north-central Surry County and southern Carroll County, VA; two small dischargers located on a tributary approximately 3.8 miles upstream at the state line (NC0029190 and NC0039420, Total Q_w=0.05 MGD); creek is impounded approximately 4.1 miles upstream by the Mountain View Watershed Dam; no municipalities in the watershed; tributary to the Ararat River. **Habitat** -- greatest total habitat score of any fish community site in 2011; same habitats as in 2006 with good quality riffles, runs, fast and deep chutes, and side pools; total habitat score range 83-94. **Water Quality** -- specific conductance low for a Piedmont stream, range 23-44 µS/cm. **2011** -- about 25% fewer fish collected in 2011 than in 2006 (670 vs. 906), but still abundant and diverse; still rated Excellent with no change in the NCIBI score. **1996-2011** -- 23 species known from the site including 4 exotics, 3 intolerants, 3 darters, and 4 sucker species; dominant species is the Redlip Shiner (38-47%); trophic metric consistently stable (percentage of insectivores 22-29% and percentage of omnivores+herbivores 71-78%); site has consistently rated Excellent for 15 years. **Recommendation** -- continued basinwide assessment of this fish community regional reference site in 2016; qualifies for HQW if so petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
TOMS CR	**SR 2024**	**04/29/10**	**QF57**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
SURRY	3	03040101	36.3860715	-80.5298551	12-72-14-(4)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	37.7	880	13	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	80	5	15	0

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

Water Quality Parameters

Temperature (℃)	20.6
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	67
pH (s.u.)	6.5

Water Clarity: Clear-very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	11
Riffle Habitat	10
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	86

Site Photograph

Substrate: Cobble, sand, silt, bedrock shelves

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/11	2011-47	22	56	Excellent
06/19/06	2006-83	22	58	Excellent
06/21/01	2001-70	23	56	Excellent

Most Abundant Species, 2011: Redlip Shiner (n = 312, 33%)

Exotic Species: Central Stoneroller (n=3), Mountain Redbelly Dace (n=2), Northern Hog Sucker (n=1), Green Sunfish (n=9)

Species Change Since Last Cycle: **Gained** -- First collection ever for Mountain Redbelly Dace (n=2). **Lost** -- Spotted Bass (n=1).

Data Analysis

Watershed -- drains eastern Surry County, including the Town of Pilot Mountain, and a small portion of western Stokes County; one NPDES permitted discharger located approximately 4.5 mi. upstream (NC0068365, WTP, Qw = unlimited); tributary to the Ararat River. **Habitats** -- no substantial changes since 2001 in the moderately high quality instream and riparian habitats; riffles, chutes, and pools; wide riparian zones; total habitat score range 73-86. **Water Quality** -- specific conductance typical for a rural Piedmont stream, stable, ranging between 61-67 µS/cm. **2011** -- total number of fish collected was greater than in 2006 (935 vs.834, respectively); Redlip Shiner and Bluehead Chub accounted for 55% of all the fish collected. **2001-2011** -- an abundant, trophically balanced and diverse fish community; 27 species are known from the site, including 5 exotics, 3 intolerants, 3 darters, and 4 sucker species; dominant species are Redlip Shiner (2001-2011) and Bluehead Chub (2001); total number of fish collected has been steadily increasing, but the catch per unit effort has been stable, ranging from 19.1-21.1 fish/100 seconds shocking time; community has consistently rated Excellent being sampled during the same week over the past 10 years. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE YADKIN R	**SR 1236**	**04/29/10**	**QF60**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
STOKES	2	03040101	36.31305556	-80.40055556	12-77	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	32.3	830	14	0.4	No

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

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

Water Quality Parameters

Temperature (℃)	20.6
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	74
pH (s.u.)	6.2

Water Clarity: Slightly turbid, very silty

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Riffle Habitat (16)	4
Pool Variety (10)	6
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	67

Site Photograph

Substrate: Cobble, sand, gravel, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/11	2011-46	20	52	Good
06/19/06	2006-82	17	54	Excellent
06/21/01	2001-71	22	54	Excellent
05/17/96	96-53	21	54	Excellent

Most Abundant Species, 2011: Bluehead Chub (n=422, 45%)

Exotic Species: Central Stoneroller and Spotted Bass (n=1, each)

Species Change Since Last Cycle

Gained -- First collection ever for Central Stoneroller (n=1), Spottail Shiner (n=2), and Spotted Bass (n=1); Flat Bullhead (n=4). **Lost** -- Mountain Redbelly Dace (n=1), Rosyside Dace (n=4).

Data Analysis

Watershed -- drains southwest Stokes County; no NPDES dischargers or municipalities in the watershed; tributary to the Yadkin River. **Habitat** -- wide and shallow pools with narrow gravel and cobble riffles and runs; total habitat scores range from 67-78. **Water Quality** -- specific conductance typical for a Piedmont stream, range 43-74 µS/cm. **2011** -- as in past two cycles, a very abundant fish community (n=935 vs. 1,058 and 1,002 in 2001 and 2006); a slight decline in the NCIBI score and rating due to the dominance of Bluehead Chub. **1996-2011** -- a very abundant and diverse community, 28 species known from the site including 5 exotics, 4 intolerants, 3 darters, and 3 sucker species; dominant species are Bluehead Chub (1996-2011; 30-45%) and Redlip Shiner (2006; 37%); consistent abundance of the omnivorous Bluehead Chub and the greater than expected percentage of omnivores+herbivores (30-46%) did suggest a moderate and persistent level of nutrient enrichment; two intolerant species, Thicklip Chub and Fieryblack Shiner, have not been collected since 2001. **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N DEEP CR	SR 1605	04/29/10	QF61	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
YADKIN	2	03040101	36.1360838	-80.6296071	12-84-1-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	35.8	795	9	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	50	25	10	15 (Utility kV line R-O-W)

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

Water Quality Parameters

Temperature (℃)	19.3
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	83
pH (s.u.)	5.9
Water Clarity	Turbid (orange)

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	1
Pool Variety (10)	8
Erosion (7)	1
Bank Vegetation (7)	4
Light Penetration (10)	5
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	42

Site Photograph

Substrate Sand, clay, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/16/11	2011-41	14	42	Good-Fair
06/07/06	2006-79	16	42	Good-Fair
06/21/01	2001-72	13	44	Good-Fair
05/15/96	96-46	13	44	Good-Fair

Most Abundant Species, 2011 Bluehead Chub (n=60, 30%)

Exotic Species No exotic species have ever been collected from this site

Species Change Since Last Cycle **Gained** -- First collection ever for Piedmont Darter (n=3). **Lost** -- Golden Shiner (n=1), Largemouth Bass (n=3), Black Crappie (n=5).

Data Analysis

Watershed -- drains north-central Yadkin County, including portions of the towns of Boonville and Yadkinville; no NPDES dischargers in the watershed; tributary to Deep Creek and ultimately the Yadkin River. **Habitat** -- low quality instream and riparian habitats and same as in previous cycles; blowouts and side snags; sticks in the current, but no true riffles; massive bank erosion prevalent along both banks; no canopy in upper one-third of the reach; total habitat score range 38-50. **Water Quality** -- specific conductance gradually increasing from 50 µS/cm in 1996 to 83 µS/cm in 2011. **2011** -- consistently lower than expected species diversity; percentage of tolerant fish greater than expected (41%, primarily Redbreast Sunfish and Satinfin Shiner). **1996-2011** -- 18 species known from the site including 3 intolerants, 2 darters, and 1 sucker species; dominant species is the Bluehead Chub, but its abundance has been steadily decreasing (51 to 48 to 37 to 30%) as has the percentage of omnivores+herbivores since 2001 (51% to 42% to 36%), the intolerant Fieryblack Shiner has not been collected since 2001 when 40 specimens were collected, the other two intolerant species, Highback Chub and Piedmont Darter (n=3, each) are rare at this site; no change in NCIBI rating over the past 15 years; Shore-Styers Mill/Shacktown Falls is approximately 3.7 miles downstream which may naturally reduce species diversity and be a barrier to recolonization efforts. **Recommendation** -- continued basinwide assessment of this fish community in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S DEEP CR	SR 1152	04/29/10	QF62	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
YADKIN	2	03040101	36.0973876	-80.6759318	12-84-2-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III	50.6	775	11	0.4	No

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

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

Water Quality Parameters

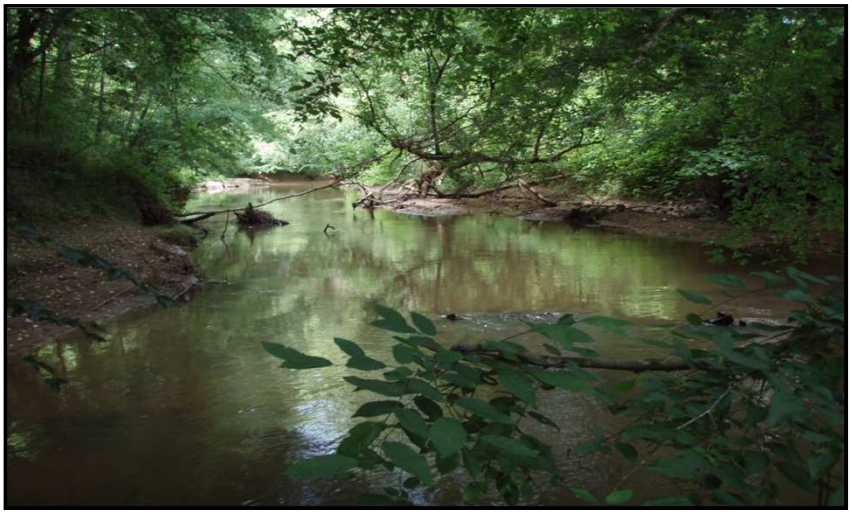
Temperature (℃)	19.3
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	74
pH (s.u.)	6.0

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	8
Erosion (7)	4
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	59

Site Photograph



Substrate: Sand, clay, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/16/11	2011-42	21	50	Good
06/06/06	2006-78	17	52	Good
06/22/01	2001-73	19	52	Good
05/15/96	96-47	17	48	Good

Most Abundant Species, 2011: Bluehead Chub (n=75, 27%)

Exotic Species: Green Sunfish (n=5) and Spotted Bass (n=1)

Species Change Since Last Cycle

Gained -- First collection ever for Sandbar Shiner (n=2) and Spotted Bass (n=1); Whitefin Shiner (n=6), White Sucker (n=5), Flat Bullhead (n=5), Green Sunfish (n=5), Margined Madtom (n=2). **Lost** -- Highback Chub (n=1), Eastern Mosquitofish (n=1), Largemouth Bass (n=1), Piedmont Darter (n=1).

Data Analysis

Watershed -- drains west-central Yadkin County, no municipalities in the watershed; one small NPDES discharger located in the headwaters (NC0070459, Q_w=0.026 MGD); tributary to Deep Creek and ultimately the Yadkin River. **Habitat** -- same habitats as in previous cycles with bluff and boulder outcrop on the left creating a deep chute; sticks in the current creating small riffles; sandy runs and side snags; total habitat score range 50-59. **Water Quality** -- specific conductance range 48-74 µS/cm with last three measurements ranging 64-74 µS/cm. **2011** -- greatest species diversity ever documented at this site; percentage of tolerant fish much greater than expected (36%) due to the abundance of Redbreast Sunfish and Satinfin Shiner. **1996-2011** -- 27 species known from the site including 3 exotics, 3 intolerants, 3 darters, and 3 sucker species; intolerant species (Fieryblack Shiner, Highback Chub, and Piedmont Darter) are uncommon at this site, only 12 of the 1,024 fish collected have been 1 of these 3 species; dominant species is the Bluehead Chub (27-38%); slight changes in the NCIBI scores, but rating has not changed over the past 15 years. **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SILAS CR	SR 1137	04/29/10	QF64	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FORSYTH	4	03040101	36.04555556	-80.35416667	12-94-10	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	11.9	690	9	0.3	No

	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 (℃)	20.0
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	158
pH (s.u.)	6.1

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	5
Erosion (7)	2
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	46

Site Photograph

Substrate: Sand, clay

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/11	2011-09	16	50	Good
06/05/06	2006-72	13	44	Good-Fair
04/24/02	2002-31	12	44	Good-Fair
04/30/01	2001-28	12	40	Fair

Most Abundant Species, 2011: Bluehead Chub and Redlip Shiner (n=34 (16%) and 31 (15%), respectively)

Exotic Species: Rosefin Shiner and Green Sunfish (n=10 and 3, respectively)

Species Change Since Last Cycle: **Gained** -- First collection ever for Eastern Mosquitofish (n=1), Largemouth Bass (n=1); Green Sunfish (n=3), Bluegill (n=8), sunfish hybrid (n=1). **Lost** -- Warmouth (n=1).

Data Analysis

Watershed -- drains west central Forsyth County, including the western portion of Winston-Salem and the US 421 and I-40 corridors; no NPDES dischargers in the watershed; tributary to Muddy Creek. **Habitat** -- same lower quality instream and riparian habitats as in previous cycles; badly eroded banks; periphyton atop the sand; sticks in the current; total habitat score range 40-46. **Water Quality** -- moderately elevated from urban and nonpoint source runoff, range 127-158 µS/cm. **2011** -- most species ever collected at this site; percentage of tolerant fish (30%), primarily Redbreast Sunfish, Satinfin Shiner, White Sucker, and Flat Bullhead, was slightly greater than expected; a more balanced trophic structure contributed to the increase in NCIBI score and rating. **2001-2011** -- 19 species known from the site including 3 exotics, 1 intolerant, 2 darters, and 1 sucker species; dominant species are Bluehead Chub (2001-2011) and Redlip Shiner (2011); only one intolerant species (Highback Chub) is known from this site and it has not been collected since 2002 when 2 specimens were collected. **Recommendation** -- continued basinwide assessment of this site in 2016 to determine if the improvement in the NCIBI rating persists.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK MUDDY CR	**SR 2902**	**04/29/10**	**QF66**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FORSYTH	4	03040101	36.00611111	-80.30194444	12-94-13	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	42.9	685	10	0.3	No

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

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

Water Quality Parameters

Temperature (℃)	19.2
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	90
pH (s.u.)	6.2

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	10
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	6
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	55

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/11	2011-08	18	44	Good-Fair
06/05/06	2006-71	19	52	Good
04/30/01	2001-31	13	42	Good-Fair

Most Abundant Species, 2011 Bluehead Chub (n=31, 22%)

Exotic Species Green Sunfish, Rosefin Shiner, and Spotted Bass (n=13, 1, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Spotted Bass (n=1); Redlip Shiner (n=4), Margined Madtom (n=9), Green Sunfish (n=13). **Lost** -- Gizzard Shad (n=1), Fieryblack Shiner (n=3), Eastern Silvery Minnow (n=3), White Sucker (n=1), Channel Catfish, n=1), Piedmont Darter (n=1).

Data Analysis

Watershed -- drains south-central Forsyth and northern Davidson counties, including a southern portion of the Winston-Salem metropolitan area; no NPDES dischargers in the watershed; tributary to Muddy Creek and ultimately the Yadkin River. **Habitat** -- same lower quality instream habitats as in previous cycles; shallow sandy runs with side snags; some instream coarse woody debris; rip/rap at the iron sewer pipe crossing the stream at the end of the reach creating riffle habitats; entrenched; site is just upstream from an old sand dipping operation. **Water Quality** -- specific conductance stable, only slightly elevated despite the characteristics of the watershed, range 90-101 µS/cm. **2011** -- slight declines in number of fish (141 vs. 150) and in the number of species of darters, suckers, and intolerant species all contributed to the substantial decrease in the NCIBI score and rating; intolerant species were absent (Fieryblack Shiner and Piedmont Darter had last been collected in 2006). **2001-2011** -- 24 species known from the site including 4 exotics, 2 intolerants, 3 darters, and 1 sucker species; dominant species are Satinfin Shiner (2001, 2006) and Bluehead Chub (2011). **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MUDDY CR	**SR 1891**	**04/29/10**	**QF159**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
FORSYTH	4	03040101	36.0531902	-80.3692105	12-94-(0.5)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	89.2	690	11	0.4	No

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

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

Water Quality Parameters

Temperature (℃)	20.8
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	129
pH (s.u.)	6.6

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Riffle Habitat (16)	3
Pool Variety (10)	6
Erosion (7)	3
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	58

Site Photograph

Substrate Boulder, bedrock, sand, silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/11	2011-35	21	52	Good
04/30/01	2001-29	13	38	Fair
05/14/96	96-42	15	34	Poor

Most Abundant Species, 2011 Bluegill (n=58, 27%)

Exotic Species Green Sunfish, Spotted Bass, Channel Catfish, and Rosefin Shiner (n=8, 4, 2, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Eastern Silvery Minnow (n=2), Highback Chub (n=1), Speckled Killifish (n=5), Eastern Mosquitofish (n=4), Pumpkinseed (n=4), sunfish hybrid (n=1), Spotted Bass (n=4); Brassy Jumprock (n=1), Flat Bullhead (n=1), Channel Catfish (n=2), Green Sunfish (n=8). **Lost --** Rosyside Dace (n=2), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains western Forsyth County, including the western portion of Winston-Salem, and a small portion of southern Stokes County; no NPDES dischargers in the watershed; tributary to the Yadkin River. **Habitat** -- lower quality instream habitats; eroding banks with exposed tree roots; runs, snags, coarse woody debris and sticks in the channel creating riffles; sewer right of way within left riparian zone (overgrown with shrubs) and row crop field on the right; total habitat score range 44-58. **Water Quality** -- specific conductance elevated from nonpoint source runoff, range 99-129 µS/cm. **2011** -- most species ever collected at this site; the percentage of tolerant fish was greater than expected (41%, primarily Redbreast Sunfish and Satinfin Shiner), but a very balanced trophic structures and the addition of the Brassy Jumprock and intolerant Highback Chub all contributed to the substantial increase in the NCIBI score and improvement in the rating. **1996-2011** -- 25 species known from the site including 5 exotics, 1 intolerant, 2 darters, and 2 sucker species; only 1 specimen of 1 intolerant species (Highback Chub) has been collected at this site; dominant species are variable, including Satinfin Shiner (1996), Bluehead Chub (2001), and Bluegill (2011). **Recommendation** -- continued basinwide assessment of this fish community in 2016 to determine if the improvements in NCIBI rating persists.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
DUTCHMANS CR	US 158	04/29/10	QF3	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIE	5	03040101	35.9468972	-80.5360099	12-102-(2)a	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	57.6	660	10	0.4	No

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

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

Water Quality Parameters

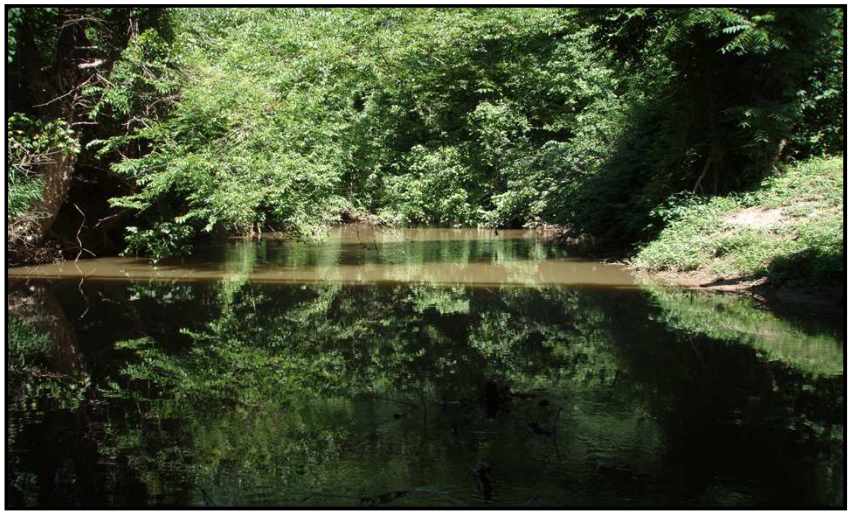
Temperature (℃)	21.7
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	121
pH (s.u.)	7.1

Water Clarity: Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	11
Bottom Substrate (15)	4
Riffle Habitat (16)	3
Pool Variety (10)	6
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	59

Site Photograph



Substrate: Sand, boulder outcrops

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/11	2011-36	19	46	Good-Fair
06/05/06	2006-73	20	46	Good-Fair
05/04/01	2001-42	17	44	Good-Fair
05/13/96	96-40	12	38	Fair

Most Abundant Species, 2011: Redbreast Sunfish (n=77, 31%)

Exotic Species: Green Sunfish, Channel Catfish, and Yellow Perch (n=4, 1, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Creek Chub (n=1), White Perch (n=2), Warmouth (n=1), Yellow Perch (n=1); Creek Chub Sucker (n=1), Eastern Mosquitofish (n=1), sunfish hybrid (n=3). **Lost** -- Threadfin Shad (n=6), White Sucker (n=2), Notchlip Redhorse (n=1), Flat Bullhead (n=1), Redear Sunfish (n=1), Spotted Bass (n=1).

Data Analysis

Watershed -- drains north-central Davie, southern Yadkin, and northeast Iredell counties, including the I-40 corridor; no NPDES dischargers or municipalities in the watershed; tributary to the Yadkin River. **Habitat** -- lower quality instream habitats; some boulders on the left; pools were primarily side snags with undercuts; stick riffles and an artificial riffle (bridge rubble) beneath the bridge; some coarse woody debris in the channel; left riparian zone with sewer right of way; total habitat score range 44-61 with last two cycle scores ranging from 61 and 59. **Water Quality** -- specific conductance slightly to moderately elevated, range 104-140 µS/cm. **2011 --** intolerant species absent; percentage of tolerant fish much greater than expected. **1996-2011** -- 30 species known from the site including 7 exotics, 1 intolerant, 2 darters, and 5 sucker species; intolerant species are rare at this site, only one species, Highback Chub, has ever been collected at this site and it was last collected in 2001 (n=2); dominant species are Redbreast Sunfish (1996, 2006, 2011) and Bluehead Chub (2001); percentage of tolerant fish increasing since 2001 (21 to 42 to 51%) although NCIBI rating has not changed since 2001. **Recommendation** -- continued basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CEDAR CR	**SR 1437**	**04/29/10**	**QF5**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIE	5	03040101	35.98611111	-80.52555556	12-102-13-(2)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	10.9	685	5	0.3	No

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

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

Water Quality Parameters

Temperature (℃)	21.4
Dissolved Oxygen (mg/L)	5.7
Specific Conductance (µS/cm)	192
pH (s.u.)	6.1
Water Clarity	Slightly turbid & dark

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	4
Riffle Habitat (16)	10
Pool Variety (10)	6
Erosion (7)	4
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph

Substrate Sand, some gravel and cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/11	2011-10	11	36	Fair
07/26/04	2004-134 (off SR 1410)	8	40	Fair
05/04/01	2001-43	11	50	Good
05/13/96	96-41	11	46	Good-Fair

Most Abundant Species, 2011 Redbreast Sunfish (n=72, 39%)

Exotic Species Green Sunfish (n=44) and Red Shiner (n=10)

Species Change Since Last Cycle

Gained -- First collection ever for Spotted Sucker (n=1), Flat Bullhead (n=2), Eastern Mosquitofish (n=1). **Lost** -- Satinfin Shiner (n=19), Creek Chubsucker (n=1), Highback Chub (n=3).

Data Analysis

Watershed -- drains northeast Davie County; no NPDES dischargers or municipalities in the watershed; site is approximately 1.9 miles below Cedar Creek Soil & Water Dam/Reservoir No. 8; tributary to Dutchman Creek. **Habitat** -- shallow, gravel riffles with side snag pools; extremely high levels of filamentous algae and *Corbicula;* wide and forested riparian zone on the right; total habitats score range 60-75. **Water Quality** -- greatly elevated specific conductance due to nonpoint source runoff, range 192-222 µS/cm; odor of land application of animal waste was detected. **2011** -- a 60% decline in the number of fish collected between 2001 and 2011 (183 vs. 437, especially Redbreast Sunfish); greatest percentage of tolerant fish collected at any fish community site in 2011 (71%, primarily Redbreast Sunfish and Green Sunfish); very skewed trophic metrics with 97% of the fauna comprised of insectivores and only 3% of the fauna omnivores+herbivores (Bluehead Chub rare, n=5) which is collectively contributing to a substantial decline in the NCIBI score and rating at this site between 2001 and 2011. **1996-2011** -- 17 species known from the site including 2 exotics, 1 intolerant, 1 darter, and 3 sucker species; intolerant species are rare at this site, only one species, Highback Chub, has been collected and only in 2011 (n=3); dominant species is the tolerant Redbreast Sunfish (39-78%).
Recommendation -- continued basinwide assessment of this site in 2016 to determine if the decline in the NCIBI rating persists.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Victor Holland

Waterbody	Location	Station ID	Date	Bioclassification
S YADKIN R	**SR 1159**	**QB223**	**08/23/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
DAVIE	6	03040102	35.844444	-80.659444

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	306.5	16	0.5

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

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

Water Quality Parameters

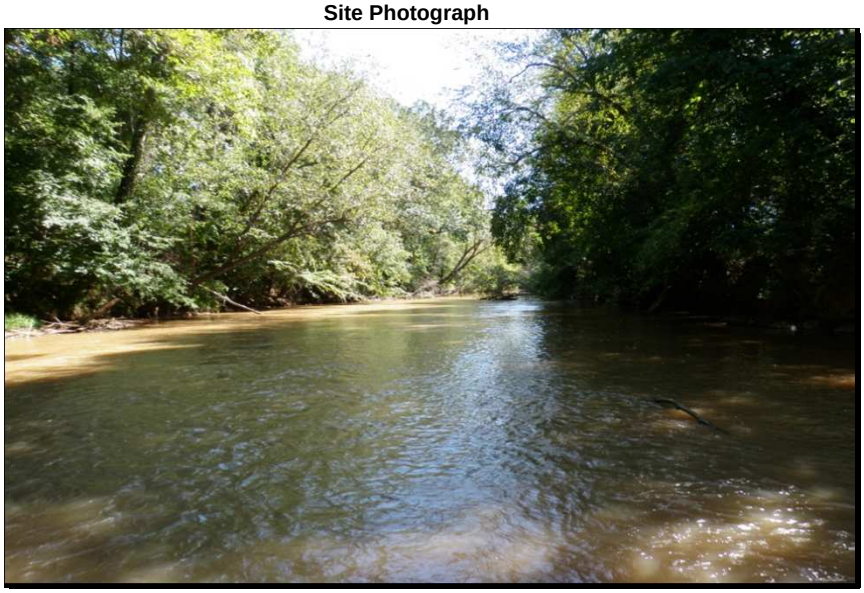
Temperature (℃)	22.2
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	65
pH (s.u.)	7.0

Water Clarity: turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	10
Pool Variety (10)	8
Riffle Habitat (16)	3
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	72

Site Photograph



Substrate: Slightly embedded mix of boulder, cobble, gravel, and sand

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/23/11	11194	Full Scale	71	29	4.98	4.28	Good
09/11/06	9995	Full Scale	77	32	4.95	4.46	Excellent
07/24/01	8489	Full Scale	80	32	4.60	3.90	Excellent
08/06/96	7150	Full Scale	60	29	4.46	3.88	Good
07/13/89	4980	Full Scale	73	32	4.60	3.83	Excellent
08/05/86	3899	Full Scale	79	26	5.03	4.28	Good
08/27/84	3315	Full Scale	83	34	4.73	3.93	Excellent

Data Analysis

This sampling station rated Good in 2011 and has received a Good or Excellent bioclassication since 1984. Both tolerant and intolerant taxa were collected from this station in 2011 including some taxa that are relatively tolerant of organic pollution such as various midge, odonate, and beetle taxa. EPT richness (29) continues to be high with many intolerant EPT taxa abundant or common at the site. A rarely collected hydropsychid caddisfly, *Hydropsyche mississippiensis* was collected in the 2011 sample. The NCBI (4.98) has only slightly increased since 1989 suggesting mostly stable water quality conditions. This site was on the cusp of receiving and Excellent rating again in 2011 and received the Good bioclassification as a result of the low EPT abundance (109) within the sample. This lower abundance may be the result of several rain events that occured the week before sampling this station. These events can cause drift of macroinvertebrates and their associated habitats to downstream locations.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
ROCKY CR	SR 1884	QB221	09/14/11	Good

County	Subbasin	8 digit HUC	Latitude	Longitude
IREDELL	6	03040102	35.965278	-80.836111

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	56.5	7	0.4

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

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

Water Quality Parameters

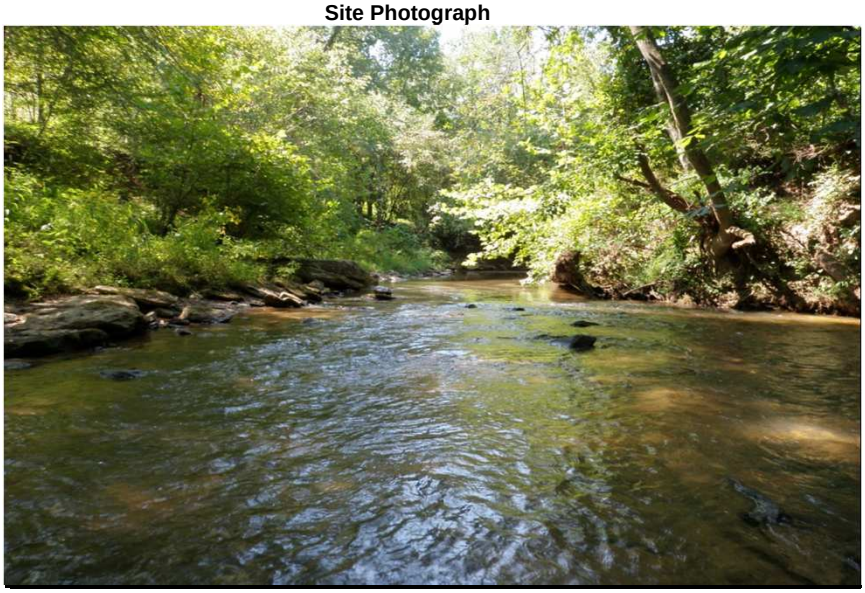
Temperature (℃)	20.4
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	47
pH (s.u.)	6.6

Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	9
Pool Variety (10)	5
Riffle Habitat (16)	7
Bank Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	70

Site Photograph



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

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/14/11	11296	EPT	26	26	4.34	4.34	Good
09/28/06	10001	EPT	35	35	3.78	3.78	Excellent
07/26/06	9990	EPT	44	44	3.94	3.94	Excellent
07/23/01	8485	EPT	38	38	3.62	3.62	Excellent
08/05/96	7146	EPT	26	26	3.87	3.87	Good

Data Analysis

Although the 2011 sample declined to Good from three consecutive Excellent ratings, the invertebrate community is generally pollution intolerant. Pollution intolerant taxa collected from each of the five collections include the mayflies *Hexagenia spp* , *Heptagenia marginalis* , *Isonychia spp* , the long-lived stoneflies *Acroneuria abnormis* , *Paragnetina fumosa* and the caddisfly *Ceratopsyche sparna* . The decline in rating was caused by a decrease in EPT diversity and included the absence of some edge dwelling species such as the caddsiflies *Triaenodes ignitus* and *Brachycentrus nigrosoma* . It is possible that lowered flows resulted in slightly less habitat available for colonization and the lowered rating. This is supported by the consistently low specific conductance at this site (47 µS/cm in 2001, 44µS/cm in 2006) which indicates favorable water quality. The preponderance of pollution intolerant taxa supports this conclusion.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
PATTERSON CR	**SR 1890**	**QB217**	**09/14/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
IREDELL	6	03040102	35.924167	-80.824167

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	35.3	8	0.4

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

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

Water Quality Parameters

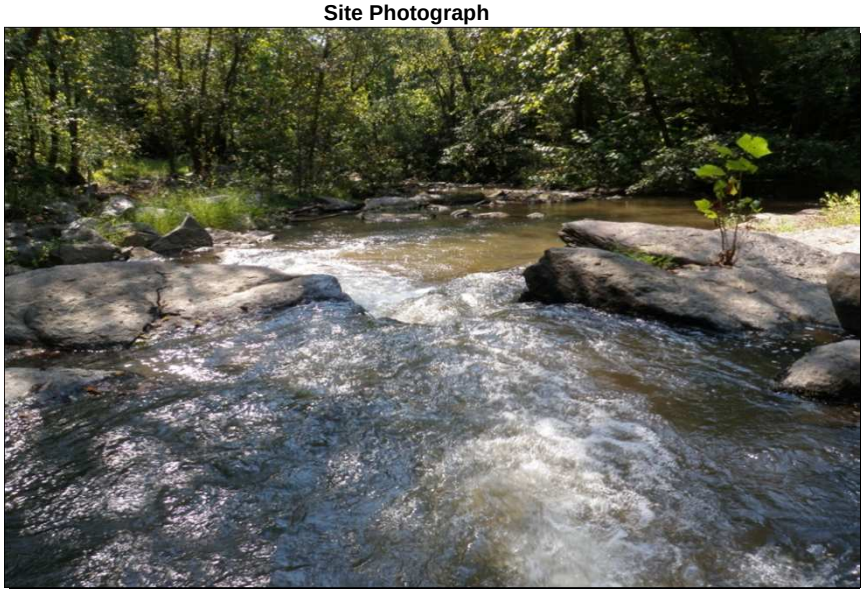
Temperature (℃)	18.6
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	70
pH (s.u.)	6.6

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	7
Riffle Habitat (16)	14
Bank Erosion (7)	3
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	85

Site Photograph



Substrate: Gravel, cobble, sand, silt, boulder, and a trace of bedrock.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/14/11	11299	EPT	7	7	4.64	4.64	Fair
07/26/06	9991	EPT	32	32	3.79	3.79	Excellent
04/04/06	9836	EPT	39	39	3.51	3.51	Excellent
12/02/03	9316	EPT	35	35	4.03	4.03	Good
07/23/01	8486	EPT	25	25	3.99	3.99	Good
11/07/90	5495	Full Scale	77	32	5.32	4.61	Good

Data Analysis

The invertebrate community present in 2011 has been drastically reduced relative to all other samples. There has been an increase in both BI metrics from all previous samples and a sharp reducting in EPT species diversity. Although the specific conductance was higher in 2011 relative to previous years (range was 54 µS/cm to 61 µS/cm) an increase to 70 µS/cm observed in 2011 would not be enough to engender these alterations. It is possible that low flows preceeding the 2011 sampling event may account for some of the reductions observed. However, the filter feeding caddisfly *Cheumatopsyche spp* was common from this collection as was the edge dwelling caddisfly *Nectopsyche exquisita* . The presence of these taxa suggest adequate flows. This is further supported by the fact that severe drought conditions present in 2001-2003 produced two Good bioclassifications. This evidence notwithstanding, there were several flow requiring mayflies (e.g., *Maccaffertium modestum* , *Isonychia spp* , *Leucrocuta spp*) that were completly absent in 2011 but common or abundnat from all previous collections and no long-lived stoneflies were present in 2011 whereas previous collections usually resulted in at least three of these taxa. This suggests flows were low or absent before the 2011 sample. The conflicting evidence at this site dictate that follow up sampling should be conducted at this location to verify the 2011 sample.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
HUNTING CR	**SR 2115**	**QB206**	**09/14/11**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude
IREDELL	6	03040102	36.000000	-80.745556

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Northern Inner Piedmont	156.0	25	0.4

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

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

Water Quality Parameters

Temperature (℃)	22.2
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	61
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	6
Pool Variety (10)	2
Riffle Habitat (16)	4
Bank Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	56

Site Photograph

Substrate Sand, silt, gravel and cobble.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/14/11	11295	Full Scale	88	37	5.04	3.75	Excellent
09/11/06	9994	Full Scale	85	34	5.64	4.31	Good
07/23/01	8481	Full Scale	74	31	4.89	4.21	Excellent
08/07/96	7153	Full Scale	66	30	4.53	3.58	Excellent
07/27/88	4665	Full Scale	72	27	5.28	4.18	Good
07/30/85	3609	Full Scale	79	33	4.88	3.87	Excellent
08/10/83	3136	Full Scale	78	28	5.24	4.31	Good

Data Analysis

The long-term sampling history at this location indicate favorable water quality. Availalbe water chemistry from the last three samples support this conclusion as specific conductance is generally low with little interannual variation (57 µS/cm in 2001, 58 µS/cm in 2006 and 61 µS/cm in 2011). As there are no NPDES dischargers in the immediate vicinity, variation in flow and corresponding nonpoint inputs are likely the reason for the small variability in bioclassificaton. Pollution intolerant taxa collected in 2011 and consistently present from earlier samples include the mayflies *Heptagenia marginalis* , *Leucrocuta spp* , the long-lived stoneflies *Acroneuria abnormis* , *Paragnetina fumosa* , *Pteronarcys dorsata* , and the caddisflies *Nyctiophylax moestus* , *N. celta* , and *Psychomyia nomada* .

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
FOURTH CR	**SR 1003**	**QB197**	**09/14/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
ROWAN	6	03040102	35.787778	-80.646667

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	74.3	10	0.3

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

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

Water Quality Parameters

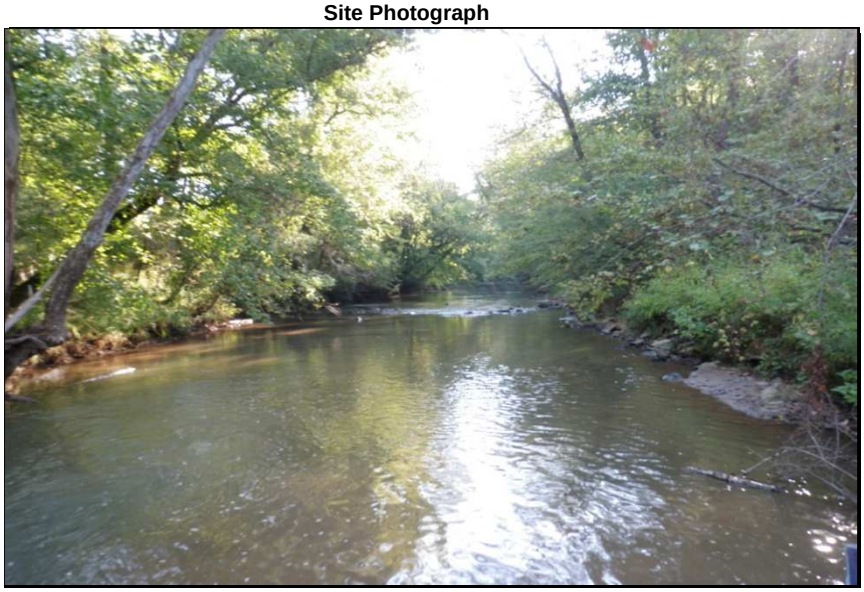
Temperature (℃)	19.0
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	195
pH (s.u.)	7.3

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	9
Pool Variety (10)	5
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	80

Site Photograph



Substrate: Cobble, gravel, boulder, sand, silt and a trace of bedrock.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/14/11	11298	EPT	22	22	4.49	4.49	Good
07/26/06	9992	EPT	28	28	4.65	4.65	Excellent
09/11/01	8614	EPT	21	21	5.07	5.07	Good
07/24/01	8484	EPT	20	20	4.92	4.92	Good-Fair
08/06/96	7151	EPT	23	23	5.08	5.08	Good

Data Analysis

Other than the 2001 and 2006 samples, this station has consistently rated Good. The 2006 improvement to Excellent was the result of many industrial dischargers ceasing operations thereby improving the quality of the effluent from the Fourth Creek WWTP (located approximately 10 miles upstream). Convesely, the drought and low flows in 2001 concentrated the instream waste concentration at this location which resulted in the lowered Good-Fair rating. Indeed, specific conductance in 2006 (163 µS/cm) was the lowest recorded at this location and was its highest (200 µS/cm) in 2001. Although the EPT diversity dropped in 2011 from 2006, the BI and EPTBI lowered slightly suggesting that this community is currently stable and largely pollution intolerant. Pollutiuon intolerant taxa collected from this location from each of the five previous collections include the mayfly *Heptagenia marginalis* , and the caddisflies *Ceratopsyche sparna* , *Leucotrichia pictipes* , *Nectopsyche exquisita* , and *Triaenodes ignitus* .

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S YADKIN R	SR 1561	04/29/10	QF6	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
IREDELL	6	03040102	35.88638889	-80.99	12-108-(5.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	69.3	805	13	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)	18.3
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	65
pH (s.u.)	5.6
Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	7
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	4
Erosion (7)	2
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	49

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/15/11	2011-38	14	44	Good-Fair
06/06/06	2006-75	14	42	Good-Fair
05/03/01	2001-39	16	46	Good-Fair
05/14/96	96-45	11	40	Fair

Most Abundant Species, 2011 Bluehead Chub (n=111, 48%).

Exotic Species Striped Jumprock (n=4).

Species Change Since Last Cycle **Gained** -- Striped Jumprock (n=4), Flat Bullhead (n=1). **Lost** -- Green Sunfish (n=2), Piedmont Darter (n=1)

Data Analysis

Watershed -- drains northeast Alexander County, including the Town of Taylorsville; no NPDES dischargers in the watershed; tributary to the Yadkin River. **Habitat** -- same as in previous cycles with very low quality instream habitats; some coarse woody debris in the channel; fairly uniform channel depth; with deeply entrenched, eroding banks; shallow sandy runs; stick riffles; total habitat score range 40-49. **Water Quality** -- specific conductance generally low for a Piedmont stream, range 47-65 µS/cm. **2011** -- lower than expected species diversity for a stream of this size; a slightly more balanced trophic structure in 2011 than in 2006 even though there were still indications of nutrient enrichment by the consistently high abundance of Bluehead Chub; no change in the NCIBI rating. **1996-2011** -- number of fish collected has decreased significantly since 2001 (639 to 332 to 230); 20 species known from the site including 2 exotics, 3 intolerants, 2 darters, and 4 sucker species; dominant species is the Bluehead Chub (31-61%); consistently rated Good-Fair over the past 10 years. **Recommendation** -- continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
OLIN CR	SR 1892	04/29/10	QF9	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
IREDELL	6	03040102	35.94416667	-80.86777778	12-108-11-3-3	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	9.4	825	5	0.3	No

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

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)	7.9
Specific Conductance (µS/cm)	56
pH (s.u.)	6.2

Water Clarity: Clear, became extremely turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	4
Pool Variety (10)	4
Erosion (7)	2
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	49

Site Photograph

Substrate: Sand, some gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/15/11	2011-39	12	46	Good-Fair
06/05/06	2006-74	10	44	Good-Fair
05/14/96	96-44	9	36	Fair

Most Abundant Species, 2011: Bluehead Chub (n=214, 57%)

Exotic Species: None

Species Change Since Last Cycle

Gained -- First collection ever for White Sucker (n=2) and Eastern Mosquitofish (n=12); Margined Madtom. **Lost** -- Fathead Minnow (n=1).

Data Analysis

Watershed -- drains rural north-central Iredell County; no NPDES dischargers or municipalities in watershed; small tributary to Patterson Creek and ultimately the South Yadkin River. **Habitat** -- same as in previous cycles with low quality instream habitats; tributary near the bridge and on the right drains a livestock pasture; riparian zone on the left with severe erosion in places; shallow sandy runs; stick and gravel riffles; undercutbanks and snag pools; total habitat score range 49-53. **Water Quality** -- specific conductance generally low for an agricultural Piedmont stream, range 35-56 µS/cm. **2011** -- greatest species diversity recorded at this site; a somewhat skewed trophic structure with the greatest percentage of omnivores+herbivores of any fish community site in this basin; no change in NCIBI rating. **1996-2011** -- gradual increase in the species diversity over time; 13 species known from the site including 1 exotic, 1 intolerant, 1 darter, and 1 sucker species; dominant species is the Bluehead Chub (40-57%); only one intolerant species known from this site (Highback Chub) and only three specimens have been collected since 2006, none collected in 1996. **Recommendation** -- continue basinwide assessment of this small watershed in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HUNTING CR	**NC 115**	**04/29/10**	**QF10**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WILKES	6	03040102	36.07888889	-80.9775	12-108-16-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III	29.8	960	10	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	65	0	35	0

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

Water Quality Parameters

Temperature (℃)	24.6
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	44
pH (s.u.)	6.2

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Sand, silt, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/13/11	2011-67	18	58	Excellent
06/22/06	2006-93	14	52	Good
05/03/01	2001-40	17	58	Excellent
05/15/96	96-48	16	56	Excellent
06/16/92	92-19	12	52	Good

Most Abundant Species, 2011 Bluehead Chub (n=112, 28%)

Exotic Species Smallmouth Bass (n=1).

Species Change Since Last Cycle

Gained -- First collection ever for sunfish hybrid (n=1); Fieryblack Shiner (n=5), White Sucker (n=5), Notchlip Redhorse (n=1), Piedmont Darter (n=7). **Lost --** None.

Data Analysis

Watershed -- drains the southeast corner of Wilkes County; stream flows parallel to NC 115 upstream of the sampling site; no municipalities or NPDES dischargers in the watershed. **Habitat** -- riffles at the end of the reach; snag pools at the beginning; undercut banks; gravel runs; slightly turbid. **Water Quality** -- specific conductance generally low for a Piedmont stream, range 38-56 µS/cm. **2011** -- extremely high flows did not negatively impact the fish community, greatest diversity of fish ever collected at the site, increase in total species diversity and species of suckers and darters resulted in an increase in the NCIBI score and rating. **1992-2011** -- 21 species known from the site including 1 exotic, 5 intolerants, 3 darters, and 4 sucker species; dominant species are Bluehead Chub (1992, 1996, 2001, 2011) and Rosyside Dace (2006); trophically no change, very stable metrics; NCIBI ratings fluctuate between high Good and high Excellent. **Recommendation** -- continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N L HUNTING CR	**SR 1829**	**04/29/10**	**QF12**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
IREDELL	6	03040102	36.02027778	-80.76694444	12-108-16-6	Northern Inner Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III	54.5	770	13	0.4	No

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

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)	7.9
Specific Conductance (µS/cm)	69
pH (s.u.)	6.0

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	8
Bottom Substrate (15)	3
Riffle Habitat (16)	3
Pool Variety (10)	8
Erosion (7)	3
Bank Vegetation (7)	5
Light Penetration (10)	5
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	47

Site Photograph

Substrate Sand, boulder outcrop on the left

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/15/11	2011-40	20	50	Good
06/06/06	2006-77	16	44	Good-Fair
05/03/01	2001-41	21	50	Good
05/14/96	96-43	17	44	Good-Fair

Most Abundant Species, 2011 Bluehead Chub (n=178, 38%)

Exotic Species Smallmouth Bass, Spotted Bass, and Striped Jumprock (n=3, 1, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Thicklip Chub (n=2), Striped Jumprock (n=1), Spotted Bass (n=3); Rosyside Dace (n=2), Tessellated Darter (n=2), Piedmont Darter (n=1). **Lost --** Bluegill (n=4), Largemouth Bass (n=1).

Data Analysis

Watershed -- site is at at the lowermost crossing before the creek's confluence with Hunting Creek; no municipalities in watershed; one small discharger (NC0028614; Q_w=0.018 MGD) located on a tributary in the creek's upper reaches. **Habitat** --- low quality instream habitats were the same as in previous cycles; wide at the bridge with shifting sandy runs; snags and chutes on the left bank; undercut banks and woody debris on the right; sticks in the current and a few gravel riffles; total habitat score range 32-47. **Water Quality** -- specific conductance typical for a Piedmont stream, but gradually increasing from 37 µS/cm in 1996 to 69 µS/cm in 2011. **2011** -- a more balanced trophic structure and greater species and darter diversities contributed to the increase in NCIBI score and rating; as in previous cycles large specimens of Notchlip Redhorse, Brassy Jumprock, and Smallmouth Bass were collected. **1996-2011** -- 25 species known from the site including 3 exotics, 5 intolerants, 3 darters, and 4 sucker species; generally poor habitats for darters who are rare in this stream; dominant species is the Bluehead Chub (38-49%); percentage of tolerant fish have been gradually increasing (17 to 33 to 41 since 2001) as has the percentage of tolerant Redbreast Sunfish (2 to 6 to 18 to 28%) which, combined with the increasing specific conductance, may indicate a beginning decline in water quality; however, NCIBI ratings continue to fluctuate between medium Good-Fair and medium Good. **Recommendation** -- continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BEAR CR	**SR 1116**	**04/29/10**	**QF13**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIE	6	03040102	35.8256708	-80.5849347	12-108-18-(3)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	29.1	650	9	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 (℃)	21.6
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	122
pH (s.u.)	6.2

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	11
Bottom Substrate (15)	3
Riffle Habitat	1
Pool Variety (10)	8
Erosion (7)	2
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	56

Site Photograph

Substrate Sand, cobble, boulder, some boulder and cobble at the bridge (rip/rap)

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/14/11	2011-37	12	44	Good-Fair
07/09/04	2004-117	15	40	Fair

Most Abundant Species, 2011 Redbreast Sunfish (35%)

Exotic Species Green Sunfish (n=6)

Species Change Since Last Cycle

Gains -- sunfish hybrid. **Lost** -- Brassy Jumprock, Pumpkinseed, and Warmouth. All species gained or lost were represented by 1 fish/species.

Data Analysis

Watershed -- drains west-central Davie County, including the western area of the Town of Mocksville; no NPDES dischargers in the watershed; site is approximately 1 mile upstream of the creek's confluence with the South Yadkin River. **Habitat** -- artificial riffle upstream of the bridge from rip/rap and rubble; wide riparian zones providing good canopy over the creek; eroding banks contributing coarse woody debris to the stream, but otherwise, poor instream habitats, no natural cobble or gravel riffles. **Water Quality** -- specific conductance typical for a stream draining an agricultural/rural Piedmont watershed; ranging from 122 to 150 µS/cm. **2011** -- total species diversity, diversity of darters, and number of fish collected (n=100) were lower than expected; only one species of darter was collected (Tessellated Darter); intolerant species were absent; percentage of tolerant fish was greater than expected (56 percent and included the Satinfin Shiner, White Sucker, Brown Bullhead, Redbreast Sunfish, and Green Sunfish). **2004 & 2011** -- 15 species are known from this site, but not the Redlip Shiner which is a ubiquitous species in this basin and is considered Intermediate in terms of its tolerance to pollution; dominant species in 2004 and 2011 was the tolerant Redbreast Sunfish; intolerant species are absent from this system; although the NCIBI rating improved from Fair to Good-Fair, the low species diversity and fish abundance, an absence of intolerant species, and a high percentage of tolerant fish continues to suggest some level of degradation to this community from nonpoint pollution sources. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FOURTH CR	SR 1985	04/29/10	QF18	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ROWAN	6	03040102	35.7975	-80.60277778	12-108-20c	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	80	640	15	0.5	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Statesville's Fourth Creek WWTP	NC0031836	6

Water Quality Parameters

Temperature (℃)	21.5
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	159
pH (s.u.)	6.7

Water Clarity: Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	8
Erosion (7)	4
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	56

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/25/11	2011-20	18	44	Good-Fair
07/07/09	2009-83	16	42	Good-Fair
07/29/03	2003-42	11	34	Poor
06/03/03	2003-19	8	26	Poor
05/02/01	2001-38	12	28	Poor
04/26/96	96-39	9	32	Poor

Most Abundant Species, 2011: Bluegill (n=48, 38%)

Exotic Species: Green Sunfish, Red Shiner, Rosefin Shiner, Yellow Perch, and Channel Catfish (n=6, 5, 2, 2, and 1, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Rosyside Dace (n=1), Black Crappie (n=5), Yellow Perch (n=2); Red Shiner (n=5), Flat Bullhead (n=2), White Perch (n=13), Largemouth Bass (n=1). **Lost** -- Spottail Shiner (n=1), Spotted Sucker (n=6), Spotted Bass (n=1), Warmouth (n=1), Redear Sunfish (n=5), Tessellated Darter (n=5).

Data Analysis

Watershed -- drains central Iredell and northwestern Rowan counties, including the City of Statesville and the I-40 and I-77 corridors; one additional discharger (NC0082821, Q_w=0.144) located approximately 0.7 miles downstream of NC0031836, both facilities are located approximately 14 miles upstream of this site; tributary to the South Yadkin River. **Habitat** -- sticks and snags in the channel creating riffles; undercut banks; coarse woody debris; historic channelization evident; wide riparian forests; good canopy, but entrenched with eroding banks, total habitat score range 43-64. **Water Quality** -- specific conductance elevated, range 125-160 µS/cm; water turbid even though flow was less than median flow. **2011** -- species diversity greatest ever recorded for this site, 1 of 3 sites where no darters were collected due to poor instream habitats; slight increase in the NCIBI score, but not the rating. **1996-2011** -- for a stream of its size, the species diversity and abundance are lower than expected; less than 600 fish total have been collected in six attempts; 27 species known from the site including 8 exotics (the most exotic species at any site in the basin in 2011), 0 intolerants, 1 darter, 2 suckers, and 10 tolerant species; dominant species are Bluegill (1996, 2011) and Bluehead Chub (2001, 2003, 2009); intolerant species (e.g. Highback Chub, Fieryblack Shiner, and Piedmont Darter) and Redlip Shiner, a wide-spread species, have never been collected at the site; the percentage of species with multiple ages classes has for the majority of samples been less than expected indicating poor recruitment; percentage of tolerant fish greater than expected; NCIBI rating has improved since 2003; site was part of a turbidity TMDL study in 2003 and was a random Ambient Monitoring site in 2009-2010. **Recommendation** -- continue basinwide assessment of this site in 2016 to document the urbanization of the watershed and any WWTP discharge impacts.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
THIRD CR	SR 1970	04/29/10	QF14	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ROWAN	6	03040102	35.7675	-80.62583333	12-108-20-4b	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	96.6	660	12	0.6	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)
City of Statesville's Third Creek WWTP	NC0020591	8

Water Quality Parameters

Temperature (°C)	20.9
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	130
pH (s.u.)	6.5

Water Clarity: Turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/25/11	2011-19	13	44	Good-Fair
05/11/06	2006-44	10	32	Poor
05/02/01	2001-37	11	34	Poor
04/25/96	96-38	13	40	Fair

Most Abundant Species, 2011: Bluegill (n=13, 20%)

Exotic Species: Yellow Perch, Green Sunfish, Spotted Bass, and Channel Catfish (n=5, 4, 3, and 2, respectively)

Species Change Since Last Cycle: **Gained** -- First collection ever for Spotted Bass (n=3), Black Crappie (n=1); Gizzard Shad (n=1), Tessellated Darter (n=6). **Lost --** Pumpkinseed (n=1).

Data Analysis

Watershed -- drains portions of Statesville; five NPDES dischargers are located upstream (total Q_w = 8.333 MGD); tributary to Fourth Creek and ultimately the South Yadkin River. **Habitat** -- swift and deep even though flow was only 15 cfs above median flow; chutes, coarse woody debris and deep snags; wide riparian zones within the reach; total habitat score range 42-60. **Water Quality** -- specific conductance elevated, but decreasing over time from 262 µS/cm in 2001 to 130 µS/cm in 2011. **2011** -- second fewest fish of any site in this basin (n=66); low species and darter diversity; no intolerant species; 1 of 3 sites with no darters; an increase in the total species diversity, a balanced trophic structure, and a greater percentage of species with multiple age classes contributed to the substantial increase in the NCIBI score and rating. **1996-2011** -- for a stream of its size, the species diversity and abundance are consistently lower than expected; less than 200 fish have been collected at this site in four attempts; 23 species known from the site including 5 exotics, 1 intolerant, 1 darter, and 2 sucker species; dominant species are Bluegill (1996, 2011) and Bluehead Chub (2001, 2006); Redlip Shiner, a wide-spread species, has never been collected at the site; only in 2001 has an intolerant species (Fieryblack Shiner, n=4) been collected. **Recommendation** -- continue basinwide assessment of this site in 2016 to determine if the improved NCIBI rating persists and to document the urbanization of the watershed and any WWTP discharge impacts.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N SECOND CR	SR 1526	04/29/10	QF19	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ROWAN	6	03040102	35.69694444	-80.61166667	12-108-21a	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	63.3	660	9	0.4	No

	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)	18.8
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	133
pH (s.u.)	6.4

Water Clarity: Turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/25/11	2011-18	13	44	Good-Fair
05/11/06	2006-43	12	46	Good-Fair
05/02/01	2001-36	9	42	Good-Fair
04/25/96	96-37	13	40	Fair

Most Abundant Species, 2011: Bluegill (n=33, 25%)

Exotic Species: Green Sunfish and Fathead Minnow (n=4, each)

Species Change Since Last Cycle

Gained -- First collection ever for Satinfin Shiner (n=5), Fathead Minnow (n=4); White Sucker (n=1), Flat Bullhead (n=2). **Lost --** Highback Chub (n=2), Redear Sunfish (n=1), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains eastern Iredell and western Rowan counties, including the northeast part of the Town of Mooresville; no NPDES dischargers in the watershed; tributary to the South Yadkin River. **Habitat** -- low quality instream habitats; historic channelization; shallow sandy runs; snags and sticks common in the channel; active sand dipping operation above the bridge; corn and other row crops beyond the narrow riparian zones; total habitat score range 22-50. **Water Quality** -- specific conductance elevated and very gradually increasing from 99 µS/cm in 1996 to 133 µS/cm in 2011. **2011** -- a slight increase in diversity metrics were offset by an absence of piscivores and intolerant species. **1996-2011** -- for a stream of its size, the species diversity and abundance are consistently lower than expected; less than 600 fish total have been collected in four attempts; 18 species known from the site including 4 exotics, 1 intolerant, 2 darters, and 2 sucker species; dominant species are Bluegill (1996, 2011) and Bluehead Chub (2001, 2006); Redlip Shiner, a wide-spread species in this basin has never been collected at the site; Highback Chub, an intolerant species, has declined from 43 to 2 to 0 since 2001; no change in the NCIBI score in the past 10 years. **Recommendation** -- continue basinwide assessment of this site in 2016.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
ABBOTTS CR	SR 1243	QB233	09/13/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
DAVIDSON	7	03040103	35.806667	-80.235278

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	175.0	12	0.5

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

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

Water Quality Parameters

Temperature (℃)	22.0
Dissolved Oxygen (mg/L)	5.3
Specific Conductance (µS/cm)	238
pH (s.u.)	6.9

Water Clarity	milky

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Gravel, cobble, boulder, sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/13/11	11294	Full Scale	62	15	6.38	5.65	Good-Fair
09/12/06	9997	Full Scale	63	11	6.58	6.01	Fair
07/25/01	8494	Full Scale	61	15	6.82	5.99	Fair
08/09/96	7161	Full Scale	62	17	6.44	5.87	Good-Fair
11/13/85	1612	Full Scale	49	12	7.35	5.82	Fair

Data Analysis

This site has a history of fluctuating bioclassifications and water chemsitry. For example, specific conductance was 479 µS/cm in 2001, 153 µS/cm in 2006 and 238 µS/cm in 2011. Despite the small increase in specific conductance in 2011 from 2006, there was a decrease in the BI and EPTBI to the lowest levels measured at this site. Several tolerant taxa present from all previous samples but absent in 2011 included the chironomids *Natarsia spp* , *Rheocricotopus robacki* , the dipteran *Tipula spp* , and the oligochaete *Branchiura sowerbyi* . In addition, two intoleant mayflies were collected for the first time in 2011 (*Hexagenia spp* and *Habrophlebiodes spp*). These data suggest that the discharge from the upstream Lexington WWTP may fluctuate in composition from year to year. Follow up monitoring at this location is reccomended to confirm the 2011 Good-Fair rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
BRUSHY FK	**SR 1802**	**QB563**	**09/13/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Davidson	7	03040103	35.948920	-80.180326

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	--	5	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)

Water Quality Parameters

Temperature (℃)	18.6
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	115
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	4
Pool Variety (10)	3
Riffle Habitat (16)	7
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	9
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	56

Site Photograph

Substrate: Sand, silt and cobble.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/13/11	11292	EPT	---	19	---	4.44	Good-Fair
09/12/06	9999	Full-Scale	61	15	5.88	4.97	Good-Fair
05/14/03	9131	Full-Scale	79	25	5.60	4.31	Good-Fair
07/30/01	8498	Full-Scale	53	20	5.31	4.26	Good
08/08/96	7159	EPT	---	13	---	4.90	Fair

Data Analysis

The 2011 sample was moved upstream to SR 1802 due to a lack of flow (due to resevoir backflow) at the historic location on SR 1810. Despite the change in location and methodology from the two most recent samples (2003 and 2006) there was no change in bioclassification. Although the 2001 sample resulted in a Good bioclassification (the result of decreaed non-point inputs as a result of drought impacts), specific conductance has been remarkably consistent with a measured vale of 115 µS/cm in 2001, 102 µS/cm (2003), 116 µS/cm (2006) and 115 µS/cm (2011). Water chemistry valeus were not routinely obtained prir to 2000. In summary, the pollution tolerance of the invertebrate community at this location has been stable since 2003 and included many of the same taxa including the mayflies *Baetis intercalaris* , *Isonychia spp* , *Hexagenia spp* , the caddisfly filter-feeding caddisfly *Cheumatopsyche spp* , and the long lived and pollution intolerant stonefly *Pteronarcys spp* .

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
HAMBY CR	**SR 2017**	**QB241**	**09/13/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
DAVIDSON	7	03040103	35.831389	-80.163333

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	21.0	8	0.4

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Thomasville WWTP	NC0024112	4.0

Water Quality Parameters

Temperature (℃)	20.7
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	360
pH (s.u.)	7.6

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	11
Pool Variety (10)	5
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	78

Site Photograph

Substrate Sand, gravel, cobble, and boulder.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/13/11	11293	Full Scale	52	13	6.51	5.83	Fair
09/12/06	9998	Full Scale	51	11	6.94	6.35	Fair
05/12/03	9128	Full Scale	60	9	7.17	5.74	Fair
07/30/01	8499	Full Scale	58	12	6.65	6.26	Fair

Data Analysis

This site is located approximately 4 miles downstream of the Thomasville WWTP and has characteristically high specific conductance values ranging between 417 µS/cm (2001) and 237 µS/cm (2003). As would be expected of a small stream located so close to a large discharger, the invertebrate community is dominated by pollution tolerant taxa. Indeed, numerous pollution tolerant taxa have been collected here from each of the four samples and include the mayfly *Baetis flavistriga* , the caddisflies *Cheumatopsyche spp* and *Hydropsyche betteni* , the odonates *Calopteryx spp* , *Argia spp* , the oligochaete Lumbricullidae, and three species of chironomids.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
LICK CR	**NC 8**	**QB268**	**09/13/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
DAVIDSON	8	03040103	35.613056	-80.173889

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	28.7	7	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Denton WWTP	???	???

Water Quality Parameters

Temperature (℃)	22.8
Dissolved Oxygen (mg/L)	4.3
Specific Conductance (µS/cm)	247
pH (s.u.)	6.7

Water Clarity: tannin stained

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	15
Pool Variety (10)	7
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph

Substrate: Cobble, gravel, boulder and sand with a trace of silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
09/13/11	11297	EPT	7	7	6.55	6.55	Fair
08/11/06	10053	Full Scale	81	13	6.65	6.51	Fair
09/08/03	9287	Full Scale	79	17	6.39	5.51	Good-Fair
08/07/01	8504	EPT	11	11	6.55	6.55	Fair
08/06/96	7128	EPT	12	12	5.44	5.44	Fair
05/20/85	3454	Full Scale	76	22	6.02	4.93	Good-Fair

Data Analysis

With the exception of the 1985 and 2003 samples, this site has always received a Fair bioclassification. Although flows are typically low at this location, this is the natural condition as this catchment is located within the Slate Belt ecoregion where low summer flows are normal. Despite the low flows, flow was persistent throughout the sample reach and several flow-dependent taxa were collected at this site in abundance in 2011 including the mayfly *Maccaffertium modestum*, and the filter-feeding caddsiflies *Cheumatopsyche spp* and *Hydropsyche betteni*. These data suggest that although flows were low during the sample, flows were sufficient preceding the 2011 sample. Specific conductance is consistently high at this station (382 µS/cm in 2001, 179 µS/cm in 2006) and is expected as the town of Denton, and its WWTP are located approximately 2.5 miles upstream. These data suggest that the consistent Fair bioclassification is the result of point and nonpoint pollution and not low flows.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
UWHARRIE R	**NC 109**	**QB293**	**08/16/11**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude
MONTGOMERY	9	03040103	35.430833	-80.018056

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	361.0	30	0.2

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	23.6
Dissolved Oxygen (mg/L)	5.6
Specific Conductance (µS/cm)	57
pH (s.u.)	6.8

Water Clarity: turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	6
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	88

Site Photograph

Substrate: Mostly boulder, rubble, and gravel with small amounts of sand.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/16/11	11099	Full Scale	98	37	4.95	3.91	Excellent
08/11/06	10051	Full Scale	118	35	4.99	3.72	Excellent
03/22/05	9576	Full Scale	100	34	4.61	3.17	Excellent
058/05/01	8551	Full Scale	89	33	4.92	3.73	Excellent
08/08/96	7135	Full Scale	80	27	5.18	4.14	Good
07/23/90	5389	Full Scale	81	30	5.09	4.08	Good
07/15/88	4612	Full Scale	101	30	5.21	3.87	Good
07/25/86	3861	Full Scale	100	27	5.34	3.91	Good
08/14/84	3278	Full Scale	84	27	5.10	4.13	Good

Data Analysis

Total taxa richness declined from 2006 to 2011 due to less chironomid midges (11 in 2011 vs. 26 in 2006), however the Uwharrie River at this location maintains a bioclass of Excellent. The EPT BI increased slightly even though more taxa were collected, but the BI improved slightly so conditions remain essentially the same. The diverse macroinvertebrate community included numerous intolerant taxa such as the mayflies *Heterocloeon curiosum* and *Ephemera sp.* , the abundant stonefly *Neoperla sp* ., and the caddisflies *Lepidostoma sp* . and *Helicopsyche borealis.* Beetles were very diverse with 16 species represented.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
L UWHARRIE R	SR 1405	QB286	08/16/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
RANDOLPH	9	03040103	35.764444	-80.004167

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	48.4	6	0.2

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	24.5
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	120
pH (s.u.)	7.5

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Predominantly gravel and rubble with some boulder.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/16/11	11101	EPT	17	17	4.16	4.16	Good-Fair
05/16/06	9904	Full Scale	75	18	5.76	4.49	Good
08/09/01	8555	EPT	18	18	4.25	4.25	Good-Fair
08/08/96	7141	EPT	14	14	4.45	4.45	Good-Fair

Data Analysis

This location on the Little Uwharrie River has changed very little since first being sampled in 1996. The list of taxa and their abundance values in 2011 are very similar to those from the last EPT sample in 2001. One notable exception is the tolerant mayfly *Baetis intercalaris* which was abundant in 2001 but totally absent in 2011. As a result of this small shift, the EPT BI improved slightly in 2011. Another mayfly, *Stenonema femoratum* , which is largely limited to the Slate Belt, was first found here for the first time in 2011.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Eric Fleek

Waterbody	Location	Station ID	Date	Bioclassification
CARAWAY CR	SR 1331	QB280	10/26/09	GOOD-FAIR

County	Subbasin	8 digit HUC	Latitude	Longitude
RANDOLPH	9	03040103		

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt		7	0.5

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

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

Water Quality Parameters

Temperature (°C)	13.3
Dissolved Oxygen (mg/L)	4.6
Specific Conductance (µS/cm)	111
pH (s.u.)	6.6

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	19
Bottom Substrate (15)	14
Pool Variety (10)	5
Riffle Habitat (16)	4
Bank Erosion (7)	4
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	72

Site Photograph

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

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
10/16/09	10882	Full-Scale	79	20	6.00	4.66	Good-Fair
05/15/06	9906	Full-Scale	74	17	5.75	5.06	Good-Fair
08/09/01	8554	EPT		18		4.40	Good-Fair
08/08/96	7139	EPT		17		4.78	Good-Fair

Data Analysis

This site has rated Good-Fair on four consecutive samples. There has been very little fluctuation in both biotic index and EPTs over that period. Similarly, specific conductance has also been relatively stable with measured values of 128 µS/cm in 2006, 131 µS/cm in 2001, and 111 µS/cm in 2009. Numerous facultative invertebrate taxa have been collected at this location from each of the four samples and include the mayflies *Caenis spp*, *Maccaffertium modestum*, *Stenacron interpunctatum*, and the caddisflies *Cheumatopsyche spp*, *Triaenodes ignitus*, and *Chimarra spp*.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
BARNES CR	**SR 1303**	**QB276**	**08/16/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
MONTGOMERY	9	03040103	35.438611	-79.998889

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	0.0	5	0.2

	Forested/Wetland	Residential	Agriculture	Road	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)	22.7
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	43
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Equal amounts of bedrock, boulder, rubble, and gravel.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/16/11	11100	Full Scale	71	25	4.82	4.34	Good
07/15/09	10745	Full Scale	83	27	4.61	3.92	Good
05/15/06	9908	Full Scale	94	37	4.64	3.75	Excellent
09/28/01	8637	Full Scale	79	38	3.98	2.90	Excellent
08/09/01	8552	Full Scale	108	40	3.93	3.27	Excellent
08/07/96	7134	Full Scale	99	36	4.29	3.21	Excellent
07/11/89	4975	Full Scale	83	24	4.82	3.66	Good
07/20/87	4162	EPT	28	28	3.92	3.92	Excellent
07/08/87	4133	Full Scale	0	0	0.00	0.00	Good
08/01/85	3573	Full Scale	0	0	0.00	0.00	Excellent

Data Analysis

A decline in total taxa richness was due mainly to the loss of chironomid midges (31 species in 2006 but only 14 in 2011) Several intolerant mayfies such as *Acentrella sp., Plauditus puctiventris, Baetis pluto* , and *Epeorus vitreus* were lost between 2006 and 2011. This shift to a more tolerant community raised the EPT BI and dropped the bioclass from Excellent to Good. A 2009 special study sample also rated Good with an EPT BI value in between those of 2006 and 2011. This shift between Good and Excellent is most likely due to impacts from extremely low flows during drought conditions.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
DUTCHMANS CR	**SR 1150**	**QB283**	**08/15/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
MONTGOMERY	9	03040103	35.379722	-80.030278

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	3.5	3	0.1

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	23.9
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	51
pH (s.u.)	7.2

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	14
Bank Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	89

Site Photograph

Substrate: Mostly rubble and gravel with small portions of boulder and sand

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/15/11	11098	EPT	21	21	3.32	3.32	Good
08/24/06	10067	EPT	23	23	3.26	3.26	Good
08/10/06	10050	EPT	30	30	3.52	3.52	Excellent
06/16/05	9660	Qual 4	74	34	3.73	3.28	Excellent
05/11/05	9614	Qual 4	60	34	3.43	2.72	Not Impaired
08/08/01	8550	EPT	26	26	3.19	3.19	Not Rated
08/07/96	7133	Full scale	63	29	3.49	3.00	Excellent
07/31/85	3610	Full scale	60	24	3.70	2.93	Not Rated

Data Analysis

At the time of sampling, this stream had very low flows with most root mats and margin habitat out of the water. While fewer EPT taxa were collected in 2011 compared to the two samples in 2006, the EPT BI was essentially comparable to both samples obtained in 2006. The catchment upstream of this location is contained entirely within the Uwharrie National Forest, and as a result habitat and water quality have remain unchanged. These data suggest that the last two Good bioclassifications were the result of lower flow and less habitat available for invertebrate colonization and not the result of decreasing water quality.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ABBOTTS CR	**SR 1800**	**04/29/10**	**QF28**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIDSON	7	03040103	35.9385249	-80.1464422	12-119-(1)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III;CA	37.1	690	9	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	20.4
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	143
pH (s.u.)	5.9

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	8
Bottom Substrate (15)	3
Riffle Habitat	2
Pool Variety (10)	6
Erosion (7)	2
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	53

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/11	2011-11	10	38	Fair
05/10/06	2006-37	14	40	Fair
05/01/01	2001-32	15	46	Good-Fair
04/24/96	96-34	15	44	Good-Fair

Most Abundant Species, 2011: Bluehead Chub (n=60, 38%)

Exotic Species: Green Sunfish (n=3)

Species Change Since Last Cycle

Gained -- None. **Lost** -- Brassy Jumprock, Flat Bullhead, Tessellated Darter, and Carolina Fantail Darter. All species lost were represented by 1 fish/species, except for Carolina Fantail Darter (n=5).

Data Analysis

Watershed -- drains the extreme southeastern corner of Forsyth and the northeastern corner of Davidson counties, including a portion of the City of Kernersville; one discharger (NC0034452, Qw = 0.08 MGD) approximately 5.5 miles upstream; and this location is approximately 2.9 miles upstream from Lake Tom-a-Lex. **Habitat** -- wide forested riparian zones providing good canopy over the creek, but deeply entrenched with vertical banks and severe bank erosion, abundant coarse woody debris and snags in the channel; riffles formed by sticks in the current; total habitat score range 42-63. **Water Quality** -- specific conductance has been gradually increasing since 1996 (104, 121, 138, 143 µS/cm, respectively) while pH has been gradually decreasing (8.6, 7.0, 6.2, and 5.9 s.u., respectively). **2011** -- low total species diversity; suckers, darters, and intolerant species absent, 1 of 3 sites where no darters were collected; high percentage of tolerant fish. **1996-2011** -- fewer species than expected for a stream of this size, only 19 species known from the site including 1 exotic, 0 intolerant, 2 darters, and 3 sucker species; total number of fish (505, 319, and 159, respectively) and species diversity have been declining since 2001 while the percentage of tolerant fish has been steadily increasing (17%, 37%, and 43%, respectively); but trophically no substantial change since 2001; dominant species is the Bluehead Chub. **Recommendation** -- impairment seems to stem from nonpoint source runoff due to large changes in landuse patterns (i.e., increased imperviousness of the watershed). For example, between 1996 and 2006 the percentage of developed lands increased from 7.4% to 17.8% while the percentage of agricultural lands decreased from 30.9% to 0.6%. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
RICH FK	NC 109	04/29/10	QF29	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIDSON	7	03040103	35.936815	-80.113083	12-119-7b	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	19.1	695	7	0.3	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of High Point's Westside WWTP; Instream Waste Concentration = 93%	NC0024228	6.2

Water Quality Parameters

Temperature (°C)	24.1
Dissolved Oxygen (mg/L)	6.7
Specific Conductance (µS/cm)	410
pH (s.u.)	6.8
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	5
Pool Variety (10)	8
Erosion (7)	3
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	57

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/20/11	2011-45	16	40	Fair
05/10/06	2006-38	16	36	Fair
05/01/01	2001-33	13	40	Fair
04/25/96	96-35	10	34	Poor

Most Abundant Species, 2011 Eastern Silvery Minnow (n=99, 35%)

Exotic Species Swallowtail Shiner and Green Sunfish (n=10 and 4, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Eastern Silvery Minnow (n=99), Golden Shiner (n=1); Gizzard Shad (n=1), Spottail Shiner (n=2), Pumpkinseed (n=1). **Lost** -- Creek Chubsucker (n=2), White Catfish (n=1), Warmouth, Redear Sunfish, Tessellated Darter (n=7).

Data Analysis

Watershed -- drains northeast Davidson, southeast Forsyth, and southwest Guilford counties, including a portion of High Point; two additional dischargers (NC0046035 and NC0055212, Total Q_w=0.026 MGD) located in the stream's headwaters in Forsyth County; tributary to Abbotts Creek and ultimately High Rock Reservoir (Yadkin River). **Habitat** -- side snags and a few deep pools present, woody debris and sticks in the current creating shallow riffles; sand dipping operation downstream and WWTP discharge at end of reach, total habitat score range 39-66, 3 of 4 scores < 60. **Water Quality** -- chlorine/treated effluent odor, greatest specific conductance (along with Rocky River) of any fish site in 2011; range 326-410 µS/cm. **2011** -- twice as many fish collected in 2011 than in 2006 (279 vs. 136); 1 of 3 sites where no darters were collected, suckers and intolerant species were also absent; a more balanced trophic structure present currently than in 2006, but still with evidence of nutrient enrichment. **1996-2011** -- 23 species known from the site including 3 exotics, 0 intolerants, 1 darter, and 1 sucker species; Redlip Shiner, a wide-spread species in the Yadkin River basin, has not been collected since 1996. **Recommendation** -- with proposed expansion of the WWTP and increasing urbanization of its watershed, any improvement in the fish community is not expected to continue and additional basinwide assessment of this impaired stream is not warranted.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LICK CR	NC 8	04/29/10	QF31	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIDSON	8	03040103	35.61305556	-80.17333333	12-126-(3)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	28	580	9	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Denton's WWTP; Instream Waste Concentration = 100%	NC0026689	0.8

Water Quality Parameters

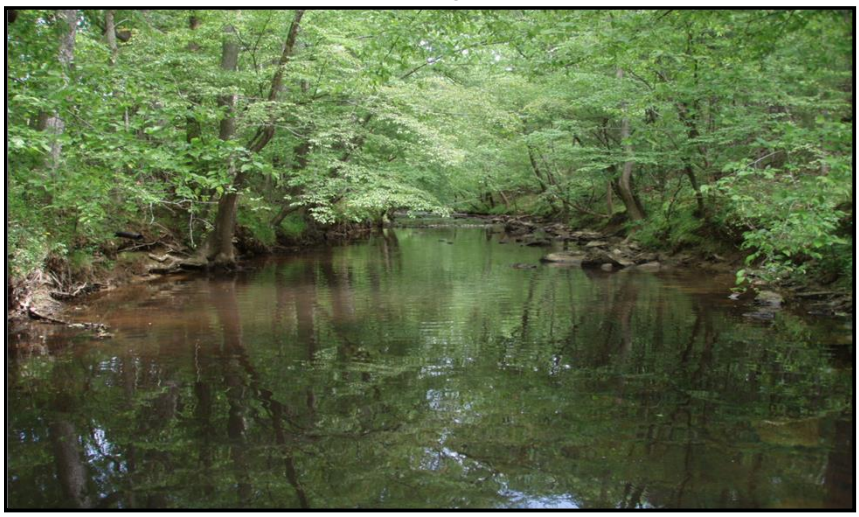
Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	4.6
Specific Conductance (µS/cm)	172
pH (s.u.)	5.7

Water Clarity: Clear/tannic, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	10
Riffle Habitat (16)	10
Pool Variety (10)	8
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	81

Site Photograph



Substrate: Cobble, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/11	2011-12	12	38	Fair
05/10/06	2006-40	14	44	Good-Fair
04/19/01	2001-27	16	44	Good-Fair
04/23/96	96-31	14	44	Good-Fair

Most Abundant Species, 2011: Bluehead Chub (n=297, 48%)

Exotic Species: Green Sunfish (n=10)

Species Change Since Last Cycle

Gained -- First collection ever for White Sucker (n=4), Spotted Sucker (n=21); Eastern Mosquitofish (n=2). **Lost** -- Highfin Shiner (n=2), Creek Chub (n=4), Flat Bullhead (n=1), Warmouth (n=1), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains southeast corner of Davidson County, including the Town of Denton; site is approximately 3 mi. below the WWTP outfall, discharge provides constant flows during droughts; tributary to Tuckertown Reservoir (Yadkin River) and location is approximately 3 miles above the creek's confluence with the reservoir. **Habitat** -- a typical Carolina Slate Belt-type stream with moderate quality instream and riparian habitats; flat, slick rocks; root mats; pools; short and shallow riffles due to very low flow conditions; side and instream snags; periphyton were abundant; total habitat scores 67-81. **Water Quality** -- specific conductance elevated, even more so during the low flow conditions, range 91-172 µS/cm, last three measurements range 123-172 µS/cm; lowered dissolved oxygen concentration, only 52% of saturation. **2011** -- 1.7 times more fish collected in 2011 than in 2006 (625 vs. 368); declines in trophic metrics contributed to a decrease in the NCIBI score and rating; nutrient enrichment evident by the abundance of Bluehead Chub and high percentage of omnivores (54%); continued decline in total species diversity and greater than expected percentage of tolerant fish, primarily Redbreast Sunfish. **1996-2011** -- 22 species known from the site including 3 exotics, 0 intolerants, 2 darters, and 4 sucker species; dominant species are Bluehead Chub (1996, 2001, 2011) and Redbreast Sunfish (2001, 2006); Carolina Fantail Darter absent last two cycles, despite favorable habitat conditions; Highback Chub and Piedmont Darter, two intolerant species, are absent from this Carolina Slate Belt stream; recolonization avenues and source populations are affected by proximity to Tuckertown Reservoir. **Recommendation** --continue basinwide assessment of this site in 2016 to document any impacts from the WWTP.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CABIN CR	SR 2536	04/29/10	QF32	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
DAVIDSON	8	03040103	35.56833333	-80.17944444	12-127-(2)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	18.7	670	11	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	65	0	35	0

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

Water Quality Parameters

Temperature (°C)	22.0
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	116
pH (s.u.)	5.7

Water Clarity: Clear, slightly stained, easily silted

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Cobble, boulder, silt, detritus, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/28/11	2011-13	12	42	Good-Fair
05/11/06	2006-41	16	38	Fair
05/01/01	2001-34	15	48	Good
04/24/96	96-32	12	52	Good

Most Abundant Species, 2011: Bluegill (n=324, 76%)

Exotic Species: Yellow Perch, Redear Sunfish, and Green Sunfish (n=26, 6, and 4, respectively)

Species Change Since Last Cycle

Gained -- First collection ever for Golden Shiner (n=1), Brown Bullhead (n=8); Spotted Sucker, Largemouth Bass. **Lost** -- Bluehead Chub, Notchlip Redhorse, Black Bullhead, Flat Bullhead, Pirate Perch, Chain Pickerel, Eastern Mosquitofish, Redbreast Sunfish. All species gained or lost were represented by 1 or 2 fish/species, except for Redbreast Sunfish (n=10).

Data Analysis

Watershed -- drains southeast Davidson County, including a portion of the Town of Denton; no NPDES dischargers in the watershed; tributary to Tuckertown Reservoir, site is approximately 0.8 mi. upstream of the reservoir. **Habitat** -- a typical Carolina Slate Belt-type stream but periodically impacted by beaver dams and low flow events; pools are deep and wide; large debris dam near the upper one-third of the reach; root mats present; riffles rare; riparian zones bordered by NCWRC Gamelands; total habitat score range 69-74. **Water Quality** -- specific conductance slightly elevated for a Piedmont stream, range 98-116 µS/cm. **2011** -- greatest percentage of diseased fish (Bluegill with nematode popeye; 3.99%) than at any other site in 2011; 3.7 times more fish collected in 2011 than in 2006 (426 vs. 116); skewed trophic structure with percentage of omnivores only accounting for 3% of all the fish collected; Bluehead Chub absent, its abundance has declined from 25% in 2001 to 0% in 2011. **1996-2011** -- 24 species known from the site including 4 exotics, 0 intolerant, 2 darters, 3 suckers, and 7 sunfish species, but only 3 species of minnows; Redlip Shiner, a wide-spread species in the basin, has never been collected at this site; Creek Chub, White Sucker, and Carolina Fantail Darter have not been collected since 1996; proximity to reservoir influences species assemblage and is a barrier to recolonization after prolonged droughts. **Recommendation** --continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
UWHARRIE R	**SR 1406**	**04/29/10**	**QF98**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RANDOLPH	9	03040103	35.76555556	-79.9925	13-2-(0.5)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III	41.3	440	11	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	23.2
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	150
pH (s.u.)	7.1

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Riffle Habitat (16)	4
Pool Variety (10)	6
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	55

Site Photograph

Substrate Sand, slate bedrock, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/20/11	2011-44	19	58	Excellent
05/02/06	2006-30	22	58	Excellent
10/26/99	99-71	15	52	Good
06/15/99	99-49	20	56	Excellent
04/14/99	99-13	18	58	Excellent
04/24/96	96-33	23	56	Excellent

Most Abundant Species, 2011 Spottail Shiner (n=149, 16%)

Exotic Species Swallowtail Shiner (n=131) and Green Sunfish (n=32)

Species Change Since Last Cycle

Gained -- First collection ever for Highfin Shiner (n=1); Piedmont Darter. **Lost** -- Gizzard Shad, White Sucker, Creek Chubsucker, Pumpkinseed, Redear Sunfish. All species gained or lost were represented by 1-3 fish/species.

Data Analysis

Watershed -- drains northwestern Randolph County, including the southwest portion of the City of High Point and the I-85 and US 29/70 corridors; upstream from Lake Reese; borders the Southern Outer Piedmont; one small discharger located in the headwaters (NC0084786, Q_w=0.001 MGD). **Habitat** -- a typical Carolina Slate Belt-type stream with lots of boulder outcrops and bedrock veins; abundant periphyton, boulder chutes and riffles; forested riparian zones; ORVs with access to the stream with evidence of past use; very low flow; total habitat score range 55-79. **Water Quality** -- specific conductance elevated from nonpoint and urban runoff, range 118-150 µS/cm, 4 of 6 measurements > 140 µS/cm. **2011** -- an abundant fish community, almost twice as many fish collected in 2011 than in 2006 (924 vs. 477); despite the low flow and lower quality habitats available under low flow conditions, the community consistently rates Excellent. **1996-2011** -- 28 species known from the site including 3 exotics, 2 intolerants, 3 darters, and 4 sucker species; dominant species are variable, including Bluehead Chub (1996, June 1999), Brassy Jumprock (April 1999), Swallowtail Shiner (October 1999), Bluegill (2006), and Spottail Shiner (2011). **Recommendation** -- continue basinwide monitoring of this site in 2016; qualifies for HQW if so petitioned, although downstream reaches of the river did not qualify as ORW as detailed in BAU Memorandum 20021028.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CARAWAY CR	SR 1331	04/29/10	QF104	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RANDOLPH	9	03040103	35.71583333	-79.93027778	13-2-3	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	43.9	435	8	0.4	No

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

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)	5.1
Specific Conductance (µS/cm)	147
pH (s.u.)	6.6

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	78

Site Photograph

Substrate Cobble, boulder, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/20/11	2011-43	23	54	Excellent
07/07/09	2009-82	19	52	Good
05/08/06	2006-31	19	54	Excellent

Most Abundant Species, 2011 Redbreast Sunfish (n=134, 33%)

Exotic Species Swallowtail Shiner (n=6) and Green Sunfish (n=2)

Species Change Since Last Cycle

Gained -- First collection ever for Whitemouth Shiner (n=1), Swallowtail Shiner (n=6), White Sucker (n=6); Redlip Shiner (n=35), Creek Chub (n=11), Piedmont Darter (n=6). **Lost** -- Brassy Jumprock (n=3), Redear Sunfish (n=2).

Data Analysis

Watershed -- drains west-central Randolph County; the US 311 corridor traverses its headwaters northwest of the City of Asheboro and the US 64 corridor dissects the lower one-third of the watershed west of Asheboro; three small dischargers in the watershed (NC0040908, NC0056201, and NC0086029; Total Q_w = 0.097); tributary to the Uwharrie River. **Habitat** -- Carolina Slate Belt-type stream; abundant cobble and gravel riffles; wide and forested riparian zones; deeply entrenched with moderate-severe bank erosion in some places, total habitat score range 78-82. **Water Quality** -- dissolved oxygen concentrations often low: 62% and 58% of saturation in 2009 and 2011, respectively; conductivity elevated for a Piedmont stream, range 117-147 µS/cm. **2011** -- 1.7 times more fish collected in 2011 than in 2006 (412 vs. 246); percentage of tolerant fish was much greater than expected (44%) and attributed to the abundance of Redbreast Sunfish; Redlip Shiner, a ubiquitous species in the basin, which was absent in 2009, has recovered from the drought, 35 were collected in 2011; rating varies from high Good to Excellent. **2006-2011** -- 27 species known from the site including 3 exotics, 2 intolerants, 3 darters, 4 suckers, and 7 sunfish species; dominant species is Redbreast Sunfish; site was a random Ambient Monitoring site in 2009-2010. **Recommendation** -- continue basinwide assessment of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BETTY MCGEES CR	SR 1107	04/29/10	QF105	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RANDOLPH	9	03040103	35.61055556	-79.95666667	13-2-5	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	8	380	6	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)	16.9
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	110
pH (s.u.)	5.7

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Cobble, gravel, silt, clay

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/17/11	2011-17	17	50	Good
05/08/06	2006-32	18	52	Good
04/16/01	2001-15	15	52	Good
04/18/96	96-24	14	54	Excellent

Most Abundant Species, 2011 Redbreast Sunfish and Highfin Shiner (n=55 (27%) and 54 (27%), respectively)

Exotic Species Green Sunfish (n=5)

Species Change Since Last Cycle

Gained -- First collection ever for White Sucker and Carolina Darter. **Lost** -- Flat Bullhead, Eastern Mosquitofish, Redear Sunfish. All species gained or lost were represented by 1 fish/species.

Data Analysis

Watershed -- drains southwestern Randolph County, including the northern portion of the Uwharrie National Forest's Birkhead Wilderness Area; no municipalities or NPDES dischargers in the watershed; tributary to the Uwharrie River, site is approximately 1.1 miles upstream of the creek's confluence with the river. **Habitat** -- a typical Carolina Slate Belt stream with short, narrow, and shallow riffles; side snags and undercut banks; pools were generally rare; wide riparian zones but of poor quality; water withdrawal structure and concrete weir within reach may affect stream during low flow periods, total habitat score range 72-81 . **Water Quality** -- specific conductance slightly elevated for a Piedmont stream, range 88-100 µS/cm. **2011** -- percentage of tolerant fish greater than expected (39%) attributed to the abundance of Redbreast Sunfish and Creek Chub; slow recolonization of the stream following the droughts of 2007, 2008, and 2010; number of Redlip Shiner and Bluehead Chub much lower in 2011 than in 2006 (2 vs. 42 and 16 vs. 79, respectively). **1996-2011** -- 21 species known from the site including 2 exotics, 1 intolerant, 3 darters, and 2 sucker species; Carolina Darter, a state-listed species of Special Concern, was collected for the first time in 2011; consistently rated Good over the past 10 years. Recommendation -- continue basinwide assessment in 2016 of this small regional reference site.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BARNES CR	**SR 1303**	**04/29/10**	**QF102**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MONTGOMERY	9	03040103	35.4386765	79.9993515	13-2-18-(2.5)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;ORW	22.4	330	12	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)	22.9
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	62
pH (s.u.)	5.5

Water Clarity	Clear/tannic

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Riffle Habitat (16)	10
Pool Variety (10)	10
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	90

Site Photograph

Substrate Angular bedrock, boulder, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/06/11	2011-28	19	54	Excellent
05/09/06	2006-35	17	58	Excellent
04/16/01	2001-16	16	54	Excellent
10/17/97	97-86	12	44	Good-Fair
04/22/96	96-25	10	48	Good

Most Abundant Species, 2011 Redbreast Sunfish and Bluehead Chub (n=170 (26%) and 167 (26%), respectively)

Exotic Species Green Sunfish (n=7)

Species Change Since Last Cycle **Gained** -- First collection ever for Green Sunfish (n=7), Warmouth (n=1), Bluegill (n=11); Spottail Shiner, Yellow Perch. **Lost** -- Notchlip Redhorse, Smallmouth Bass, Largemouth Bass. All species gained or lost were represented by 1 or 2 fish/species.

Data Analysis

Watershed -- drains northwestern Montgomery and southwestern Randolph counties; no municipalities or NPDES dischargers in the watershed; tributary to the Uwharrie River, site is approximately 0.8 miles above the creek's confluence with the river. **Habitat** -- a typical Carolina Slate Belt-type stream with high quality instream and riparian habitats; angular bedrock and boulders; riffles; deep pools; total habitat scores range 85-96. **Water Quality** -- specific conductance greater under low flow than normal/high flow conditions (62 vs. 41-51 µS/cm), range 41-62 µS/cm. **2011** -- 1.5 times more fish collected in 2011 than in 2006 due to the low flow conditions; percentage of tolerant fish, primarily Redbreast Sunfish, was slightly greater than expected (28%). **1996-2011** -- 26 species known from the site including 3 exotics, 3 intolerants, 3 darters, and 3 sucker species; dominant species are Bluehead Chub (1996, 1997, 2006, 2011) and Redbreast Sunfish (2001, 2011); station has consistently rated Excellent during the past 10 years. **Recommendation** -- continued basinwide assessment of this regional reference and ORW site in 2016.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
L MOUNTAIN CR	**SR 1720**	**QB267**	**08/15/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
STANLY	8	03040104	35.381389	-80.113056

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	8.5	4	0.2

	Forested/Wetland	Residential	Agriculture	Road	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

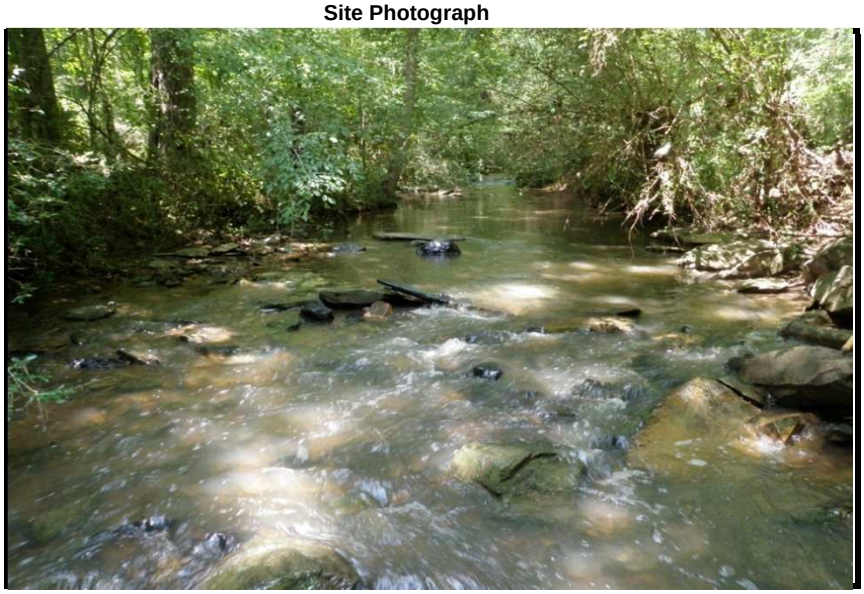
Temperature (℃)	23.4
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	111
pH (s.u.)	6.8

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	15
Pool Variety (10)	5
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	86

Site Photograph



Substrate: An even mix of boulder, rubble and gravel with minimal sand.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/15/11	11096	EPT	10	10	5.00	5.00	Fair
08/10/06	10049	Full Scale	53	10	6.16	6.03	Fair
01/20/04	9323	Full Scale	41	5	6.80	6.68	Poor
08/08/01	8547	Full Scale	54	12	5.84	5.77	Fair
08/07/96	7130	EPT	11	11	5.00	5.00	Fair

Data Analysis

Like other Slate Belt streams, Little Mountain Creek has good habitat yet experiences periodic (although natural) low flow conditions. At the time of sampling, the water had a milky tint and an elevated specific conductance. The list of tolerant EPT taxa was very similar to the 2006 sample. Only one rare stonefly *Eccoptura xanthenes* has ever been found here and it was absent in 2011. Despite a bioclass of Fair, the EPT BI has shown improvement since a 2004 sample rated Poor.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
CLARKS CR	**SR 1110**	**QB299**	**08/15/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
MONTGOMERY	10	03040104	35.210000	-80.041667

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	30.7	2	0.1

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

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

Water Quality Parameters

Temperature (℃)	23.1
Dissolved Oxygen (mg/L)	5.2
Specific Conductance (µS/cm)	98
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	15
Pool Variety (10)	10
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	91

Site Photograph

Substrate: An even mixture of boulder, rubble and gravel.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/15/11	11097	EPT	12	12	5.14	5.14	Fair
08/22/06	10081	EPT	21	21	4.47	4.47	Good
08/08/01	8549	EPT	18	18	4.70	4.70	Good-Fair
08/07/96	7132	Full Scale	82	26	5.86	5.14	Good-Fair

Data Analysis

The excellent habitat at this site is severly compromised by very low flows. All root mats and margin habitat were out of the water with just a small amount of water flowing through the rubble and boulder substrates. The total elimination of stoneflies and intolerant mayflies suggests that this stream may intermittently cease flow. As a result of the stressed conditions , only the most tolerant taxa remain. The bioclass dropped from a borderline Good in 2006 to Fair in 2011. However, 2006 was also an abnormally low-flow year and yet this stream attained its highest rating in that year. Therefore, the decline in 2011 to Fair may be the result of impacts that are independent of flow, or possibly exacerbated by low flow. If assets allow, this site should be re-sampled in 2014 to confirm the 2011 drop in bioclassification.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	NC 731	QB401	08/17/11	Good

County	Subbasin	8 digit HUC	Latitude	Longitude
MONTGOMERY	15	03040104	35.196389	-79.934722

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Triassic Basins	252.0	20	0.3

	Forested/Wetland	Residential	Agriculture	Road	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 (℃)	26.4
Dissolved Oxygen (mg/L)	5.8
Specific Conductance (µS/cm)	79
pH (s.u.)	6.9

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	5
Bank Erosion (7)	6
Bank Vegetation (7)	7
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 rubble with a small amount of sand.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/17/11	11233	Full Scale	77	33	5.30	4.05	Good
08/26/06	10082	Full Scale	85	31	4.68	4.07	Excellent
08/15/01	8589	Full Scale	72	29	4.92	4.19	Good
08/21/96	7196	Full Scale	76	29	5.24	4.30	Good

Data Analysis

This station on the Little River harbored large mats of the macrophyte *Elodea* covering an estimated 30% of the substrate. EPT taxa richness was very similar to the 2006 sample with a few notable exceptions: the long-lived stonefly *Paragnetina sp.* was abundant in in 2006 but was absent in 2011, and the intolerant caddisflies *Helicopsyche borealis* and *Macrostemum sp* .were found for the first time. Total taxa richness declined mainly due to a loss of chironomid midges and the higher BI value dropped the bioclass to Good.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MOUNTAIN CR	**SR 1720**	**04/29/10**	**QF135**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
STANLY	8	03040104	35.36333333	-80.11583333	13-5-(0.7)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	14	380	8	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	133
pH (s.u.)	6.3

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Riffle Habitat (16)	10
Pool Variety (10)	9
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	77

Site Photograph

Substrate: Angled bedrock, cobble, boulder, gravel, silt, detritus

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/27/11	2011-25	10	36	Fair
03/22/04	2004-01	16	50	Good
04/17/01	2001-18	15	46	Good-Fair
04/18/96	96-23	13	50	Good

Most Abundant Species, 2011: Bluehead Chub, Creek Chub, Redbreast Sunfish, Tessellated Darter (n=28 (20%), 27 (20%), 25 (18%), and 24 (17%), respectively).

Exotic Species: Green Sunfish (n=4)

Species Change Since Last Cycle

Gained -- First collection ever for Eastern Mosquitofish (n=1). **Lost --** Highfin Shiner (n=4), Redlip Shiner (n=21), Creek Chubsucker (n=16), Pumpkinseed (n=2), Warmouth (n=3), Bluegill (n=90), Largemouth Bass (n=12).

Data Analysis

Watershed -- drains east-central Stanly County; no municipalities or NPDES dischargers in the watershed; tributary to Lake Tillery (Pee Dee River) at Morrow Mountain State Park. *Habitat* -- a typical Carolina Slate Belt-type stream with moderate quality instream habitats; angled bedrock; open canopy at the bridge; open forested riparian zones with livestock having access to the creek causing bank erosion, nutrient enrichment, and bacterial contamination from fecal matter evident; total habitat scores range 77-88; very low flow. **Water Quality** -- specific conductance elevated because of the low flow conditions, range 74-133 µS/cm. **2011** -- a substantial decline in the NCIBI score and rating due to prolonged drought conditions, possibly exacerbated by the livestock enrichment; far fewer fish (n=138 vs. 472) and fewer species and a large increase in the percentage of tolerant fish (44% vs. 27%), Redlip Shiner, once an abundant species, has dramatically declined since 2004. **1996-2011** -- 19 species known from the site including 2 exotics, 0 intolerant, 1 darter, and 2 sucker species; lack of intolerant species and the low diversity of darters are the result of Lake Tillery serving as a recolonization barrier; dominant species is consistently the Bluehead Chub; a low flow affected stream. **Recommendation** -- because the community is so affected by flow conditions and a lack of recolonization opportunities, future assessments involving Use Support determinations is not advised, unless assessments follow prolonged average- or above-average precipitation seasons; if flows are satisfactory the stream should be re-sampled in April 2012 to verify if declines in the biological integrity of the fish community are persistent and independnet of low flow before placement of the stream on the 303 (d) list.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BROWN CR	SR 1230	04/29/10	QF99	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ANSON	10	03040104	34.88111111	-80.30166667	13-20a	Triassic Basins

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	25.2	310	7	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	16.5
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	119
pH (s.u.)	6.3

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	12
Bottom Substrate (15)	3
Riffle Habitat (16)	5
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	60

Site Photograph

Substrate: Clay, gravel, sand, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/07/11	2011-05	11	34	Poor
04/12/06	2006-14	18	44	Good-Fair
04/10/01	2001-09	20	52	Good
04/16/96	96-16	17	50	Good

Most Abundant Species, 2011: Golden Shiner (n=73, 51%)

Exotic Species: Black Bullhead (n=1)

Species Change Since Last Cycle

Gained -- Creek Chubsucker (n=17), Black Bullhead (n=1). **Lost** -- Rosyside Dace (n=1), Bluehead Chub (n=2), Highfin Shiner (n=1), Redfin Pickerel (n=1), Green Sunfish (n=2), Warmouth (n=5), Bluegill (n=13), Redear Sunfish (n=1), Swamp Darter (n=6), Tessellated Darter (n=1).

Data Analysis

Watershed -- originates in the Town of Pageland in Chesterfield County, SC and flows through the southeastern corner of Union County into southwestern Anson County; site is in the upper part of the watershed and borders the Carolina Slate Belt and Sand Hills; no NPDES dischargers in the watershed; direct tributary to the Pee Dee River. **Habitat** -- pools and side snags; gravel riffles; some woody debris; wide blowout pool downstream from culverts; fairly straight channel with a berm along the east side, may have been historically channelized; at least three deceased swine had been illegally dumped into the creek above the culverts. **Water Quality** -- specific conductance slightly elevated, range 92-126 µS/cm. **2011** -- although the number of fish increased from 2006 (143 vs. 73), the number of species declined and the percentage of tolerant fish (56% vs. 16%, primarily Golden Shiner) increased substantially, along with a shift in the trophic metrics, all indicating a significant change in the community. **1996-2011** -- 25 species known from the site including 3 exotics, 0 intolerants, 3 darters, 1 sucker, and 9 sunfish species; dominant species variable, including Redbreast Sunfish (1996), Whitemouth Shiner (1996), Pirate Perch (2001), Bluegill (2006), and Golden Shiner (2011); Carolina Darter, a state-listed species of Special Concern, has been collected in every cycle; NCIBI scores and ratings have been declining since 2006. **Recommendation** -- continue basinwide monitoring of this site in 2016 because it is the only site that can be waded in this large tributary; if flows are satisfactory the stream should be re-sampled in April 2012 to verify if declines in the biological integrity of the fish community are persistent and before placement of the stream on the 303 (d) list.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE R	SR 1127	04/29/10	QF107	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RANDOLPH	15	03040104	35.55611111	-79.84527778	13-25-(1)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	24.7	600	8	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)	25.4
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	95
pH (s.u.)	6.9
Water Clarity	Clear, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Riffle Habitat (16)	14
Pool Variety (10)	6
Erosion (7)	7
Bank Vegetation (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	89

Site Photograph

Substrate Cobble, boulder, bedrock veins

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/07/11	2011-32	12	48	Good
05/08/06	2006-33	19	56	Excellent
04/14/99	99-12	14	52	Good

Most Abundant Species, 2011 Bluehead Chub (n=188, 31%)

Exotic Species Green Sunfish (n=4)

Species Change Since Last Cycle

Gained -- First collection ever for Green Sunfish (n=4). **Lost** -- Rosyside Dace, Creek Chubsucker, Brassy Jumprock, Snail Bullhead, Warmouth, Bluegill, Redear Sunfish, Largemouth Bass. All species lost were represented by 1-3 fish/species.

Data Analysis

Watershed -- drains southern Randolph County, including the southern portion of the City of Asheboro; headwaters near the intersection of US 49/64/220; one NPDES discharger (NC0089052; Q_w=0.017 MGD) located approximately 4.5 miles upstream; tributary to the Pee Dee River. **Habitat** -- a typical Carolina Slate Belt-type stream with high quality instream and with the same riparian characteristics as in 2006; shallow and wide riffles but many with low flow, root mats out of water; small pools; periphyton abundant with silt depositis in substrates; total habitat scores range 89-94. **Water Quality** -- specific conductance greater under low flow than under normal/high flow conditions, range 71-95 µS/cm, typical for a Piedmont stream. **2011** -- under very low flow conditions there was a loss of species, especially suckers and sunfish, causing the decline in the NCIBI score and rating. **1999-2011** -- 21 species known from the site including 2 exotics, 2 intolerants, 3 darters, and 2 sucker species; dominant species are Redlip Shiner (1999) and Bluehead Chub (1999, 2006, 2011); a low flow affected stream. **Recommendation** -- continue basinwide monitoring of this site in 2016 to document the potential urbanization of the upper watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
DUMAS CR	**SR 1310**	**04/29/10**	**QF111**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MONTGOMERY	15	03040104	35.39388889	-79.89722222	13-25-20-8	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;HQW	13.6	470	7	0.3	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)	20.8
Dissolved Oxygen (mg/L)	4.3
Specific Conductance (µS/cm)	70
pH (s.u.)	5.6

Water Clarity	Clear/tannic

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Riffle Habitat (16)	14
Pool Variety (10)	6
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)	90

Site Photograph

Substrate Angular boulders, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/07/11	2011-30	13	50	Good
04/16/01	2001-17	16	54	Excellent

Most Abundant Species, 2011 Highfin Shiner (n=91, 42%)

Exotic Species No exotic species have ever been collected at this site.

Species Change Since Last Cycle

Gained -- Creek Chubsucker (n=2), Chain Pickerel (n=4), Warmouth (n=1). **Lost** -- Rosyside Dace (n=26), Redlip Shiner (n=154), Creek Chub (n=1), Brassy Jumprock (n=14), Flat Bullhead (n=2), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains north central Montgomery County; no municipalities or NPDES dischargers in the watershed; tributary to Densons Creek and ultimately the Little and Pee Dee rivers. **Habitat** -- a typical Carolina Slate Belt-type stream with high quality instream and riparian habitats; angular rocks with abundant periphyton; variety of shallow pool sizes; snags and undercut banks abundants; wide forested riparian zones; low flow, total habitat scores 84 and 90. **Water Quality** -- specific conductance greater under low flow than under normal flow conditions (70 vs. 48 µS/cm, respectively), still typical for a Piedmont stream; lowered dissolved oxygen concentration, only 48% of saturation. **2011** -- a skewed trophic structure caused by the dominance of insectivores (primarily Highfin Shiner) contributed to the decline in the NCIBI score and rating; although fish were still abundant, less than half the number were collected in 2011 than in 2001 (217 vs. 461); Redlip Shiner, the dominant species in 2001 (n=154, 33%) was absent in 2011; only one specimen of the intolerant Highback Chub was collected, 30 were collected in in 2001; changes were attributed to the persistent droughts, low flows, and loss of instream habitats. **2001 & 2011** -- 19 species known from the site including 0 exotic, 1 intolerant, 3 darters, and 2 sucker species; dominant species are Redlip Shiner (2001) and Highfin Shiner (2011); Carolina Darter, a state-listed species of Special Concern, was collected in 2001 and 2011; a low flow affected stream. **Recommendation** -- continued basinwide monitoring of this reference HQW site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
W FK LITTLE R	**SR 1311**	**04/29/10**	**QF109**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MONTGOMERY	15	03040104	35.48194444	-79.85027778	13-25-15	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	19	560	10	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)	21.6
Dissolved Oxygen (mg/L)	3.7
Specific Conductance (µS/cm)	69
pH (s.u.)	6.1

Water Clarity: Slightly turbid/tannic, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	91

Site Photograph

Substrate: Boulder, bedrock veins, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/07/11	2011-31	20	54	Excellent
05/09/06	2006-34	19	52	Good
04/17/01	2001-20	16	52	Good
04/23/96	96-30	14	56	Excellent

Most Abundant Species, 2011: Redlip Shiner and Bluehead Chub (n=415 (26%), 414 (26%), respectively)

Exotic Species: Green Sunfish (n=2)

Species Change Since Last Cycle: **Gained** -- First collection ever for Spottail Shiner (n=3); Whitemouth Shiner, Spottail Shiner, White Sucker, Green Sunfish. **Lost** -- Golden Shiner, Spotted Sucker, Chain Pickerel. All species gained or lost were represented by 1-3 fish/species.

Data Analysis

Watershed -- drains northeastern Montgomery and southwestern Randolph counties; no municipalities or NPDES dischargers in the watershed; tributary to the Little River and ultimately the Pee Dee River. **Habitat** -- a typical Carolina Slate Belt-type stream with high quality instream and riparian habitats including angular cobble and boulder riffles and long, deep pools; open canopy at the bridge; and abundant periphyton growth, same habitats as in 2006; low flow with many riffles dry, total habitat score range 88-97. **Water Quality** -- specific conductance greater under low flow than under normal/high flow conditions, range 46-69 µS/cm, typical for a Piedmont stream; loweredd dissolved oxygen concentration, less than the water quality standard and only 42% of saturation. **2011** -- a very abundant community, more fish (n=1,620) collected at this site than at any other site in 2011; intolerant Highback Chub were very abundant, number of fish and species collected have steadily increased; slight change in sunfish metric and trophic metrics (no piscivores and fewer omnivores+herbivores) accounted for the slight increase in the NCIBI score and rating; overall, no appreciable change in the community. **1996-201**1 -- 23 species known from the site including 1 exotic, 2 intolerants, 3 darters, and 4 sucker species; dominant species are variable, including Redbreast Sunfish (1996), Redlip Shiner (2001, 2011), and Bluehead Chub (2006, 2011). **Recommendation** -- continue basinwide monitoring of this reference site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ROCKY CR	SR 1549	04/29/10	QF114	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MONTGOMERY	15	03040104	35.2999875	-79.90805556	13-25-30-(0.5)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;HQW	21.4	380	11	0.3	No

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

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)	6.6
Specific Conductance (µS/cm)	62
pH (s.u.)	6.2

Water Clarity: Slightly turbid/tannic, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Riffle Habitat (16)	7
Pool Variety (10)	8
Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	70

Site Photograph

Substrate: Cobble, silt, sand, leafy detritus, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/06/11	2011-29	15	52	Good
05/09/06	2006-36	15	54	Excellent
04/17/01	2001-19	18	54	Excellent

Most Abundant Species, 2011: Redbreast Sunfish (n=74, 44%)

Exotic Species: Green Sunfish (n=6)

Species Change Since Last Cycle

Gained -- Creek Chubsucker (n=1), Flat Bullhead (n=2). **Lost --** Rosyside Dace (n=4), Redlip Shiner (n=94), Bluegill (n=1).

Data Analysis

Watershed -- drains central Montgomery County; one tributary (Warner Creek) drains the Town of Troy; no NPDES dischargers in the watershed; tributary to the Little River. **Habitat** -- cobble riffles with shallow runs and pools present; old beaver dam near the end of the reach; riparian zone altered along the east bank with the clearing of land and house construction; forested land along the west bank were timbered within the past five years; both banks with poor quality riparian zones; low flow; total habitat score range 70-74; no longer considered a fish community regional reference site due to changing landuse. **Water Quality** -- specific conductance greater under low flow (62 µS/cm) than under normal flow conditions (47 µS/cm), still typical for a Piedmont stream. **2011** -- slight decline in NCIBI score and rating due to increase in the dominance by Redbreast Sunfish; community may still be recovering from slow recolonization of the stream following the droughts of 2007, 2008, and 2010. **2001-2011** -- 21 species known from the site including 2 exotics, 2 intolerants, 3 darters, and 3 sucker species; dominant species are Redlip Shiner (2001, 2006) and Redbreast Sunfish (2011); continued decline in the number of fish (530 to 268 to 168, respectively) and increasing dominance of the tolerant Redbreast Sunfish (3% to 23% to 44%) over the past three cycles may signify an overall water quality change; Redlip Shiner, dominant in 2001 and 2006, was absent in 2011. Approximately 100 yards below the site was an open shelf (natural) bedrock cascade which may be a barrier to fish dispersal and re-colonization of the stream following persistent low flow events and droughts. **Recommendation** -- continue basinwide monitoring of this HQW site in 2016 to determine if local watershed changes and low flows may continue to impact the community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CHEEK CR	SR 1541	04/29/10	QF116	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MONTGOMERY	15	03040104	35.16388889	-79.90055556	13-25-36b	Triassic Basins

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	32.3	190	8	0.3	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)	22.3
Dissolved Oxygen (mg/L)	2.9
Specific Conductance (µS/cm)	106
pH (s.u.)	6.3

Water Clarity: Slightly turbid/tannic, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	4
Riffle Habitat (16)	5
Pool Variety (10)	8
Erosion (7)	2
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	61

Site Photograph

Substrate

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/08/11	2011-33	19	48	Good
04/26/06	2006-26	21	50	Good
04/23/96	96-29	19	54	Excellent

Most Abundant Species, 2011: Green Sunfish (n=68, 25%)

Exotic Species: Green Sunfish (n=68)

Species Change Since Last Cycle

Gained -- First collection ever for Black Bullhead (n=3), White Sucker (n=1), Warmouth (n=3), Carolina Darter (n=3). **Lost --** Satinfin Shiner, Comely Shiner, Redlip Shiner, Spottail Shiner, Margined Madtom, Piedmont Darter. All species lost were represented by 1-4 fish/species, except for Spottail Shiner (n=9).

Data Analysis

Watershed -- drains southeastern Montgomery County; no municipalities or NPDES dischargers in the watershed; tributary to the Little River and ultimately the Pee Dee River; site is 0.5 mi. above confluence with the river. **Habitat** -- entrenched with severe bank erosion; forested bluff on right; bare and unstable vertical banks; an abundance of coarse, large woody debris; shallow runs and riffles; low flow conditions, total habit score range 58-66. **Water Quality** -- specific conductance slightly elevated, range 55-106 µS/cm with last two measurements of 110 and 106 µS/cm; lowered dissolved oxygen concentration, less than the water quality standard, and only 33% of saturation. **2011** -- increase in the number of fish and species with multiple age classes were offset by the loss of intolerant species and fewer piscivores, resulting in the decrease in the NCIBI score, but not the rating; percentage of tolerant fish still much greater than expected (48%). **1996-2011** -- a diverse community with 30 species known from the site, including 3 exotics, 2 intolerants, 3 darters, and 4 sucker species; dominant species are variable, including Bluehead Chub (1996), Tessellated Darter (1996, 2006), and Green Sunfish (2011); the tolerant Green Sunfish has been increasing from 0 to 17 to 25% of all the fish collected since 1996; intolerant species, Highback Chub and Piedmont Darter, have become rare at this site (19 to 1 to 0 since 1996); Carolina Darter, a state-listed species of Special Concern, was collected for the first time in 2011.
Recommendation -- continue basinwide monitoring of this site in 2012.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MOUNTAIN CR	**SR 1150**	**04/29/10**	**QF118**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RICHMOND	10	03040104	35.08861111	-79.83527778	13-28-(0.5)	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	65.1	220	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)	22.2
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	86
pH (s.u.)	6.5
Water Clarity	Clear/tannic

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	10
Riffle Habitat (16)	10
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	5
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	76

Site Photograph

Substrate Cobble, boulder, bedrock, gravel, old leafpack detritus

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/08/11	2011-34	26	58	Excellent
04/25/06	2006-25	20	56	Excellent
04/15/96	96-12	16	52	Good

Most Abundant Species, 2011 Bluehead Chub (n=189, 32%)

Exotic Species Green Sunfish (n=14) and Yellow Perch (n=1)

Species Change Since Last Cycle

Gained -- First collection ever for White Sucker (n=2), Notchlip Redhorse (n=1), Chain Pickerel (n=1), Eastern Mosquitofish (n=3), Green Sunfish (n=14), Pumpkinseed (n=6), Black Crappie (n=2), Yellow Perch (n=1); Brassy Jumprock (n=9), Pirate Perch (n=11). **Lost** -- Creek Chub (n=1), Spotted Sucker (n=4), Roanoke Bass (n=2), Largemouth Bass (n=1).

Data Analysis

Watershed -- drains north-northwestern region of Richmond County; the Town of Ellerbee drains into Little Mountain Creek; the town's WWTP (NC0021784) discharges 0.18 MGD into Little Mountain Creek, approximately 4.6 miles upstream of the site; tributary to Blewett Falls Reservoir (Pee Dee River). **Habitat** -- a typical Carolina Slate Belt-type stream with moderate quality habitats; deep, rocky pools above and below the bridge; shallow cobble riffles; snags; boulder outcrops; off-road vehicles with access to the creek just below the bridge which are contributing major sources of sediment to the creek; low flow; total habitat score range 76-80. **Water Quality** -- specific conductance greater under low flow than under normal/high flow conditions (86 vs. 62 µS/cm, respectively), range 42-86 µS/cm, typical for a Piedmont stream. **2011** -- a very diverse and abundant community; more species collected at this site than at any other site in 2011. **1996-2011** -- total diversity steadily increasing; a very diverse community with 31 species known from the site, including 3 exotics, 2 intolerants, 3 darters, and 4 sucker species; dominant species are variable, including Redbreast Sunfish (1996), Redlip Shiner (2006), and Bluehead Chub (2011); 1996 sample was collected under high flow conditions and number of species and fish (n=93) were not typical for this stream. **Recommendation** -- continue basinwide monitoring of this site in 2016; qualifies for HQW if so petitioned.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
ROCKY R	**SR 2420**	**QB333**	**08/02/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Mecklenburg	11	03040105	35.475000	-80.779722

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	13.3	4	0.1

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Rocky River WWTP	NC0046728	>1MGD

Water Quality Parameters

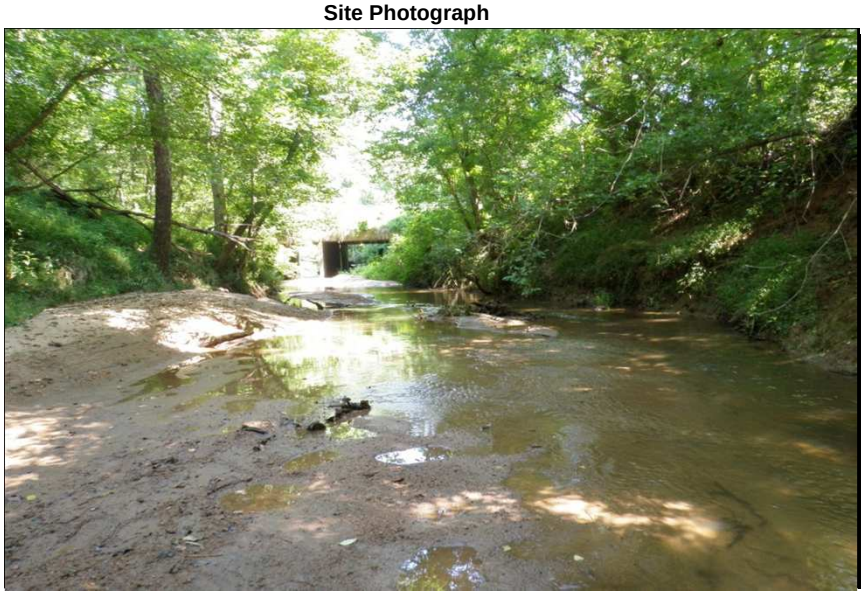
Temperature (℃)	24.3
Dissolved Oxygen (mg/L)	5.3
Specific Conductance (µS/cm)	443
pH (s.u.)	7.1

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	8
Bottom Substrate (15)	3
Pool Variety (10)	3
Riffle Habitat (16)	2
Bank Erosion (7)	1
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	44

Site Photograph



Substrate: Mostly sand with some gravel

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/02/11	11259	EPT	---	9	---	5.82	Fair
08/21/06	10057	Full Scale	48	9	6.6	5.95	Fair
08/21/01	8597	Full Scale	41	8	6.7	6.06	Fair
08/19/96	7164	EPT	---	7	---	6.04	Fair
03/26/85	3416	Full Scale	64	13	6.4	5.00	Fair

Data Analysis

This uppermost macroinvertebrate site in the Rocky River watershed is still below the Rocky River WWTP. Water quality here has consistently rated Fair since 1985. Additionally, after a significant reduction in EPT taxa seen in 1996, richness has remained relatively stable, although the tolerance of the EPT community has slightly decreased over the prior ten years. Reasons for low EPT richness include high specific conductance and very poor habitat. Shifting sediments and scour, due to high flows and collapsing banks, also are detrimental to the benthos.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
ROCKY R	**US 601**	**QB361**	**08/03/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
CABARRUS	12	03040105	35.323889	-80.516389

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	392.0	35	0.4

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	75	25	---	---	---

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Rocky River WWTP	NC0036269	34.0 MGD
Chemical Specialties Inc.	NC0006351	0.025 MGD
Mallard Creek WWTP	NC0030210	12.0 MGD
Rocky River WWTP	NC0046728	5.2 MGD

Water Quality Parameters

Temperature (℃)	26.4
Dissolved Oxygen (mg/L)	5.6
Specific Conductance (µS/cm)	338
pH (s.u.)	6.5

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	10
Bank Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph

Substrate: mostly sand with cobble, some boulder, gravel, and sand

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/03/11	11263	Full Scale	59	17	6.56	5.40	Fair
08/29/06	10069	Full Scale	55	13	6.23	5.40	Good-Fair
07/02/02	8847	Full Scale	40	9	6.82	6.17	Fair
08/22/01	8601	Full Scale	48	15	6.53	5.62	Fair
08/20/96	7168	Full Scale	56	19	6.14	5.44	Good-Fair
07/12/89	4978	Full Scale	66	19	6.35	5.21	Good-Fair

Data Analysis

The Rocky River watershed ranges over western Cabarrus, southern Rowan, and northeastern Mecklenburg Counties. This large river has 3 major dischargers and one minor discharger upstream of the sampling site. The bioclassification at this site has alternated between Good-Fair and Fair over six basinwide cycles. The most recent rating of Fair results from a high Biotic Index and low EPT richness which ,while higher than 2006 richness, is mitigated by a very tolerant non-EPT community, particularly taxa tolerant of enrichment and siltation. As expected, some taxa typically found only in degraded water were collected here and included *Paracloeodes fleeki* and *Paracloeodes minutus.* However, there were also some relatively intolerant taxa such as the caddisfly *Ceraclea enodis* and *Lepidostoma* .

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
Coddle Cr	**SR 1304**	**QB539**	**08/04/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Cabarrus	11	03040105	35.358870	-80.635140

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	68.5	7	0.3

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

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

Water Quality Parameters

Temperature (℃)	25.3
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	166
pH (s.u.)	6.9

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	10
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	7
Bank Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	57

Site Photograph

Substrate: sand with cobble, some boulder and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/04/11	11262	EPT	---	13	---	5.70	Fair
08/21/06	10058	Full Scale	65	13	6.3	5.44	Fair
07/31/03	9119	Full Scale	48	12	6.6	5.85	Fair
08/21/01	8598	Full Scale	67	14	6.6	5.47	Fair
08/19/96	7165	EPT	---	13	---	5.48	Fair

Data Analysis

Coddle Creek drains urban areas southeast of Concord and east of Kannapolis. The basinwide site was moved one road crossing (approx. 2 miles) upstream from NC 49 due to flow and access issues at the previous site. This reduced the drainage area sampled by 6 square miles. While habitat was better at SR 1304 than the previous basinwide site and included more hard substrates, Coddle Creek continued to rate Fair. Urban runoff and habitat issues have kept this stream from improving and is reflected in the low EPT richness seen over the past 5 macroinvertebrate samplings. Stoneflies were completely absent from this site which have historically been absent from the previous basinwide site at NC 49.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
IRISH BUFFALO CR	**SR 1132**	**QB356**	**08/02/11**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Cabarrus	12	03040105	35.347222	-80.547778

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	45.3	8	0.2

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	25	65	---	---	10 (fallow field)

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

Water Quality Parameters

Temperature (℃)	27.2
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	182
pH (s.u.)	7.8

Water Clarity: clear

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Mostly cobble and sand with some boiulder, gravel, and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/02/11	11260	Full Scale	72	20	5.79	5.26	Good-Fair
09/29/06	10070	Full Scale	54	12	6.50	5.88	Fair
08/21/01	8599	Full Scale	56	15	6.30	5.34	Good-Fair
08/19/96	7166	Full Scale	58	15	6.00	5.38	Good-Fair

Data Analysis

Irish Buffalo Creek catchment includes most of Concord and there are no documented dischargers. Extremely low water levels in 2011 may actually have helped to improve water quality as urban runoff from surrounding municipalities was not entering the stream. The stream rated Good-Fair after briefly declining to Fair in 2006 and is reflected by the steadily decreasing Biotic Index. The highest EPT richness ever recorded for this stream occurred in 2011 but did not include any stonefly taxa. Some species never before collected at this site were the baetid mayflies *Acentrella alachua, Procloeon,* and the caddisflies *Chimarra* and *Hydroptila*.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
COLDWATER CR	NC 49	QB343	08/02/11	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude
Cabarrus	12	03040105	35.376667	-80.536389

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Southern Outer Piedmont	57.6	4	0.1

	Forested/Wetland	Urban	Agriculture	Road	Other (describe)
Visible Landuse (%)	50	40	---	---	10 (sewer easement)

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

Water Quality Parameters

Temperature (℃)	29.3
Dissolved Oxygen (mg/L)	4.7
Specific Conductance (µS/cm)	84
pH (s.u.)	6.8

Water Clarity: clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	8
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	0
Bank 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)	55

Site Photograph

Substrate: sand and silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/02/11	11261	EPT	---	14	---	5.82	Good-Fair
08/22/06	10059	EPT	---	13	---	5.76	Fair
08/21/01	8600	EPT	---	15	---	5.45	Good-Fair
08/19/96	7167	EPT	---	14	---	5.27	Good-Fair

Data Analysis

Coldwater Creek is an urban stream that drains most of Concord and Kannapolis. This stream was sampled after a spate in 2006 resulting in high turbid water and probable scour. Sampling in 2011 was performed amidst a drought and flows were very low leading to habitat out of water. Despite these disturbances, Coldwater Creek has had a relatively stable EPT community over the past four basinwide cycles. Coldwater Creek at NC 49 re-attained its Good-Fair rating after dropping to Fair in 2006. The community, however, appears to be shifting to a more tolerant one as seen by the increasing EPT Biotic Index and the absence of stoneflies.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
GOOSE CR	**US 601**	**QB355**	**08/03/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Union	12	03040105	35.153889	-80.535000

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	24.1	7	0.2

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

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

Water Quality Parameters

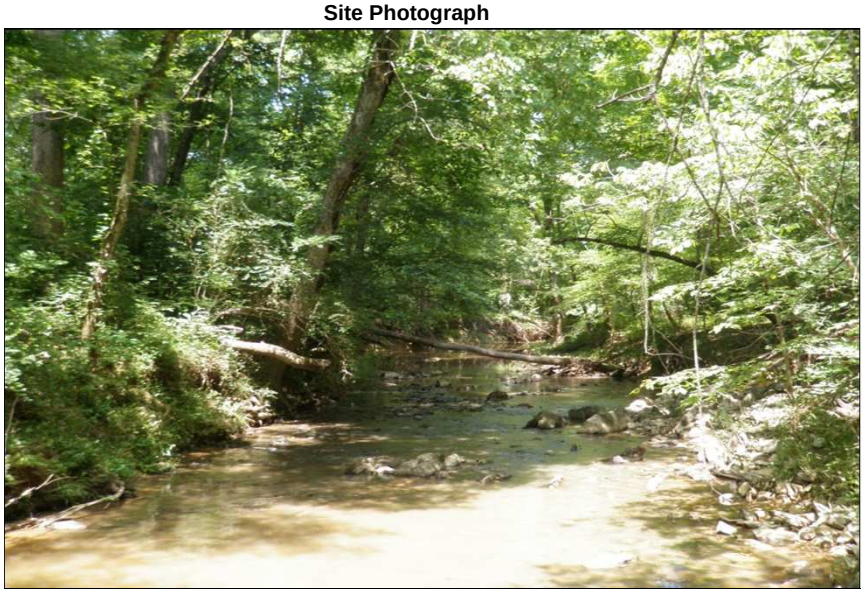
Temperature (℃)	26.1
Dissolved Oxygen (mg/L)	5.0
Specific Conductance (µS/cm)	110
pH (s.u.)	6.0

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	10
Pool Variety (10)	5
Riffle Habitat (16)	14
Bank Erosion (7)	5
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	76

Site Photograph



Substrate: and even mix of boulder, cobble, gravel, sand , and, silt

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/03/11	11264	Full Scale	44	6	6.31	5.69	Fair
07/14/09	10672	Full Scale	61	12	6.82	6.33	Fair
08/22/06	10060	Full Scale	67	11	6.88	6.54	Fair
08/22/01	8603	Full Scale	48	5	7.18	6.22	Poor
04/21/98	7550	Full Scale	47	10	7.36	5.49	Poor
08/20/96	7170	EPT	---	2	---	6.44	Poor

Data Analysis

Goose Creek provides critical habitat for the endangered Carolina heelsplitter, *Lasmigona decorata,* and has been subject to stringent regulation regarding development, riparian buffer rules, and dischargers. Continued macroinvertebrate sampling at US 601 indicates that, since 2001, water quality has improved, possibly as a result of these regulations. This can be seen from the steadily decreasing Biotic Index and increasing EPT richness over time. Low EPT richness in 2011 can be attributed to low flows as much of Goose Creek habitat was out of water. Edge species previously collected, *Oecetis persimilis* and *Triaenodes ignitus* , were entirely absent. Goose Creek substrates are heavily silted, however, and affect the benthos negatively. Goose Creek rated Fair in 2011.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
CROOKED CR	**SR 1547**	**QB344**	**08/03/11**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude
Union	12	03040105	35.145000	-80.471667

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	47.3	7	0.2

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	75	25	---	---	---

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Crooked Creek WWTP #2	NC0069841	1.9 MGD

Water Quality Parameters

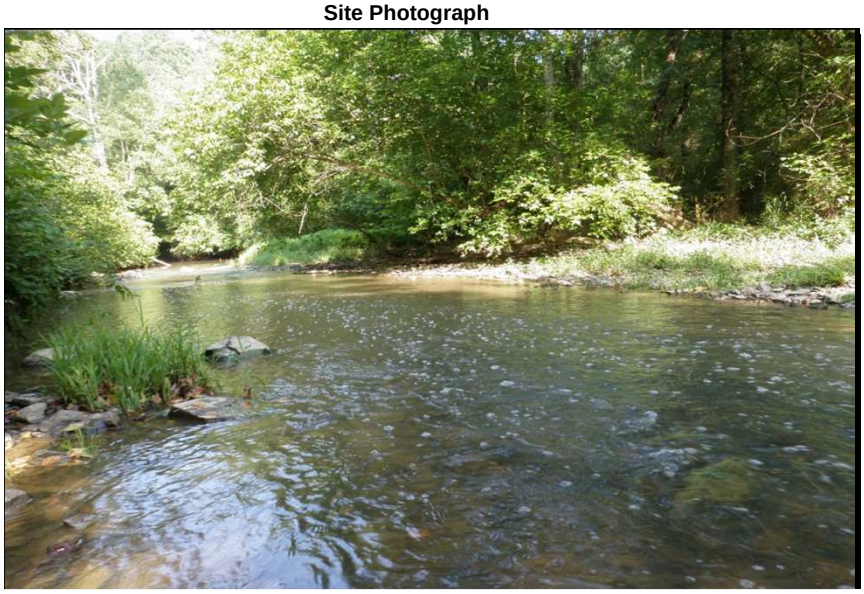
Temperature (℃)	27.5
Dissolved Oxygen (mg/L)	6.2
Specific Conductance (µS/cm)	107
pH (s.u.)	6.9

Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	11
Pool Variety (10)	4
Riffle Habitat (16)	14
Bank Erosion (7)	6
Bank Vegetation (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	78

Site Photograph



Substrate mostly cobble and gravel with a few boulders and some sand

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/03/11	11265	Full Scale	54	13	6.23	5.85	Fair
07/14/09	10743	Full Scale	58	10	6.57	5.46	Fair
08/23/06	10061	Full Scale	63	11	6.33	5.80	Good-Fair
08/22/01	8604	Full Scale	68	18	5.98	4.86	Good-Fair
08/20/96	7171	EPT	---	12	---	4.73	Fair

Data Analysis

The catchment of Crooked Creek encompasses a small northwestern portion of Union County and includes the small municipality of Stallings and a major discharger. Metric values obtained in 2011 as a result of sampling are actually slightly better than when Crooked Creek actually was rated Good-Fair in 2006. However, EPT abundance values in 2011 were about 25% lower than abundance values in 2006 (62 in 2011 vs. 85 in 2006) thereby giving the stream a Fair rating. Flows were chronically low in 2011 and may have negatively affected the benthic abundance. Algae and periphyton were very abundant indicating enrichment. Continued monitoring is justified to ascertain if 2011 conditions are, in fact, stable

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Tracy Morman

Waterbody	Location	Station ID	Date	Bioclassification
LONG CR	**SR 1917**	**QB372**	**08/17/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
STANLY	13	03040105	35.223889	-80.259167

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	0.0	15	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Oakboro WWTP	NC0043532	0.9 MGD
Long Creek WWTP	NC0024244	16.0 MGD

Water Quality Parameters

Temperature (℃)	23.5
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	129
pH (s.u.)	6.7

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	12
Bank Erosion (7)	4
Bank Vegetation (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	85

Site Photograph

Substrate: Cobble and gravel with small portions of boulder,sand and silt.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/17/11	11232	Full Scale	60	22	5.20	4.42	Good
08/23/06	10065	Full Scale	73	22	5.72	4.90	Good
08/23/01	8606	Full Scale	71	20	5.73	4.64	Good-Fair
08/22/96	7177	Full Scale	64	14	5.76	5.03	Good-Fair
07/12/89	4976	Full Scale	76	22	6.16	5.15	Good-Fair

Data Analysis

This location on Long Creek has shown steady improvement since first sampled in 1989. In 2011, total taxa richness was down, but EPT numbers were similar to previous efforts. The mayflies *McCaffertium lenati, Heterocloeon curiosum,* and *Stenacron interpunctatum,* first recorded in 2006, were all abundant in 2011. Another addition to the taxa list in 2011 was the intolerant snail *Elimia sp.* which was also abundant. Both BI and EPT BI improved significantly with this site retaining a bioclass of Good.

BENTHIC MACROINVERTEBRATE SAMPLE

Analyst: Steven Beaty

Waterbody	Location	Station ID	Date	Bioclassification
RICHARDSON CR	**SR 1600**	**QB384**	**08/04/11**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude
Anson	14	03040105	35.158056	-80.236389

Level IV Ecoregion	Drainage Area (mi2)	Stream Width (m)	Stream Depth (m)
Carolina Slate Belt	234.6	20	0.3

	Forested/Wetland	Residential	Agriculture	Road	Other (describe)
Visible Landuse (%)	25	25	50	---	---

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Monroe WWTP	NC0024333	10.4 MGD

Water Quality Parameters

Temperature (℃)	28.5
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	685
pH (s.u.)	7.4

Water Clarity: clear

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: sand with cobble, boulder and gravel. Silt at the edges.

Sample Date	Sample ID	Method	ST	EPT	BI	EPT BI	Bioclassification
08/04/11	11266	EPT	---	26	---	4.11	Good
08/23/06	10064	EPT	---	24	---	4.11	Good
08/22/06	10080	EPT	---	21	---	4.09	Good
08/23/01	8608	EPT	---	24	---	3.92	Good
08/21/96	7176	EPT	---	18	---	4.00	Good-Fair

Data Analysis

This site in Anson County is located near the confluence with the Rocky River but drains northeastern Union County and this location also receives wastewater from the Monroe WWTP. Habitat is relatively good although there are prodigious amounts of green filamentous algae and periphyton present which suggest nutrient enrichment. An overall facultative EPT community resides within Richardson Creek and is relatively diverse for a Piedmont stream. Water conditions at this site are stable and this site rated Good for the fourth consecutive time.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ROCKY R	SR 1608	04/29/10	QF97	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CABARRUS	11	03040105	35.47497	-80.7794608	13-17a	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	13.4	655	6	0.3	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Mooresville's Rocky River WWTP; Instream Waste Concentration=94%	NC0046728	5.2

Water Quality Parameters

Temperature (°C)	17.9
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	410
pH (s.u.)	7.1

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	2
Riffle Habitat (16)	2
Pool Variety (10)	2
Erosion (7)	2
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	46

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/10/11	2011-14	12	42	Good-Fair
05/12/06	2006-45	16	50	Good
04/14/99	99-14	11	32	Poor
04/17/96	96-18	10	34	Poor

Most Abundant Species, 2011: Speckled Killifish and Redlip Shiner (n=26 (29%) and 24 (26%), respectively)

Exotic Species: None

Species Change Since Last Cycle: **Gained** -- none. **Lost** -- Highback Chub (n=4), Spottail Shiner (n=6), Green Sunfish (n=2), Warmouth (n=1).

Data Analysis

Watershed -- drains small portions of southeastern Iredell, northeastern Mecklenburg, and northwestern Cabarrus counties, including the Town of Mooresville; flow, especially during droughts, is augmented by the WWTP discharge. **Habitat** -- poor instream habitats consist of shallow sandy runs and soft, shifting sand substrates; deep pools absent; and coarse woody debris rare; entrenched with sloughing banks although wide and forested riparian zones are present. **Water Quality** -- greatest specific conductance (along with Rich Fork) of any fish site in 2011; range 362-479 µS/cm. **2011** -- generally, a depauperate community in terms of the number of fish collected (n=91) and much lower than expected; four fewer species collected in 20011 than in 2006. **1996-2011** -- 16 species known from the site including 1 exotic, 2 intolerants, 1 darter, and 0 sucker species; dominant species are variable, including Rosyside Dace (1996), Bluehead Chub (1999, 2006), Speckled Killifish (2011) and Redlip Shiner (2011); 3 of the 4 assessments have collected < 100 fish/assessment. **Recommendation** -- continue basinwide monitoring of this site in 2016 to document the continuing urbanization of its watershed and any impacts from the WWTP.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CLARKE CR	SR 1449	04/29/10	QF86	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CABARRUS	11	03040105	35.41416667	-80.75194444	13-17-4	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	21.9	620	6	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	65	0	35	0

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

Water Quality Parameters

Temperature (°C)	22.7
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	196
pH (s.u.)	6.9

Water Clarity	Turbid (greenish)

Habitat Assessment Scores (max)

Channel Modification (5)	0
Instream Habitat (20)	7
Bottom Substrate (15)	1
Riffle Habitat (16)	0
Pool Variety (10)	2
Erosion (7)	2
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	35

Site Photograph

Substrate Silt, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/10/11	2011-16	5	24	Poor
07/18/06	2006-100	9	30	Poor

Most Abundant Species, 2011 Bluegill (n=24, 50%)

Exotic Species Green Sunfish (n=4)

Species Change Since Last Cycle

Gained -- none. **Lost** -- Golden Shiner (n=4), Whitemouth Shiner (n=41), Highfin Shiner (n=5), Spottail Shiner (n=16), Eastern Mosquitofish (n=59).

Data Analysis

Watershed -- drains northeastern Mecklenburg County, including portions of Huntersville; one small discharger (NC0073539, Q_w=0.048 to Ramah Creek, a tributary to Clarke Creek) is located approximately 5.6 miles upstream; tributary to the Rocky River. **Habitat** -- lowest habitat score of any fish community site in 2011; evidence of historic channelization, poor quality instream habitats, moderate bank erosion, primarily one long shallow pool with no riffles present. **Water Quality** -- odor of animal waste, specific conductance greatly elevated, 194 and 196 µS/cm. **2011** --lowest NCIBI score, rating and fewest fish (n=48) and species collected of any fish community site; large decrease in the number of fish collected between 2006 and 2011 (n=235 and 48, respectively); very skewed trophic structure, only site where no omnivores+herbivores were collected; 46% of all fish were the tolerant Redbreast Sunfish and Green Sunfish. **2006 & 2011** -- very low diversity for a stream of its size, only 10 species known from the site (the fewest of any site in 2011 for which more than one assessment has been made) including 1 exotic, 0 intolerant, 1 darter, and 0 sucker species. **Recommendation** -- until water quality enhancement projects are implemented throughout the watershed, continued basinwide monitoring of this site is unnecessary because no improvements are to be expected in the fish community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MALLARD CR	**SR 2467**	**04/29/10**	**QF91**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	11	03040105	35.32611111	-80.77361111	13-17-5a	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	11.9	620	7	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	20.0
Dissolved Oxygen (mg/L)	9.5
Specific Conductance (µS/cm)	149
pH (s.u.)	6.9

Water Clarity	Clear

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Cobble, boulder, sand (in the pools)

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/10/11	2011-15	18	54	Excellent
07/18/06	2006-99	16	44	Good-Fair
04/19/01	2001-26	20	56	Excellent
06/10/96	96-69	19	50	Good

Most Abundant Species, 2011 Redlip Shiner (n=148, 21%)

Exotic Species Green Sunfish (n=2)

Species Change Since Last Cycle

Gained -- Rosyside Dace (n=36), Highback Chub (n=3), Highfin Shiner (n=1), White Sucker (n=2), Creek Chubsucker (n=1). **Lost** -- Eastern Mosquitofish (n=1), Bluegill (n=31), Redear Sunfish (n=3).

Data Analysis

Watershed -- drains the northeast metropolitan area of the City of Charlotte; no NPDES dischargers in the watershed; tributary to the Rocky River. **Habitat** -- good instream and riparian habitats for an urban stream; a Carolina Slate Belt-type stream with plentiful angular rock substrate, frequent riffles and shelves; stable banks; filamentous algae at nuisance levels; low flow; total habitat scores range 70-80. **Water Quality** -- specific conductance elevated from urban runoff, range 135-153 µS/cm. **2011** -- community rated Excellent as it had in 2001; an abundant and diverse community; increases in the number of sunfish, suckers, and intolerant species collected and improvements in a more balanced trophic structure; intolerant species (Highback Chub) had returned, but still rare (n=3). **1996-2011** -- abundant and diverse community, 24 species known from the site, including 2 exotics, 2 intolerants, 2 darters, and 3 sucker species; dominant species are Bluehead Chub (1996), Redlip Shiner (2001, 2011), and Spottail Shiner (2006); dominance by Bluehead Chub gradually decreasing (38% to 22% to 11% to 9%) which may cause an ultimate decrease in nest associates (i.e., Redlip Shiner); because of its size, piscivores (primarily Largemouth Bass) are absent from this site; only one intolerant species known from this site, Highback Chub, and it has become rare, only 3 specimens collected in 2011 and it was absent in 2006; a low flow affected stream; NCIBI scores and ratings variable, from Good-Fair to Excellent. **Recommendation** -- continue basinwide monitoring of this unique urban site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
REEDY CR	**SR 1136**	**04/29/10**	**QF94**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CABARRUS	11	03040105	35.30333333	-80.59472222	13-17-8	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	30.9	525	10	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Cedar Park Estates WWTP	NC0034711	0.03

Water Quality Parameters

Temperature (°C)	14.0
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	214
pH (s.u.)	6.6

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Riffle Habitat (16)	2
Pool Variety (10)	10
Erosion (7)	1
Bank Vegetation (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	51

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/08/11	2011-06	20	56	Excellent
07/18/06	2006-101	17	46	Good-Fair
04/18/01	2001-24	17	46	Good-Fair

Most Abundant Species, 2011: Tessellated Darter (n=70, 34%)

Exotic Species: Green Sunfish (n=14)

Species Change Since Last Cycle

Gained -- First collection ever for Eastern Mosquitofish (n=1), Pumpkinseed (n=1), Fantail Darter (n=5); White Sucker, Brassy Jumprock, Flat Bullhead, Margined Madtom. **Lost** -- Gizzard Shad, Sandbar Shiner, Warmouth, Largemouth Bass. All species gained or lost were represented by 1-8 fish/species.

Data Analysis

Watershed -- drains northeastern Mecklenburg and southwestern Cabarrus counties, including portions of Charlotte; downstream from five NPDES dischargers with a total Q_w=1.78 MGD (largest discharger's Q_w= 0.95 MGD). **Habitat** -- sloughing banks contribute large quantities of sand and coarse woody debris; large, fallen tree trunks provide instream cover, riffles, snags, and side pools; very sinuous; severe erosion and sediment deposition evident; deeply entrenched; total habitat scores range 33-51; greater flow than in previous cycle. **Water Quality** -- greatly elevated specific conductance from dischargers and nonpoint sources, range 211-329 µS/cm. **2011** -- surprisingly high diversity and rating of the community; increase in the diversities of darters and suckers, a more balanced trophic structure, and a greater percentage of species with multiple age classes, all contributed to an increase in the NCIBI score and rating. **2001-2011** -- 25 species known from the site including 2 exotics, 2 intolerants, 3 darters, and 2 sucker species; dominant species are variable, including Bluehead Chub (2001), Spottail Shiner(2006), and Tessellated Darter (2011). **Recommendation** -- continue basinwide monitoring of this site in 2016 to document the increasing urbanization of the watershed and any impacts from the dischargers.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
IRISH BUFFALO CR	**SR 1132**	**04/29/10**	**QF95**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CABARRUS	12	03040105	35.34833333	-80.54833333	13-17-9-(2)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	45.4	520	10	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	10	25	65	0

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

Water Quality Parameters

Temperature (°C)	22.0
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	208
pH (s.u.)	6.7

Water Clarity: Slightly turbid, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	83

Site Photograph

Substrate: Cobble, gravel, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/26/11	2011-21	22	56	Excellent
05/12/06	2006-46	18	54	Excellent
04/19/01	2001-25	22	50	Good
04/17/96	96-20	20	52	Good

Most Abundant Species, 2011: Bluehead Chub (n=72, 18%)

Exotic Species: Green Sunfish (n=17)

Species Change Since Last Cycle

Gained -- First collection ever for Sandbar Shiner and Notchlip Redhorse (n=2 each); American Eel (n=1), Highback Chub (n=1), Golden Shiner (n=1), Whitemouth Shiner (n=1), sunfish hybrid (n=1), Largemouth Bass (n=4). **Lost** -- Gizzard Shad (n=21), Threadfin Shad (n=6), Rosyside Dace (n=1).

Data Analysis

Watershed -- drains southwestern Rowan and northern Cabarrus counties, including the cities of Kannapolis and Concord; impounded upstream by Kannapolis Lake; one small discharger (NC0006220; Q_w=0.367) is located approximately 16 miles upstream; borders the Carolina Slate Belt; tributary to Coldwater Creek and ultimately the Rocky River. **Habitat** -- Carolina Slate Belt-type stream; same habitats as in 2006; cobble riffles; with shallow pools and snags; silt deposits, total habitat scores range 51-83. **Water Quality** -- specific conductance elevated from urban runoff, but stable, range 195-208 µS/cm. **2011** -- a diverse and abundant community, increase in the percentage of piscivores was off-set by an increase in the percentage of tolerant fish (primarily Satinfin Shiner, Redbreast Sunfish, and Green Sunfish) which was slightly greater than expected (28%); some nutrient enrichment continued to be evident by the greater than expected percentage of omnivores (primarily Bluehead Chub and Spottail Shiner); overall no change in rating. **1996-2011** -- a very diverse and abundant fish community with 28 species known from the site including 3 exotics, 2 intolerants, 3 darters, and 4 sucker species; dominant species is the Bluehead Chub (18-34%). **Recommendation** -- continue basinwide monitoring of this site in 2016 to document the increasing urbanization of its watershed on the resident fish community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
COLDWATER CR	**NC 73**	**04/29/10**	**QF96**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CABARRUS	12	03040105	35.41583333	-80.55583333	13-17-9-4-(1.5)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	34.6	550	10	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	16.1
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	123
pH (s.u.)	6.0
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	3
Riffle Habitat (16)	3
Pool Variety (10)	8
Erosion (7)	4
Bank Vegetation (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	55

Site Photograph

Substrate Sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/08/11	2011-07	18	48	Good
05/12/06	2006-47	14	36	Fair
04/18/01	2001-23	17	44	Good-Fair
04/17/96	96-19	19	52	Good

Most Abundant Species, 2011 Satinfin Shiner (n=70, 20%)

Exotic Species Green Sunfish (n=4)

Species Change Since Last Cycle

Gained -- First collection ever for American Eel (n=1), Spottail Shiner (n=45); Redlip Shiner (n=20), Green Sunfish (n=4). **Lost** -- Creek Chubsucker (n=1).

Data Analysis

Watershed -- drains southwestern Rowan and northern Cabarrus counties, including the cities of Kannapolis and Concord; no NPDES dischargers in the watershed; impounded upstream by lakes Fisher and Concord; tributary to the Rocky River. **Habitat** -- undercut banks; snags; sandy runs; large coarse woody debris dam at the end of the reach; total habitat score range 40-55. **Water Quality** -- much lower specific conductance at the higher flow in 2011 than in the lower flow years of 2001 and 2006, but still moderately to greatly elevated, range 123-202 µS/cm. **2011** -- increases in total species diversities, a very balanced trophic structure, and a majority of species with multiple age classes all lead to a substantial increase in the NCIBI score and rating; almost twice as many fish collected in 2011 than in 2006 (344 vs. 190); percentage of tolerant taxa greater than expected and increasing gradually since 2001 (from 24% to 30% to 43%). **1996-2011** -- 24 species known from the site including 1 exotic, 1 intolerant, 2 darters, and 1 sucker species; dominant species are variable, including Redbreast Sunfish (1996), Speckled Killifish (2001), Whitemouth Shiner (2006), and Satinfin Shiner (2011); only one intolerant species (Highback Chub) known from this site and it has not been collected during the past two cycles whereas 27 had been collected in 2001. **Recommendation** -- continue basinwide monitoring of this site in 2016 to document the increasing urbanization of its watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ISLAND CR	SR 1118	04/29/10	QF77	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
STANLY	14	03040105	35.1975	-80.37388889	13-17-26	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	19.2	370	7	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	25.1
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	112
pH (s.u.)	6.1

Water Clarity: Clear/tannic; easily sitled

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Riffle Habitat (16)	14
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	87

Site Photograph

Substrate: Bedrock, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/26/11	2011-23	17	50	Good
04/13/06	2006-17	18	54	Excellent
04/11/01	2001-13	20	54	Excellent

Most Abundant Species, 2011: Tessellated Darter (n=55, 22%) and Bluehead Chub (n=50, 20%)

Exotic Species: Green Sunfish (n=19)

Species Change Since Last Cycle: **Gained** -- First collection ever for Golden Shiner (n=2), Eastern Mosquitofish (n=4); White Sucker (n=1). **Lost** -- Redlip Shiner (n=2), Spottail Shiner (n=11), Bluegill (n=10), Redear Sunfish (n=1).

Data Analysis

Watershed -- drains the southwest corner of Stanly County between the small towns of Stanfield and Oakboro; no NPDES dischargers in the watershed; tributary to the Rocky River. **Habitat** -- a typical Carolina Slate Belt type stream with moderately high quality instream and riparian habitats; slick bedrock and cobble riffles; undercut banks with well developed root mats; bedrock pools of various depths; abundant periphyton; low flow, total habitat score range 78-87. **Water Quality** -- specific conductance slightly elevated, but stable even under low flow conditions, range 93-112 µS/cm. **2011** -- slight changes in the percentage of piscivores, tolerant fish, and species with multiple age classes contributed to a slight decrease in the NCIBI rating and score; intolerant species continue to be absent; Redlip Shiner, a wide-spread species was absent; decline attributed to low flow conditions. **2001-2011** -- 26 species known from the site including 2 exotics, 1 intolerant, 2 darters, and 2 sucker species; dominant species are Bluehead Chub (2001-2011) and Tessellated Darter (2006, 2011); only one intolerant species(Highback Chub) known from this site and it has not been collected during the past two cycles, 22 had been collected in 2001. Highback Chub, an intolerant species, has not been collected since 2001; Carolina Darter, a state-listed species of Special Concern, has been collected in every cycle; a low flow affected stream. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG BEAR CR	**NC 73**	**04/29/10**	**QF79**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
STANLY	13	03040105	35.3825	-80.34277778	13-17-31-5	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	19.1	490	9	0.3	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	15	10	75	0

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

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	3.4
Specific Conductance (µS/cm)	168
pH (s.u.)	6.1
Water Clarity	Clear, easily silted

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	10
Riffle Habitat (16)	10
Pool Variety (10)	8
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	82

Site Photograph

Substrate bedrock, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/27/11	2011-24	13	36	Fair
06/24/04	2004-105 (@ SR 1134)	16	46	Good-Fair
04/18/01	2001-21	13	48	Good
04/18/96	96-22	15	52	Good

Most Abundant Species, 2011 Whitemouth Shiner (n=176, 38%)

Exotic Species Green Sunfish (n=53)

Species Change Since Last Cycle (2001) **Gained** -- First collection ever for Rosyside Dace (n=3), Creek Chub (n=2), Eastern Mosquitofish (n=4); Bluehead Chub, Bluegill. **Lost** -- Redlip Shiner, Notchlip Redhorse, Redbreast Sunfish, Warmouth, Fantail Darter. All species gained or lost were represented by 1-6 fish/species).

Data Analysis

Watershed -- drains west-central Stanly and northeastern Cabarrus counties; no municipalities or NPDES dischargers in the watershed; tributary to the Rocky River. **Habitat** -- a typical Carolina Slate Belt type stream with moderately high quality instream and riparian habitats; angular bedrock; shallow pools and riffles; although riffles mostly dry due to low flow conditions; silt deposits on substrates; total habitat scores range 75-82. **Water Quality** -- elevated specific conductance under low flow conditions, has ranged from 81-168 µS/cm; lowered dissolved oxygen concentration, less than the water quality standard, and only 38% of saturation. **2011** -- loss of a species of sucker and sunfish and a highly skewed trophic structure (4% omnivores and 96% insectivores) caused a substantial decline in the NCIBI score and rating between 2001 and 2011; changes were attributed to the low flow conditions. **1996-2011** -- 22 species known from the site including 1 exotic, 0 intolerant, 3 darters, and 1 sucker species; dominant species are Whitemouth Shiner (1996, 2011) and Highfin Shiner (2001); Carolina Darter, a state-listed species of Special Concern, was collected in 2001 and 2011; changes due to persistent low flow conditions and slow recolonization (e.g. by Margined Madtom and Fantail Darter) of the stream following the droughts of 2007, 2008, and 2010 rather than any significant water quality change. **Recommendation** -- continued basinwide assessments of this site, if flows are satisfactory the stream should be re-sampled to verify if declines in the biological integrity of the fish community are persistent and before placement of the stream on the 303 (d) list.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SALEM CR	SR 1006	04/29/10	QF83	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
UNION	14	03040105	35.075	-80.36833333	13-17-36-15	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	23.6	390	9	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)	21.3
Dissolved Oxygen (mg/L)	2.9
Specific Conductance (µS/cm)	249
pH (s.u.)	5.9
Water Clarity	Clear/tannic

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/26/11	2011-22	16	50	Good
04/12/06	2006-16	17	46	Good-Fair
04/11/01	2001-12	18	48	Good
06/10/96	96-68	19	36	Fair

Most Abundant Species, 2011 Pirate Perch (n=173, 29%)

Exotic Species Green Sunfish (n=56)

Species Change Since Last Cycle

Gained -- First collection ever for sunfish hybrid (n=1); Golden Shiner, Redlip Shiner, Spotted Sucker, Brown Bullhead. **Lost** -- Spottail Shiner, Creek Chub, Brassy Jumprock, Flat Bullhead, Eastern Mosquitofish. All species gained or lost were represented by 1-3 fish/species, except for Golden Shiner (n=19).

Data Analysis

Watershed -- drains eastern Union County, including the north side of the Town of Marshville, including the US 74 corridor; no NPDES dischargers in the watershed; tributary to Richardson Creek and ultimately the Rocky River. **Habitat** -- a typical Carolina Slate Belt-type stream with moderate quality instream and riparian habitats; silt deposits, with long pools, left riparian zone has re-vegetated from past timber harvesting; total habitat scores range 77-81. **Water Quality** -- greatly elevated specific conductance under low flow conditions; urban and nonpoint source runoff contribute to elevated conductivity, range 153-249 µS/cm; lowered dissolved oxygen concentrations, less than the water quality standard, and only 33% of saturation. **2011** -- more than twice as many fish collected in 2011 than in 2006 (607 vs. 231); very strong Age 1 class for Pirate Perch; Redlip Shiner, a wide-spread species, still rare (n=1); slight decrease in the percentage of tolerant fish and a greater percentage of species with multiple age classes led to the slight increase in NCIBI score and rating; change in rating attributed to low flow rather than a change in water quality. **1996-2011** -- 27 species known from the site including 2 exotics, 0 intolerants, 2 darters, and 3 sucker species; dominant species are variable and include Redbreast Sunfish (1996), Highfin Shiner (2001), Green Sunfish (2006), and Pirate Perch (2011); Redlip Shiner rare at the site, only 3 specimens collected in four monitoring cycles; intolerant species (Highback Chub and Piedmont Darter) absent from this small Carolina Slate Belt stream; a low flow-affected stream. **Recommendation** -- continue basinwide monitoring of this site in 2016 to document any future urbanization of its watershed.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CARTELEDGE CR	SR 1142	04/29/10	QF122	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
RICHMOND	16	03040201	34.98722222	-79.84527778	13-35	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	30.2	140	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)	11.1
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	35
pH (s.u.)	5.1

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	6
Riffle Habitat (16)	5
Pool Variety (10)	10
Erosion (7)	6
Bank Vegetation (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	75

Site Photograph

Substrate: Gravel, sand, some cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/06/11	2011-01	14	46	Good-Fair
04/10/06	2006-06	21	52	Good
04/06/01	2001-05	17	50	Good

Most Abundant Species, 2011: Bluegill (n=23, 26%)

Exotic Species: Green Sunfish (n=1)

Species Change Since Last Cycle

Gained -- First collection ever for Whitefin Shiner (n=2), Creek Chubsucker (n=2), Chain Pickerel (n=1); Green Sunfish. **Lost** -- Rosyside Dace, Highfin Shiner, Redlip Shiner, Coastal Shiner, Sandbar Shiner, Margined Madtom, Flat Bullhead, Redfin Pickerel, Eastern Mosquitofish, Warmouth, Largemouth Bass. All species lost were represented by 1 or 2 fish/species, except for Redlip Shiner and Highfin Shiner (n=18 and 3, respectively)

Data Analysis

Watershed -- drains western Richmond County with its headwaters in the Town of Ellerbee; no NPDES dischargers in the watershed; borders the Triassic Basin; direct tributary to the Pee Dee River. **Habitat** -- an atypical Carolina Slate Belt-type stream with no angular rocks and no rock riffles; many snags present, wide riparian zones bordering the NCWRC Pee Dee River Game Land; total habitat scores range 61-78. **Water Quality** -- specific conductance range 35 µS/cm (high-normal flow) to 67 µS/cm (low flow). **2011** -- decrease in the NCIBI and rating between 2011 and 2006 was due to substantial declines in the number of species and fish collected (88 vs. 170, especially Bluehead Chub and Redlip Shiner); lower than expected diversities of darters and suckers, and slightly greater percentage of tolerant fish than expected, also 7 of 14 species with only 1 or 2 fish per species (similar to 2001 and 2006); declines in diversities and abundances may be due to slow recolonization of the stream following the droughts of 2007, 2008, and 2010 rather than any gross water quality change. **2001-2011** -- 27 species known from the site including 1 exotic, 2 intolerants, 2 darters, and 2 sucker species; dominant species are Bluehead Chub (2001, 2006) and Bluegill (2011); a low flow affected stream. **Recommendation** -- continue basinwide monitoring of this reference site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BAILEY CR	**SR 1811**	**04/29/10**	**QF130**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ANSON	17	03040201	34.92277778	-80.01861111	13-42-1-3	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	13	250	5	0.3	No

	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)	12.9
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	96
pH (s.u.)	5.2

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	4
Riffle Habitat (16)	4
Pool Variety (10)	6
Erosion (7)	5
Bank Vegetation (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	57

Site Photograph

Substrate: Sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/06/11	2011-02	14	52	Good
04/10/06	2006-08	14	44	Good-Fair
04/06/01	2001-06	20	52	Good
04/15/96	96-14	19	52	Good

Most Abundant Species, 2011: Bluehead Chub (n=72, 35%)

Exotic Species: None

Species Change Since Last Cycle

Gained -- Yellow Bullhead (n=2), Piedmont Darter (n=1). **Lost** -- Whitemouth Shiner (n=4), Bluegill (n=6).

Data Analysis

Watershed -- drains southeast Anson County, including the eastern portion of the Town of Wadesboro; no NPDES dischargers in the watershed; borders the Triassic Basin; tributary to North Fork Jones Creek and ultimately the Pee Dee River. **Habitat** -- an atypical substrate Carolina Slate Belt-type stream with no angular rocks; no riffles but instead with sand and gravel runs with some snags and undercuts; livestock are now fenced out along both sides of the stream; total habitat scores range 43-62. **Water Quality** -- specific conductance slightly elevated from urban runoff and agriculture, range 82-122 µS/cm. **2011** -- 1 of 2 sites where only one species of sunfish (Redbreast Sunfish) was collected; slight improvements in the disease and trophic metrics. **1996-2011** -- 24 species known from the site including 1 exotic, 1 intolerant, 2 darters, and 1 sucker species; intolerant species, Piedmont Darter, rare at this site (n=5 since 1996); dominant species is Bluehead Chub; decline in the NCIBI score and rating in 2006 may have been due to low flow conditions; several species of catfish and sunfish (e.g., Flat Bullhead, Warmouth, Pumpkinseed, etc.) have not recolonize the stream following the persistent droughts and species diversity remains lower than previous assessments. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK JONES CR	**SR 1821**	**04/29/10**	**QF131**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ANSON	17	03040201	34.89611111	-80.01138889	13-42-2	Carolina Slate Belt

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	34.6	225	8	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)	12.2
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	73
pH (s.u.)	5.8

Water Clarity: Slightly turbid/tannic

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	4
Riffle Habitat (16)	5
Pool Variety (10)	6
Erosion (7)	7
Bank Vegetation (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	66

Site Photograph

Substrate: Sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/07/11	2011-03	15	42	Good-Fair
04/11/06	2006-10	15	44	Good-Fair
04/10/01	2001-08	18	54	Excellent

Most Abundant Species, 2011: Bluehead Chub (57, 38%)

Exotic Species: No exotic species have ever been collected at this site.

Species Change Since Last Cycle

Gained -- First collection ever for Highback Chub (n=1), Notchlip redhorse (n=1), Chain Pickerel (n=1); Sea Lamprey, Pumpkinseed. **Lost** -- Spottail Shiner, Margined Madtom, Redfin Pickerel, Piedmont Darter. All species gained or lost were represented by 1 or 2 fish/species, except for Piedmont Darter and Spottail Shiner (n=7 and 2, respectively).

Data Analysis

Watershed -- drains south-central Anson County; no municipalities or NPDES dischargers in the watershed; borders the Triassic Basins; tributary to Jones Creek and ultimately the Pee Dee River. **Habitat** -- an atypical Carolina Slate Belt-type stream with no angular rocks; same habitats as in 2006 -- rock riffles absent although gravel runs were observed, side snags and instream deadfalls common with wide riparian zones; total habitat scores range 50-66. **Water Quality** -- specific conductance typical for a Piedmont stream, range 59-73 µS/cm. **2011** -- three metrics improved (two diversity and one multiple class metrics), but three metrics declined (one diversity, one tolerant, and disease metrics); a slight decrease in the NCIBI score, but not the rating. **2001-2011** -- 25 species known from the site including 0 exotic, 2 intolerants, 2 darters, and 1 sucker species; dominant species is Bluehead Chub; community may be affected by persistent low conditions typical of Carolina Slate Belt and Triassic Basins creeks, rather than nonpoint source runoff impacts. **Recommendation** -- continue basinwide monitoring of this site in 2016.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MILL CR	SR 1826	04/29/10	QF132	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ANSON	16	03040201	34.85638889	-79.91666667	13-43	Sand Hills

Stream Classification	Drainage Area (mi^2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	18.6	105	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)	12.8
Dissolved Oxygen (mg/L)	10.4
Specific Conductance (µS/cm)	47
pH (s.u.)	5.6

Water Clarity	Clear/tannic

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	5
Riffle Habitat (16)	7
Pool Variety (10)	10
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)	81

Site Photograph

Substrate Gravel, sand, cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/07/11	2011-04	22	54	Excellent
04/11/06	2006-11	26	56	Excellent

Most Abundant Species, 2011 Bluehead Chub (24, 16%)

Exotic Species No exotic species have ever been collected at this site.

Species Change Since Last Cycle

Gained -- Eastern Silvery Minnow, Golden Shiner, White Sucker, Chain Pickerel, Dollar Sunfish. **Lost** -- Satinfin Shiner, Highback Chub, Spottail Shiner, Yellow Bullhead, Mud Sunfish, Pumpkinseed, Warmouth, Spotted Sunfish, Largemouth Bass, Piedmont Darter. All species gained or lost were represented by 1 or 2 fish/species, except for Piedmont Darter and Spottail Shiner, n=12 and 9, respectively.

Data Analysis

Watershed -- drains southeastern Anson County, including the small Town of Morven; no NPDES dischargers in the watershed; borders the Carolina Slate Belt; direct tributary to the Pee Dee Rive, site is approximately 1.1. miles above the creek's confluence with the river. **Habitat** -- same habitats as in 2006 with characteristics of Piedmont and Sand Hills streams -- coarse woody debris log jams present, undercut banks, runs, and side and bend pools present with wide riparian zones; total habitat scores 74 and 81. **Water Quality** -- specific conductance typical for a lower drainage basin stream, 47 and 58 µS/cm. **2011**-- slight change in two metrics (an increase in the diversity of suckers and an absence of both intolerant species, Highback Chub and Piedmont Darter, that were collected in 2006), but no overall change in the rating of the community. **2006 & 2011** -- a very diverse community with 32 species known from the site (the most of any site in 2011 for which more than one assessment has been made) including 0 exotic, 2 intolerants, 3 darters, 2 suckers, and 8 sunfish species; dominant species is Bluehead Chub; new county distribution record for Dollar Sunfish. **Recommendation** -- continue basinwide monitoring of this reference site in 2016; qualifies for HQW if so petitioned.