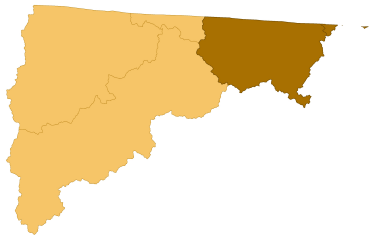
CHAPTER 3

LITTLE RIVER & CHESTNUT CREEK WATERSHEDS



HUC 0505000104 & 0505000106

Includes: Elk Creek, Bledsoe Creek, Pine Swamp Creek, Glade Creek, Brush Creek & Crab Creek

GENERAL WATERSHED DESCRIPTION

These two ten-digit hydrologic unit code (HUC) watersheds, with an area of about 145 square miles, are the equivalent to DWQ's old subbasin 05-07-03 and contain the Little River and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the Maps Chapter). These watersheds have been combined in the same chapter due to the small size of the Chestnut Creek watershed (0505000106).

Almost the entire watershed lies within Alleghany County. The Little River/Chestnut Creek watersheds flow northeast and drain the Town of Sparta. High, hilly plateaus can be found in these watersheds from North Carolina into the Virginia Blue Ridge Mountains.

These watersheds have the least amount of forested area (50%) as compared to other watersheds in the basin. Instead, more land is devoted to agricultural activities (40%) including pasture, orchards, cultivated cropland, livestock, dairy farms, and Christmas tree production. Developed areas (7.5%) are limited to the Town of Sparta.

Roughly 2,400 acres of conservation land are found in these watersheds and include easements held by local watershed groups and State agencies, Bullhead Mountain State Park, and the Blue Ridge Rural Land Trust.

The population of these watersheds are centered mostly around the Town of Sparta. Sparta declined in population between 1990 and 2000 by 7% and was estimated to decline another one percent by 2010, according to the 2000 census.

WATERSHED AT A GLANCE

COUNTIES:

Alleghany & Surry

MUNICIPALITIES:

Sparta

ECOREGIONS:

New River Plateau & Southern Crystaline Ridges and Mountains

PERMITTED FACILITIES:

NPDES WWTP: 3
- Major 1
- Minor 2

Non-Discharge Facilities: 1
Stormwater: 2
- General 2
- Individual 0

Animal Operations: 9

POPULATION:

2010: ..... Coming Soon

2006 LAND COVER:

Developed.....7.72%
Forest 51.83%
Agriculture.....40.24%
Wetlands.....0.21%

2001 Impervious Surface ..0.64%

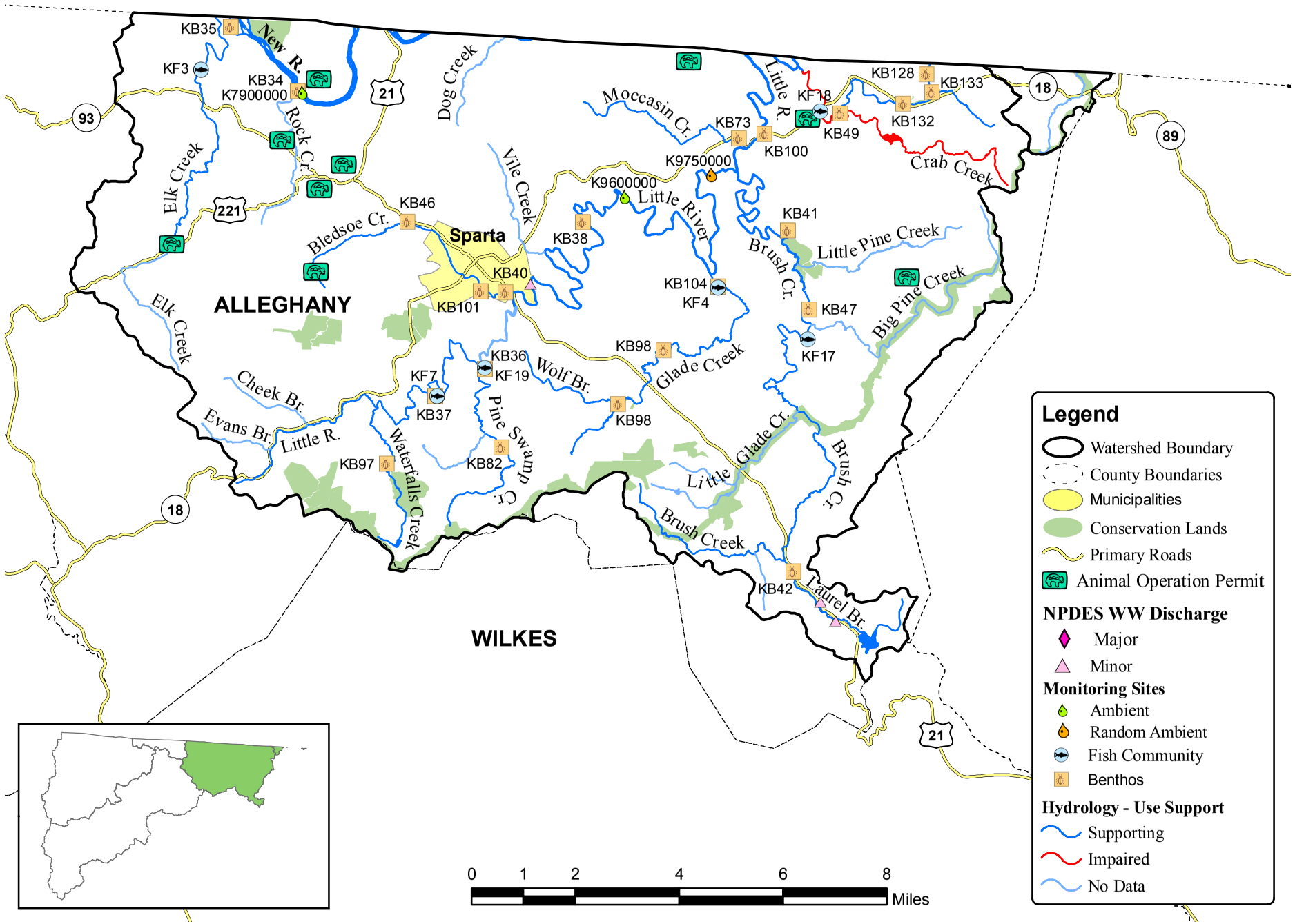


FIGURE 3-1: LITTLE RIVER WATERSHED (0505000104 & 0505000106)

Watershed Water Quality Overview

The Little River & Chestnut Creek Watersheds combined are the smallest in the New River basin. It has the highest percent of agricultural land cover of any watershed in the basin and also contains all nine animal operation permits within the basin. While waters in these watersheds are slightly more impacted by human activities, they are of relatively good quality.

Crab Creek [AU#: 10-9-12] is the only Impaired water in these watersheds and was added to the Impaired Waters list in 2010. This is the first Impaired water in these watersheds since Laurel Branch [AU#: 10-9-10-2] appeared on the 1998 list but was removed from the 2000 list. Crab Creek's impairment and other information is discussed in the Crab Creek-Little River 12-digit section below.

Water Quality Data Summary for these Watersheds

Monitoring stream flow, aquatic biology and chemical/physical parameters is a large part of the basinwide planning process. More detailed information about DWQ monitoring and the effects each parameter has on water quality is discussed in Chapters 2 and 3 of the Supplemental Guide to North Carolina's Basinwide Planning document.

Understanding the Data

Biological & Ambient Rating Converted to Use Support Category

Biological (benthic and fish community) samples are given a bioclassification/rating based on the data collected at the site by DWQs Environmental Sciences Section (ESS). These bioclassifications include Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair and Poor. For specific methodology defining how these rating are given see Benthic Standard Operating Procedures (SOP) or the Fish Community SOP. Once a rating is given, it is then translated into a Use Support Category (see Figure 2-2).

Figure 3-2: Use Support Categories for Biological Ratings

Biological Ratings	Aquatic Life Use Support
Excellent	Supporting (Categories 1-2)
Good	
Good-Fair	
Not Impaired	
Not Rated	Not Rated (Category 3)
Fair	Impaired (Categories 4-5)
Poor	

Ambient monitoring data are analyzed based on the percent of samples exceeding the state standard for individual parameters for each site within a two year period. If a standard is exceeded in greater than 10.0% of samples taken for a particular parameter, that stream segment is Impaired for that parameter. The fecal coliform bacteria parameter is the exception to the rule. See the Fecal Coliform Bacteria section in the Ambient Data portion below. For the purposes of this plan, any site with greater than 7.0% to 10.0% of samples not meeting a parameter's standard will be considered Impacted.

Figure 3-3: Example of a Use Support and Monitoring Box

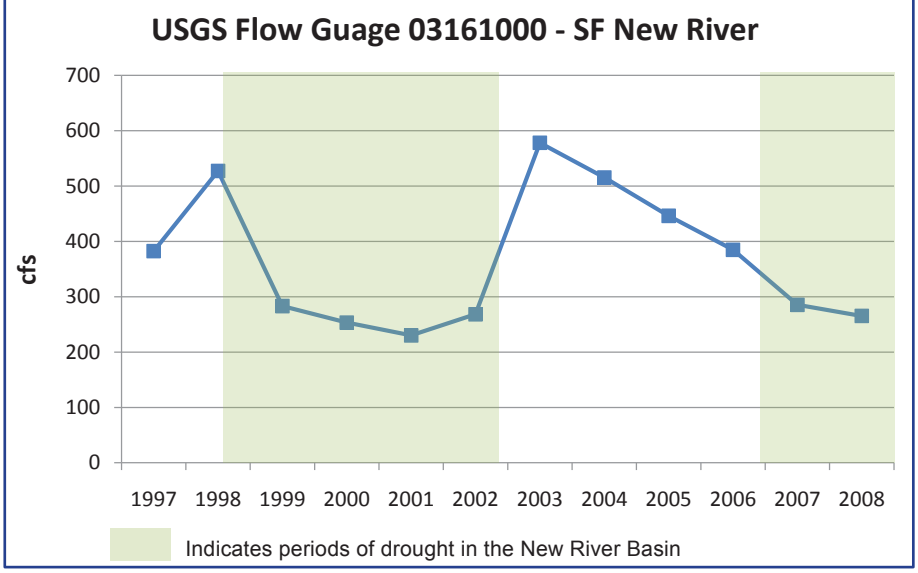
Use Support: **Impaired** (14 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB1)	Fair (2008)
Fish Com (CF1)	Good-Fair (2008)
AMS (C1234500)	Turbidity - 12% FCB - 48%

Each biological parameter (benthic and fish community) and each ambient parameter is assigned a Use Support Category based on its rating or percent exceedance. Definitions for each category can be found in Use Support Methodology Chapter. Each monitored stream segment is then given an overall category which reflects the highest individual parameter category. For example, using the data from Figure 3-3 the individual parameter categories would be as follows: Benthos - 5, Fish Community - 1, Turbidity - 5. Therefore, the overall category, which is reported on the Integrated Report, would be 5 (Impaired). An Integrated Report is developed by the state every two years and reported to the U.S. Environmental Protection Agency.

STREAM FLOW

The basin experienced prolonged droughts in 1998-2002 and 2007-2008, and exceptionally high flows resulting from the remnants of several hurricanes (Figure 3-4). During a three week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Rainfall estimates for the combined three storms totaled more than 20-30 inches in certain watersheds. Runoff from the storms produced flash-floods throughout the region with peak flows in excess of 10,000 cfs (approximately 500 times median flows) in upper tributary streams; peaks flows in some tributary rivers exceeded 50,000 cfs. In the New River basin, the peak flow during Hurricane Frances (September 7th - 9th) was 14,700 cfs, which has an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which has an approximate recurrence interval of 2 to 5 years. More detail about flows in the New River Basin can be found in the **2009 Basinwide Assessment Report: New River Basin** produced by DWQ-Environmental Science Section.

FIGURE 3-4: YEARLY AVERAGE FLOW RATES (CFS) OF THE USGS GAGE STATION IN THE NEW RIVER BASIN BETWEEN 1997 & 2008



BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle, in addition to special studies. Overall, 27 biological sampling sites were monitored within the Little River Watershed. The ratings for each of the sampling stations can be seen in **Appendix 3-B**.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 3-5 and color coded based on the current rating. As seen on the map, all samples taken in this watershed received a Supporting rating. Each of these sites are discussed in more detail in the subwatershed discussions below.

BENTHIC SAMPLING SUMMARY

- Total Stations Monitored 21
- Total Samples Taken.....25
- Stations Monitored Twice..... 4
- Number of New Stations..... 11

Figure 3-6 shows 100% of the 25 sampling events received a Supporting rating and 0% received an Impaired rating. Figure 3-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if there are any overall shifts in ratings. Five percent of ratings declined, 19% improved in rating and 24% had no change in rating. This indicates that the watershed is mostly stable with some improvements.

Figure 3-5: Benthic Stations Color Coded by Current Rating in the Little River Watershed

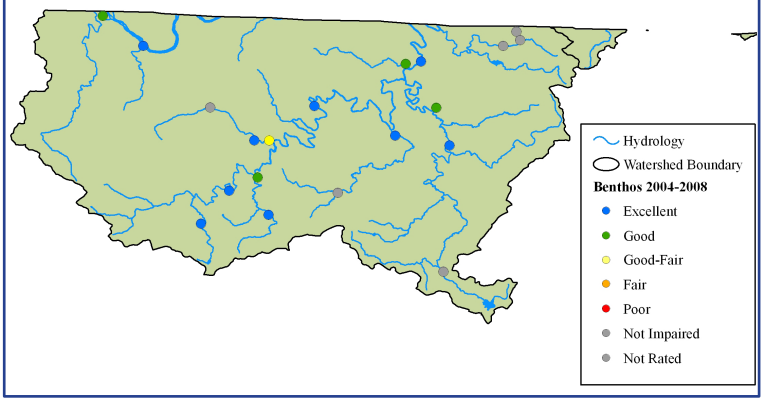


Figure 3-6: Current Benthic Site Ratings

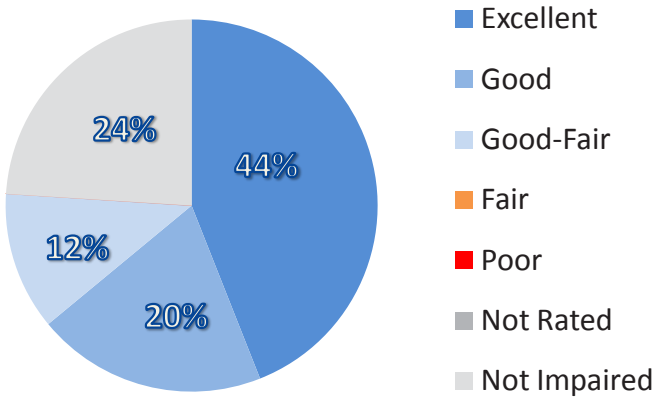
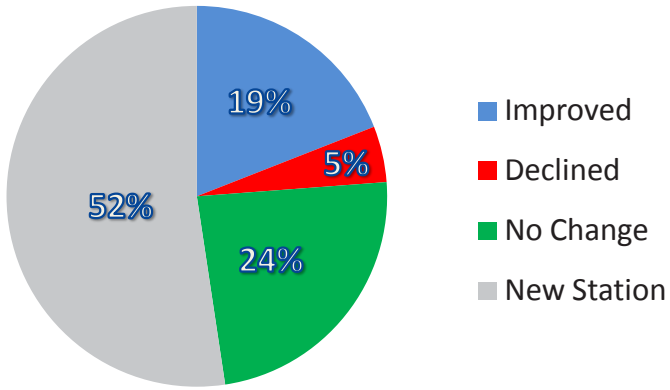


Figure 3-7: Change in Benthic Site Ratings



Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 3-8 and color coded based on the current rating. Three of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine their potential for becoming fish community regional reference sites.

Fish Com. Sampling Summary

- Total Stations Monitored 6
- Total Samples Taken.....6
- Number of New Stations.....3

As shown in Figure 3-9, 83% of the six sampling events received a Supporting rating and 17% received an Impaired rating. Figure 3-10 is a comparison of fish community site ratings sampled during the last two cycles to determine if there are any overall watershed shifts in ratings. It shows 17% improved and 33% had no change in rating indicating a stable and somewhat improving fish community.

FIGURE 3-8: FISH COMMUNITY STATIONS COLOR CODED BY CURRENT RATING IN THE LITTLE RIVER WATERSHED

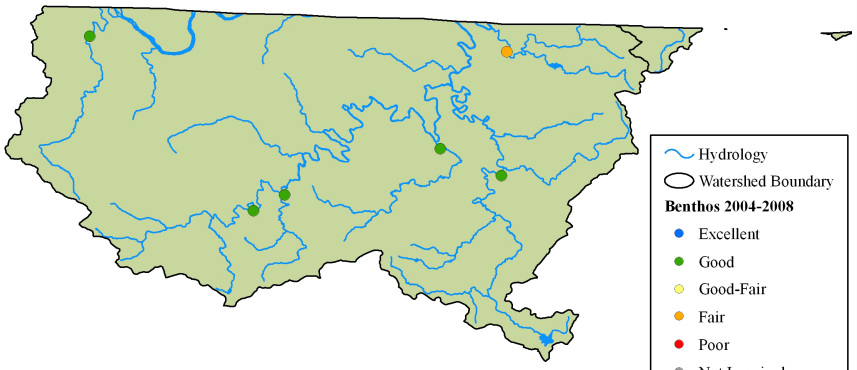


FIGURE 3-9: CURRENT FISH COMMUNITY SITE RATINGS

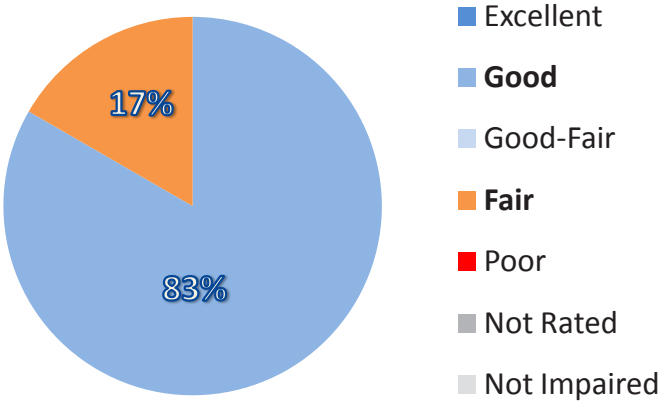
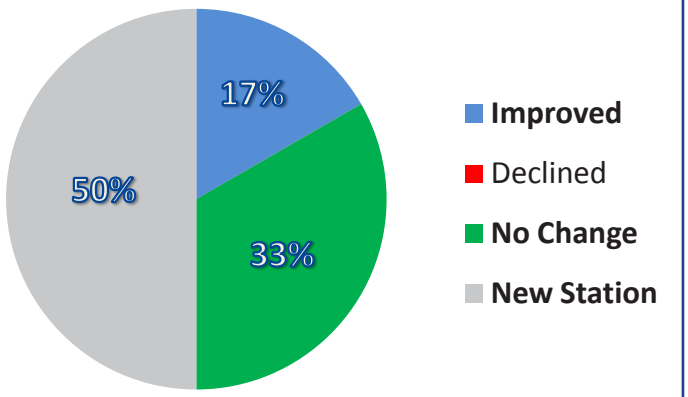


FIGURE 3-10: CHANGE IN FISH COMMUNITY SITE RATINGS



For more information about biological data in these watersheds, see the 2009 New River Basinwide Assessment Report. Detailed data sheets for each sampling site can be found in Appendix 3-B.

Fish Kills/Spill Events

No fish kills were reported in these watersheds during this planning cycle.

AMBIENT DATA

Ambient data are used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2010 version and is based on data collected between 2004 and 2008. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The New River Basin portion of the 2010 IR can be found in Appendix 3-A and statewide on the Modeling & TMDL Unit's website.

Two Ambient Monitoring System (AMS) stations are located in the Little River watershed; one on the New River and the other on the Little River (see Figure 3-1 for station locations). During the current sampling cycle (January 2004 - December 2008), samples were collected for all parameters on a monthly basis, except metals which were sampled quarterly until 2007. For more information about the ambient monitoring, parameters, how data are used for use support assessment and other information, see Chapter 2 of the Supplemental Guide to North Carolina's Basinwide Planning.

Long Term Ambient Monitoring

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for the two AMS stations in this watershed by specific parameter over a 13 year period (1997-2009). Each major parameter is discussed in this Section even, if no current impairment exists. The graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use or climate conditions can affect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the data set. Box and whisker plots of individual ambient stations were completed by parameter for data between 2004 and 2008 by DWQ's Environmental Sciences Section (ESS) and can be found in the New River Basin Ambient Monitoring System Report.

pH

The water quality standard for pH in surface freshwater is 6.0 to 9.0 su. Both AMS stations in these watersheds were each monitored 58 times and each exceeded the high pH standard of 9 once. As seen in Figure 3-11, this is less than 10% of samples taken and neither stream will be listed as Impaired for pH. Figure 3-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the Little River watershed. The pH pattern seen during this 13 year period is a steady increase towards the upper 7 range. This trend is seen in all three 10-digit watersheds in the New River Basin and is discussed further in the Executive Summary.

FIGURE 3-11: PERCENTAGE OF SAMPLES EXCEEDING THE PH STANDARDS (2003-2008)

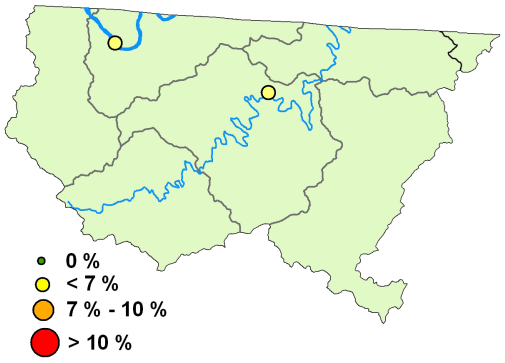
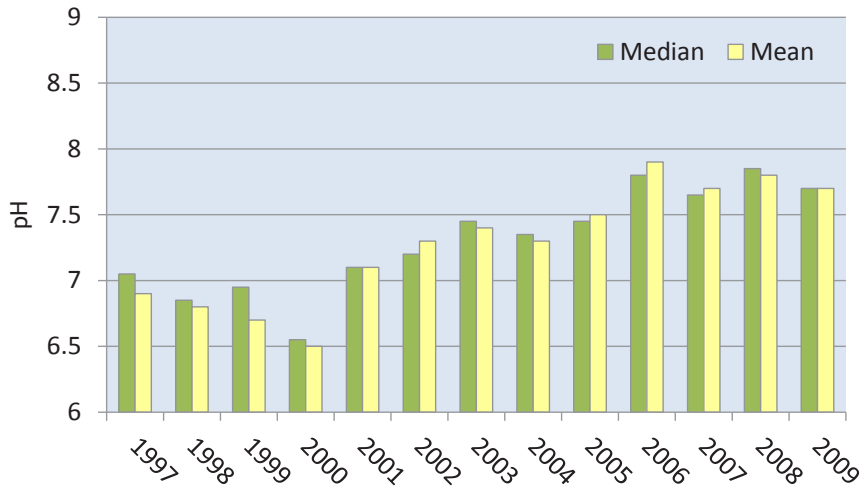


FIGURE 3-12: SUMMARIZED PH VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000104



* NC pH Standard: Between 6 and 9 su

Turbidity

Both AMS sites in this watershed had at least two records that exceeded the state standard. Site K7900000 on the New River had 7% of samples exceed the standard during this monitoring cycle, as seen in Figure 3-13. Possible sources of the elevated turbidity levels are discussed in the 12-digit subbwatershed sections below. Figure 3-14 shows the mean and median of turbidity levels for all samples taken over the course of 13 years in the Little River watershed. The yearly averages are well below the state standard of 50 NTUs with the exception of the 2007 mean. The highest violation occurred in 2007 at site K7900000, measuring at 450 NTUs.

While some erosion is a natural phenomenon, human land use practices accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations and excessive stormwater flow from impervious surfaces are all potential sources. Turbidity violations demonstrate the importance of **protecting and conserving stream buffers and natural areas**.

FIGURE 3-13: PERCENTAGE OF SAMPLES EXCEEDING THE TURBIDITY STANDARD (2003-2008)

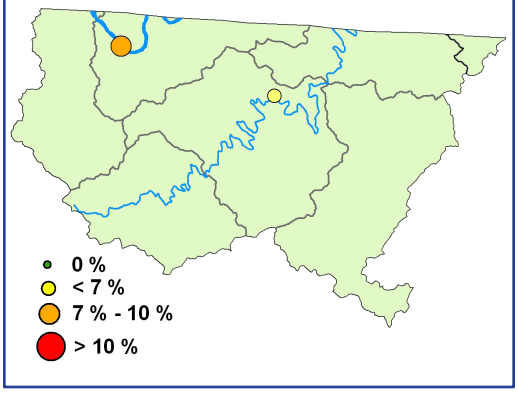
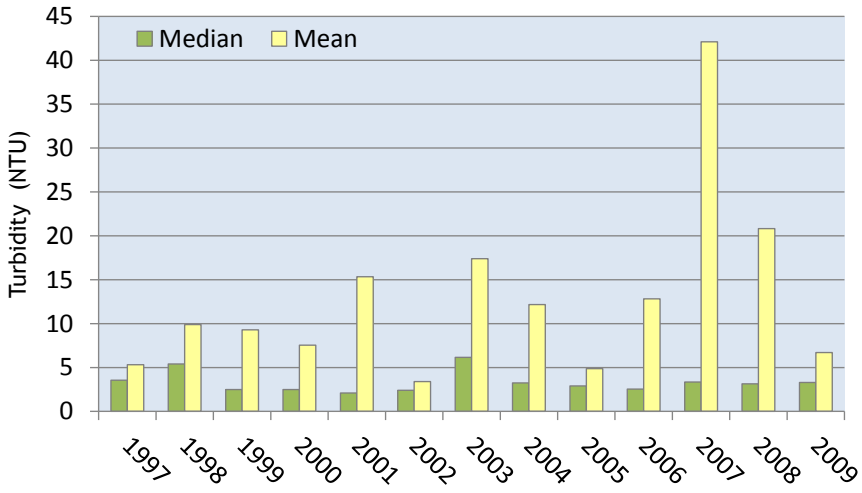


FIGURE 3-14: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000104



Dissolved Oxygen

As seen in Figure 3-15, neither site had a DO standard exceedance recorded during this monitoring cycle. Figure 3-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the Little River watershed. DO at these stations have been stable for the past 13 years and have seen little to no change.

FIGURE 3-15: PERCENTAGE OF SAMPLES EXCEEDING THE DO STANDARD (2003-2008)

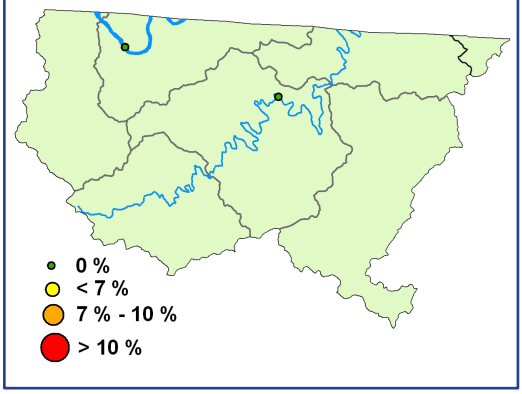
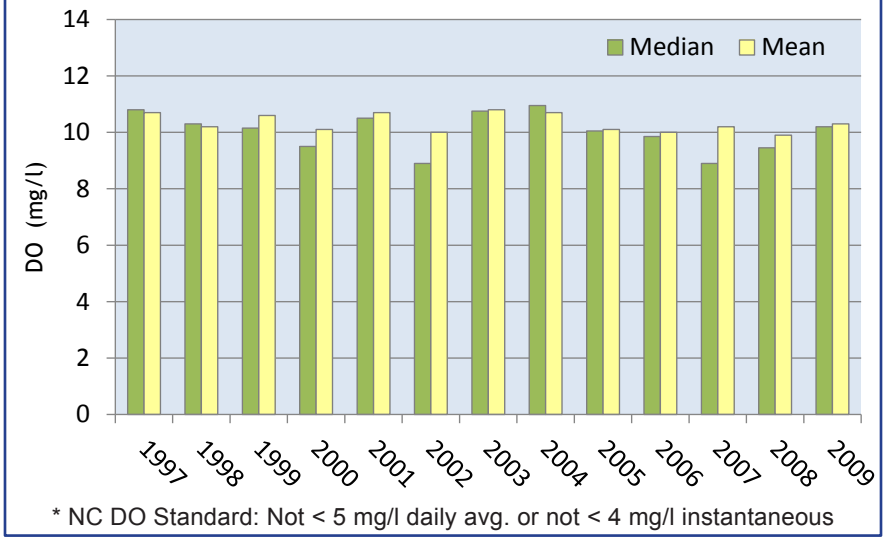


FIGURE 3-16: SUMMARIZED DO VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000104



Temperature

Figure 3-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the Little River watershed. The water temperature trend for these stations are closely linked to the flow. During low flow or drought periods, the water can sit in small pools and become heated. However, no stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 3-17).

Figure 3-17: Percentage of Samples Exceeding Water Temperature Standard (2003-2008)

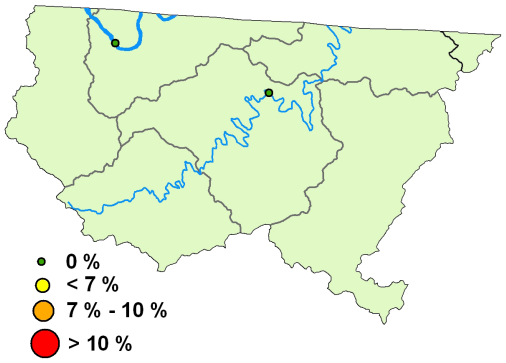
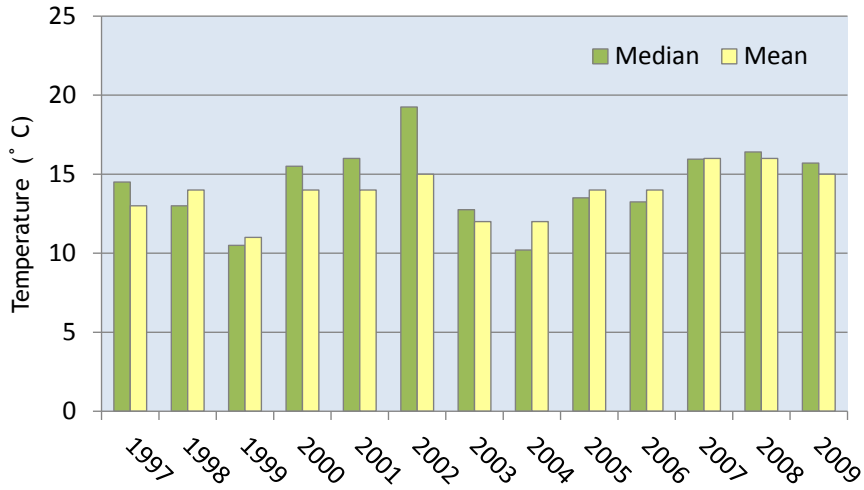


Figure 3-18: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 0505000104

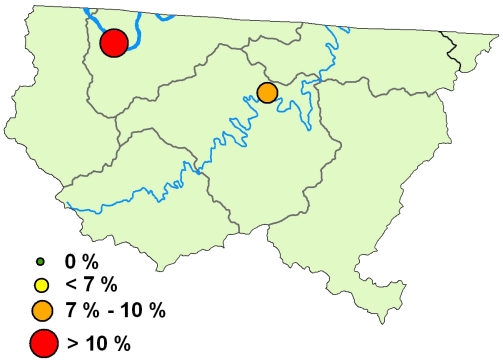


* NC Temperature Standard for Mountain/Upper Piedmont Region: 29˚C (84.2˚F)

Fecal Coliform Bacteria

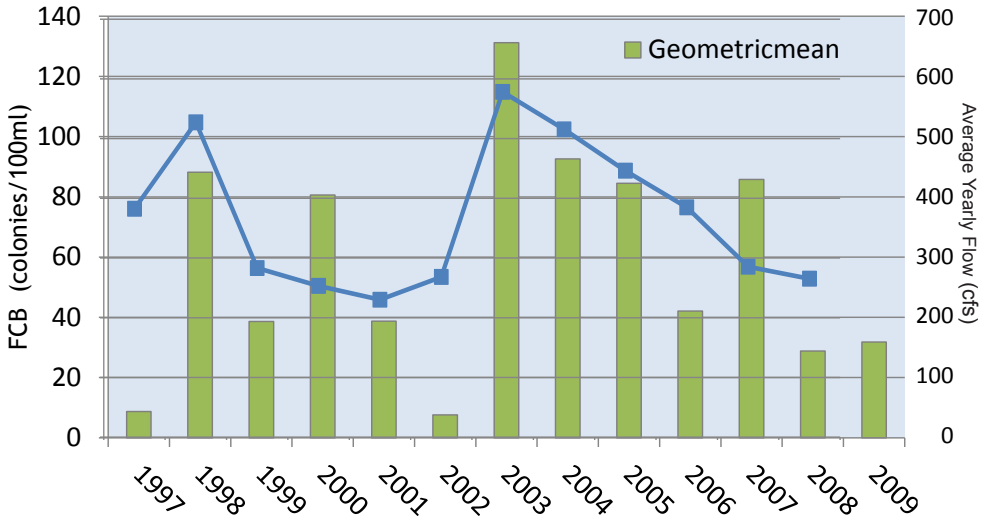
Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit.

Figure 3-19: Percentage of Samples with Elevated FCB Levels (2003-2008)



Two AMS stations are located within these watersheds which are located on the New and Little Rivers. As seen in Figure 3-19, the Little River site had 7 to 10% of samples taken during this cycle result in levels over 400 colonies/100 ml and the New River site had greater than 10%. Possible sources of elevated levels of FCB are discussed in the subwatershed sections. Figure 3-20 shows the geometric mean of FCB levels for all samples taken over the course of 13 years in the Little River watershed. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers and doesn't indicate outliers or spikes. The highest yearly geometric mean in these watersheds for FCB was recorded in 2003 and is the highest yearly geometric mean of all other watersheds. The figure also includes the yearly average stream flow, as seen in Figure 3-4, to show how flow can be closely linked to FCB levels. These elevated FCB levels could be caused by livestock with access to streams, failing septic systems, or leaking municipal collection systems.

FIGURE 3-20: SUMMARIZED FECAL COLIFORM BACTERIA VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000102 WITH OVERLAYING FLOW



* NC FCB Standard (5-in-30 data only): Geomean not > 200/100 ml or 400/100 ml in 20% of samples.

For more information regarding any of the parameters listed above, see Section 3.3 of the **Supplemental Guide to North Carolina's Basinwide Planning**. For additional information about ambient monitoring data collected in this river basin, see the **New River Basin Ambient Monitoring System Report**.

Recommendations & Action Plans at the Watershed Scale

DWQ Notable Waters & Priority Summary

Table 3-1 is a list of waters in the Little River & Chestnut Creek Watersheds that DWQ has prioritized for restoration/protection. The order of priority is not based solely on the severity of the steam's impairment or impacts but rather by the need for particular actions to be taken. A stream that is currently supporting its designated uses may be prioritized higher within this table than a stream that is currently impaired. This is based on a more wholistic evaluation of the drainage area which includes monitoring results, current and needed restoration/protection efforts, land use and other activities that could potentially impact water quality in the area. Some supporting streams may have a more urgent need for protections than an impaired stream with restoration needs already being implemented.

The third and fourth columns of this table list **potential** stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact (s). The last column includes a list of recommended actions.

Table 3-1: Prioritization of Waters in the Little River & Chestnut Creek Watersheds (Highest to Lowest Priority)

Stream Name	AU#	Class.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
Crab Cr.	10-9-12	C;Tr	Habitat Degradation, Nutrients, Flow	Agriculture, Golf Course, Construction, Beaver Dams, Volume & Velocity	**Impaired**	R, SEC, Ag, NMC, RBR
Bledsoe Cr.	10-9-7	C;Tr	Habitat Degradation (Riparian Buffers), Toxins, FCB, Nutrients, Turbidity	Urban Impacts	**Impacted**	R, SC, SEC BMPs, RBR
Elk Cr.	10-6-(1) & 10-6-(2)	C;Tr;+ C;+	Nutrients	Agriculture	Supporting	Ag, E, NMC, SS
Laurel Br.	10-9-10-2	C;Tr	Habitat Degradation (Riparian Buffers)	Golf Course Communities	Supporting	RBR, E, SC
Pine Swamp Cr.	10-9-5	C;Tr	Habitat Degradation (Riparian Buffers)		Supporting	RBR, Ag
New R.	10b	C;ORW	Turbidity, Copper, Zinc		**Impacted**	RBR
Waterfalls Cr.	10-9-4	C;Tr	Habitat Degradation	Agriculture	Supporting	RBR
Moccasin Cr.	10-9-11	C	Nutrients, Low DO	Agriculture	Supporting	Ag, NMC
Little R.	10-9-(1)a	C;Tr	Habitat Degradation, pH		Supporting	RBR
Brush Cr.	10-9-10	C;Tr	Habitat Degradation (Riparian Buffers), Nutrients	Agriculture	Supporting	RBR, Ag
UT to Crab Cr.	10-9-12ut8	C;Tr	Habitat Degradation (Riparian Buffers)	Straight Channels	Supporting	R - Currently Underway

Class.: Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor: Chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use (e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.).

Source: The cause of the stressor. (Volume & Velocity: when a stream receives stormwater runoff at a much higher volume and velocity than it would naturally receive due to ditching, impervious surfaces, etc.)

Status: Impaired, Impacted, Supporting, Improving

Actions Needed: Restoration (**R**), Protection (**P**), Stormwater Controls (**SC**), Stressor Study (**SS**), Education (**E**), Local Ordinance (**LO**), Best Management Practices (**BMPs**), Sediment and Erosion Control BMPs (**SEC**), Species Protection Plan (**SPP**), Forestry BMPs (**F**), Agriculture BMPs (**Ag**), Nutrient Mgnt Controls (**NMC**), Riparian Buffer Restoration (**RBR**), Daylight Stream (**DS**), Monitoring (**M**), Watershed Restoration Plan (**WRP**).

STATUS & RECOMMENDATIONS FOR MONITORED WATERS

UNDERSTANDING THIS SECTION

In this Section, more detailed information about stream health, special studies, aquatic life stressors and sources and other additional information is provided by each 12-digit Hydrological Unit Code (HUC). Waterbodies discussed in this Chapter include all monitored streams, whether monitored by DWQ or local agencies with approved methods. Use Support information on all monitored streams within this watershed can be seen on the map in Figure 3-1, and a Use Support list of all monitored waters in this basin can be found in the Use Support Methodology Chapter.

Use Support & Monitoring Box:

Each waterbody discussed in the Status & Recommendations for Monitored Waters within this Watershed section has a corresponding Use Support and Monitoring Box (Table 3-2). The top row indicates the 2010 Use Support and the length of that stream or stream segment. The next two rows indicate the overall Integrated Report category which further defines the Use Support for both the 2008 and the 2010 reports. These first three rows are consistent for all boxes in this Plan. The rows following are based on what type of monitoring stations are found on that stream or stream segment and may include benthic, fish community and/or ambient monitoring data. If one of these three types of monitoring sites is not shown, then that stream is not sampled for that type of data. The first column indicates the type of sampling in bold (e.g., **Benthos**) with the site ID below in parenthesis (e.g., CB79). The latest monitoring result/rating of that site is listed in the next column followed by the year that sample was taken. If there is more than one benthic site, for example, on that stream, the second site ID and site rating will be listed below the first. The last row in the sample box in Table 3-2 is the AMS data. The data window for all AMS sites listed in the boxes in this Plan is between 2004-2008. Only parameters exceeding the given standard are listed in the second column with the percent of exceedance listed beside each parameter.

TABLE 3-2: EXAMPLE OF A USE SUPPORT AND MONITORING BOX

USE SUPPORT: **IMPAIRED** (14 MI)	
2008 IR Cat.	**4a**
2010 IR Cat.	**4**
Benthos (CB79) (CB80)	 Fair (2002) Fair (2002)
Fish Com (CF33)	 Good-Fair (2002)
AMS (C1750000)	Turbidity - 12% FCB - 48%

Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Table 3-2) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

LITTLE RIVER

Little River [AU#: 10-9-(1)a, (1)b, (6), & (11.5)]

Little River is approximately 35 miles from source to the NC/VA state line and is the main receiving water for this 10-digit watershed. The source of Little River is found along the southwest boundary of the Little River 12-digit subwatershed (HU 050500010404) and flows 11.6 miles to the next subwatershed (Glade Creek - Little River: HU 050500010406), then through the Crab Creek - Little River subwatershed (HU 050500010407) before crossing the state line. Land use is mixed between agriculture and forestry. There are numerous large Christmas tree farms and pasture land which drain to the Little River. The Town of Sparta is also located along the banks of the Little River.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of the NC Ecosystem Enhancement Program (EEP). The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006, several biological and chemical/physical samples were taken as well as sediment and nutrient studies

completed. The data from these samples and studies were compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit EEP's New River Basin Local Watershed Plan page.

AU#: 10-9-(1)a

Use Support: Supporting (11.6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB37)	Excellent (2008)
Fish Com (KF7)	Good (2008)

This 11.6 mile segment flows from source to Pine Swamp Creek and falls completely within the Little River 12-digit subwatershed (HU 050500010404). The entire length of this segment, and most streams running to it, carry a secondary use classification of Trout Waters.

Water Quality Status

The benthic site was sampled twice during this planning cycle and both times resulted in an Excellent rating. The site has been sampled each cycle since 1993, when it received its highest rating. Samples from 1998 and 2003 dropped down to a Good rating and showed evidence of instream water quality issues, as well as some habitat issues. The 2008 sample collected more pollution intolerant taxa that had not been collected since 1998. This indicates water quality is improving; however, not to 1993 levels yet.

The 2008 fish community sample increased a rating from Good-Fair in 1998 to Good. In general, the habitat was in good condition but had a narrow riparian buffer along the right bank. Biologists noted that the percent of pollution tolerant species found was greater than expected for a mountain stream and that the site had the lowest pH (5.5) of any other fish community site in the basin.

Recommendation

Riparian buffer restoration is suggested for this segment. Buffers of adequate width can filter pollutants out of stormwater and help restore pH levels to more natural levels.

AU#: 10-9-(6)

Use Support: Supporting (17.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB38) (KB100)	Excellent (2008) Excellent (2008)
AMS (K9600000)	No Exceedances
RAMS (K9750000)	Data Not Yet Available

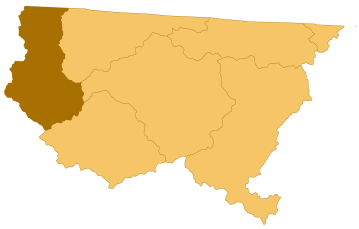
This 17.5 mile segment flows from the Sparta Lake dam to NC-18 and is mostly within the Glade Creek - Little River subwatershed (HU 050500010406). About one mile of the segment is within the Crab Creek - Little River subwatershed (HU 050500010407). The upstream end of this segment flows along the southeast edge of the Town of Sparta.

Water Quality Status

Two benthic monitoring stations are located along this segment of the Little River. The most upstream site is KB38 which has been sampled four times since 1993. Each sample since that time, including the 2008 sample, rated Excellent. The second benthic site (KB100) has been sampled five times since 1990, all of which were also rated Excellent. The extended history of Excellent ratings at both sites indicates a very stable benthic community.

An AMS station is located between these two benthic sites. Results from this station reflect the good water quality findings in the benthic samples. A second temporary AMS station, known as Random Ambient Monitoring System station, (RAMS K9750000) is located a few miles downstream. This site was sampled for two years (2009-2010) as part of a statewide random AMS sampling effort. Results from RAMS K9750000 will be added to this plan once they are available.

ELK CREEK (050500010401)



Includes: New River [AU#: 10b] **& Elk Creek** [AU#: 10-6-(1) & (2)]

This subwatershed has mixed land use of mostly agriculture with small patches of forest and residential areas. There are no NPDES dischargers in this subwatershed.

Elk Creek [AU#: 10-6-(1) & (2)]

Elk Creek is a little over 11 miles from source to the New River [AU#: 10b]. Agriculture along this stream and its tributaries is mostly pastures and row crops. The upstream segment of Elk Creek [AU#: 10-6-(1)] from source to US-221 holds a secondary use classification of Trout Waters.

USE SUPPORT: SUPPORTING (11.1 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB35)	Good (2008)
Fish Com (KF3)	Good (2008)

Water Quality Status

Elk Creek was monitored for benthic and fish communities in 2008 at two locations. The most upstream site was a fish site (KF3) at State Route 1341 which was sampled one other time in 1998. Both samples taken at this location throughout the years were rated Good and received the same NCIBI value. Even though the NCIBI numbers were identical, there were differences in the types and numbers of fish found. Those differences are an indication of elevated nutrients levels from nonpoint sources which prevent survival of more pollution intolerant species.

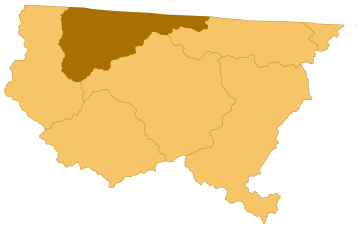
Further downstream, about a half mile from the New River [AU#: 10b], a benthic sample was collected and rated Good in 2008. This site (KB35) has been monitored once every five years since 1993. Rating values given to this site are also similar to past years, but also had shifts similar to the fish sample. There were several taxa collected at this site for the first time which are more pollution tolerant than those collected in past samples, indicating an impact to the benthic community.

Both fish and benthic communities are showing signs of being impacted by elevated nutrient levels. Since the 1995 New River Basinwide Water Quality Plan, nutrients have been noted in this stream based on the presence of periphyton and biological sampling results.

Recommendation

DWQ will work with SWCD to prioritize the need for agricultural nutrient management controls within this drainage area. Educational efforts should focus on the importance of riparian buffers, keeping livestock out of the streams and how to reduce nutrient runoff after applying fertilizers. A stressor study may be needed to determine specific sources of elevated nutrients. A grant application to improve water quality can be more competitive when paired with a stressor study.

BRUSH CREEK - NEW RIVER (050500010403)



Includes: New River [AU#: 10b]**, Rock Creek** [AU#: 10-7] **& Dog Creek** [AU#: 10-8]

This subwatershed has mixed land use of agriculture, residential and scattered forest. There are no NPDES point source dischargers within this subwatershed, but there are five cattle animal o

USE SUPPORT: SUPPORTING (6.4 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB34)	Excellent (2008)
AMS (K7900000)	Copper (23.1%) Zinc (15.4%)

New River [AU#: 10b]

This segment of the New River begins at the NC/VA state line where the river enters back into NC. The river winds back and forth across the state line several times before flowing northeast into Virginia. The drainage area contains a mix land use of agriculture, residential and scattered patches of forest.

Water Quality Status

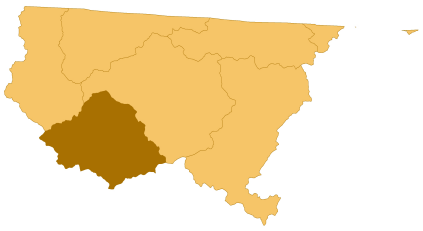
There is one benthic monitoring site (KB34) on this segment of the New River. This site has been monitored since 1983 and has received either an Excellent or Good classification each time. The 2008 sample had similar results with an Excellent rating. Habitat at this site was lacking proper riparian buffers, with agricultural activities lining the north bank. Biologists noted the sample included several new taxa collected for this site which vary in pollution tolerance levels. One of these new taxa has only been collected by DWQ nine previous times within the state.

Just downstream of the benthic station is an AMS station (K7900000). Samples taken monthly at this site between 2005 and 2009 resulted in elevated levels of turbidity, copper and zinc. Turbidity did not exceeded the State water quality standards. Copper and zinc did exceed the state standard; however, these levels are believed to be natural. Therefore, this segment will not be placed on the Impaired Waters list for these parameters. During this time period, fecal coliform bacteria (FCB) levels declined by half of what was measured between 1998 and 2003.

Recommendation

Riparian buffer restoration is suggested for this segment of the New River to reduce impacts from stormwater runoff.

Little River (050500010404)



Includes: Little River [AU#: 10-9-(1)a]**, Waterfall Creek** [AU#: 10-9-4] **& Pine Swamp Creek** [AU#: 10-9-5]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters but mostly along streambanks. There are no NPDES dischargers in this subwatershed. Majority of streams in the subwatershed hold the secondary use classification of Trout Waters.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of EEP. The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006 several biological and chemical/physical samples were taken, as well as sediment and nutrient studies were completed. The data from these samples and studies are compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit EEP's New River Basin Local Watershed Plan page.

Waterfalls Creek [AU#: 10-9-4]

Waterfalls Creek is approximately four miles from source to the Little River [AU#: 10-9-(1)a]. Just downstream of the source is a privately owned dam which creates Willis Lake. The drainage area is mostly forested with agriculture concentrated along streams.

Use Support: Supporting (4.3 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB97)	Excellent (2006)

Water Quality Status

In 2006, a benthic sample was taken on Waterfalls Creek at Airbellows Gap Road off of Waterfall Road (KB97). The stream was monitored as part of a special study being conducted on the Little River and had not been monitored by DWQ previously. The special study and results are discussed below (B-20060815). It was chosen as a reference site and was rated Excellent. The benthic community was abundant and diverse; however, the habitat score was low because of it being in a fallow field.

Between the source of the stream and the sampling location, the stream flows through forest. The transition to farmland begins just upstream of the sampling site and continues through farmland to its confluence with the Little River. Therefore, aquatic life present at this site reflect more of the water quality within the forested area.

Recommendation

Waterfalls Creek would benefit from the installation of a riparian buffer zone along the stretch that is within a fallow field. This will allow stormwater runoff to be filtered before reaching the stream.

Pine Swamp Creek [AU#: 10-9-5]

Pine Swamp Creek is approximately five miles long from source to the Little River [AU#: 10-9-(1)a]. The major land use within this drainage area is agriculture with small scattered patches of forest.

USE SUPPORT: SUPPORTING (5 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB36) (KB82)	Good (2008) Excellent (2006)
Fish Com (KF19)	Good (2008)

Water Quality Status

During the last basinwide cycle Pine Swamp Creek's benthic community was monitored at site KB36 and received a Good-Fair rating in 2003. This rating was likely a reflection of impacts from a two year drought (2001-2002).

In 2006, DWQ conducted a special study (B-20060815) which included two benthic samples on this stream. One sample was collected at the basinwide site (KB36) and the second was taken upstream at Pine Swamp Road (KB82). Both sites received an Excellent rating during this study; however, the upstream site had a slightly lower overall score. KB82 is surrounded by farmland with no riparian buffers. The higher score downstream is likely due to the larger riparian buffer zone which assists with removing pollutants and excess nutrients from the water.

In 2008, a benthic site (KB36) and a fish community site (KF19) were sampled. The benthic sample dropped a rating to Good but was borderline an Excellent rating. The fish community sample was the first fish sample collected on this stream by DWQ and resulted in a Good rating. The percent of pollution tolerant fish was slightly higher than expected for a mountain stream, indicating some water quality impact.

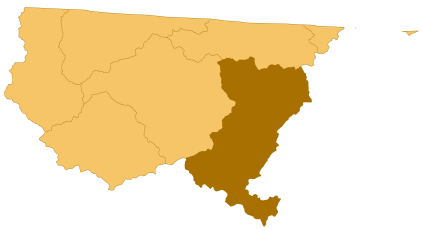
Recommendations

Even though it has been rated Excellent and Good, this stream is showing signs of impacted water quality. Sections of the stream have been channelized and others completely lack riparian buffer zones. Livestock also have easy access to the stream, which can result in degraded streambanks and high levels of fecal coliform bacteria in the water. DWQ will work SWCD to prioritize the implementation of fencing livestock out of the stream and stream restoration BMPs.

Little River [AU#: 10-9-(1)a]

This segment of the River flows through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

BRUSH CREEK (050500010405)



Includes: Brush Creek [AU#: 10-9-10], Laurel Branch [AU#: 10-9-10-2], Little Glade Creek [AU#: 10-9-10-3] & Little Pine Creek [AU#: 10-9-10-5]

Land use here is mostly agriculture with scattered residential areas throughout the subwatershed, and forested headwaters. There are two Minor NPDES dischargers and one large cattle animal operation permit in this subwatershed. Majority of streams in this subwatershed hold the secondary use classification of Trout Waters.

Local Initiatives

The EEP partnered with local agencies to begin implementing a Local Watershed Management Plan for the Little River/Brush Creek watershed areas. Work focused for this area includes identifying stream and wetland restoration and preservation sites, development of specific stormwater management recommendations for the Town of Sparta and the identification and modeling of stormwater BMP project sites. More information on this effort can be found in the Other Natural Resource Program Chapter or on the EEP New River website.

Laurel Branch [AU#: 10-9-10-2]

Use Support: Supporting (5.2 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB42)	Not Impaired (2008)

Laurel Branch is approximately five miles long from source to the confluence with Brush Creek [AU#: 10-9-10]. This drainage area has a mixed land use of residential, forest and a small amount of agriculture. Three large golf courses with corresponding residential properties are found in the headwaters of Laurel Branch and includes Lake Louise, a man made lake. Olde Beau Golf & Country Club and High Meadows Golf & Country Club hold a minor NPDES permit.

Water Quality Status

Laurel Branch has been monitored by DWQ since 1988 at SR-1105. The stream has experienced significant change, mostly in the headwaters, since that time. Between 1988 and 1992 the benthic site rated either a Fair or Poor which resulted in the stream's impairment. A sample collected in 1998 showed there had been significant recovery with a Good rating. The 2008 sampled indicated little to no change in the benthic quality since the 2003 sample which also resulted in a Good rating. In 2008, habitat conditions were good; however, the recorded pH levels were low.

The gradual seven-year recovery and improvement in water quality condition can be contributed to DWQ enforced restoration activities. The construction of the Olde Beau Golf Club was responsible for large amounts of sediment filling the stream and smothering benthic habitat. Restoration efforts included removing sediment from the stream, stabilizing streambanks and adding more natural stream substrate.

There are three large golf course communities clustered in the headwaters of Laurel Branch, which have little to no riparian buffer protection along streams on those properties. These small tributary streams to Laurel Branch receive stormwater runoff from the communities, which likely carries excess nutrients from maintaining golf course turf grasses and other pollutants from residential properties into Laurel Branch.

Downstream of the golf course communities, the steam flows through about a mile and a half of forest before reaching the benthic site. This allows plants and other biological material to filter some pollutants and nutrients from the water column before reaching the benthic monitoring site and Brush Creek.

Recommendation

DWQ recommends adequate riparian buffers be installed and protected along the length of Laurel Branch and its tributaries which flow through the golf course communities. Educational efforts should also be taken by the communities to inform residents of the benefits riparian buffers have to the water in their backyard.

Brush Creek [AU#: 10-9-10]

Use Support: Supporting (27.8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB47) (KB41) (KB42)	 Excellent (2006) Good (2007) Not Imp. (2008)
Fish Com (KF17)	Good (2008)

Brush Creek is approximately 28 miles from source to the Little River [AU# 10-9-(6)]. The drainage area has a mixture of land uses which include residential, agriculture and forested area.

Water Quality Status

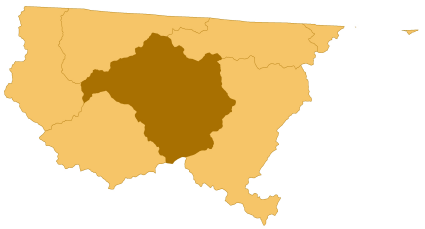
Four biological samples were taken during this sampling cycle. Three out of those four are benthic monitoring samples. One of the benthic samples (KB47) was collected in 2006 as part of a special study (B-20060815) and received an Excellent rating with good overall habitat. The site furthest upstream (KB42) has been sampled five times since 1992 when it received a Fair rating. Since that first sample, the site has rated Good and has shown little to no change in water quality. The 2008 rating was Not Impaired due to the drainage area being less than 3.0 mi^2. The site furthest downstream (KB41) has been rated four times since 1993 and was rated Good in 2008. Biologists suspect the rating would have been higher if the sample was taken during the summer months versus in October. All sites had moderate habitats.

The fish community sample was taken just upstream of Big Pine Creek. This is the first fish sample to be taken by DWQ on Brush Creek. The results from this sample indicated some impact on the fish community by nonpoint source nutrients. The percent of pollution tolerant fish was also a little higher than expected for a mountain stream. These nonpoint source impacts are likely associated with the large amount of agriculture in this drainage area. Biologists also noted a lack of riparian buffers along this section.

Recommendation

DWQ will work with SWCD to prioritize agricultural BMPs which are needed to target nutrient runoff reductions and establishing riparian zones.

GLADE CREEK - LITTLE RIVER (050500010406)



Includes: Little River [AU#: 10-9-(1)b & (6)]**, Bledsoe Creek** [AU#: 10-9-7] **& Glade Creek** [AU#: 10-9-9]

This subwatershed has mixed land use including small patches of forest, urban and agriculture. There are two minor NPDES dischargers and one large cattle animal operation permit in this subwatershed. Majority of the streams, excluding the Little River, hold the secondary use classification of Trout Waters. The Town of Sparta is located in the western portion of the subwatershed.

Local Watershed Planning Efforts

The Little River watershed was the subject of a recent local watershed planning effort of the NC Ecosystem Enhancement Program (EEP). The coordinated, multi agency, effort began in 2004 and ended in 2007 with the completion of the Little River - Bledsoe Creek Watershed Management Plan. Between 2004 and 2006 several biological and chemical/physical samples were taken as well as sediment and nutrient studies were completed. The data from these samples and studies are compiled and summarized in the management plan. Restoration projects are also prioritized on a watershed and subwatershed scale. For more documents and information on the advisory group and results of this effort visit the EEP New River Basin Local Watershed Plan page.

Bledsoe Creek [AU#: 10-9-7]

Bledsoe Creek is approximately six miles from source to the Little River [AU#: 10-9-(6)] and holds a secondary use classification of Trout Waters. The upstream half of the stream is mostly agriculture with one large cattle operation and the downstream half flows through the Town of Sparta.

USE SUPPORT: SUPPORTING (5.9 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB46)	Not Impaired (2006)
(KB101)	Excellent (2008)
(KB40)	Good-Fair (2006)

Water Quality Status

Bledsoe Creek was the main focus of an EEP Watershed Management Plan. This plan covers the entire Little River watershed and is discussed in more detail in the Little River section. In the process of developing this management plan, three benthic samples were taken along Bledsoe Creek. The most upstream site (KB46) was given a rating of Not Impaired due to the small drainage size. However, biologist noted if the drainage area was slightly larger, it would have received an Excellent rating. This site also received the highest habitat score of the three sites.

The second site (KB101) is about an eighth of a mile upstream of the Little River confluence. This site rated Good-Fair during the EEP study in 2006 and was noted as the most degraded of the three sites. Results from this sample indicated impacts from toxins which were not seen in the upstream sample. Biologist also noted a strong sewage smell in the creek. The most downstream sample had similar results but to a lesser degree. Both lower sites had insufficient habitat for a healthy benthic population.

Two chemical/physical sites were also sampled in Bledsoe Creek during the study. Those results showed elevated fecal coliform bacteria (FCB) levels, some of which were over 400 colonies per 100 ml indicating potential sewer leaks and sources of animal waste. During storm events, the Bledsoe Creek sites had some

of the highest nutrient and sediment levels of any other site during the study period. More detailed results are discussed in the Assessment of Bledsoe Creek Subwatersheds document prepared by WK Dickson & Company, Inc. for EEP.

The middle benthic site (KB101) discussed above is also a basinwide site which was sampled again in 2008. At that time the rating improved to Excellent from the Good-Fair it received in 2006. The difference between the two samples lies in the increased number of taxa collected and their sensitivity to pollution. More pollution intolerant taxa were collected in the 2008 sample which indicates an improvement in water quality. Even though the benthic population has improved the habitat is less than optimal with poor riparian zones and silty cover of *aufwuchs* over the cobble and boulders within the stream.

Local Initiatives

Through the Community Conservation Assistance Program the Alleghany Soil & Water Conservation District is helping to treat stormwater runoff on 1,826,850 sq/ft of impervious surface in the Bledsoe Creek priority watershed with BMPs like critical area stabilization and a stormwater wetland project through partnering with the Town of Sparta to complete. These practices will assist in reducing nitrogen and phosphorus from the stream. The Alleghany district is also assisting in installation of pet waste receptacles in the Sparta Town Park to further protect Bledsoe Creek/Little River/New River.

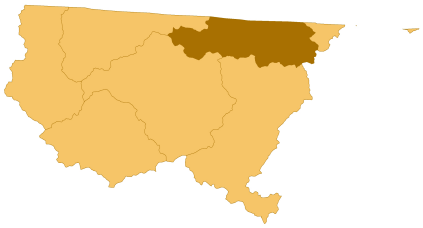
Recommendation

DWQ supports funding the efforts set forth in the Little River - Bledsoe Creek Watershed Restoration Plan. Stakeholders involved in the development of the plan should continue reevaluating the types and priority of BMPs as monitoring data and BMP result data become available.

Little River [AU#: 10-9-(1)b & (6)]

Two segments [AU#: 10-9-(1)b & (6)] of the Little River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

Crab Creek - Little River (050500010407)



Includes: Little River [AU#: 10-9-(6) & (11.5)], Moccasin Creek [AU#: 10-9-11], Crab Creek [AU#: 10-9-12] & Unnamed Tributary to Crab Creek [AU#: 10-9-12ut8]

This subwatershed has a land use of small patches of forest and urban areas mixed with a large amount of agriculture. There are no NPDES dischargers but one large cattle animal operation permit is in this subwatershed. Crab Creek is the only stream listed on the 2010 Impaired Waters list within this subwatershed.

Local Initiatives

The Ecosystems Enhancement Program partnered with local agencies to begin implementing a Local Watershed Management Plan for the Little River/Crab Creek watershed areas. Work focused for this area includes identifying stream and wetland restoration and preservation sites, development of specific stormwater management recommendations for the Town of Sparta and the identification and modeling of stormwater BMP project sites. More information on this effort can be found in the Other Natural Resource Program Chapter or on the EEP New River website.

Moccasin Creek [AU#: 10-9-11]

Moccasin Creek is approximately four and a half miles long from source to Little River [AU#: 10-9-(6)]. Land cover in this drainage area is mostly agriculture with a few patches of forest.

Use Support: Supporting (4.4 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB73)	Good (2006)

Water Quality Status

This creek was sampled for the first time by DWQ in 2006. The sample was taken as part of the EEP **Little River - Bledsoe Creek Watershed Management Plan** study. This plan covers the entire Little River watershed and is discussed in more detail in the Little River section. The benthic sampling was completed and analyzed by DWQ and documented in the B-20060815 special study report. The site was rated Good; however, it had the most pollution tolerant taxa of any other site in the study with exception of site KB101 on Bledsoe Creek. This site was the only one within the study to show benthic signs of nutrient enrichment and low DO indicators.

Cattle have direct and easy access to the stream just up from the sampling location and could be the source of nutrients. The entire drainage area is largely agriculture.

Recommendation

DWQ will work with SWCD and Bledsoe Creek watershed stakeholders to prioritize agricultural BMPs such as fencing out livestock and nutrient reductions BMPs. Funding for implementing of efforts spelled out in the **Little River - Bledsoe Creek Watershed Management Plan** are supported by DWQ.

Unnamed Tributary to Crab Creek [AU#: 10-9-12ut8 & 12ut8ut4]

This unnamed tributary (UT1) is approximately four and a half miles from source to Crab Creek [AU#: 10-9-12]. This section also covers a second UT (UT2) [AU#: 10-9-12ut8ut4] which flows to UT1. The drainage area has a mixed land use of agriculture, forest and some urban areas.

USE SUPPORT: SUPPORTING (4.5 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos	
(KB128)	Not Impaired (2007)
(KB133)	Not Impaired (2007)
(KB132)	Good (2007)

Water Quality Status

These two unnamed tributaries were monitored as part of a special study (B-20080129) conducted by DWQ in 2007. The study was requested by EEP to determine the current water quality status before beginning construction on a restoration project. The benthic sampling showed better water quality and habitat at the most upstream site in UT2. Further downstream on UT1, the water quality becomes impacted by channelization and total lack of riparian buffers. This was most apparent at the KB132 site, which received the lowest habitat score. The Not Impaired ratings given to the upstream sample sites (KB128-UT2 & KB133-UT1) were due to the small sized drainage areas. The lower site on UT1 (KB132) is located in a much larger drainage area and even though it received the lowest habitat score, it received the highest bioclassification. This is mainly due to the fact that in smaller drainage areas it is expected to have a much smaller benthic population than the larger drainage areas. Therefore the differences at these sites are because of size.

Local Initiatives

The 2008 EEP project (as seen in the Figure 3-21 below) was to reestablish meanders within the stream channel. This will slow flows during storm events and reduce flooding downstream as well as create a more natural habitat.

Figure 3-21: EEP Stream Restoration. (Left: Before; Right: Mid Construction)

Crab Creek [AU#: 10-9-12]

Crab Creek is approximately eight miles long from source to the Little River [AU#: 10-9-(11.5)] and holds a secondary classification of Trout Waters. The land cover in this drainage area is a mixture of agriculture including one cattle animal operations permit, forest and some residential. The stream includes an impoundment built in 1973 which created a small lake (Mountain Lake). Crab Creek is Impaired due to a Fair fish community rating in 2008.

Use Support: Impaired (7.8 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB49)	Good-Fair (2007)
Fish Com (KF18)	Fair (2008)

Water Quality Status

Crab Creek was sampled for the first time by DWQ in 2003 as part of a special study to support the local watershed planning efforts of the Wetland Restoration Program. At that time, site KB49 received a Good rating; however, biologist noted streambanks were eight meters high and reinforced with old tires and other farm debris. Large amounts of periphyton growth was also noted.

The same site was sampled again in 2007 as part of the special study (B-20080129) on the Crab Creek drainage areas as mentioned above. This site was the most downstream site of that study and received the lowest rating of Good-Fair. Beaver dams were noted above and below the site which caused a significant flow reduction. When comparing the data to the previous 2003 sample, a decline in water quality is apparent by the decline in number and pollution intolerance levels of the benthic community now present. The channelization, lack of riparian buffers and overall poor habitat conditions caused this decline as predicted in the **2005 New River Basinwide Water Quality Plan**.

A fish community sample (KF18), located at NC18, was taken in 2008 for the first time on Crab Creek. This site had the most collected fish of any other site within the basin; however, there was limited diversity and mostly omnivores and herbivores indicative of nonpoint source nutrient loading. A large cattle farm and a row crop/pasture farm are located on either side of the stream at this sampling location. These, in addition to multiple upstream farms, a golf course and a lack of riparian buffers, could all be contributing to this low fish community rating and resulting Impairment. Satellite imagery also shows two large land disturbing activities which occurred in 2009 which could cause future sedimentation issues.

Recommendations

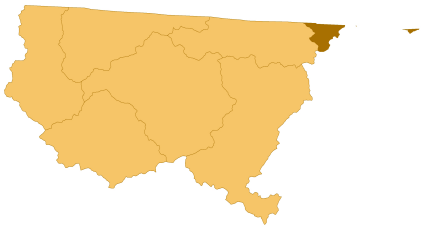
Riparian buffers are a significant element in reducing the impacts from nonpoint source runoff. Educational efforts should be made in this watershed to inform golf course attendants, farmers and other residence of the importance of maintaining a proper riparian buffer. Educational material for golf course owners and

maintenance crews to maintain the course in a way that protects water quality can be found on the Basinwide Planning Unit website. Approved sedimentation and erosion control measures should be in place during land disturbing activities.

Little River [AU#: 10-9-(6) & (11.5)]

Two segments [AU#: 10-9-(6) & (11.5)] of the Little River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

Chestnut Creek (050500010603)



Includes: West Fork Chestnut Creek [AU#: 10-10-1]

This subwatershed has a land cover mixture of mostly agriculture and forest. There are no NPDES dischargers in this subwatershed. The majority of this subwatershed falls in Virginia with the two most southern tips in North Carolina. No streams are monitored by DWQ at this time.

References

References marked with (*) indicates a DWQ special study report. These reports are not currently available online. Contact Jay Sauber by phone at (919) 743-8416 or by e-mail at Jay.Sauber@ncdenr.gov to receive a hardcopy.

North Carolina Department of Environment and Natural Resources (NCDENR). Division of Water Quality (DWQ). August 2004a. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCA 2B. Raleigh, NC. (http://h2o.enr.state.nc.us/csu/).

____. DWQ. Planning Section. Basinwide Planning Unit (BPU). November 2008. *Supplemental Guide to Basinwide Planning: A support document for basinwide water quality plans.* Raleigh, NC. (http://portal.ncdenr.org/web/wq/ps/bpu/about/supplementalguide)

____. DWQ. Environmental Sciences Section (ESS). Ecosystems Unit. April 2010. *New River Basin Ambient Monitoring Systems Report (January 1, 2004 through December 31, 2008)*. Raleigh, NC. (http://portal.ncdenr.org/c/document_library/get_file?uuid=01be0501-d4a0-42ae-b4c3-1349dd8d0ea6&groupId=38364)

____. DWQ. Environmental Sciences Section (ESS). Biological Assessment Unit (BAU). April 2009. *Basinwide Assessment Report: New River Basin*. Raleigh, NC. (http://www.esb.enr.state.nc.us/documents/NewBasinwideFinal_09.pdf)

____. *DWQ. ESS. BAU. August 2006. (B-20060815) *EEP Benthic Macroinvertebrate Special Study, Little River Watershed, New River Subbasin 03 Alleghany County, April 2006*. Raleigh, NC.

____. *DWQ. ESS. BAU. January 2008. (B-20080129) *EEP Benthic Macroinvertebrate pre-restoration Study, Little River Watershed, New River Subbasin 03, Alleghany County, October 2007*. Raleigh, NC.

Pate, Travis. 2009. Watershed Assessment in North Carolina: Building a Watershed Database with Population, Land Cover, and Impervious Cover Information. Master Theses, University of North Carolina at Chapel Hill.

Note: URL addresses for hyperlinks found in this plan are listed in the Acronyms & Definitions Chapter.

Appendix 3-A

Use Support Ratings for all Monitored Waters In the Little River & Chestnut Creek Watersheds

Draft 2010 IR Category	Integrated Reporting Categories for individual Assessment Unit/Use Support Category/ Parameter Assessments. A single AU can have multiple assessments depending on data available and classified uses.
1	All designated uses are monitored and supporting
1b	Designated use was impaired, other management strategy in place and no standards violations for the parameter of interest (POI)
1nc	DWQ have made field determination that parameter in exceedance is due to natural conditions
1r	Assessed as supporting watershed is in restoration effort status
1t	No criteria exceeded but approved TMDL for parameter of interest
2	Some designated uses are monitored and supporting none are impaired Overall only
2b	Designated use was impaired other management strategy in place and no standards violations Overall only
2r	Assessed as supporting watershed is in restoration effort status overall only
2t	No criteria exceeded but approved TMDL for POI Overall only
3a	Instream/monitoring data are inconclusive (DI)
3b	No Data available for assessment
3c	No data or information to make assessment
3n1	Chlorophyll a exceeds TL value and SAC is met-draft
3n2	Chlorophyll a exceeds EL value and SAC is not met first priority for further monitoring-draft
3n3	Chlorophyll a exceeds threshold value and SAC is not met first second priority for further monitoring-draft
3n4	Chlorophyll a not available determine need to collect-draft
3t	No Data available for assessment –AU is in a watershed with an approved TMDL
4b	Designated use impaired other management strategy expected to address impairment
4c	Designated use impaired by something other than pollutant
4cr	Recreation use impaired no instream monitoring data or screening criteria exceeded
4cs	Shellfish harvesting impaired no instream monitoring data- no longer used
4ct	Designated use impaired but water is subject to approved TMDL or under TMDL development
4s	Impaired Aquatic Life with approved TMDL for Aquatic Life POI or category 5 listing
4t	Designated use impaired approved TMDL
5	Designated use impaired because of biological or ambient water quality standards violations and needing a TMDL
5r	Assessed as impaired watershed is in restoration effort status

NC 2010 Integrated Report

All 13,123 Waters in NC are in Category 5-303(d) List for Mercury due to statewide fish consumption advice for several fish species

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
Category	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year

New River Basin — **Little River-New River Watershed 0505000104**

10-9-7	**Bledsoe Creek**	From source to Little River		**5.9 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008		
10-9-10	**Brush Creek**	From source to Little River		**27.8 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		
10-9-12	**Crab Creek**	From source to Little River		**7.8 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007		
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2008	2010	
10-6-(2)	**Elk Creek (North Carolina Portion)**	From U.S. Hwy. 221 to New River		**7.4 FW Miles**	C:+	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		
10-9-9	**Glade Creek**	From source to Little River		**8.3 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		
10-9-10-2	**Laurel Branch (Laurel Creek)**	From source to Brush Creek		**5.2 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2008		
10-9-(6)	**Little River**	From dam at Sparta Lake to NC 18 (Blevins Crossroads)		**17.5 FW Miles**	C	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008		
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008		
10-9-(11.5)	**Little River (North Carolina Portion)**	From NC 18 (Blevins Crossroads) to New River (state line)		**3.6 FW Miles**	C;HQW	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2003		
10-9-(1)a	**Little River (Sparta Lake)**	From source to Sparta Lake at Pine Swamp Creek		**11.6 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		

NC 2010 Integrated Report

All 13,123 Waters in NC are in Category 5-303(d) List for Mercury due to statewide fish consumption advice for several fish species

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
Category	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year

New River Basin — **Little River-New River Watershed** — **0505000104**

10-9-11	**Moccasin Creek**	From source to Little River	**4.4 FW Miles**	C	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	
10-9-5	**Pine Swamp Creek**	From source to Little River	**5.2 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008	
10-9-12ut8ut4	**UT CRAB CR**	Source to CRAB CR	**0.7 FW Miles**		
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2008	
10-9-12ut8	**UT UT CRAB CR**	Source to UT CRAB CR	**4.5 FW Miles**		
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2007	
10-9-4	**Waterfalls Creek**	From source to Little River	**4.3 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2006	
10-9-9-1	**Wolf Branch**	From source to Glade Creek	**2.8 FW Miles**	C;Tr	
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2006	

APPENDIX 3-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
KB35	Elk Cr.	10-6-(2)	From U.S. Hwy. 221 to New River	Alleghany	SR 1344	08 - Good 03 - Good
KB37	Little R.	10-9-(1)a	From source to Sparta Lake at Pine Swamp Creek	Alleghany	SR 1128	08 - Excellent 03 - Good
KB38	Little R.	10-9-(6)	From dam at Sparta Lake to NC 18 (Blevins Crossroads)	Alleghany	SR 1424	08 - Excellent 03 - Excellent
KB100	Little R.	10-9-(6)	From dam at Sparta Lake to NC 18 (Blevins Crossroads)	Alleghany	NC 18	08 - Excellent 03 - Excellent
KB41	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1422	07 - Good 03 - Excellent
KB47*	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1444	06 - Excellent
KB42	Laurel Br.	10-9-10-2	From source to Brush Creek	Alleghany	SR 1105	08 - Not Impaired 03 - Good
KB73*	Moccasin Cr.	10-9-11	From source to Little River	Alleghany	NC 18	06 - Good
KB49	Crab Cr.	10-9-12	From source to Little River	Alleghany	SR 1450	07 - Good-Fair 03 - Good
KB132*	Ut. Ut. Crab Cr.	10-9-12ut8	Source to Ut. Crab Creek	Alleghany	NC 18	07 - Not Impaired
KB133*	Ut. Ut. Crab Cr.	10-9-12ut8	Source to Ut. Crab Creek	Alleghany	Ab. Ut. Crab Cr.	07 - Not Impaired
KB128*	Ut. Crab Cr.	10-9-12ut8ut4	Source to Crab Cr.	Alleghany	400 meters S. of state line	07 - Not Impaired
KB97*	Waterfalls Cr.	10-9-4	From source to Little River	Alleghany	SR 1132	06 - Excellent
KB36	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1128	08 - Good 03 - Good-Fair
KB82*	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1126	06 - Excellent
KB101	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	SR 1172	08 - Excellent 03 - Good
KB40*	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	SR 1171	06 - Good-Fair
KB46*	Bledsoe Cr.	10-9-7	From source to Little River	Alleghany	US 21	06 - Not Impaired
KB104	Glade Cr.	10-9-9	From source to Little River	Alleghany	SR 1422	08 - Excellent 03 - Good
KB98*	Wolf Br.	10-9-9-1	From source to Glade Cr.	Alleghany	SR 1117	06 - Not Impaired
Fish Community Sample Sites						
KF17*	Brush Cr.	10-9-10	From source to Little River	Alleghany	SR 1433	08 - Good
KF18*	Crab Cr.	10-9-12	From source to Little River	Alleghany	NC 18	08 - Fair
KF3	Elk Cr.	10-6-(2)	From U.S. Hwy. 221 to New River	Alleghany	SR 1341	08 - Good 98 - Good
KF4	Glade Cr.	10-9-9	From source to Little River	Alleghany	SR 1422	08 - Good 98 - Good
KF7	Little R.	10-9-(1)a	From source to Sparta Lake at Pine Swamp Creek	Alleghany	SR 1128	08 - Good 98 - Good-Fair
KF19*	Pine Swamp Cr.	10-9-5	From source to Little River	Alleghany	SR 1128	08 - Good

* New station location; therefore, no data from the previous cycle.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NEW R	**SR 1345**	**KB34**	**08/19/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.552222	-81.183333	10b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C; ORW	823	2335	125	0.4

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone, Jimmy Smith WWTP	NC0020621	4.82
United Chemi-Con, Inc.	NC0000019	1.018

Water Quality Parameters

Temperature (°C)	26.1
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	75
pH (s.u.)	8.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	3
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	0
Left Riparian Score (5)	3
Right Riparian Score (5)	0
Total Habitat Score (100)	61

Site Photograph

Substrate mix of gravel, sand; some boulder, cobble, bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10535	105	50	4.58	3.42	Excellent
08/21/03	9236	86	51	3.61	3.13	Excellent
08/19/98	7721	73	37	4.40	3.53	Good
07/26/93	6278	102	47	4.70	3.61	Excellent
07/11/90	5376	99	49	4.88	3.52	Good

Taxonomic Analysis

Despite having 11 prior sampling events, there were still several EPT taxa reported for the first time at the site in 2008, including: *Acroneuria evoluta, Apatania, Protoptila, Mystacides, Oecetis avara,* and *Triaenodes perna/helo*. Also collected for the first time at the site was the midge *Cricotopus nostocicola*; there are only nine other records for the species in the BAU database.

Data Analysis

The site is 4.6 northwest of Sparta. The site receives water from the North Fork and South Fork New River catchments along with smaller catchments in Virginia.

The site has undergone yearly summer benthic sampling from 1983 through 1990, then once each five years beginning in 1993. The site has received ratings of either Good or Excellent following each sampling event. EPT Richness range from 37 to 51; NCBI values from 3.61 to 5.53. EPT richness in 2008 is near the highest value for the site; NCBI value is near the middle of the range. Overall the benthic community at the site has generally been stable since 1983.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ELK CR	**SR 1341**	**05/07/08**	**KF3**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.5575	-81.2169444	10-6-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;+	17.4	2470	10	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 (°C)	11.9
Dissolved Oxygen (mg/L)	9.6
Specific Conductance (µS/cm)	50
pH (s.u.)	5.8
Water Clarity	Slightly-moderately turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**84**

Site Photograph

Substrate Cobble, boulder, bedrock, and silts and sands in the pools

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/07/08	2008-31	20	48	Good
06/30/98	98-60	17	48	Good

Most Abundant Species Central Stoneroller

Exotic Species Whitetail Shiner, Saffron Shiner, Rock Bass, Redbreast Sunfish, and Smallmouth Bass

Species Change Since Last Cycle **Gains** -- Kanawha Minnow, Redbreast Sunfish, Greenside Darter, and Appalachia Darter. **Losses** -- Mottled Sculpin.

Data Analysis

Watershed -- drains northwestern Alleghany County; no municipalities within the watershed; tributary to the New River. **Habitat** -- unstable banks along both shorelines; fairly open canopy; riffles, bedrock shelves, veins, and pools; better habitat downstream than upstream from the bridge; beaver dam upstream from the bridge. **2008** -- Central Stoneroller accounted for 41% of all the fish collected in 2008; high percentage of Omnivores+Herbivores, indicative of nonpoint sources of nutrients. **1998 & 2008** -- almost twice as many fish collected in 2008 than in 1998, the number of Central Stoneroller doubled; 21 species known from the site, including 11 species of cyprinids, 4 endemic species (Kanawha Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter), and 5 nonindigenous species; and Mottled Sculpin was represented by only 1 fish in 1998 and was absent in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
ELK CR	**SR 1344**	**KB35**	**08/19/08**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.569722	-81.206944	10-6-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	21	2360	8	0.2

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

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

Water Quality Parameters

Temperature (°C)	21.9
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	58
pH (s.u.)	6.4

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	19
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	84

Site Photograph

Substrate mix of boulder, cobble; some gravel, sand, silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10536	---	30	---	3.14	Good
08/18/03	9219	---	34	---	3.52	Good
08/20/98	7723	---	34	---	3.36	Good
07/26/93	6286	---	36	---	3.48	Excellent

Taxonomic Analysis

The site has been sampled on four occassions. The 30 EPT taxa collected in 2008 is the lowest number for the site.

Several taxa were recorded for the first time in 2008, including: *Caenis* (rare in the sample); *Stenacron interpunctatum* (common); and *Apatania* (rare). Neither *Glossosoma* nor *Ceratopsyche morosa* were collected in 2008; both taxa were reported from the first three sampling events at the site.

Data Analysis

The site is 0.4 stream-miles above the confluence with New River and within 0.2 miles of the Virginia border.

The drop in the number of EPT taxa collected between 2003 and 2008 may be indicative of impacts to the benthic community, though that is offset by the decrease in the EPT BI value. As in 2003, periphyton was noted on the boulders and cobbles, which indicates some nutrient enrichment at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	SR 1128	KB37	08/19/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.467778	-81.133333	10-9-(1)a	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	14	2875	9	0.3

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	60	0	0	40 (road, firing range)

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

Water Quality Parameters

Temperature (°C)	17.3
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	40
pH (s.u.)	6.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	7
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	70

Site Photograph

Substrate mostly sand, gravel, silt; some bedrock, boulder, cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10534	102	42	3.74	3.27	Excellent
04/05/06	9828	103	42*	4.05*	2.32	Excellent
08/18/03	9218	75	36	4.03	3.53	Good
08/20/98	7724	72	37	3.94	3.18	Good
07/26/93	6303	84	45	3.32	2.53	Excellent

* values corrected for seasonality

Taxonomic Analysis

The number of EPT taxa collected in 2008 is siginificantly higher than in 1998 and 2003, though still lower than in 1993. There are a few notable differences in the EPT taxa present between 1993 and the following years. Two ephemerellids, *Drunella conestee* and *Serratella serratoides* , were both abundant in the 1993 sample but have not been recorded from any sampling event since. Also, *Drunella cornutella* was abundant in 1993, rare in 1998, and absent in each following sampling event. *Serratella deficiens* was also abundant in 1993 and absent from each summer sampling event since, though it was common in the spring sample collected in 2006.

Data Analysis

The site is 2.7 miles SSW of Sparta, and is the site most upstream of the three basinwide sites on Little River.

The increase in EPT Richness and lower NCBI values in 2008 compared to the prior summer sampling events in 1998 and 2003 suggests better recent water quality. Those changes have improved the classification of the site from Good 1998 and 2003 to Excellent in 2008. However, both EPT Richness and NCBI values have not returned to the standards set in 1993.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE R	**SR 1128**	**05/06/08**	**KF7**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.46777778	-81.13277778	10-9-(1)a	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	14.1	2870	10	0.3	Yes

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

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

Water Quality Parameters

Temperature (°C)	9.9
Dissolved Oxygen (mg/L)	10.3
Specific Conductance (µS/cm)	35
pH (s.u.)	5.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	10
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**85**

Site Photograph

Substrate Cobble and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/06/08	2008-28	16	50	Good
07/01/98	98-61	15	44	Good-Fair

Most Abundant Species Redlip Shiner and Rosyside Dace

Exotic Species Highback Chub, Redlip Shiner, Brown Trout, Redbreast Sunfish, and Tessellated Darter

Species Change Since Last Cycle **Gains** -- Highback Chub, Mountain Redbelly Dace, and Longnose Dace. **Losses** -- Tonguetied Minnow and Rainbow Trout.

Data Analysis

Watershed -- drains southern Alleghany County; no municipalities within the watershed. **Habitat** -- snags and undercuts; silts along the margins and atop the rocks; cobble riffles and runs; wide riparian zone on the left, but narrow along the right bank; site is a popular fishing spot. **2008** -- diversity of Rock Bass+Smallmouth Bass+Trout and Intolerant species were slightly lower than expected; percentage of tolerant fish (White Sucker, Creek Chub, and Redbreast Sunfish) was slightly greater than expected for a mountain stream; lowest pH of any fish community site in the basin in 2008. **1998 & 2008** -- 18 species known from the site, including 3 endemic species (Tonguetied Minnow, Kanawha Darter, and Appalachia Darter) and 6 nonindigenous species; ~ 6 times more fish collected in 2008 than in 1998 (1,444 vs. 224) ; Mountain Redbelly Dace constituted 9% of the fauna in 2008, but absent in 1998; and species present in 1998, but absent in 2008 were represented by 1 or 3 fish each.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	SR 1424	KB38	08/18/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.517222	-81.083611	10-9-(6)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	36	2600	16	0.3

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

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

Water Quality Parameters

Temperature (°C)	20.9
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	61
pH (s.u.)	7.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	4
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	76

Site Photograph

Substrate mix of cobble, boulder, gravel, sand; some silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10530	111	47	3.90	3.00	Excellent
08/21/03	9232	104	49	4.11	3.23	Excellent
08/20/98	7726	80	41	3.94	2.95	Excellent
07/26/93	6277	98	48	3.98	2.92	Excellent

Taxonomic Analysis

Several taxa were recorded for the first time from the site in 2008, including: *Rhithrogena, Anthopotamus distinctus, Paragnetina ichusa/media, Apatania, Ceratopsyche walkeri,* and *Hydropsyche scalaris*.

Data Analysis

The site is 2.2 miles ENE of Sparta, which is entirely included in the catchment above the site.

NCBI values have been very similar between the four most recent sampling events at the site, as have EPT Richness values with the exception of 1998. The site has rated as Excellent following each sampling event since 1993 at the site, though a spring sampling event in 1989 resulted in classification of Fair. Improvements to the Sparta WWTP (permit NC0026913; discharge 0.6 million gallons per day) occurred in 1990 and apparently improved water quality at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LITTLE R	**NC 18**	**KB100**	**08/18/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.543056	-81.021389	10-9-(6)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	99	2410	30	0.4

	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)	23.4
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	46
pH (s.u.)	7.2
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	12
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	0
Left Riparian Score (5)	5
Right Riparian Score (5)	0
Total Habitat Score (100)	67

Site Photograph

Substrate mostly bedrock and boulder; some sand, cobble, gravel, silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10531	129	59	3.96	2.80	Excellent
08/20/03	9233	89	47	3.96	3.40	Excellent
08/20/98	7727	84	46	3.53	2.72	Excellent
07/27/93	6288	89	49	3.73	2.84	Excellent
07/11/90	5377	93	44	4.36	3.15	Excellent

Taxonomic Analysis

The 59 EPT taxa from 2008 was the most ever recorded for the site, which has been sampled a total of nine times; the previous high for a summer sample was 49, last attained in 1993. The site has received a classification of Excellent following each sampling event except for August 1986, when it received a rating of Good. Several EPT taxa are reported for the first time in 2008: *Heterocloeon anoka, Heterocloeon curiosum, Maccaffertium exiguum, Anthopotamus distinctus, Micrasema bennetti, Hydropsyche venularis, Hydroptila,* an unamed species of *Nectopsyche* , and *Neophylax fuscus* .

Data Analysis

The site is 2.6 stream-miles upstream of the Virginia border and six miles ENE of the town of Sparta, which is entirely included in the catchment above the site. This is the furthest downstream of the three basinwide sites on Little River. Cattle were present in a pasture on the west side and had unhindered access to the river at the reach sampled.

EPT Richness for the seven summer sampling events at the site prior to 2008 has been rather stable, with a range of 44 to 49 taxa collected, making the 59 EPT taxa recorded for 2008 anomalous. NCBI values have ranged from 3.53 (in 1998) to 4.50 (in 1986 and 1988), putting the 2008 value of 3.96 near the middle of the range.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
PINE SWAMP CR	**SR 1128**	**05/06/08**	**KF19**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.4759215	-81.1166911	10-9-5	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	5.3	2760	7	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	12.4
Dissolved Oxygen (mg/L)	10.0
Specific Conductance (µS/cm)	29
pH (s.u.)	6.1

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	13
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	**91**

Site Photograph

Substrate Cobble, boulder, and angular bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/06/08	2008-29	16	52	Good

Most Abundant Species Mountain Redbelly Dace and Rosyside Dace

Exotic Species Highback Chub, Redlip Shiner, Brown Trout, Rock Bass, Redbreast Sunfish, and Tessellated Darter

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains southern Alleghany County; no municipalities within the watershed; tributary to the Little River, site is ~ 60 ft. upstream from the creek's confluence with the river. **Habitat** -- runs, riffles, plunge pools, undercuts, and overhangs; riparian zone of multifloral rose then pasture along the left banks. **2008** -- percentage of tolerant fish (Creek Chub, White Sucker and Redbreast Sunfish) was slightly greater than expected for a mountain stream; one endemic species (Kanawha Darter) was present; and the lowest conductivity of any fish site, along with Brush Creek, in the basin in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PINE SWAMP CR	SR 1128	KB36	08/19/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.475556	-81.116667	10-9-5	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	5.3	2805	5	0.2

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

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)	---
Specific Conductance (µS/cm)	38
pH (s.u.)	5.6
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	83

Site Photograph

Substrate mix of cobble, boulder, bedrock; some gravel, sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10533	---	34	---	2.72	Good
04/04/06	9827	---	41*	---	2.69	Excellent
08/18/03	9217	---	26	---	3.63	Good-Fair
08/20/98	7725	---	34	---	3.52	Good
07/27/93	6290	---	33	---	3.45	Good

* value corrected for seasonality

Taxonomic Analysis

A few taxa were collected for the first time in 2008: *Baetisca* , which was rare in the sample; *Chimarra* and *Dolophilodes* , two philopotamid genera, which were common and abundant respectively.

Data Analysis

The site is about two miles south of Sparta and just upstream of the confluence with Little River.

The number of EPT taxa collected in 2008 returned to the previous high of 34 (in 1998) for a summer sampling event at the site. The EPT BI in 2008 was significantly lower than for any prior summer sampling event. There is currently very little evidence for water-quality impacts to the stream at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BLEDSOE CR	**SR 1172**	**KB101**	**08/18/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.497222	-81.118611	10-9-7	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	5.6	2795	4	0.2

	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)	7.6
Specific Conductance (µS/cm)	72
pH (s.u.)	5.8

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	0
Right Riparian Score (5)	4
Total Habitat Score (100)	68

Site Photograph

Substrate mix of gravel, cobble, sand; some boulder, silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10532	---	42	---	3.75	Excellent
04/05/06	9831	---	25*	---	3.32	Good-Fair
08/20/03	9231	---	30	---	3.39	Good
08/19/98	7722	---	21	---	4.67	Good-Fair
07/26/93	6287	---	33	---	3.31	Good

* value corrected for seasonality

Taxonomic Analysis

The 42 EPT taxa collected in 2008 greatly surpasses the previous high of 33 collected in 1993. Several taxa were reported for the first time from the site in 2008 (all rare in the sample), including: *Plauditus cestus, Baetisca berneri, Leucrocuta, Tricorythodes, Ceratopsyche morosa,* and *Rhyacophila carolina*. There were also a few taxa present in 2008 that had not been recorded from the site since the sampling event in 1993: *Serratella serratoides*, which was abundant in 1993 and common in 2008; *Heptagenia marginalis*, abundant in 1993 and rare in 2008; *Tallaperla,* rare in 1993 and common in 2008.

Data Analysis

The site is in the town of Sparta and 0.8 stream-miles above the confluence with Little River.

Despite the location within the town of Sparta, the suboptimum habitat, and a silty cover of *aufwuchs* over the cobbles and boulders, the site attained a classification of Excellent in 2008. Less surprising is the relatively high EPT BI score for a mountain sample not associated with a discharger.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
GLADE CR	SR 1422	05/06/08	KF4	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.49972222	-81.03638889	10-9-9	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	13.6	2520	7	0.5	Yes

	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)	16.2
Dissolved Oxygen (mg/L)	9.2
Specific Conductance (µS/cm)	32
pH (s.u.)	5.9

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate Sand, silt, and bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/06/08	2008-30	20	52	Good
07/01/98	98-62	19	50	Good

Most Abundant Species Redlip Shiner and Mountain Redbelly Dace

Exotic Species Highback Chub, Redlip Shiner, Tennessee Shiner, Brown Trout, Black Crappie, and Tessellated Darter

Species Change Since Last Cycle **Gains** -- Tonguetied Minnow, Highback Chub, Black Crappie, and Appalachia Darter. **Losses** -- Bigmouth Chub and Kanawha Rosyface Shiner.

Data Analysis

Watershed -- drains east central Alleghany County; no municipalities within the watershed; tributary to the Little River, site is ~ 0.3 miles above the creek's confluence with the river. **Habitat** -- runs, bedrock riffles, fairly open canopy; sands and silts in the pools; bottom substrate showed evidence of excessive sedimentation from upstream landuse practices. **2008** -- Redlip Shiner and Mountain Redbelly Dace, both common along the silty banks, accounted for almost 60% of the fish collected; percentage of Omnivores+Herbivores was slightly elevated and indicative of nonpoint source nutrient inputs; Rock Bass and Smallmouth Bass were absent. **1998 & 2008** -- ~6 times more fish collected in 2008 than in 1998 (1,862 vs. 297), Redlip Shiner increased almost 16 fold and Mountain Redbelly Dace increased 20 fold; 23 species known from the site, including 14 species of cyprinids, 6 endemic species (Tonguetied Minnow, Bigmouth Chub, Kanawha Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter), and 7 nonindigenous species; and species present in 1998, but absent in 2008 were represented by 2 or 4 fish each.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BRUSH CR	SR 1433	05/05/08	KF17	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.4858811	-81.0049272	10-9-10	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	18.1	2570	10	0.4	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 (°C)	17.7
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	29
pH (s.u.)	6.2

Water Clarity: Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**75**

Site Photograph

Substrate: Cobble, gravel, and soft silts along the banks

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/05/08	2008-27	19	52	Good

Most Abundant Species: Mountain Redbelly Dace

Exotic Species: Highback Chub, Redlip Shiner, Rainbow Trout, Brown Trout, and Tessellated Darter

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains the southeastern corner of Alleghany County; no municipalities within its watershed; tributary to the Little River. **Habitat** -- runs, riffles, and swiftly flowing chutes; side snag pools; minimal canopy and riparian zones along both banks. **2008** -- Mountain Redbelly Dace and Bluehead Chub accounted for 39% of all the fish collected; moderate percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; percentage of tolerant fish (White Sucker and Creek Chub) was slightly greater than expected for a mountain stream; three endemic species (Kanawha Minnow, Kanawha Darter, and Appalachia Darter) were present; and the lowest conductivity of any fish site, along with Pine Swamp Creek, in the basin in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BRUSH CR	**SR 1422**	**KB41**	**10/02/07**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.516111	-81.012500	10-9-10	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	32	2500	8	0.1

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

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

Water Quality Parameters

Temperature (°C)	11.9
Dissolved Oxygen (mg/L)	9.4
Specific Conductance (µS/cm)	38
pH (s.u.)	6.2
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	2
Total Habitat Score (100)	69

Site Photograph

Substrate mix of cobble, sand; some boulder, gravel, silt, bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
10/02/07	10345	88	36*	4.87*	3.46	Good
08/20/03	9230	83	42	3.94	3.34	Excellent
08/20/98	7728	62	36	4.04	3.56	Good
07/27/93	6289	96	40	4.73	3.38	Good

* values corrected for seasonality

Taxonomic Analysis

Sampling for this site was last done in October of 2007; all other sampling events occurred in July or August. There were four EPT taxa present (rare in the sample) in October that were not present in the summer samples; of those only one taxon (*Isoperla lata*) shows a seasonal distribution in North Carolina mountain stream sites (it has not been recorded from summer mountain samples). EPT Richness was decremented by one to compensate for the seasonality of the species.

There are five EPT taxa that have been identified from each of the three summer samples and not present in the October sample. Of those, four taxa show a moderate to strong seasonal distribution for mountain stream sites with peak occurrence in the summer and much reduced occurrence in the fall: *Serratella serratiodes* (common in 2003); *Epeorus vitreus* (abundant in 2003); *Micrasema wataga* (common in 2003); and *Neophylax oligius* (abundant in 2003). The four taxa have low tolerance values, ranging from 1.2 to 2.6.

Data Analysis

The site is about six miles east of Sparta, 2.9 miles NW of the closest point on the Blue Ridge Parkway, and 5.2 stream-miles above the confluence with Little River.

Seasonal effects are evident when comparing taxa from the October sample from 2007 with samples from summer in prior years. Reduced EPT richness and a higher NCBI value in 2007 compared to 2003 may be due to seasonal effects and not a decline in water quality between the two years.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LAUREL BR	SR 1105	KB42	08/18/08	Not Impaired

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.420833	-81.008333	10-9-10-2	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	2.7	2705	4	0.2

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

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

Water Quality Parameters

Temperature (°C)	16.0
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	42
pH (s.u.)	5.6
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	87

Site Photograph

Substrate mix of cobble, boulder, gravel, sand; some silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10529	---	26	---	3.51	Not Impaired
04/04/06	9824	100	36*	4.58*	2.73	Good
08/18/03	9216	66	33	4.12	3.53	Good
08/21/98	7729	49	28	3.72	2.91	Good
09/03/92	6008	---	14	---	4.21	Fair

* values corrected for seasonality

Taxonomic Analysis

No unambiguously new taxa were collected in 2008 at the site. The EPT collection method was used in 2008 rather than the Full-Scale method used for the three prior sampling events, complicating comparison of 2008 taxonomic results with those prior events.

Data Analysis

The site is about 8.6 miles southeast of Sparta in southeast Alleghany County, and 0.3 stream-miles from the confluence with Brush Creek.

Current BAU criteria do not allow for classification of stream sites with drainage areas under 3.0 square miles except in unusual circumstances (such as for Little Peak Creek at SR 1595/Ashe County).

Due to the small size of the stream it was decided for the latest sampling effort to use EPT rather than Full-Scale collection methods (as was used for the prior three sampling events at the site); part of the reason for the decrease in EPT Richness between 2008 and the prior summer sampling event in 2003 is certainly due to the differenct collection methods used. The EPT BI is better for comparison of conditions when those two sampling methods are used; there is no evidence of change in water quality between 2003 and 2008 using that metric.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CRAB CR	NC 18	05/05/08	KF18	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	3	05050001	36.5495584	-81.0023167	10-9-12	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	11.2	2450	8	0.4	No

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

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)	9.7
Specific Conductance (µS/cm)	50
pH (s.u.)	6.7

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	4
Total Habitat Score (100)	**77**

Site Photograph

Substrate Slick bedrock, boulders, silts on the substrate

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/05/08	2008-26	14	38	Fair

Most Abundant Species Mountain Redbelly Dace and Central Stoneroller

Exotic Species Redlip Shiner, Saffron Shiner, Rainbow Trout, and Tessellated Darter

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains the northeastern corner of Alleghany County; no municipalities within the watershed; site is ~ 1.5 miles upstream of the creek's confluence with the Little River. **Habitat** -- runs and riffles; side undercuts, bedrock pools; minimal riparian zone along the right shoreline and minimal canopy. **2008** -- more fish were collected at this site (n = 2,368) than at any other site in the basin in 2008; Central Stoneroller, Mountain Redbelly Dace, and Bluehead Chub constituted 65% of all the fish collected; high percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; diversity metrics lower than expected -- total, cyprinid, Rock Bass+Smallmouth Bass+Trout, and Intolerant diversities; and two endemic species (Kanawha Darter and Appalachia Darter) were present.

Appendix 3-C

Ambient Monitoring Systems
Station Data Sheets

Station ID	Waterbody	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K7900000	New R.	10	SR 1345 at Amelia	Copper (22.2%) Iron (44.4%) Zinc (22.2%)	Fecal Coliform (7.1%)
K9600000	Little R.	10-9-(6)	SR 1426 near Edwards Crossroads	Copper (11.1%) Iron (11.1%) Zinc (11.1%) Fecal Coliform (10.7%)	---

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEW RIV AT SR 1345 AT AMELIA
Station #: K7900000 **Hydrologic Unit Code:** 05050001
Latitude: 36.55190 **Longitude:** -81.18172 **Stream class:** C ORW
Agency: NCAMBNT **NC stream index:** 10

Time period: 02/01/2005 to 12/08/2009

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Percentiles Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		5.2	7.8	8.4	9.5	11.4	13.7	15.4
	57	0	<5	0	0		5.2	7.8	8.4	9.5	11.4	13.7	15.4
pH (SU)	58	0	<6	0	0		6.7	7.1	7.4	7.7	8.1	8.4	9.1
	58	0	>9	1	1.7		6.7	7.1	7.4	7.7	8.1	8.4	9.1
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				42	55	61	66	73	77	94
Water Temperature (°C)	58	0	>29	0	0		0.7	3.8	7.8	15.7	22.9	26.4	27.7
Other													
TSS (mg/L)	19	9	N/A				2.5	2.5	6.2	6.2	18	171	280
Turbidity (NTU)	58	1	>50	4	6.9		1	1.4	1.9	4.1	11.8	31.1	450
Nutrients (mg/L)													
NH3 as N	57	45	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.1
NO2 + NO3 as N	57	1	N/A				0.05	0.24	0.36	0.55	0.73	0.8	0.87
TKN as N	57	24	N/A				0.2	0.2	0.2	0.2	0.28	0.53	2.8
Total Phosphorus	57	8	N/A				0.02	0.02	0.02	0.03	0.04	0.1	0.96
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				60	60	83	320	7975	16000	16000
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	9	8	>50	0	0		17	17	25	25	25	25	25
Copper, total (Cu)	9	6	>7	2	22.2		2	2	2	2	9	15	15
Iron, total (Fe)	9	0	>1000	4	44.4		220	220	240	520	10550	20000	20000
Lead, total (Pb)	9	8	>25	0	0		10	10	10	10	10	13	13
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	9	7	>88	0	0		10	10	10	10	10	13	13
Zinc, total (Zn)	9	5	>50	2	22.2		10	10	10	10	41	73	73

Fecal Coliform Screening(#/100mL)

# results:	Geomean:	# > 400:	% > 400:	%Conf:
56	24.9	4	7.1	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Location: LITTLE RIV AT SR 1426 NR EDWARDS CROSSROADS

Station #: K9600000 **Hydrologic Unit Code:** 05050001

Latitude: 36.52465 **Longitude:** -81.06939 **Stream class:** C

Agency: NCAMBNT **NC stream index:** 10-9-(6)

Time period: 02/01/2005 to 12/08/2009

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Percentiles Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.9	7.9	8.5	9.9	11.7	13.3	15.1
	58	0	<5	0	0		5.9	7.9	8.5	9.9	11.7	13.3	15.1
pH (SU)	58	0	<6	0	0		6.4	7.2	7.4	7.8	8	8.4	9.4
	58	0	>9	1	1.7		6.4	7.2	7.4	7.8	8	8.4	9.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				35	42	47	50	54	61	86
Water Temperature (°C)	58	0	>29	0	0		0.6	4.4	8.4	14.5	20.2	23.7	26.4
Other													
TSS (mg/L)	18	8	N/A				2.5	2.5	3.1	6.2	6.2	72.7	178
Turbidity (NTU)	58	6	>50	2	3.4		1	1	1.5	2.3	4	15.2	110
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	N/A				0.65	0.65	0.65	0.65	0.65	0.65	0.65
TKN as N	1	1	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Phosphorus	1	0	N/A				0.03	0.03	0.03	0.03	0.03	0.03	0.03
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				51	51	66	120	240	18000	18000
Arsenic, total (As)	9	9	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	9	9	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	9	9	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	9	8	>7	1	11.1		2	2	2	2	2	17	17
Iron, total (Fe)	9	0	>1000	1	11.1		89	89	190	200	340	19000	19000
Lead, total (Pb)	9	8	>25	0	0		10	10	10	10	10	15	15
Mercury, total (Hg)	8	8	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	9	8	>88	0	0		10	10	10	10	10	25	25
Zinc, total (Zn)	9	8	>50	1	11.1		10	10	10	10	10	80	80

Fecal Coliform Screening(#/100mL)

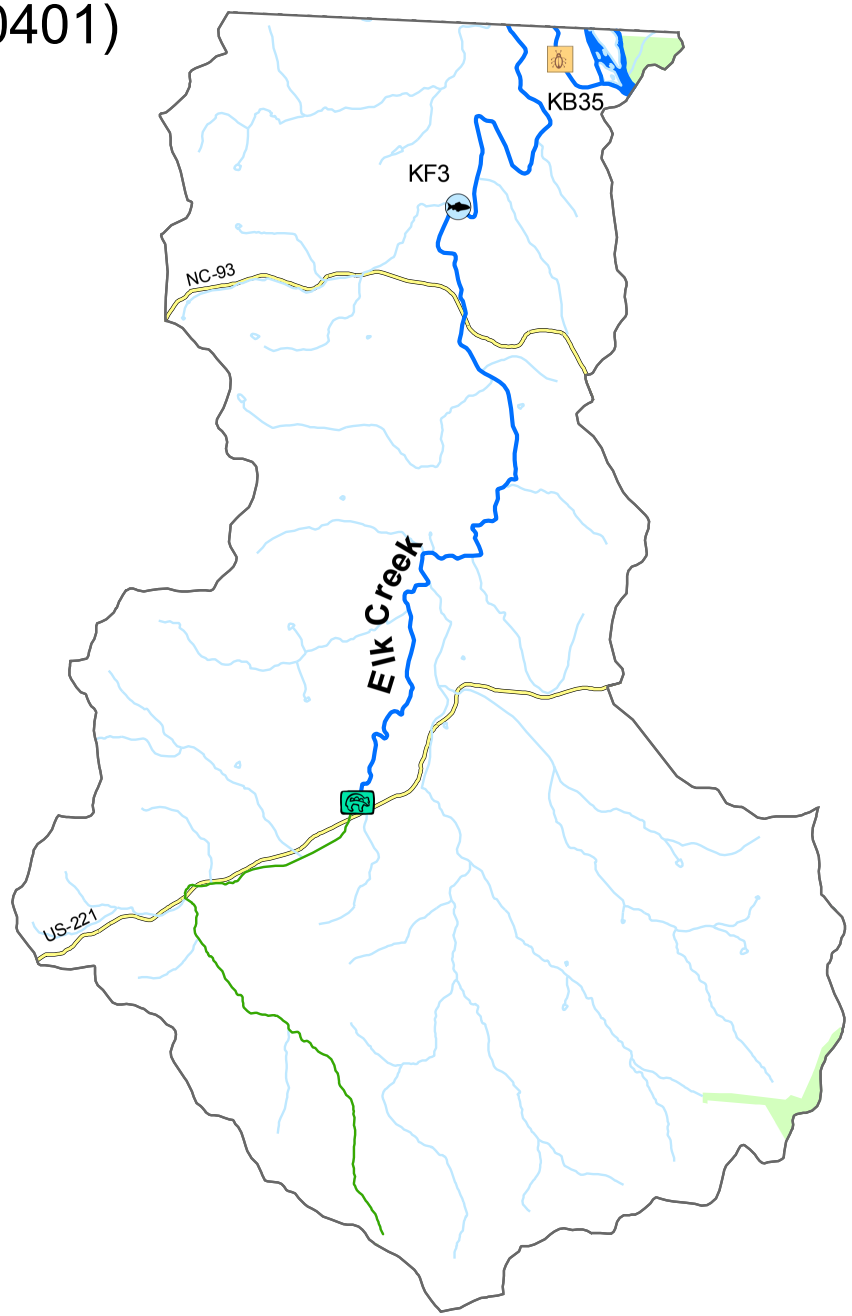
# results:	Geomean:	# > 400:	% > 400:	%Conf:
56	85.1	6	10.7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
%Conf : States the percent statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Appendix 3-D

12-Digit Subwatershed Maps

Elk Creek Subwatershed (050500010401)



Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

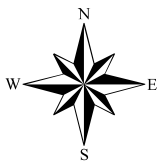
- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

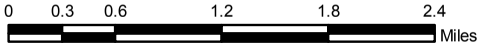
- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

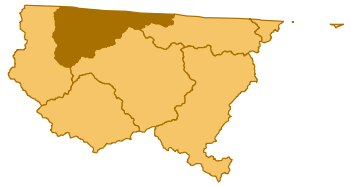
- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

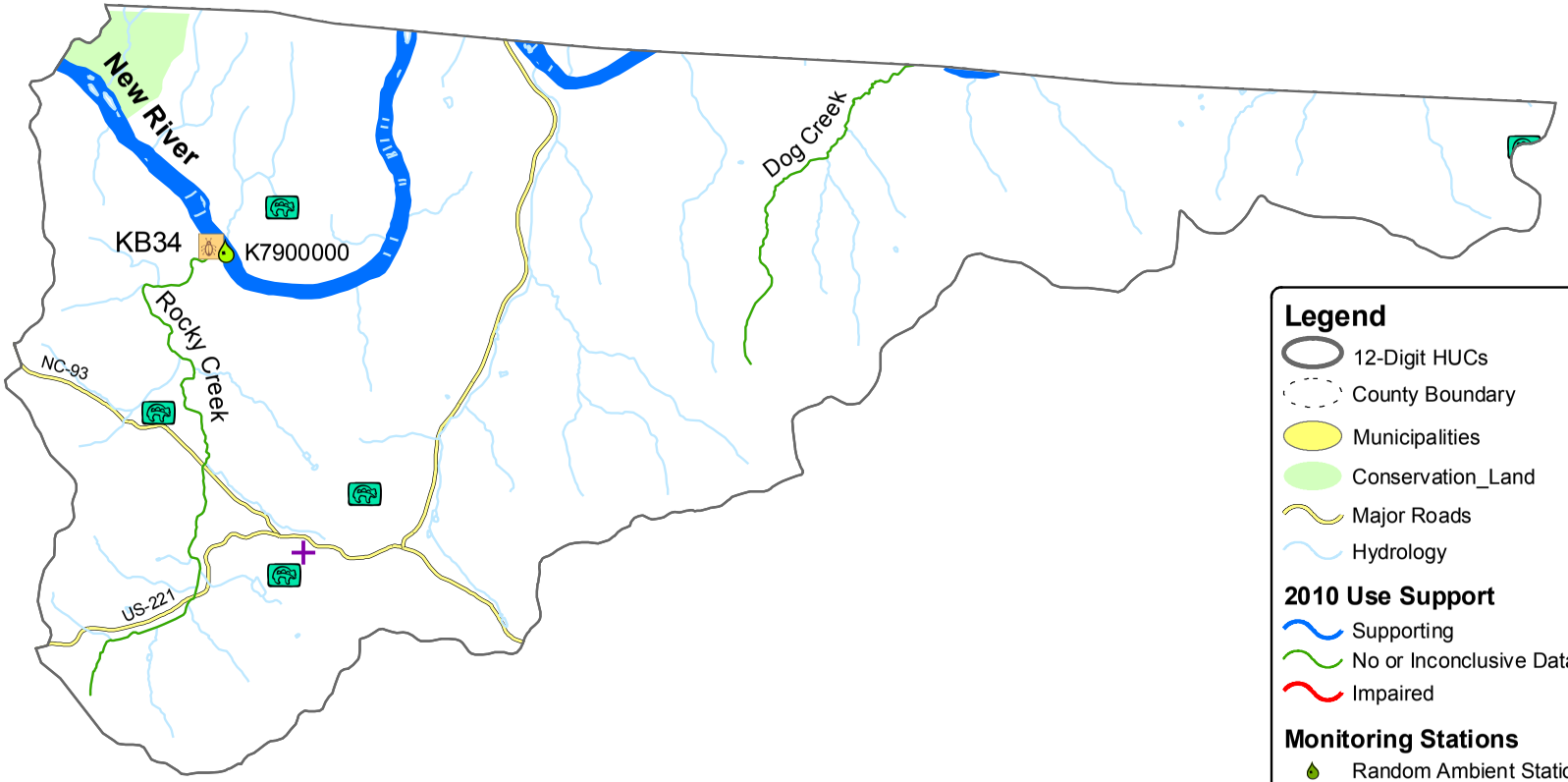


NC Division of Water Quality
Basinwide Planning Unit
January 2011



Brush Creek Subwatershed (050500010403)





Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

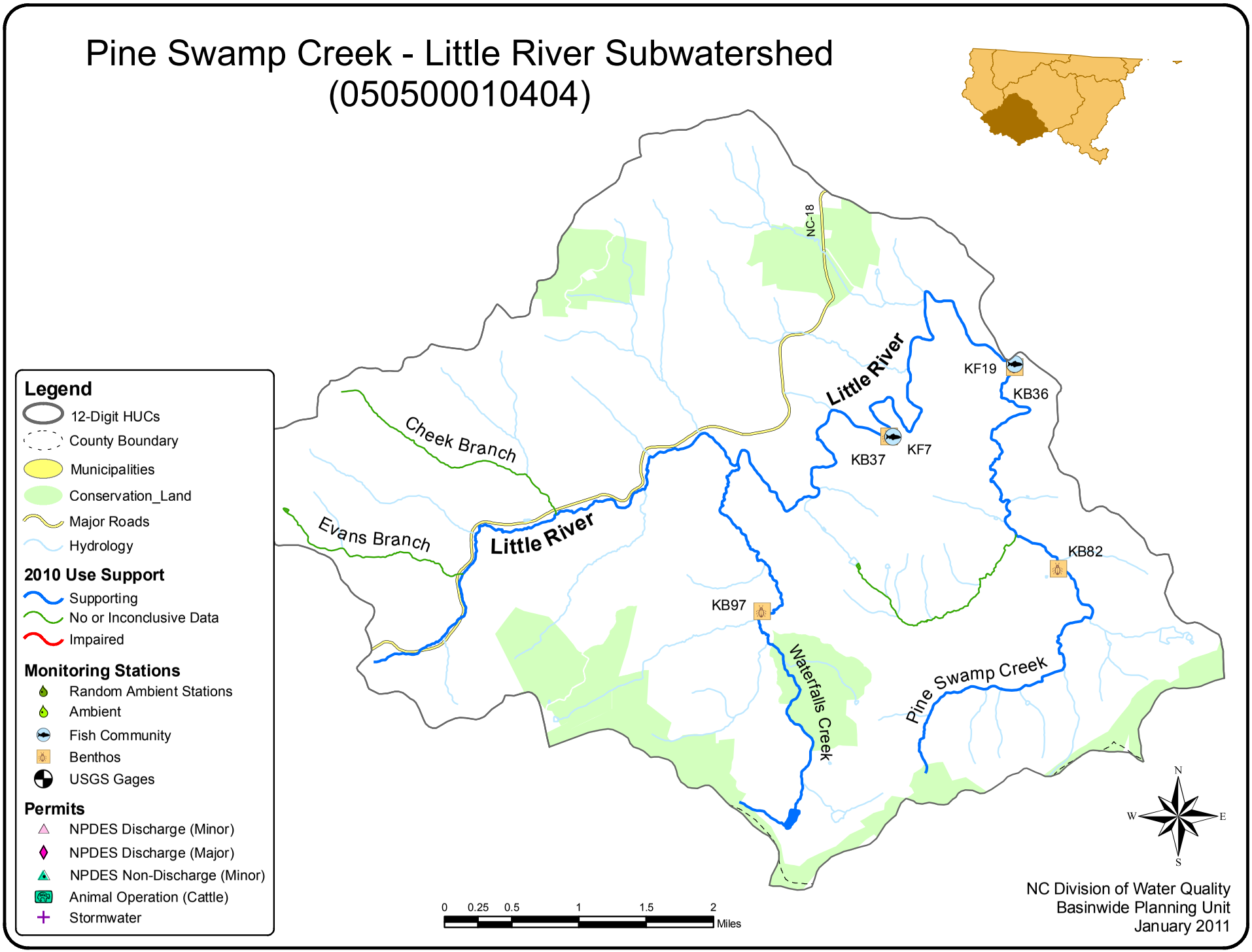
N
W E
S

NC Division of Water Quality
Basinwide Planning Unit
January 2011

0 0.3 0.6 1.2 1.8 2.4
Miles

3-D.4

Pine Swamp Creek - Little River Subwatershed (050500010404)



Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

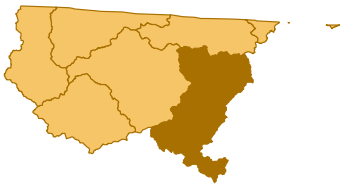
Monitoring Stations

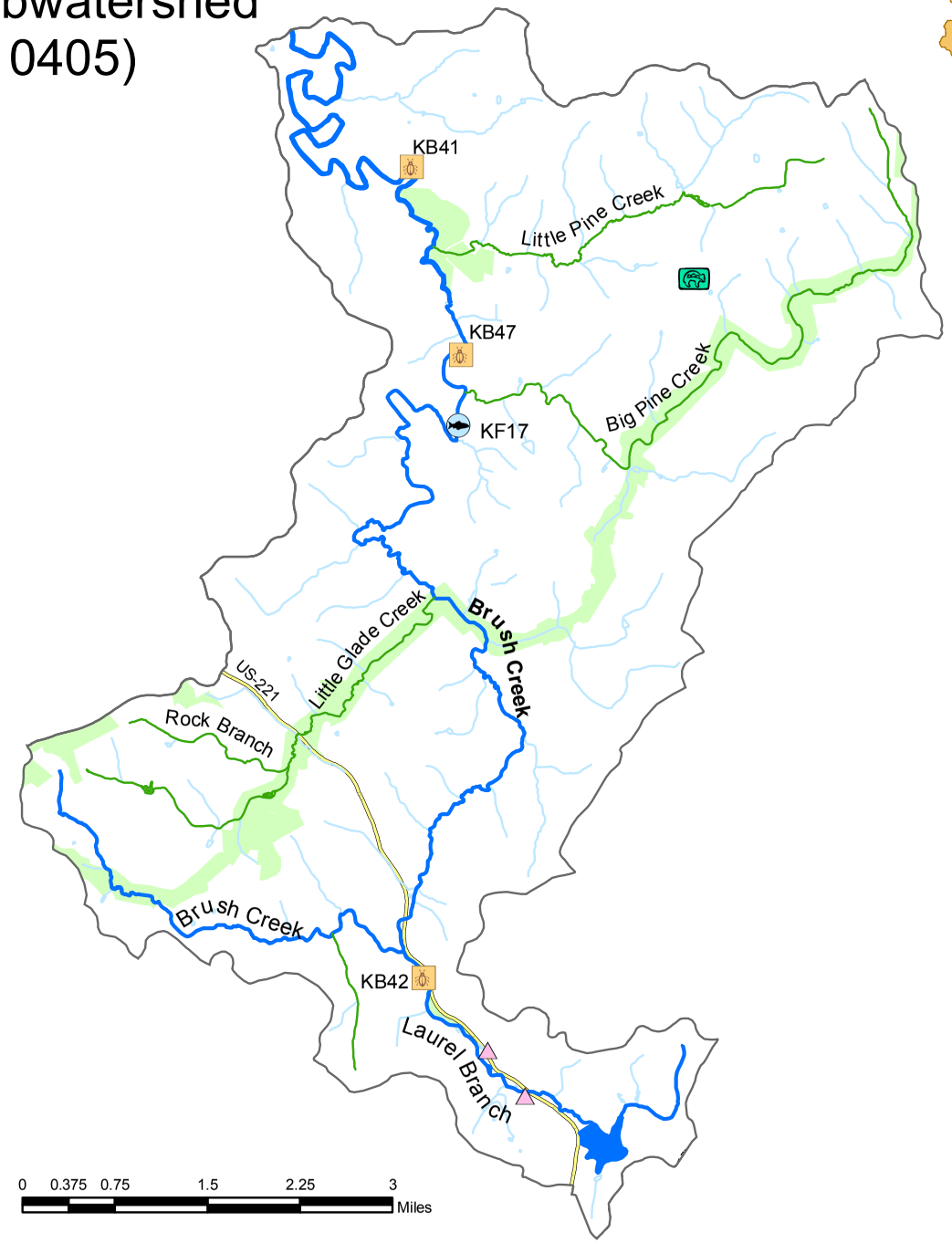
- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

Brush Creek Subwatershed (050500010405)





Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

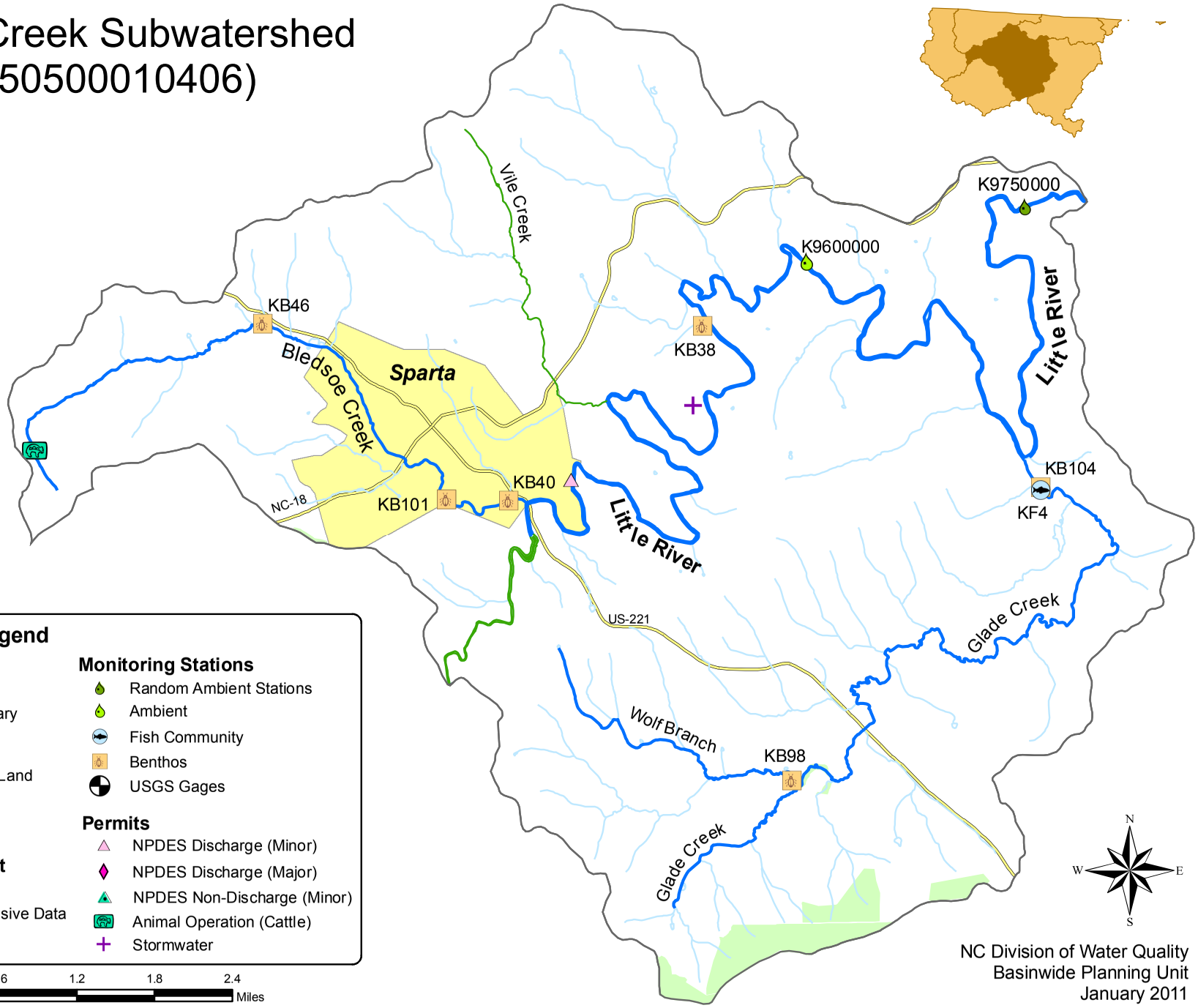
Permits

- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

NC Division of Water Quality
Basinwide Planning Unit
January 2011

3-D.6

Glade Creek Subwatershed (050500010406)



Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

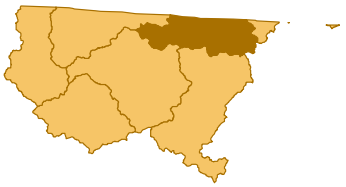
Permits

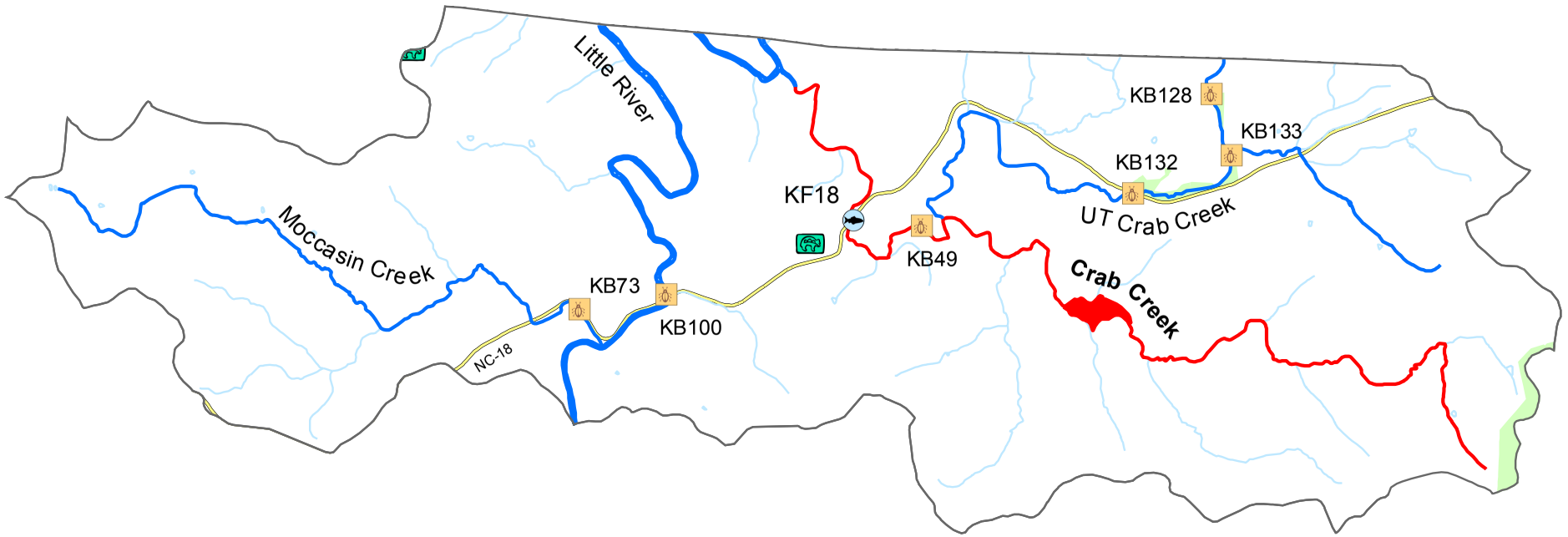
- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

0 0.3 0.6 1.2 1.8 2.4 Miles

NC Division of Water Quality
Basinwide Planning Unit
January 2011

Crab Creek-Little River Subwatershed (050500010407)





Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation_Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

0 0.25 0.5 1 1.5 2 Miles

N W E S

NC Division of Water Quality
Basinwide Planning Unit
January 2011

3-D.8