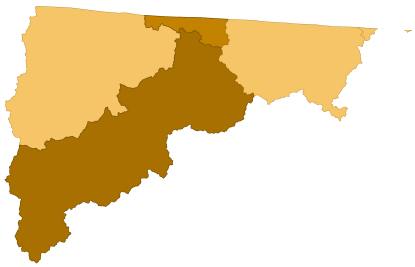
CHAPTER 2

SOUTH FORK NEW RIVER & FOX CREEK WATERSHEDS



HUCs 0505000102 & 0505000103

Includes: Meat Camp Creek, Elk Creek, Pine Swamp Creek, Beaver Creek, Naked Creek, Peak Creek, Cranberry Creek, Prather Creek, Grassy Creek & Bridle Creek

GENERAL WATERSHED DESCRIPTION

These two ten-digit hydrologic unit code (HUC) watersheds, with an area of about 351 square miles, are the equivalent to DWQ's old subbasin 05-07-01 and contain the South Fork New River, Fox Creek and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the Maps Chapter). These two watersheds are combined in the same chapter due to the small size of the Fox Creek watershed (0505000103).

Majority of these watersheds lie within Watauga and Ashe Counties. When combined, the South Fork New River and Fox Creek are the largest watersheds in this basin. The river flows north northeast through fairly mountainous terrain before joining with the North Fork New River to form the New River in northern Ashe County.

The land cover within these watersheds is mostly forested (64%) and has the largest amount of developed/urban area (8.2%) within the New River basin. These areas include the Towns of Blowing Rock, Boone, and Jefferson. Outside these urban areas, the land is dotted with rural residential communities, pastures and Christmas tree farms. Agricultural activities (25% of land cover) have historically consisted of cattle grazing, but within the last 15 years have expanded to include Christmas tree farming.

Roughly 7,800 acres of conservation land are found in these watersheds, and including easements held by local watershed groups and State agencies: Elk Knob State Park, Mt. Jefferson State Natural Area, New River State Park and Blue Ridge Rural Land Trust among others.

The population in these watersheds is centered mostly around the towns of Blowing Rock, Boone and Jefferson. The population of all three municipalities increased between 1990 and 2000 by a collective 22%. Boone is estimated to increase 10%, Blowing Rock by 5% and Jefferson by 1.4% by 2010 according to the 2000 census.

WATERSHED AT A GLANCE

COUNTIES:

Alleghany, Ashe & Watagua

MUNICIPALITIES:

Jefferson, Lansing & West Jefferson

ECOREGIONS:

Amphibolite Mountains, New River Plateau, Southern Crystaline Ridges and Mountains, Southern Metasedimentary Mountains, & Southern Sedimentary Ridges

PERMITTED FACILITIES:

NPDES WWTP: 14
- Major 2
- Minor 12

Non-Discharge Facilities: 9
Stormwater: 6
- General 6
- Individual 0

Animal Operations: 0

POPULATION:

2010: ..... Coming Soon

2006 LAND COVER:

Developed..... 8.42%
Forest 64.72%
Agriculture..... 26.74%
Wetlands..... 0.11%

2001 Impervious Surface .. 0.84%

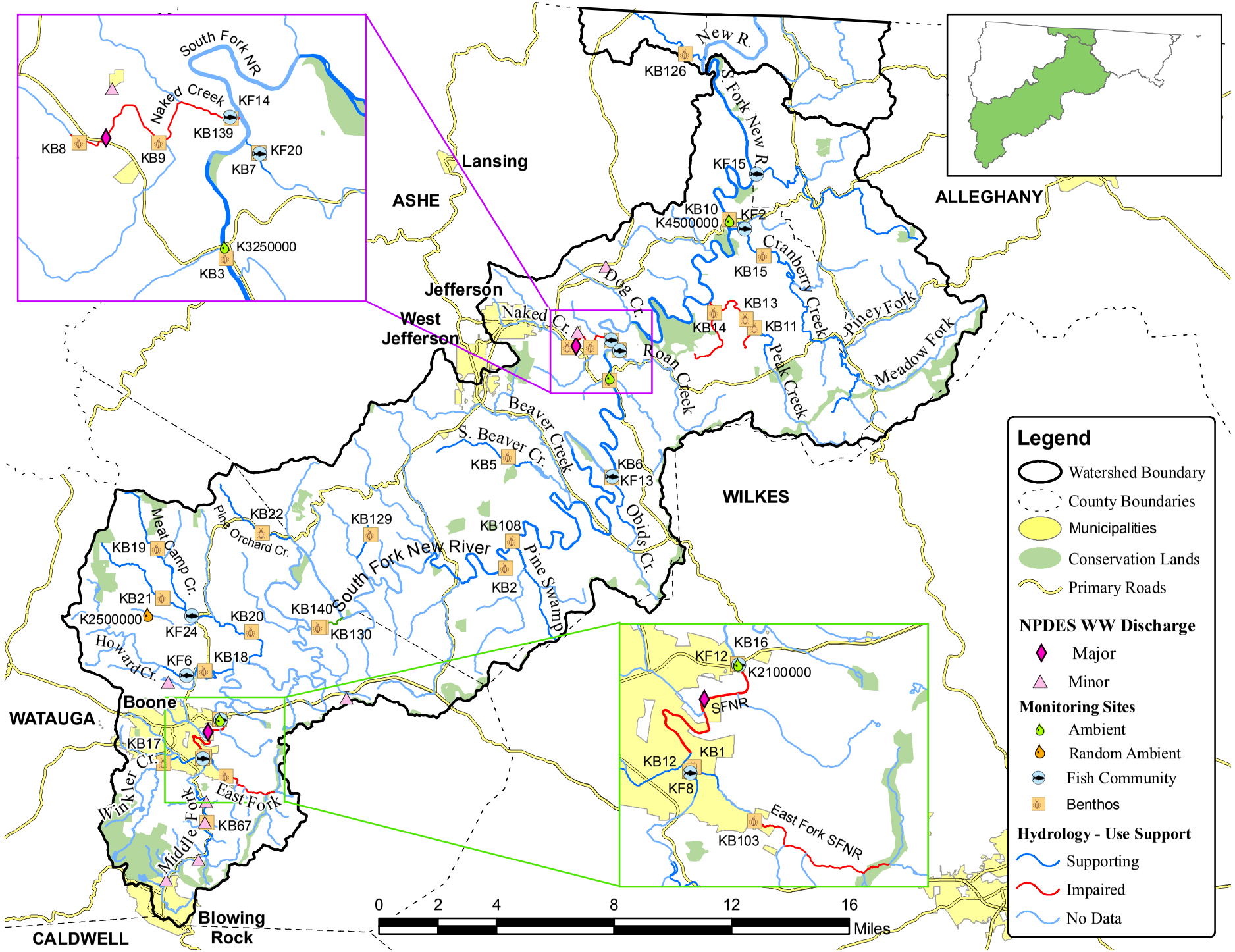


FIGURE 2-1: SOUTH FORK NEW RIVER/FOX CREEK WATERSHEDS (05050000102 & 05050000103)

Watershed Water Quality Overview

The South Fork New River/Fox Creek watershed contains seven out of the eight Impaired stream segments within the New River basin. Four of those segments include Naked Creek, Ore Knob Branch, Peak and Little Peak Creeks, which have been on the Impaired Waters list for several years. The remaining three Impaired segments (two segments of the South Fork New River and the East Fork South Fork New River) were added to the 2008 Impaired Waters list.

This watershed has the largest population of the three watersheds in the New River basin and contains more of an of urban and agriculture land use mix. Several waterbodies in the watershed have pristine water quality conditions and are in need of protection as land use changes from forest to urban or agriculture areas.

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 DWQ's 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 2-2: 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 2-3: Example of a Use Support and Monitoring Box

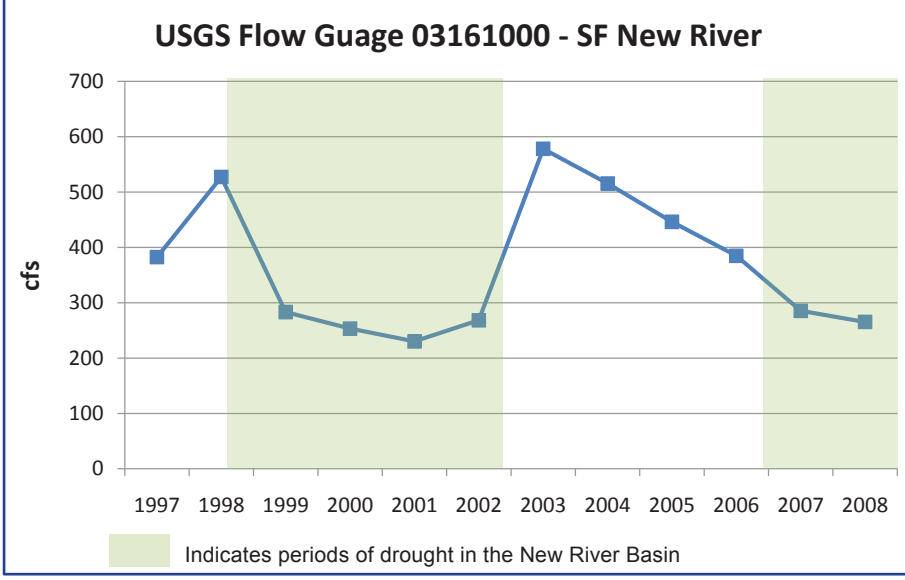
Use Support: **Impaired** (14 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB1)	Fair (2008)
Fish Com (CF1)	Good-Fair (2008)
AMS (C1234500)	Turbidity - 12% FCB - 48%

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 2-3 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 2-4). 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. 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 had an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which had 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 2-4: 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 ESS as part of the five year basinwide sampling cycle, in addition to special studies. Overall, 36 biological sampling sites were monitored within the South Fork New River Watershed. The ratings for each of the sampling stations can be seen in **Appendix 2-B**.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 2-5 and color-coded based on the current rating. As seen on the map, the majority of samples taken in this watershed were Supporting. This map also shows where the Impaired benthic sites are clustered in the basin. Each of these sites are discussed in more detail in the subwatershed discussions below.

BENTHIC SAMPLING SUMMARY

- Total Stations Monitored 25
- Total Samples Taken.....27
- Stations Monitored Twice..... 2
- Number of New Stations..... 5

Figure 2-6 shows 81% of the 27 sampling events received a Supporting rating and 12% received an Impaired rating. Figure 2-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if there are any overall shifts in ratings. Twenty-four percent of ratings declined and 12% improved in rating. Majority of ratings however, did not change which indicates no watershed scale shift in water quality.

Figure 2-5: Benthic Stations Color Coded by Current Rating in the South Fork New River Watershed

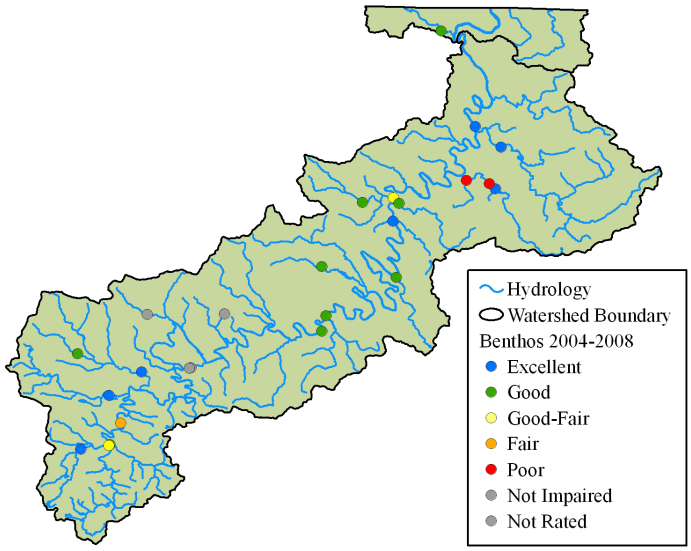


Figure 2-6: Current Benthic Site Ratings

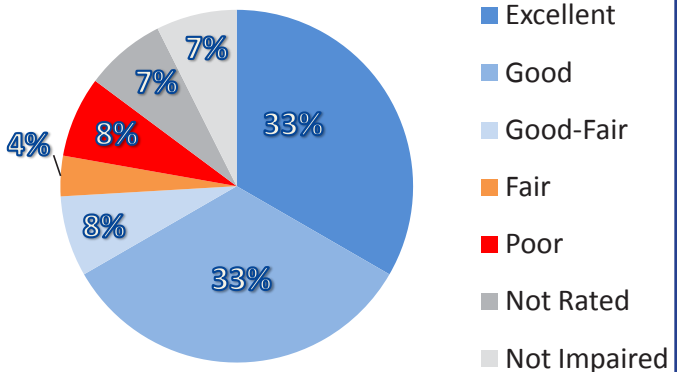
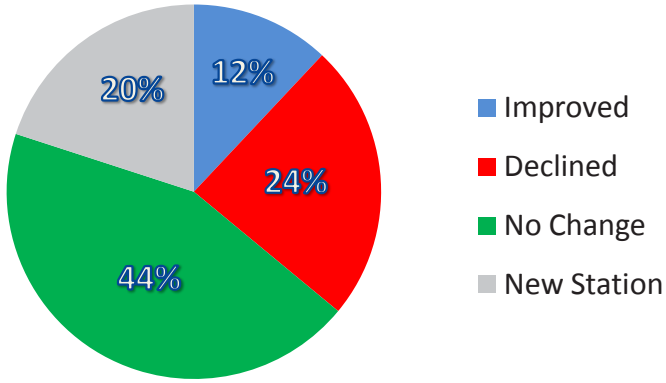


Figure 2-7: Change in Benthic Site Ratings



Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 2-8 and color coded based on the current rating. Five of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine potential for becoming fish community regional reference sites.

Fish Com. Sampling Summary

- Total Stations Monitored 11
- Total Samples Taken..... 11
- Number of New Stations..... 5

As shown in Figure 2-9, 55% of the 11 sampling events were Supporting and nine percent received an Impaired rating. Thirty-six percent of the samples were Not Rated; therefore, the segments are neither Impaired nor Supporting. These four sites were Not Rated due to their location in a small mountain trout stream which does not currently have rating criteria. DWQ is developing this criteria and will apply it to these sites once completed.

Figure 2-10 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 10% declined and 40% had no change in rating, indicating a somewhat stable fish community.

FIGURE 2-8: FISH COMMUNITY STATIONS COLOR CODED BY CURRENT RATING IN THE SOUTH FORK NEW RIVER WATERSHED

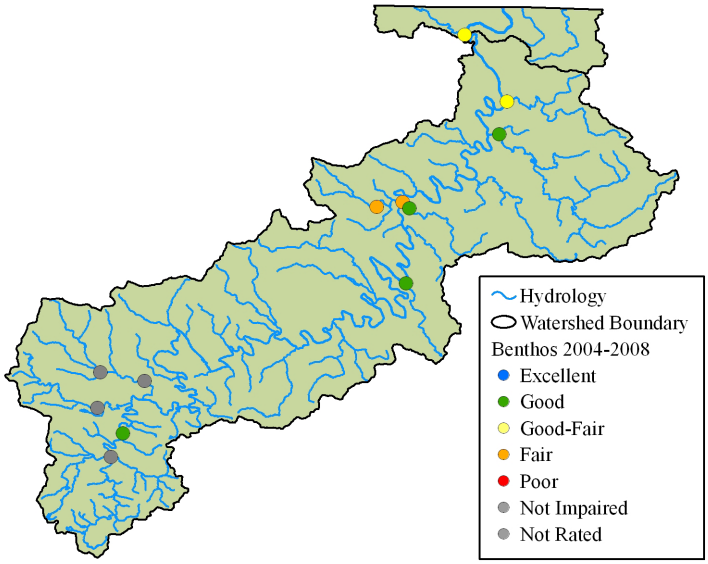


FIGURE 2-9: CURRENT FISH COMMUNITY SITE RATINGS

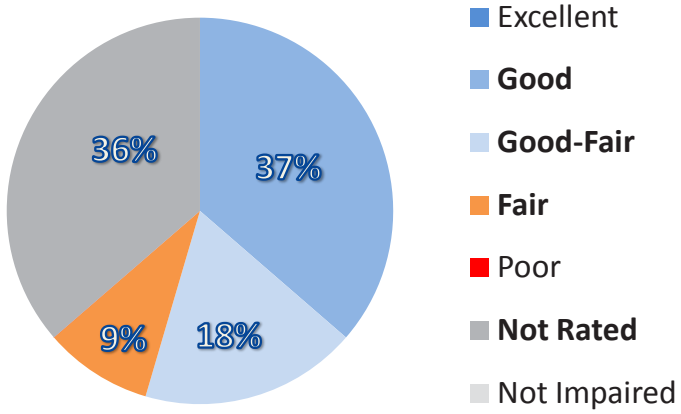
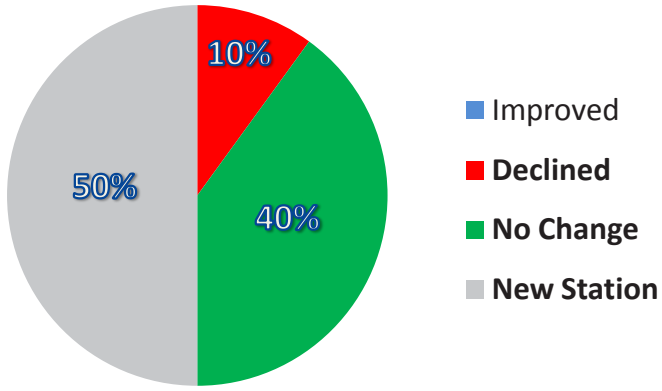


FIGURE 2-10: CHANGE IN FISH COMMUNITY SITE RATINGS



When comparing the changes in biological site ratings to the other watersheds in this basin, it appears this watershed had the largest overall decline. However, this watershed had almost twice as many monitoring stations that could be compared between the previous monitoring cycle and the current. For more information about biological data in this watershed, see the 2009 New River Basinwide Assessment Report. Detailed data sheets for each sampling site can be found in Appendix 2-B.

Fish Kills/Spill Events

Hodges Creek [AU#: 10-1-4-4-1]:

A fish kill was reported on July 17, 2010 on Hodges Creek of roughly 100 trout, crayfish and snails. This kill was the result of parking lot sealant being applied to the parking lot, located at 2458 NC Hwy. 105, right before a rain event. The rain event caused the sealant to runoff the parking lot before it was able to dry properly.

AMBIENT DATA

The 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 2-A and statewide on the Modeling & TMDL Unit's website.

Three AMS stations are located in the South Fork New River watershed (see Figure 2-1). During the current sampling cycle (January 2004 and 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 major ambient monitoring parameters includes graphs showing the median and mean concentration values for the three AMS stations in this watershed by specific parameter over a 13 year period (1997-2009). Each major parameter is discussed, 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

AMS site K3250000 (located on the South Fork New River, just southeast of the Town of Jefferson) was the only AMS site in this watershed which recorded a pH standard exceedance. Two samples were over the 9.0 standard during this monitoring cycle, as indicated in Figure 2-11 by a yellow dot. Figure 2-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the South Fork New 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 2-11: Percentage of Samples Exceeding the pH Standards (2003-2008)

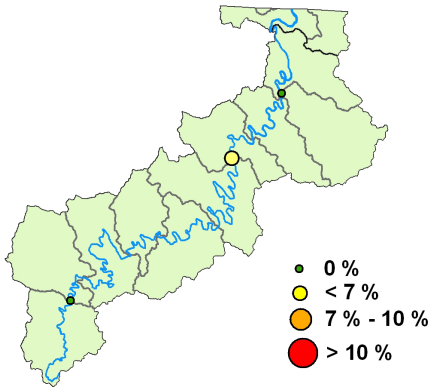
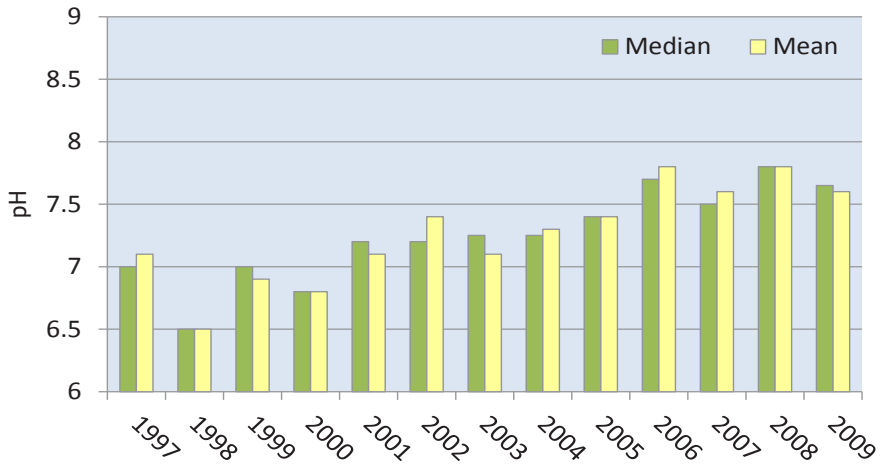


Figure 2-12: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 0505000102



Turbidity

All three AMS sites (which are located on the South Fork New River) exceeded the state's turbidity standard in three to seven percent of samples, as seen in Figure 2-13 indicated by a yellow dot. Possible sources of elevated turbidity levels are discussed in the 12-digit subbwatershed section. Figure 2-14 shows the mean and median of turbidity levels for all samples taken over the course of 13 years in the South Fork New River watershed. The yearly averages are well below the state standard of 50 NTUs. The highest two violations occurred in 2009 at sites K3250000 and K4500000, measuring at 380 NTU and 260 NTU, respectively.

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 off impervious surfaces are all potential sources. Turbidity violations demonstrate the importance of **protecting and conserving stream buffers and natural areas.**

FIGURE 2-13: PERCENTAGE OF SAMPLES EXCEEDING THE TURBIDITY STANDARD (2003-2008)

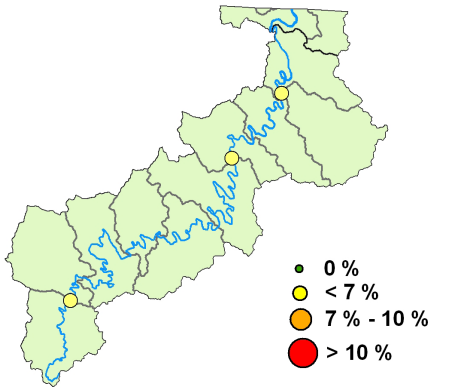
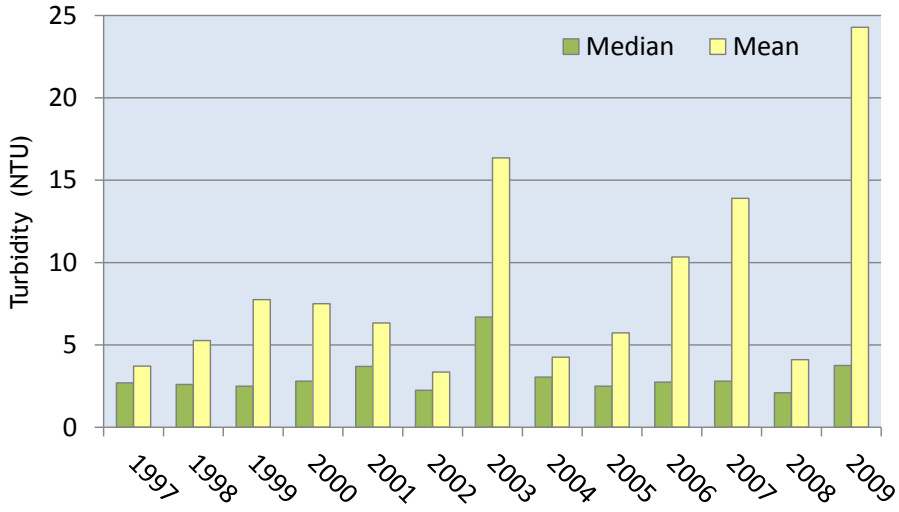


FIGURE 2-14: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000102



* NC Turbidity Standard: 50 NUT

Dissolved Oxygen

As seen in Figure 2-15, none of the three sites recorded DO standard exceedance during this monitoring cycle. Figure 2-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the South Fork New River watershed. These averages are well within the normal DO range.

FIGURE 2-15: PERCENTAGE OF SAMPLES EXCEEDING THE DO STANDARD (2003-2008)

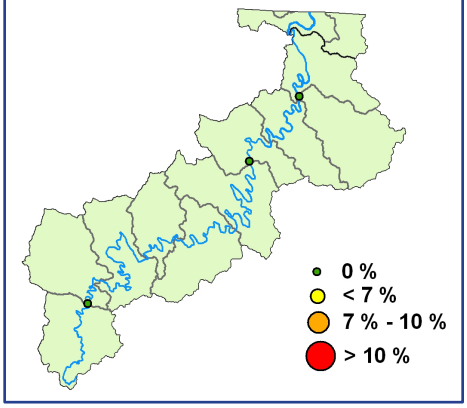
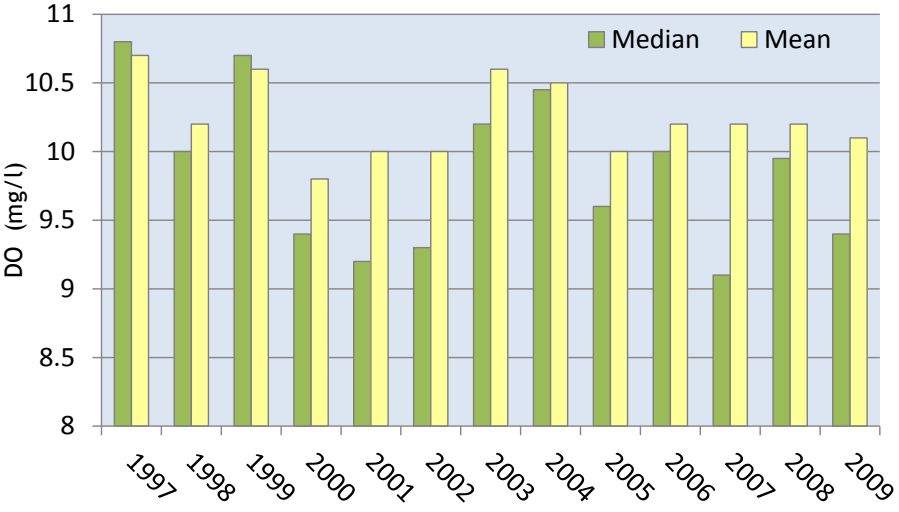


FIGURE 2-16: SUMMARIZED DO VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000102



* NC DO Standard: Not < 5 mg/l daily avg. or not < 4 mg/l instantaneous

Temperature

The NC standard for temperature is not to exceed 29°C (84.2°F) in the mountain/upper piedmont regions. The discharge of heated liquids to trout waters (Tr) should not increase the natural water temperature by more than 0.5°C (0.9°F), and in no case, exceed 20°C (68°F). A map of designated Trout Waters in the New River basin can be found in the **Maps Chapter**. No stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 2-17).

Figure 2-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the South Fork New River watershed. The change in the water temperature trend for this watershed can be linked to the change in stream flow levels. During low flow or drought periods, water can sit in small pools and become heated by the sun.

Figure 2-17: Percentage of Samples Exceeding Temperature Standard (2003-2008)

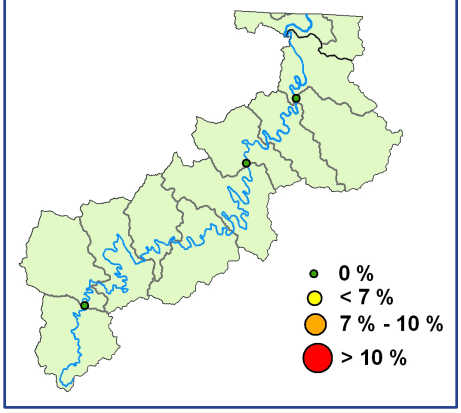
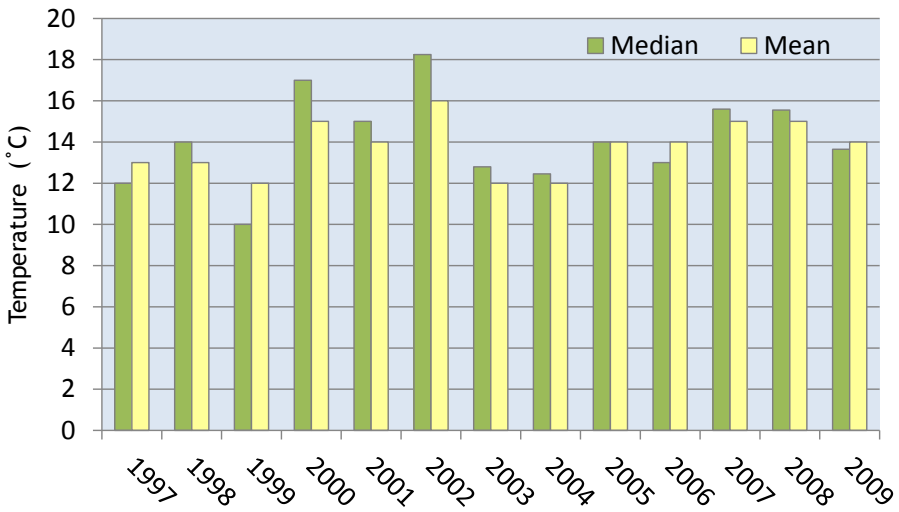


Figure 2-18: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 0505000102

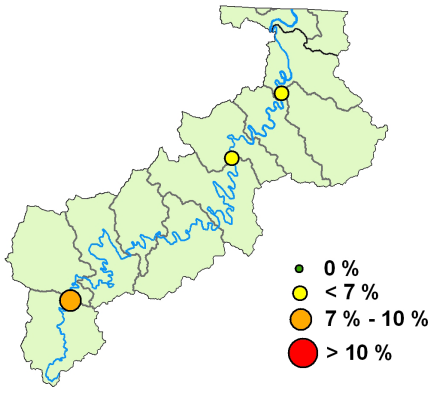


* NC Temperature Standard for Mountain/Upper Piedmont Region: 29˚C (84.2˚F)

Fecal Coliform Bacteria

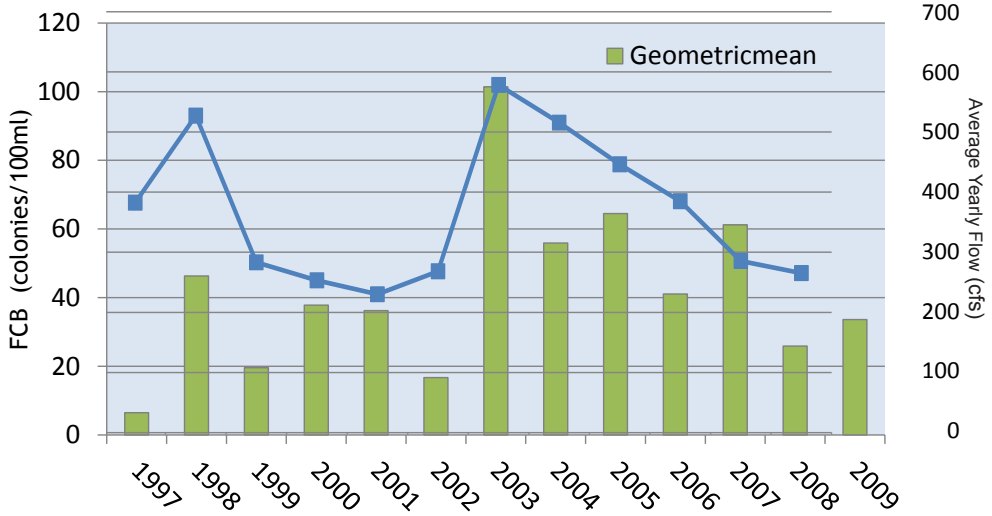
Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 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. Three AMS stations are located within this watershed which are all along the South Fork New River.

Figure 2-19: Percentage of Samples with Elevated FCB Levels (2003-2008)



As seen in Figure 2-19, two of the sites had 0 to 7% of samples taken during this cycle result in levels over 400 colonies/100 ml and the southern most site had 7 to 10%. Possible sources of elevated levels of FCB are discussed in the subwatershed sections. Figure 2-20 shows the geometric mean of FCB levels for all samples taken over the course of 13 years in the South Fork New 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. The highest yearly geometric mean for FCB was recorded in 2003. The figure also includes the yearly average stream flow, as seen in Figure 2-4, to show how flow can be linked to FCB levels.

FIGURE 2-20: 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 PRIORITY SUMMARY

Table 2-1 is a list of waters in the South Fork New River & Fox Creek Watersheds that DWQ has prioritized for restoration/protection. The order of priority is not based solely on the severity of the steams 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 2-1: Prioritization of Waters in the South Fork New River & Fox Creek Watersheds (Highest to Lowest Priority)

Stream Name	AU#	Class.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
South Fork New R. (SFNR)	10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b	WS-IV;CA;+ C;+ C;+	Habitat Degradation, Nutrients, pH	Construction, WWTP	**Impaired**	SS, SEC, NMC, P (Hellbender Salamander)
Boone Cr. (Kraut Cr.)	10-1-4-4	C;Tr;+	Habitat Degradation, Temperature, Turbidity, DO, Copper	ASU Steam Station, Urban Impacts, Construction, Piped Streams	**Impacted**	DS, RBR, SC, E
SFNR	10-1-(33.5)	B;ORW	Habitat Degradation, Turbidity, pH, Nutrients, Copper	Agriculture, Abandoned Mine	Supporting	RBR, Ag, NMC
Naked Cr.	10-1-32	C;+	Habitat Degradation (Riparian Buffers) Turbidity, Toxins	Construction, Golf Course, Urban Impacts	**Impaired**	SC, RBR, E, WRP, DS, SEC
Middle Fork SFNR	10-1-2-(1), 10-1-2-(6), 10-1-2-(14) & 10-1-2-(15)	WS-IV;+ WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+		Urban Impacts, Blowing Rock WTP	**Impacted**	M
East Fork SFNR	10-1-3-(1), 10-1-3-(7) & 10-1-3-(8)	WS-IV;Tr;+ WS-IV;+ WS-IV;CA;+	Habitat Degradation (Riparian Buffers)	Urban Impacts, Blowing Rock WTP	**Impaired**	RBR, M
Obids Cr.	10-1-27-(1) 10-1-27-(2)	C;Tr;+ WS-IV;Tr;+	Habitat Degradation (Riparian Buffers)	Agriculture (Livestock access)	Supporting	Ag, RBR, E
Pine Swamp Cr.	10-1-24	C;+	Turbidity	Stormwater Volume & Velocity	Supporting	RBR, Ag, E
Cranberry Cr. (Mulberry Cr.)	10-1-37	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Straight Channels, Agriculture	Supporting	R, Ag, RBR, E
Prathers Cr.	10-1-38	B;Tr;+	Habitat Degradation (Riparian Buffers) Nutrients	Agriculture	**Impacted**	RBR, Ag, NMC
Norris Fork	10-1-10-2	C;Tr;+	Turbidity	Construction	Supporting	SEC BMPs
SFNR	10-1-(20.5) & 10-1-(26)a	WS-V;HQW WS-IV;HQW			Supporting	RBR, E
Roan Cr.	10-1-31-(1) 10-1-31-(1.5) 10-1-31-(2)	C;Tr;+ WS-IV;Tr;+ WS-IV;CA;Tr;+	Sedimentation	Agriculture	Supporting	Ag, E, RBR
Winkler Cr.	10-1-4-(1), 10-1-4-(2), 10-1-4-(3.5)a & 10-1-4-(3.5)b	WS-II;HQW,Tr WS-II;HQW;Tr;CA C;Tr;+ C;Tr;+		Urban Impacts, Pipped Streams	Supporting	DS, M
Grassy Cr.	10-3	C;Tr;+	Nutrients, pH	Agriculture, Straight Channels	**Impacted**	Ag, RBR

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**).

STREAM NAME	AU#	CLASS.	POTENTIAL STRESSOR(S)	POTENTIAL SOURCE(S)	STATUS	ACTIONS NEEDED
Nathans Cr.	10-1-36	B;Tr;+	Habitat Degradation		**Impacted**	M
SFNR	10-1-(3.5)c & 10-1-(14.5)	C;+ C;+	Habitat Degradation, Turbidity, pH	Poor Riparian Buffers	**Impacted**	M
SFNR	10-1-(26)b & 10-1-(30)	WS-IV;HQW WS-IV;HQW;CA	pH, Turbidity, Nutrients		Supporting	SS
Little Peak Cr.	10-1-35-4	B;Tr;+	Toxins	Abandoned Mine	**Impaired**	R - Currently Underway
Ore Knob Br.	10-1-35-3	B;Tr;+	Toxins	Abandoned Mine	**Impaired**	R - Currently Underway
Peak Cr.	10-1-35-(1), 10-1-35-(2)a & 10-1-35-(2) b	C;Tr;+ B;Tr;+ B;Tr;+	Toxins	Abandoned Mine	**Impaired**	R - Currently Underway
Pine Orchard Cr.	10-1-15-1	C;Tr;+	Turbidity		Supporting	RBR
South Beaver Cr.	10-1-25-2	C;Tr;+	Habitat Degradation (Riparian Buffers)		Supporting	RBR
Piney Fork	10-1-37-3	B;Tr;+			Improving	M

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 2-1, 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 2-2). 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 2-2 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 2-2: 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 2-2) 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.

SOUTH FORK NEW RIVER (SFNR)

The full length South Fork New River runs from the Town of Boone 125 miles northeast to the New River confluence at the New River State Park. The river's watershed is split into ten smaller subwatersheds (12-digit HUs) that are discussed in the following sections. This section will review the South Forks water quality status by AU segments.

AU#'s: 10-1-(1), 10-1-(3.5)a & 10-1-(3.5)b

USE SUPPORT: IMPAIRED (5.5 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (KB16)	Fair (2008)
Fish Com (KF12)	Good (2008)
AMS (K2100000)	No Exceedances

The SFNR begins at the confluence of the Middle and East Fork South Fork New Rivers in the Town of Boone. This five and a half mile stretch within the Headwaters SFNR subwatershed (050500010201) receives runoff from a wide variety of land uses, including sports fields, commercial properties, pastures and a quarry along the stream banks with residential and forested land further up the banks. The Town of Boone's WWTP also discharges to this portion of the SFNR. The two segments of the river running from Winkler Creek to US-421 [AU#: 10-1-(3.5)a & b] were added to the 2008 Impaired Waters list for ecological/biological integrity. Segment 10-1-(3.5)b was originally placed on the Impaired Waters List in 1998 for ecological/biological integrity and removed from the 2000 List.

Water Quality Status

The majority of the SFNR located within this subwatershed, 5.1 miles of 5.5 miles, initially appeared on the Impaired Waters list in 2008. Three DWQ sampling stations, located at the US-421 bridge, monitor the benthic and fish communities as well as physical/chemical parameters (AMS). Fish community samples taken this cycle indicated an improvement in species diversity as well as the quantity of the community from the previous cycle.

However, a benthic sample collected in November of 2003, resulted in a declined rating of Fair from Good-Fair in August of 2003. The 2008 benthic rating echoed the November 2003 rating of Fair. Data from surrounding tributaries indicate the immediate drainage area is having more of an impact on the river than surrounding tributaries. Silt covered 40% of the benthos in this reach limiting habitat for aquatic macroinvertebrates. The excess silt is likely a result of stormwater runoff carrying loose sediment from a large land disturbing activity at the confluence of Hardin Creek and the SFNR.

Physical/chemical sample results also show the stream is experiencing periods of high turbidity during storm events. Nutrient levels, particularly ammonia, have been reduced as a result of upgrades to the Town of Boone's WWTP; however, reductions in total nitrogen and total phosphorus are still needed to support the river's designated uses. pH levels at this site have gradually increased from 6.6 to around 7.6 between 1997 and 2009.

In September 2010, a survey was conducted to identify locations throughout the state of the Hellbender salamander. A population was found in the SFNR near Boone. More information about the Hellbender Salamander can be found on the NC National Heritage Program website.

This section of the SFNR will remain on the Impaired Waters List in 2012 and will be re-sampled in 2013.

Recommendations

It is recommended that both county and municipal planning departments work cooperatively to ensure construction projects are completed in an environmentally responsible manner. Local governments are also urged to partner with local environmental groups and DWQ to determine the need for a Watershed Restoration Plan. A stressor study is recommended to pinpoint the source of nutrients and other stressors that are impacting the benthic community. DWQ supports the need for funding a Watershed Restoration Plan for this drainage area that includes an implementation plan and post implementation monitoring. The presence of the Hellbender salamander increases the priority of restoration and protection of this drainage area.

AU#'s: 10-1-(3.5)c & 10-1-(14.5)

Use Support: Supporting (60.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB90)	Good-Fair (1990)

These two segments of the SFNR are approximately 61 miles from the edge of Boone to just upstream of Couches Creek and flow through three subwatersheds (Meat Camp Creek-SFNR: 050500010202, Elk Creek-SFNR: 050500010203 and Old Fields Creek-SFNR: 050500010204). Land cover for the drainage area is a mixture of agriculture lining the stream banks, small scattered urban and forested areas.

Water Quality Status

These segments were last sampled in 1990 when the benthic community received a Good-Fair rating. There are no known water quality issues in the segments.

Recommendations

DWQ will monitor KB90 during the next sampling cycle, if resources are available, to determine if there as been a significant change in water quality of this drainage area.

AU#'s: 10-1-(20.5) & 10-1-(26)a

Use Support: Supporting (24.6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB2)	Good (2008)

These two segments of the SFNR are approximately 25 miles from just upstream of Couches Creek to Obids Creek and flow through three subwatersheds (Old Fields Creek-SFNR: 050500010204, Pine Swamp-SFNR: 050500010205 and Beaver Creek-SFNR: 050500010206). Land cover for the drainage area is a mixture of agriculture and forest.

Water Quality Status

The upstream segment [AU#: 10-1-(20.5)] has been monitored for benthic health three times since 1998 and holds a secondary use classification of HQW. The first two samples rated Excellent; however, the most recent sample taken in 2008 declined to a Good rating. This decline indicates more pollution tolerant taxa inhabiting the stream. Limited instream habitat and poor riparian buffers are responsible for the low habitat score. Specific conductivity and pH levels were both higher than past samples (105µS/cm and 9.2, respectively).

Habitat conditions and an increasing pollution tolerance level combined with elevated turbidity, conductivity and pH levels indicate signs of recent impacts to the aquatic life in this segment. If impacts continue, the benthic rating for this segment is expected to decline during the next cycle.

Recommendations

Riparian buffer restoration is suggested along sections of the river that are lacking buffers of the correct width or all together. Educational efforts are also suggested for this area to inform property owners of the importance of maintaining proper width riparian buffers.

AU#'s: 10-1-(26)b & 10-1-(30)

Use Support: Supporting (7.3 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB3)	Excellent (2008)
AMS (K3250000)	No Exceedances

These two segments of the SFNR [AU#: 10-1-(26)b & (30)] are approximately seven miles from just downstream of the Obids Creek to Naked Creek and flow through two subwatersheds (Beaver Creek-SFNR: 050500010206 and Naked Creek-SFNR: 050500010207). Land cover for the drainage area is a mixture of agriculture, forest and residential. Segment 10-1-(26)b was added to the 2006 Impaired Waters List for low pH violations but removed from the 2008 list.

Water Quality Status

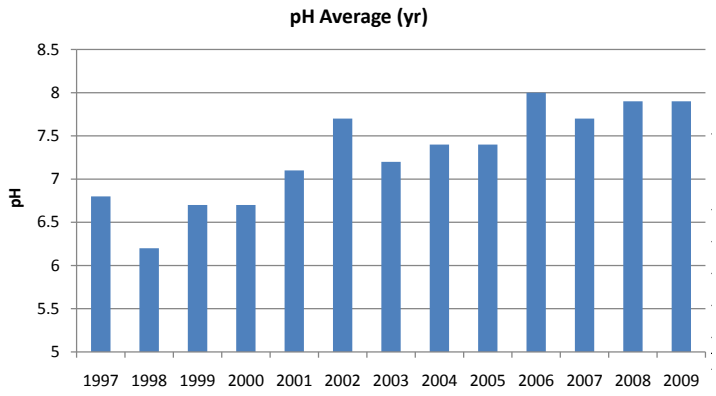
A benthic site located at NC-16/18 has been sampled five times between 1990 and 2008. Each of these samples has resulted in an Excellent rating. The most recent sample showed a large and diverse benthic community; however, this community is slightly more pollution tolerant than of those found in the 2003 sample. This is an indication that impacts to instream water quality are present.

An AMS station is located just downstream of the benthic station, at NC-16 and NC-88. Between 2005 and 2009, there were no parameters with exceedances greater than 10% which would cause the stream to be added back to the Impaired Waters list. However, parameters of interest at this station include turbidity, specific conductivity, nutrients and pH which were all elevated as compared to the previous cycle. Fecal coliform bacteria levels were, on average, lower than the previous cycle.

Several low pH readings, below the state water quality standard of 6.0, in the late 1990s and early 2000s placed this segment on the 2006 Impaired Waters List. It was removed from the 2008 list due to a reduction in the percent of samples with low pH violations. The last low pH violation was recorded in 2001 and the first high pH violation (greater than 9.0) was recorded in 2002. As seen in Figure 2-21, yearly averages of pH have been steadily increasing.

The specific cause of the increasing pH levels is unknown at this time.

FIGURE 2-21: YEARLY PH AVERAGES FOR K3250000 BETWEEN 1998 AND 2009



Recommendations

A stressor study should be conducted to determine the source of the increased pH. In western portion of the State, a downward trend is being seen in pH levels. This site does not appear to be affected by the unknown cause of low pH in the western portion; therefore, a separate study should be prioritized.

AU#: 10-1-(33.5)

This segment of the SFNR is 22.5 miles long, from Dog Creek to the confluence with the New River. The land cover in this drainage area is dominated by agriculture and forest. No permitted dischargers are located along the segment; however, it does receive flow from Peak, Little Peak Creeks and Ore Knob Branch, which are all Impaired waters. This segment holds a National Wild & Scenic River classification as well as a State use classification of ORW.

USE SUPPORT: **SUPPORTING** (22.5 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB10)	Excellent (2008)
AMS (K4500000)	No Exceedances

Water Quality Status

This segment includes an AMS station and a benthic macroinvertebrate station. Both stations are located along US-221, near Scottville. The benthic station has been monitored since 1983 and received an Excellent rating since 1990 as it did again in 2008. Specific conductivity and pH levels have both increased since the 2003 sample, indicating the presence of a water quality pollutant. Much of the streambanks along the segment lack any form of riparian buffer and are often used for agriculture activities.

Physical and chemical parameters measured at the AMS station (K4500000) were all within North Carolina's water quality standards. However, the data did show elevated levels of turbidity and copper and slightly higher nutrient levels as compared to the previous sampling cycle. A copper ore mine on Ore Knob Branch is the likely source of elevated copper. See the Peak Creek-South Fork New River subwatershed discussion for more details about the closed mine.

Recommendations

DWQ will work with SWCD to prioritize this segment of the river for the most appropriate agricultural BMPs to reduce the amount of nutrients and sediment that runs off farmlands. Educational efforts are also recommended to inform landowners of the importance of minimizing time soil is exposed between crop rotation and maintaining adequate riparian buffers.

Local Initiatives

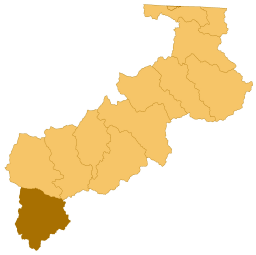
In 2008, the National Committee for the New River (NCNR) combined efforts with the New River State Park to work on a streambank and riparian buffer restoration project. The streambank along a reach of the South Fork river in the New River State Park had severely eroding streambanks and lacked accessible floodplain and vegetated riparian buffers. The primary goal of the project was to reduce erosion; establish functional riparian zones; stabilize streambanks; restore connection of the stream to the flood plain; provide shading of the streams, and improve aquatic habitat.

With funding from CWMTF, the NCNR stabilized 1350 linear feet of riverbank by sloping the banks, constructing in-stream structures to protect the bank, and planting a riparian buffer. The New River State Park contributed funds to plant trees on the project site, extending the average riparian buffer zone to over 200 feet.

FIGURE 2-22: STREAM & BUFFER RESTORATION EFFORTS ALONG SOUTH FORK (LEFT: MARCH 2010; RIGHT: MAY 2010)

*Pictures Provided by NCNR's Lynn Caldwell

SOUTH FORK NEW RIVER HEADWATERS (HUC: 050500010201)



Includes: South Fork New River [AU#: 10-1-(1), (3.5)a & (3.5)b], **Middle Fork South Fork New River** [AU#: 10-1-2-(1), (6), (14) & (15)], **East Fork South Fork New River** [AU#: 10-1-3-(1), (7) & (8)] **& Winkler Creek** [AU#:10-1-4-(1) & (3.5)]

This subwatershed has mixed land use of forest, urban and agriculture. There are five minor and one major NPDES discharger permits in this subwatershed. The majority of streams in the subwatershed hold the secondary use classification of Trout Waters. The Towns of Blowing Rock and Boone are located in the southern and northern portion of the subwatershed, respectively. The subwatershed also includes two Impaired waterbodies (South Fork New River [AU: 10-1-(3.5)b] and East Fork South Fork New River [AU#: 10-1-3-(1)]).

Middle Fork South Fork New River [AU#: 10-1-2-(1), (6), (14) & (15)]

The Middle Fork South Fork New River runs about 11 miles from its source in the Town of Blowing Rock to the SFNR confluence in the Town of Boone. The river mostly flows north along US 221/321. Between the Towns of Blowing Rock and Boone, the river receives run off from light development along the streambanks, the Boone Golf Course and discharge from four minor NPDES facilities.

USE SUPPORT: **SUPPORTING** (11.1 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB1)	Good-Fair (2008)
Fish Com (KF8)	Not Rated (2008)

Water Quality Status

The first two segments of the river [AU#: 10-1-2-(1) & (6)], or the first nine miles, were last sampled in 2003. The 2003 benthic sample (KB67) was taken as part of a special study to determine impacts of a sodium hydroxide spill and received a Good-Fair rating.

The lower portion of the river [AU#: 10-1-2-(14) & (15)] was sampled in 2008 just upstream of the SFNR confluence. This benthic site (KB1) has been sampled five times since 1993, when it received an Excellent rating. Since that time, ratings have fluctuated between Good and Good-Fair. The 2008 Good-Fair rating and analysis indicates the river has been degrading gradually over time. The largest number of pollution tolerant species were collected during this cycle. The site also had elevated specific conductivity levels and poor habitat ratings.

A fish community site is located at the same location as the benthic site and was first monitored in 1998 resulting in an Excellent rating. The fish site was not monitored in 2003 due to a sodium hydroxide spill. The 2008 sample showed a decline in number of pollution intolerant species, as well as a decline in bioclassification. The site was given a Not Rated due to the combined effects of the spill, described below, and the urban nature of this stream.

In 2003, the Blowing Rock Water Treatment Plant spilled approximately 3,000 gallons of sodium hydroxide about eight miles upstream of the sampling site, causing an estimated 14,000 to 15,000 fish kill in the Middle Fork and upper part of the SFNR. DWQ conducted a special study to determine the effect of the spill on the benthic macroinvertebrate community. Samples from three weeks after the spill indicated no significant impact to the benthic community on the Middle Fork. Other samples taken during the study on the East Fork and the SFNR; however, did show impacts. Those are discussed further in those respective stream discussions below. Due to this spill, no fish sample was taken during the last cycle.

Recommendations

DWQ will re-sample site KF8 to determine the current water quality conditions. Sampling during the upcoming cycle will also assist in evaluating if the urban land use is having an impact on the fish community.

The Boone Dam should be considered for a Dam Removal Project. American Rivers works closely with local agencies to determine whether it is environmentally beneficially to remove a particular dam or if the act of removing the dam would cause unnecessary damage to the aquatic life and it habitat. Additional information about American Rivers and what they do can be found online.

East Fork South Fork New River [AU#: 10-1-3-(1), (7) & (8)]

The East Fork South Fork New River is approximately three miles from source to the confluence with the SFNR. Headwaters drain pasture and other agricultural lands before transitioning to urban residential areas just before the confluence. The last mile of the river flows through the Boone Golf Course. One segment [AU#: 10-1-3-(1)] was added to the 2008 Impaired Waters list. The upstream and downstream segments are Supporting.

Use Support: Impaired (5.8 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos	
(KB12)	Good (2008)
(KB103)	Fair (2003)

Water Quality Status

Two segments [AU#: 10-1-3-(1) & (8)] of the river were listed for the first time on the 2008 Impaired Waters list for biological integrity; however, the most downstream segment [AU#: 10-1-3-(8)] was removed from the 2010 Impaired Waters list. The upstream two mile segment [AU#: 10-1-3-(1)] was monitored for the first time at KB103 in 2003 as part of a special study to determine impacts of a sodium hydroxide spill from the Blowing Rock WTP in November 2003. The 2003 sample rated the benthic community as Fair as a result of the WTP spill. This site has not been re-sampled; however, the biological community has likely recovered from the spill impacts.

The downstream half mile of the river [AU#: 10-1-3-(8)] has historically had an Excellent or Good benthic community at site KB12 but was rated Poor in 2003 due to the release of sodium hydroxide. The benthic community has since recovered from those impacts and received a Good rating in 2008, which removed the downstream segment from the 2010 Impaired Waters list.

Recommendations

DWQ will continue to monitor the East Fork South Fork New River basinwide benthic site KB12. Special study site KB103 will be re-sampled to determine if the water quality has improved to support the rivers use sufficiently, depending on resource availability. It is also recommended that local agencies work with the Boone Golf Course to plant a proper riparian buffer along the stretch of the river that flows through the property.

Local Initiatives

Just across the river from the golf course, the National Committee for the New River (NCNR) began efforts to restore 1,442 linear feet of an unnamed tributary of the East Fork New River located on the Deerfield United Methodist Church property. This reach was incised and one section was migrating toward Deerfield Road. There was an old, degraded, and dangerous culvert under the church parking lot and another culvert through a grassy area which had dangerous sink-holes.

The upper reach of the channel was daylighted and restored to a natural dimension, pattern, and profile. A new channel was created just downstream of a garden and a new culvert placed through the parking lot, well away from the road. Natural channel structures such as crossvanes, J-hooks, log deflection jams, and rootwads were placed throughout the high stress areas of the reach to control scour/erosion, create habitat and establish a stable riffle-pool sequence. A 50-foot riparian buffer was planted along the project reach.

Figure 2-23: Stream Restoration Efforts Along East Fork (Left: Before; Right: After)

*Pictures Provided by NCNR's Lynn Caldwell

Winkler Creek [AU#:10-1-4-(1), (2), (3.5)a & (3.5)b]

Use Support: Supporting (6.3 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB17)	Excellent (2008)

Winkler Creek is about six and a half miles long from source to the confluence with the SFNR. Headwaters of the creek drain mostly forest with single family homes and pasture lands along the streambanks. The last two miles of the stream, before it merging with the South Fork, flows through the Town of Boone. A thin riparian buffer is present along the banks of this portion; however, the area has a significant amount of impervious surface and is channeled underground periodically. The creek is currently supporting its designated uses according to the 2010 Integrated Report.

Water Quality Status

Winkler Creek has been monitored by DWQ since 1993 at a benthic station (KB17), located directly behind Watauga High School on the town limits of Boone. Historically, this station has had a stable, pollution intolerant benthic community. The sample taken in 2008 was rated Excellent as well.

Recommendations

DWQ will continue to monitor the basinwide benthic station KB17 or relocate the site to upstream of the South Fork confluence. Data from this station could provide information on changes in water quality as the land use shifts from agriculture to urban. DWQ supports local efforts which involve property owners and other stakeholders in the planning process of evaluating and determining the best strategy for daylighting the full length of the stream.

Boone Creek (Kraut Creek) [AU#: 10-1-4-4]

USE SUPPORT: -- (2.7 MI)	
2008 IR Cat.	--
2010 IR Cat.	--

Boone Creek is just over two and a half miles running from the northwest potion of the Town of Boone to Winkler Creek. The full length of the creek runs through a dense urban area with significant impervious surfaces. Portions of the creek have been piped underground. These watershed conditions can cause, among other water quality issues, flashy conditions within the stream during and shortly after storm events. DWQ does not currently collect data on this stream; therefore, the stream is not given a use support rating.

Water Quality Status (Special Study)

In 2006 and 2007, a study was conducted by Appalachian State University (*Baseline Monitoring Case Study of a High-Gradient, Urbanized Stream - Boone Creek, Boone, NC)* to provide a baseline for water quality data along Boone Creek. A two page summary of this study can be found **online**. Data for this study was collected between May 2006 and May 2007. Parameters sampled during this time were temperature, electrical conductivity, turbidity, dissolved oxygen, pH and pressure.

One of the main focuses of this study was evaluating thermal behavior of the stream. Between May and August of 2006, temperatures in the stream ranged from 40°F to 72°F, which is over the North Carolina standard for Trout Waters. During the full length of the study, temperature averaged a 10-12°F difference within a 24 hour period in a one mile segment of the stream. The greater temperature differences occurred mostly during and shortly after storm events, when parking lots and other impervious surfaces are heated by the sun and then transferred that heat to stormwater runoff. This drainage area has a large percentage of impervious surfaces which can also cause the stream to become flashy.

The study also discussed the stream's chemistry and impacts from sedimentation. High levels (600-800 NTU) of turbidity were seen in the stream following rain events for one to six hours and would remain around 50 NTU for several days. Land clearing for construction projects in and around the Appalachian State University are sources of these high levels. pH levels upstream were found to be around 7 (neutral) and declined to more acidic levels further downstream. During winter months, the decline may have been due to salt on the roads. Dissolved oxygen (DO) levels stayed between 0 and 5 mg/l during the summer months in 2006. The DO standard in North Carolina for instantaneous readings is 4 mg/l. Copper samples were also noted as above the State's action level.

Recommendations

Recommendations in the study discussed above suggested a major stream remediation. However, additional data is needed in combination to what was collected to plan a successful long term remediation. Other less expensive measures suggested by the study include wider riparian buffers and wetland areas located along the creek and installation of low impact development stormwater BMPs (e.g., green roofs, pervious pavements, bio-retention and collecting rain water). Daylighting the stream to increase habitat for benthic macroinvertebrates is also suggested by the study (Thaxton, 2007).

DWQ supports the recommendation for planning and implementation of an in-depth stream restoration/ remediation project which includes stream daylighting. This type of long term project which is planned in detail is more likely to have measurable and lasting results than installing BMPs individually. Stormwater BMPs and wider buffer zones are economically feasible options to start with until project funding is secure, but should also be included in a larger restoration plan.

Local Initiatives

Actions to restore the streambanks and riparian zones along Boone Creek have already begun. The National Committee for the New River (NCNR) applied for a grant to implement the Boone Creek/"Kraut Creek" Enhancement project, designed to improve 185 linear feet of the creek beginning just behind 970 Rivers Street in Boone. This site is in the downtown area of Boone where encroaching development and the resulting stormwater runoff had caused severe streambank erosion.

Part of an asphalt parking lot and a wooden fence (as seen in left picture in Figure 2-24) were removed on the right side of the creek. The banks were sloped to provide access to the floodplain. On the left side of the creek, a rock buttress and rock vanes were constructed to protect adjacent property. A riparian buffer was established to protect both sides of the creek, as seen in the picture to the right.

FIGURE 2-24: RIPARIAN BUFFER RESTORATION EFFORTS ALONG BOONE CREEK (LEFT: MARCH 2007; RIGHT: OCTOBER 2008)

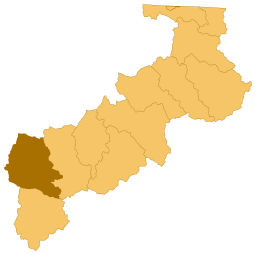
*Pictures Provided by NCNR's Lynn Caldwell

This project was initiated by the Kraut Creek Committee of Boone and NCNR. Clean Water Management Trust Fund (CWMTF) provided most of the funding for the project. The Boone Chamber of Commerce provided a cash match, and Appalachian State University provided both cash and in-kind donations.

South Fork New River [AU#: 10-1-(1), (3.5)a & (3.5)b]

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.

MEAT CAMP CREEK-SOUTH FORK NEW RIVER (050500010202)



Includes: South Fork New River [AU#: 10-1-(3.5)c], Howard Creek [AU#: 10-1-9], Meat Camp Creek [AU#: 10-1-10] & Norris Fork [AU#: 10-1-10-2]

This subwatershed has mixed land use of forest, agriculture and some urban area in the southern portion. There is one minor NPDES discharger permit in this subwatershed. The majority of streams in the subwatershed hold the secondary use classification of Trout Waters.

USE SUPPORT: SUPPORTING (10 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB18)	Excellent (2008)
Fish Com (KF6)	Not Rated (2008)

Howard Creek [AU#: 10-1-9]

Howard Creek is ten miles from source to the South Fork New River [AU#: 10-1-(3.5)c] and contains mostly agriculture, forest and spotted areas of residential land use.

Water Quality Status

A benthic and fish community monitoring site are located on either side of NC-194. The benthic site has maintained the Excellent rating it has received since 1988, with exception to the 2003 rating of Good. Results from the fish sample shows the stream is healthy and supports a rich community of fish through good quality water and habitat. The fish community was Not Rated because DWQ does not currently have criteria for small mountain trout streams.

Norris Fork [AU#: 10-1-10-2]

Norris Fork is approximately four miles long from source to Meat Camp Creek. The stream begins in pasture lands then flows over a mile through forest before reaching more pasture and residential land.

USE SUPPORT: SUPPORTING (4.3 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB21)	Good (2008)

Water Quality Status

The benthic community was first monitored on Norris Fork in 2003 when it received an Excellent rating. The 2008 sample dropped a rating to Good. Even though the number of macroinvertebrates were similar to the previous sample, the species collected in 2008 were more pollution tolerant. High silt levels due to land clearing activities for residential properties are a possible source of this decline. Residential development is expected to continue in this area.

Recommendations

Norris Fork is a designated Trout Water. The Town of Boone is delegated responsibility from the state to implement the Sediment and Erosion Control Program which inspects land clearing activities on a regular basis to ensure the sedimentation BMPs are being properly maintained.

Meat Camp Creek [AU#: 10-1-10]

Meat Camp Creek flows from the source at the northern most point of the subwatershed ten miles southeast to the South Fork New River. As in most of this subwatershed, a mixture of pastures and residential properties line this creek and its drainage area.

USE SUPPORT: SUPPORTING (10.4 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB20)	Excellent (2008)
Fish Com (KF24)	Not Rated (2008)

Water Quality Status

This stream has historically received a Good or Excellent benthic rating since monitoring began in 1990. Results from 2008 showed little to no change. The fish community was Not Rated because DWQ does not currently have criteria for small mountain trout streams. However, biologists noted a healthy fish community with decent habitat.

Cobb Creek [AU#: 10-1-10-3]

Cobb Creek is approximately three miles from source to Meat Camp Creek [AU#: 10-1-10]. This drainage area has a mixture of land cover of forest, agriculture and residential property further downstream. This stream holds the secondary use classification of Trout Waters.

USE SUPPORT: -- (2.7 MI)	
2008 IR Cat.	--
2010 IR Cat.	--
RAMS (K2500000)	Data Not Yet Available

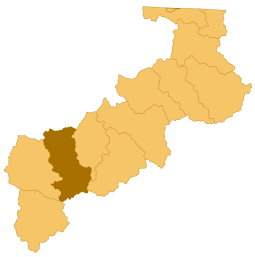
Water Quality Status

Water quality for Cobb Creek is unknown at this time; however, a DWQ Random Ambient Monitoring System (RAMS) station was located about two miles upstream of its confluence with Meat Camp Creek. This was a temporary station where data was collected for two years (2009-2010). A summary of that data will be discussed here when it is available.

South Fork New River [AU#: 10-1-(3.5)c]

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.

Elk Creek-South Fork New River (050500010203)



Includes: South Fork New River [AU#: 10-1-(3.5)c & (14.5)], **Pine Orchard Creek** [AU#: 10-1-15-1] **& Elk Creek** [AU#: 10-1-15]

This subwatershed has mixed land use of forest, agriculture and some urban area in the southern portion. There is one minor NPDES discharger permit in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Pine Orchard Creek [AU#: 10-1-15-1]

Pine Orchard Creek is three and a half miles long from source to its confluence with Elk Creek [AU#: 10-1-15]. The downstream half runs parallel to NC-194. The drainage area is mostly forested with some agriculture and residential properties on the north bank.

Use Support: **Supporting** (3.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB22)	Not Impaired (2008)

Water Quality Status

This creek has been monitored since 2003 when it received an Excellent benthic rating. Over the past five years the creek has seen little to no change in water quality. However, there was an increase in silt covering the stream floor. This indicates sediment is entering the creek during storm events.

Recommendations

Riparian buffer restorations is suggested for any reaches of the creek that is lacking proper vegetation.

Unnamed Tributary to South Fork New R. [AU#: 10-1-(14.5)ut4]

Water Quality Status

Use Support: **Supporting** (1.0 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB130) (KB104)	Not Rated (2007) Not Rated (2007)

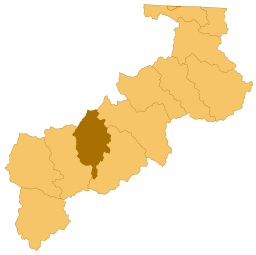
This unnamed tributary was sampled as part of a special study to evaluate possible impacts on water quality by Rockwater Farms. Two benthic samples were collected at an upstream and downstream location from the farm. The two sites were about 300 meters apart in distance. The upstream site (KB130) had habitat score of 32 out of 100 and was described by biologists as a ditch. The downstream site (KB140) had double the habitat score (66) of the upstream site and a much higher quality benthic community. Both sites were given a Not Rated because the drainage area was not large enough to meet rating criteria; otherwise, the tributary would have been Impaired.

Taxa found at the downstream site indicate the issue is being caused by poor habitat verses the instream water quality. For more information about the results of this study, see B-20070309.

South Fork New River [AU#: 10-1-(3.5)c]

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.

Old Fields Creek-South Fork New River (050500010204)



Includes: South Fork New River [AU#: 10-1-(14.5)], **Mill Creek** [AU#: 10-1-18], **& Old Field Creek** [AU#: 10-1-22]

This subwatershed has mixed land use of forest, agriculture and some urban areas. There are no NPDES discharger permits in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Unnamed Tributary to Mill Creek [AU#: 10-1-18ut4]

USE SUPPORT: SUPPORTING (1.3 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB129)	Not Impaired (2007)

This Unnamed Tributary to Mill Creek is a little over one mile from source to Mill Creek [AU#: 10-1-18]. The majority of the stream is surrounded by forest with agriculture lining the lower portion on the northern side.

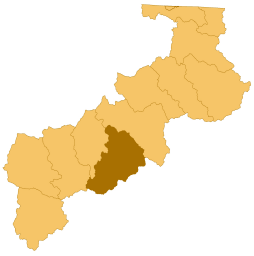
Water Quality Status

This stream was monitored in 2007 as part of the special study conducted on the unnamed tributary to the SFNR [AU#: 10-1-(14.5)ut4] discussed above. The station located on this unnamed tributary was used as a reference site for the special study (B-20070309). This site had the highest habitat score (80 out of 100) of all three sites sampled. The community collected was extremely intolerant to pollution and reflects the comparatively undisturbed nature of this drainage area. For more information about the results of this study, see B-20070309.

South Fork New River [AU#: 10-1-(14.5)]

One segment [AU#: 10-1-(14.5)] of the SFNR 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.

PINE SWAMP-SOUTH FORK NEW RIVER (050500010205)



Includes: South Fork New River [AU#: 10-1-(20.5)], Gap Creek [AU#: 10-1-23], & Pine Swamp Creek [AU#: 10-1-24]

This subwatershed has mixed land use of forest, agriculture and some urban areas. There is one minor NPDES discharger permit in this subwatershed. No waters in this subwatershed are on the Impaired Waters List.

Pine Swamp Creek [AU#: 10-1-24]

USE SUPPORT: SUPPORTING (5.5 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB108)	Good (2008)

Pine Swamp Creek runs five and a half miles from source to the South Fork New River [AU#: 10-1-(20.5)]. The majority of the stream is surrounded by cow pastures and Christmas tree farms.

Water Quality Status

This creek was monitored by DWQ in 2003 and 2008 and received a Good benthic rating for each. A large amount of silt was visible in the stream and made up 30% of the substrate. The stream also has poor riparian buffers and severe bank erosion. The silty substrate may be originating from the eroded banks or stormwater pulling sediment from the drainage area. Many farms are ditched for faster draining; however, this can cause a larger volume of sediment to enter the stream at a high velocity. This results in a stream becoming flashy which accelerates the erosion of streambanks.

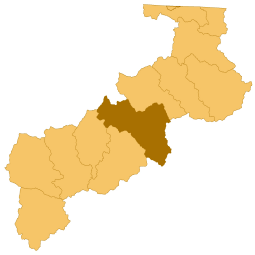
Recommendations

A restoration effort is recommended for this stretch to reestablish the streams natural meandering which will reduce the velocity. Proper riparian buffers are highly encouraged to reduce the volume of runoff that reaches the stream. DWQ also recommends an local educational effort to inform property owners of the importance of allowing streams to keep their natural flow path.

South Fork New River [AU#: 10-1-(20.5)]

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.

Beaver Creek-South Fork New River (050500010206)



Includes: South Fork New River [AU#: 10-1-(20.5), (26)a & (26)b], **South Beaver Creek** [AU#: 10-1-25-2], **Beaver Creek** [AU#: 10-1-25], **& Obids Creek** [AU#: 10-1-27]

This subwatershed has mixed land use of forest, agriculture and some urban areas including the southern portion of the Town of West Jefferson. There are two minor NPDES discharger permits in this subwatershed. The majority of streams in this subwatershed, with exception to the South Fork New River, hold the secondary use classification of Trout Waters. No waters in this subwatershed are on the Impaired Waters List.

South Beaver Creek [AU#: 10-1-25-2]

Use Support: Supporting (6.8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB5)	Good (2008)

South Beaver Creek runs about seven miles from source to its confluence with Beaver Creek and includes Lake Ashe about one mile upstream of Beaver Creek. The majority of this drainage area is forested with scattered rural communities.

Water Quality Status

This creeks benthic community was sampled in 2003 and 2008 and received a Good rating both years. The community appears to be stable with diverse and pollution sensitive taxa. The site had a relatively high habitat score of 75 out of 100; however, was lacking a riparian buffer on the right bank.

Obids Creek [AU#: 10-1-27]

Use Support: Supporting (6.3 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB6)	Good (2008)
Fish Com (KF13)	Good (2008)

Obids Creek runs over six miles from source to the SFNR [AU#: 10-1-(26) a]. The majority of this drainage area is agriculture and forest with scattered rural communities. Agriculture here is dominated by Christmas tree farms and pastures.

Water Quality Status

This creek was sampled for both benthic and fish communities in 2008 which both resulted in a Good rating. Both samples were taken at the same location near the mouth of the creek. This was the first fish sample take on the creek. The diversity and amount of pollution intolerant species were slightly lower than expected for a site that is an optimal nursery area due to its proximity to the South Fork. The benthic sample was slightly lower than the previous sample; however, it remains a Good rating. The instream habitat was in good condition but lacks steady riparian zones and cattle have access to the stream. Riparian buffer zones with shading trees can keep the water temperature down and filter pollutant or excess nutrients from storm runoff before reaching the stream.

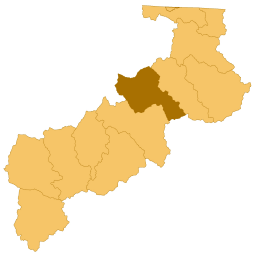
Recommendations

Currently, cattle have direct access to the creek which can degrade habitat impacting the aquatic life. DWQ will work with SWCD to prioritize the need for livestock fencing along this creek. It is also recommended that local agencies educate land owners in this drainage area about the importance of maintaining riparian zones which include trees along this stream.

South Fork New River [AU#: 10-1-(20.5), (26)a & (26)b]

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.

NAKED CREEK-SOUTH FORK NEW RIVER (05050010207)



Includes: South Fork New River [AU#: 10-1-(26)b, (30), (31.5) & (33.5)]**, Roan Creek** [AU#: 10-1-31]**, Naked Creek** [AU#: 10-1-32]**, & Dog Creek** [AU#: 10-1-33]

This subwatershed has mixed land use of forest, agriculture and urban areas including almost the entire Town of Jefferson. There are three minor NPDES discharger permits in this subwatershed. The majority of streams in this subwatershed, with exception to the SFNR and Naked Creek, hold the secondary use classification of Trout Waters. The lower portion of Naked Creek is the only water in this subwatershed that is currently on the Impaired Waters List (2010 list).

Roan Creek [AU#: 10-1-31]

Roan Creek is over 13 miles long from source to the SFNR [AU#: 10-1-(30)] and holds a secondary use classification of Trout Waters. The majority of this drainage area is agriculture and forest with scattered rural communities. Portions of the stream run along NC-88.

USE SUPPORT: SUPPORTING (13.4 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB7)	Good (2008)
Fish Com (KF20)	Good (2008)

Water Quality Status

This creek was sampled for both benthic and fish communities in 2008 which both resulted in a Good rating. Both samples were taken at the same location near the mouth of the creek. This was the first fish sample take on the creek and included a fairly diverse and abundant community. However, the benthic rating declined from the Excellent it received in 2003. The decline in abundance and pollution sensitivity of the community could be contributed to the amounts of silt filling in benthic habitat which was not seen in the 2003 sample.

Recommendations

Even though the creek was given Good bioclassification ratings, the decline in benthic community indicates the drainage area is being impacted. There is a significant amount of Fraser Fir Christmas tree farms in this drainage area which can contribute to excessive sediment reaching the stream if not harvested correctly. DWQ will work with local agencies to provide public education related to the importance of good riparian zones and other agricultural BMPs focused on the reduction of sediment reaching the stream and impacts to aquatic life.

Additional information about tree farming and best management practices are discussed in the Other Natural Resource Programs Chapter. Online educational materials are also found within that chapter.

Naked Creek [AU#: 10-1-32]

Naked Creek is just over six miles from source, north of the Town of Jefferson, to the SFNR [AU#: 10-1-(31.5)]. The first mile of the stream flows through a tree farm with little to no riparian buffers. After flowing through the Town of Jefferson it flows through farm lands and the Jefferson Landing golf course and residential area. Extensive segments of the creek are channelized and diverted underground. The lower segment of Naked Creek [AU#: 10-1-32b], which is two and a half miles, is on the 2010 Impaired Waters List for degraded ecological/ biological integrity within the fish community.

USE SUPPORT: IMPAIRED (6.1 MI)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (KB8) (KB139)	Good (2008) Good-Fair (2008)
Fish Com (KF14)	Fair (2008)

Water Quality Status

Naked Creek was originally placed on the first Impaired Waters List in 1998 and stayed on the list until 2006 when it was removed. The creek's benthic community was first monitored in 1986 when it received a Good-Fair (KB8) upstream of the Town of Jefferson's WWTP and a Poor rating (KB9) downstream of the facility. The upstream site has alternated between Good-Fair and Good ratings since that time. Degradation at this site has historically been linked to urban runoff and sedimentation. The downstream site had received a Poor or Fair rating until 2003 when it rated Good-Fair. This higher rating was likely due to a combination of major

upgrades completed at the Jefferson WWTP and heavy rains. A USGS flow gage station on the South Fork just upstream of the Naked Creek confluence recorded the highest yearly average flow (cfs) in 2003 (between 1997 and 2009). This could have had a significant impact on dilution of the WWTPs effluent and other toxins from urban stormwater runoff. It was removed from the 2006 list due to the Good-Fair benthic rating at KB9 in 2003.

Town of Jefferson WWTP

The Town of Jefferson's WWTP has been a major contributing factor or source of the impairment for Naked Creek since first listed in 1998. The plant failed three toxicity tests in 1994 which was attributed to landfill leachate being processed through the plant. Other methods of leachate disposal have since been found and is no longer processed by the facility. Due to numerous other violations and recommendations by DWQ, the facility obtained funding to make approximately $1.9 million worth of upgrades to the facility. These upgrades were completed in 2004. Latest inspections confirm the effluent discharged by the facility is no longer having an impact on the creek. Therefore, the facility will be no longer be considered a source of Naked Creek's impairment.

Current Monitoring

Naked Creek was monitored at the same upstream benthic station (KB8) in 2008; however, the downstream site (KB9) was moved in 2008 to just before the confluence with South Fork and received a new station number of KB139. The upstream site increased ratings from Good-Fair to Good in 2008 using a less intensive sampling method than the 2003 sample. The differences in ratings may be due to the type of samples taken. Despite the higher rating, aquatic habitat for this site was poor. Long sections of the creek upstream of this site completely lack riparian buffers including almost the entire downstream segment. Other upstream sections of the creek have sporadic riparian buffers of varying quality. Silt was also noted lining the substrate.

Station KB139 was moved to its current location a mile downstream because the development of a gated community blocked access to KB9. Site KB139 received a moderate habitat score; however, conductivity levels are significantly higher and water clarity was slightly turbid. The benthic surface was covered in silt and water was being withdrawn from the creek for lawn and golf course irrigation. The gated community, Jefferson Landing, includes a large golf course which was built along either side of Naked Creek spanning the last mile and a half before the South Fork confluence. During the 2008 sample, houses were being constructed along the one side of the stream.

A fish community sample was taken at the same location as KB139. This was the second sample taken at station KF14 and it received the same rating of Fair as the previous sample taken in 1998. This sample was collected about three months prior to the benthic sample at site KB139. This site received the lowest total habitat score of any other fish station in the New River Basin in 2008. This was due to turbid water, poor bank stability and lack of riparian buffers. The percent of pollution tolerant fish collected was elevated for a mountain stream. Fish populations in this stream are being stressed from instream water quality issues as well as poor habitat.

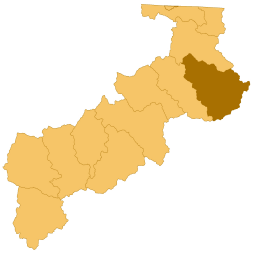
Recommendations

Naked Creek is the highest priority for stream restoration and protection in the New River basin. With exception of the 2006 and 2008 lists, Naked Creek has been on the Impaired Waters list since 1998. It is recommended that local agencies and watershed groups, with assistance from DWQ develop, a Watershed Restoration Plan that will target restoring the stream to more natural flow conditions, enhancing sediment and erosion control measures on construction sites, implementing additional controls focused on reducing volume and velocity of stormwater and establishing wider riparian zones. Riparian buffers with tree canopies would greatly assist with reducing the water temperature of the stream as well as filter pollutants before the stream reaches the SFNR. Educational efforts should be aimed towards property owners within the Naked Creek drainage area to reduce the amount of fertilizers and pesticides used as well as the need for riparian zones along the stream. DWQ supports the need to fund a Watershed Restoration Plan that includes stormwater management, post restoration monitoring and local educational efforts.

South Fork New River [AU#: 10-1-(26)b, (30), (31.5) & (33.5)]

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.

CRANBERRY CREEK (050500010208)



Includes: Cranberry Creek (Mulberry Creek) [AU#: 10-1-37], **Meadow Fork** [AU#: 10-1-37-2], **Piney Fork** [AU#: 10-1-37-3], **Piney Branch** [AU#: 10-1-37-5], **& Beaver Branch** [AU#: 10-1-37-6]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams hold the secondary use classification of Trout Waters. There are no waters in this subwatershed currently on the Impaired Waters List.

Piney Fork [AU#: 10-1-37-3]

USE SUPPORT: -- (5.2 MI)	
2008 IR Cat.	--
2010 IR Cat.	--
Benthos (KB69)	Good (1998)

Piney Fork is just over five miles from source to Cranberry Creek [AU#: 10-1-37] around Laurel Springs. Land cover in this drainage area is dominated by Christmas tree farms with patches of forest.

Water Quality Status

The stream was sampled for benthic macroinvertebrates in 1998 within the headwaters. The site received a Good rating at that time.

Local Initiatives

The Alleghany SWCD installed several agricultural BMPs in 2005 and 2006 on a property near the confluence with Cranberry Creek which included almost 3,000 feet of livestock exclusion, feed and waste storage, stream protection, stream crossings and critical area planting. These efforts will assist with reported channelization and sedimentation the SWCD noted during the previous planning cycle.

Recommendations

Depending on available resources, DWQ will monitor Piney Fork (KB69) to provide a use support rating which properly reflects any water quality improvements resulting from the implementation of these agricultural BMPs.

Cranberry Creek (Mulberry Creek) [AU#: 10-1-37]

USE SUPPORT: SUPPORTING (18.9 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB15)	Excellent (2008)
Fish Com (KF2)	Good (2008)

Cranberry Creek is almost 19 miles long from source to the SFNR [AU#: 10-1-(33.5)]. This stream is the main catchment for this subwatershed which has land cover with equal parts agriculture and forest. Christmas tree farms dominate the majority of agriculture in this drainage area.

Water Quality Status

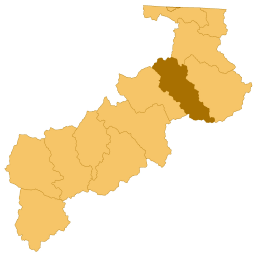
Cranberry Creek was sampled (KB15) about two miles upstream of its confluence with the South Fork. The majority of this subwatershed drains to this creek, upstream of the benthic sampling site (KB15) which provides a wholistic view of the water quality conditions in the subwatershed. This site has been monitored since 1990 and received an Excellent benthic rating in 2008. Aquatic life and habitat conditions have remain stable at this higher rating since 1998.

About a mile and a half downstream of the benthic site is a fish community station. In 1998, the creek was given an Excellent rating for its fish community. In 2008, that rating dropped to Good. The habitat was given a score of 53 out of 100 due to unstable banks, poor riparian areas, shallow pools, straight channel and the on-going stream widening. Biologists noted the presence of an abundant cyprinid population, which are attracted to waters with algae on hard surfaces. This could be an indication of high nutrient levels; however, this area is a popular fishing location and may have been stocked with cyprinids. Cyprinids can be a favorite amongst fishermen due to the size and strength of these fish.

Recommendations

Riparian buffer restoration is recommended to assist in restabilizing stream banks and reducing excess nutrients reaching the stream. Educational efforts are needed to inform local land owners of ways to reduce habitat degradation to better support the fish community and ensure recreational fishing can continue. The stream would also benefit from restoring the stream to its natural meandering channel with deeper pools which attack fish.

Peak Creek-South Fork New River (050500010209)



Includes: South Fork New River [AU#: 10-1-(33.5)], **Peak Creek** [AU#: 10-1-35-(1) & (2)], **Ore Knob Branch** [AU#: 10-1-35-3], **Little Peak Creek** [AU#: 10-1-35-4], **& Nathans Creek** [AU#: 10-1-36]

This subwatershed has mixed land use of forest, agriculture and mining. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the SFNR, hold the secondary use classification of Trout Waters. Waters on the 2010 Impaired Waters list within this subwatershed are Peak Creek, Little Peak Creek and Ore Knob Branch.

Nathans Creek [AU#: 10-1-36]

Use Support: -- (4.1 mi)	
2008 IR Cat.	--
2010 IR Cat.	--
Benthos (KB77)	Good-Fair (1998)

Nathans Creek is four miles long from source to the west side of the South Fork New River [AU#: 10-1-(33.5)]. This drainage area has a mixed land use of forest, agriculture and some urban.

Water Quality Status

Nathans Creek's benthic community was monitored in 1998 at KB77. At that time, the site received a rating of Good-Fair. Even though the macroinvertebrates present were pollution-sensitive, indicating higher water quality, the lower rating was given due to the low quantity collected.

Recommendations

DWQ will do a one-time sample at this site to ensure the water quality has not degraded further, depending on the availability of resources.

Little Peak Creek [AU#: 10-1-35-4]

Use Support: Impaired (2.8 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (KB14)	Poor (2008)

Little Peak Creek is almost three miles from source to Peak Creek [AU#: 10-1-35-(2)b]. The drainage area is a mix of some residence, forest and agriculture, dominated by tree farming. The creek also receives runoff from the Ore Knob Mine which is discussed below in the Ore Knob Branch section.

Water Quality Status

Little Peak Creek has been on the Impaired Waters List since 1998 and remains on the 2010 list. This impairment is a result of impacts to aquatic life from runoff from the Ore Knob Mine. The habitat in this creek is relatively good, indicating the issues are based on the quality of water. Due to the small drainage area of this creek, DWQ would not normally assign a rating to the benthic site (KB14) located near the confluence with Peak Creek. However, the toxic situation at this site ranks it among the worst benthic sites in the state, justifying the Poor rating.

Recommendations

Information about the Ore Knob Mine and recommendations are discussed within the Ore Knob Mine Chapter.

Ore Knob Branch [AU#: 10-1-35-3]

Use Support: Impaired (0.9 mi)	
2008 IR Cat.	5
2010 IR Cat.	5

Ore Knob Branch is just under one mile from source to Peak Creek [AU#: 10-1-35-(2)b]. The land cover is similar to the rest of the subwatershed, with exception to the presence of the Ore Knob Mine.

Water Quality Status

Ore Knob Branch has been on the Impaired Waters List since 1998 and remains on the list in 2010 due to the Poor benthic rating at KB13 on Peak Creek. This creek is the main catchment for runoff from the abandoned Ore Knob Mine. The mining site was not properly closed, which has resulted in highly acidic and metal-laden surface water running off the property and into Ore Knob Branch and Peak Creek, subsequently causing their impairment. This issue is discussed in greater detail within the Ore Knob Mine Chapter.

Initiatives

Restoration on Ore Knob began in the 1990s and still continues today. The site was classified as an EPA Superfund site in September 2009. Since that time, EPA has led the restoration efforts in coordination with state and local agencies. These efforts are discussed in greater detail within the Ore Knob Mine Chapter.

Recommendations

The state will continue to work with all local and federal agencies involved to assist in restoration efforts of the abandoned mine.

Peak Creek [AU#: 10-1-35-(1) & (2)a & b]

Peak Creek is a total of 10.5 miles long from source to the SFNR [AU#: 10-1-(33.5)] and split into three segments. The land cover in this drainage area is mix of forest and agriculture. The creek also receives runoff from the Ore Knob Mine, which is discussed above in the Ore Knob Branch section. The most downstream segment [AU#: 10-1-35-(2)b] of Peak Creek has been on the Impaired Water List since 1998 and remains on the list in 2010.

USE SUPPORT: IMPAIRED (10.5 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos	
(KB11)	Excellent (2008)
(KB13)	Poor (2008)

Water Quality Status

The middle segment ([AU#: 10-1-35-(2)a]: from the water supply dam at Appalachian Sulphides, Inc., to Ore Knob Branch) was monitored in 2008 and was rated Excellent for its benthic community (KB11). This site received a Good rating in 2003. The 2008 sample had an increase in pollution intolerant species, including the collection of an extremely rare caddisfly which has only been collected one other time in North Carolina by DWQ since 1983. An undisturbed riparian zone, diverse in-stream benthic surfaces and a mostly forested watershed resulted in one of the highest habitat scores within the basin (93 out of 100) during this cycle. There is no influence of the Ore Knob Mine on this segment of the creek.

The downstream segment of Peak Creek [AU#: 10-1-35-(2)b] is almost three miles from the Ore Knob Branch to the South Fork. The benthic sample result was similar to past results at this station and was rated Poor in 2008. Despite the high habitat score (82 out of 100), the community is highly stressed and borders extirpation. This site (KB13) is approximately one mile downstream of the KB11, which had a conductivity level of 38 µS/cm and pH of 6.3, whereas the KB13 site had levels of 170 µS/cm and 3.1, respectively. An orange precipitate covered all instream surfaces and inhabitants at the KB13 site. This dramatic drop in water quality from what is seen upstream is due to the toxic flow coming from Ore Knob Branch which, receives runoff from the Ore Knob Mine. These severely acidic and toxic conditions will continue until the abandoned mine is stabilized.

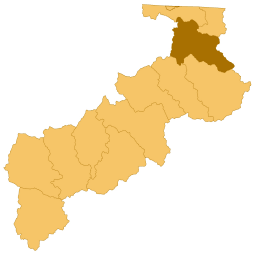
Recommendations

Information about the Ore Knob Mine and recommendations are discussed within the Ore Knob Mine Chapter.

South Fork New River [AU#: 10-1-(33.5)]

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.

PRATHER CREEK-SOUTH FORK NEW RIVER (050500010210)



Includes: South Fork New River [AU#: 10-1-(33.5)], Prathers Creek [AU#: 10-1-38] & Crab Fork [AU#: 10-1-38-1]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the South Fork New River, hold the secondary use classification of Trout Waters. There are no waters in this subwatershed on the 2010 Impaired Waters list.

Prathers Creek [AU#: 10-1-38]

USE SUPPORT: SUPPORTING (11.1 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Fish Com (KF15)	Good-Fair (2008)

Prathers Creek is approximately 11 miles from source to the SFNR [AU#: 10-1-(33.5)]. This drainage area has a mixed land use of livestock pasture agriculture and forest.

Water Quality Status

Prathers Creek's fish community was monitored for the first time during this cycle. The fish community received a rating of Good-Fair due to the pollution tolerant species collected. The high percentage of omnivores and herbivores collected indicates elevated nutrients, likely results from the combination of agricultural practices and an open tree canopy. Biologists also noted a complete lack of riparian buffer zones. A benthic site nearby was monitored in 1990 and received a Good-Fair rating.

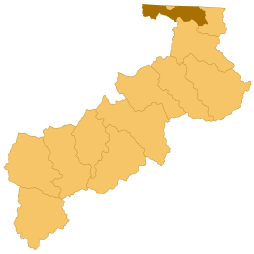
Recommendations

DWQ will continue to monitor this location and work with the SWCD to prioritize assistance with the installation of agricultural BMP measures throughout this subwatershed as well as riparian buffer restoration.

South Fork New River [AU#: 10-1-(33.5)]

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.

GRASSY CREEK-NEW RIVER (050500010302)



Includes: New River [AU#: 10a], Grassy Creek [AU#: 10-3] & Piney Creek [AU#: 10-4]

This subwatershed has mixed land use of forest and agriculture. There are no NPDES discharger permits in this subwatershed. Majority of the streams, with exception to the New River, hold the secondary use classification of Trout Waters. There are no waters in this subwatershed on the 2010 Impaired Waters list.

Grassy Creek [AU#: 10-3]

USE SUPPORT: SUPPORTING (4.1 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB126)	Good (2008)
Fish Com (KF16)	Good-Fair (2008)

Grassy Creek is approximately four miles long from the NC/VA state line to the New River [AU#: 10a]. This drainage area has a mixed land use of agriculture dominated by the growth of Christmas tress and forest.

Water Quality Status

Both benthic and fish communities were sampled here for the first time during this cycle. The fish community site (KF16 - 50 feet from the confluence with the New River) was given the highest habitat score (95 out of 100) of any fish site within the basin sampled this cycle. However, the species collected were pollution tolerant and indicated an elevated nutrient source. Possible sources of excess nutrients are agricultural practices upstream and inadequate riparian buffer zones. Biologists also noted increased photosynthetic activity by the upstream periphyton was causing an elevated pH level compared to other sites in the basin.

A benthic sample (KB126) was also collected as part of a special study (B-20081007) to determine effects of new development upstream. The site was rated Good and given a habitat score of 81 out of 100. However, the site had a relatively high specific conductance (101 µS/cm) for this river basin.

Recommendations

DWQ will work with SWCD to prioritize implementation of agricultural BMPs focused towards reducing nutrient and sediment runoff, as well as riparian buffer restoration.

New River [AU#: 10a]

The New River begins in this subwatershed where the SFNR and the North Fork New River converge and continue north four and a half miles to the NC/VA state line. This segment holds the secondary use classification of ORW. Land use in this drainage area is mostly forest, with some agriculture, which dominates the headwaters of this subwatershed. This segment of the New River is not monitored by DWQ at this time. However, the river is sampled once it crosses the state line back into NC. For more information on the water quality status of that segment, see the **Little River & Chestnut Creek Watersheds Chapter**.

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/).

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

Appendix 2-A

Use Support Ratings for all Monitored Waters In the South Fork New River & Fox 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

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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 — North Fork New River Watershed 0505000101

10-2-21-8-1	Middle Fork Little Horse Creek	From source to Little Horse Creek	4.5	FW Miles	C;Tr:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
10-2-28	Millpond Branch	From source to North Fork New River	2.0	FW Miles	C:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2003	
10-2-(1)	North Fork New River	From source to Three Top Creek	14.1	FW Miles	C;Tr:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
10-2-(12)	North Fork New River	From Three Top Creek to New River	36.5	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	
10-2-15	Rich Hill Creek	From source to North Fork New River	4.9	FW Miles	C;Tr:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
10-2-10	Roundabout Creek	From source to North Fork New River	4.0	FW Miles	C;Tr:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
10-2-13	Three Top Creek	From source to North Fork New River	13.2	FW Miles	C;Tr:+
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	
3a	Ecological/biological Integrity FishCom	Not Rated Bioclassification	Aquatic Life	2008	

New River Basin — South Fork New River Watershed 0505000102

10-1-37	Cranberry Creek (Mulberry Creek)	From source to South Fork New River	18.9	FW Miles	B;Tr:+
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2008	
10-1-3-(1)	East Fork South Fork New River	From source to Watauga County SR 1524	2.3	FW Miles	WS-IV;Tr:+
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2003	2008
10-1-3-(8)	East Fork South Fork New River	From .8 mile downstream of Watauga Co SR 1524 to S Fk New River	0.5	FW Miles	WS-IV;CA:+
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2008	

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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 — **South Fork New River Watershed 0505000102**

⊙	**10-1-9-(6)**	**Howard Creek**	From the Appalachian State University Raw Water Supply Intake Dam to South Fork New River	**3.6 FW Miles**	C;Tr,HQW	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
3a	**Ecological/biological Integrity FishCom**	Not Rated Bioclassification	Aquatic Life	2008		
⊙	**10-1-35-4**	**Little Peak Creek**	From source to Peak Creek	**2.8 FW Miles**	B;Tr:+	
4s	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2008	2000	
⊙	**10-1-10**	**Meat Camp Creek**	From source to South Fork New River	**10.4 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
3a	**Ecological/biological Integrity FishCom**	Not Rated Bioclassification	Aquatic Life	2008		
⊙	**10-1-2-(15)**	**Middle Fork South Fork New River**	From 0.4 mile downstr of US Hwy 221 & 321 to South Fk New River	**0.5 FW Miles**	WS-IV;CA:+	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008		
3a	**Ecological/biological Integrity FishCom**	Not Rated Bioclassification	Aquatic Life	2008		
⊙	**10-1-2-(6)**	**Middle Fork South Fork New River**	From Brown Branch to Boone Dam	**3.5 FW Miles**	WS-IV;Tr:+	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2003		
⊙	**10-1-32b**	**Naked Creek**	From 0.4 miles above Jefferson WWTP to South Fork New River	**2.5 FW Miles**	C:+	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008		
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2008	2010	
⊙	**10-1-10-2**	**Norris Fork**	From source to Meat Camp Creek	**4.3 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
⊙	**10-1-27-(2)**	**Obids Creek**	From a point 0.9 mile downstream of NC Hwy 163 to South Fork New River	**2.8 FW Miles**	WS-IV;Tr:+	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		
⊙	**10-1-35-3**	**Ore Knob Branch**	From source to Peak Creek	**0.9 FW Miles**	B;Tr:+	
4s	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2003	2000	
⊙	**10-1-35-(2)a**	**Peak Creek**	From Water Supply Dam at Appalachian Sulphides, Inc to Ore Knob Branch	**2.1 FW Miles**	B;Tr:+	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		

NC 2010 Integrated Report

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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 — **South Fork New River Watershed 0505000102**

10-1-35-(2)b	**Peak Creek**	From Ore Knob Branch to South Fork New River		**2.9 FW Miles**		B;Tr:+
4s	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2008	2006	
10-1-15-1	**Pine Orchard Creek**	From source to Elk Creek		**3.5 FW Miles**		C;Tr:+
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
10-1-24	**Pine Swamp Creek (Pine Swamp)**	From source to South Fork New River		**5.5 FW Miles**		C:+
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
10-1-38	**Prathers Creek**	From source to South Fork New River		**11.1 FW Miles**		B;Tr:+
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2008		
10-1-31-(2)	**Roan Creek**	From 0.5 mile upstream of mouth to South Fork New River		**0.4 FW Miles**		WS-IV;Tr,CA:+
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008		
10-1-25-2a	**South Beaver Creek(Lake Ashe)**	From source to Lake Ashe		**5.1 FW Miles**		C;Tr:+
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
10-1-(20.5)	**South Fork New River**	From a point 0.4 mile upstream of Couches Creek to a point 2.8 mile upstream of Obids Creek		**21.8 FW Miles**		WS-V;HQW
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
10-1-(26)b	**South Fork New River**	From Obids Creek to a point 0.6 miles upstream of Roan Creek		**6.6 FW Miles**		WS-IV;HQW
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		
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008		
10-1-(3.5)a	**South Fork New River**	From Winkler Creek to 0.1 miles downstream of Hunting Lane		**0.3 FW Miles**		C:+
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2003	2008	
1	**Ecological/biological Integrity FishCom**	Good 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		

NC 2010 Integrated Report

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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 — **South Fork New River Watershed 0505000102**

10-1-(3.5)b	**South Fork New River**	From 0.1 mile downstream Hunting Lane to US Hwy.221/421		**5.1 FW Miles**	C:+	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2008	2008	
1	**Ecological/biological Integrity FishCom**	Good 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		
10-1-(33.5)	**South Fork New River**	From Dog Creek to New River		**22.5 FW Miles**	B;ORW	
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		
10-1-18ut4	**UT MILL CR**	Source to MILL CR		**1.3 FW Miles**		
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2007		
10-1-(14.5)ut4	**UT S FK NEW R**	Source to S FK NEW R		**1.0 FW Miles**		
3a	**Ecological/biological Integrity Benthos**	Data Inconclusive	Aquatic Life	2007		
10-1-4-(3.5)b	**Winkler Creek**	From Winkler Creek Road (SR #1549) to South Fork New River		**1.7 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		

New River Basin — **Fox Creek-New River Watershed 0505000103**

10-3	**Grassy Creek**	From North Carolina-Virginia State		**4.1 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008		
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2008		
10b	**New River (North Carolina Portion)**	From first point of crossing state line to last point of crossing state line		**6.4 FW Miles**	C;ORW	
3a	**Copper**	Standard Violation	Aquatic Life	2006		
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008		
3a	**Zinc**	Standard Violation	Aquatic Life	2006		

APPENDIX 2-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID*	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
Benthic Sample Sites						
KB130*	Ut. S. Fk. New R.	10-1-(14.5)ut4	Source to South Fork New River	Watauga	SR 1353	07 - Not Rated
KB140*	Ut. S. Fk. New R.	10-1-(14.5)ut4	Source to South Fork New River	Watauga	SR 1353	07 - Not Rated
KB2	S. Fk. New R.	10-1-(20.5)	From a point 0.4 mile upstream of Couches Creek to a point 2.8 mile upstream of Obids Creek	Ashe	SR 1169	08 - Good 03 - Excellent
KB3	S. Fk. New R.	10-1-(26)b	From Obids Creek to a point 0.6 miles upstream of Roan Creek	Ashe	NC 16-18	08 - Excellent 03 - Excellent
KB16	S. Fk. New R.	10-1-(3.5)b	From 0.1 mile downstream Hunting Lane to US Hwy.221/421	Watauga	US 421	08 - Fair 03 - Fair
KB10	S. Fk. New R.	10-1-(33.5)	From Dog Creek to New River	Ashe	US 221	08 - Excellent 03 - Excellent
KB20	Meat Camp Cr.	10-1-10	From source to South Fork New River	Watauga	SR 1333	08 - Excellent 03 - Good
KB21	Norris Fk.	10-1-10-2	From source to Meat Camp Creek	Watauga	SR 1337	08 - Good 03 - Excellent
KB22	Pine Orchard Cr.	10-1-15-1	From source to Elk Creek	Watauga	SR 1369	08 - Not Impaired 03 - Excellent
KB1	M. Fk. S. Fk. New R.	10-1-2-(15)	From 0.4 mile downstr of US Hwy 221 & 321 to South Fk New River	Watauga	SR 1522	08 - Good-Fair 03 - Good-Fair
KB108	Pine Swamp Cr.	10-9-5	From source to S. Fork New River	Alleghany	SR 1128	08 - Good 03 - Good
KB5	S. Beaver Cr.	10-1-25-2a	From source to Lake Ashe	Ashe	SR 1147	08 - Good 03 - Good
KB6	Obids Cr.	10-1-27-(2)	From a point 0.9 mile downstream of NC Hwy 163 to South Fork New River	Ashe	SR 1192	08 - Good 03 - Good
KB12	E. Fk. S. Fk. New R.	10-1-3-(8)	From .8 mile downstream of Watauga Co SR 1524 to S Fk New River	Watauga	SR 1522	08 - Good '03 - Good
KB7	Roan Cr.	10-1-31-(2)	From 0.5 mile upstream of mouth to South Fork New River	Ashe	SR 1588	08 - Good 03 - Excellent
KB8	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	NC 16-88	08 - Good 03 - Good-Fair
KB139*	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	SR 1589	08 - Good-Fair
KB11	Peak Cr.	10-1-35-(2)a	From Water Supply Dam at Appalachian Sulphides, Inc to Ore Knob Branch	Ashe	SR 1599	08 - Excellent 03 - Good
KB13	Peak Cr.	10-1-35-(2)b	From Ore Knob Branch to South Fork New River	Ashe	SR 1599	08 - Poor '03 - Poor
KB14	L. Peak Cr.	10-1-35-4	From source to Peak Creek	Ashe	SR 1595	08 - Poor 03 - Poor
KB15	Cranberry Cr.	10-1-37	From source to South Fork New River	Ashe	SR 1603	08 - Excellent 03 - Excellent
KB17	Winkler Cr.	10-1-4-(3.5)b	From Winkler Creek Road (SR #1549) to South Fork New River	Watauga	SR 1549	08 - Excellent 03 - Excellent
KB18	Howard Cr.	10-1-9-(6)	From the Appalachian State University Raw Water Supply Intake Dam to South Fork New River	Watauga	SR 1328	08 - Excellent 03 - Good
KB126*	Grassy Cr.	10-3	From North Carolina-Virginia State	Ashe	SR 1548	08 - Good
KB34	New R.	10b	From first point of crossing state line to last point of crossing state line	Alleghany	SR 1345	08 - Excellent 03 - Excellent

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

Station ID*	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
Fish Community Sample Sites						
KF6	Howard Cr.	10-1-9-(6)	From the Appalachian State University Raw Water Supply Intake Dam to South Fork New River	Watauga	SR 1306	08 - Not Rated 98 - Not Rated
KF8	M. Fk. S. Fk. New R.	10-1-2-(15)	From 0.4 mile downstr of US Hwy 221 & 321 to South Fk New River	Watauga	SR 1522	08 - Not Rated 98 - Excellent
KF24	Meat Camp Cr.	10-1-10	From source to South Fork New River	Watauga	SR 1333	08 - Not Rated 98 - Not Rated
KF14	Naked Cr.	10-1-32b	From 0.4 miles above Jefferson WWTP to South Fork New River	Ashe	NC 16/88	08 - Fair 98 - Fair
KF13*	Obids Cr.	10-1-27-(2)	From a point 0.9 mile downstream of NC Hwy 163 to South Fork New River	Ashe	SR 1192	08 - Good
KF15*	Prathers Cr.	10-1-38	From source to South Fork New River	Alleghany	SR 1302	08 - Good-Fair
KF20*	Roan Cr.	10-1-31-(2)	From 0.5 mile upstream of mouth to South Fork New River	Ashe	SR 1588	08 - Good
KF12	S. Fk. New R.	10-1-(3.5)b	From 0.1 mile downstream Hunting Lane to US Hwy.221/421	Watauga	US 421	08 - Good 98 - Good

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

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S FK NEW R	US 421	KB16	08/19/08	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.220833	-81.640000	10-1-(3.5)b	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	35	3088	15	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone, Jimmy Smith WWTP	NC0020621	4.82

Water Quality Parameters

Temperature (°C)	23.7
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	276
pH (s.u.)	7.6
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	6
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	2
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	58

Site Photograph

Substrate mix of cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10551	75	19	5.80	4.88	Fair
11/04/03	9302	---	11	---	4.25	Fair
08/20/03	9257	67	24	5.46	4.81	Good-Fair
08/17/98	7734	71	22	5.68	4.14	Good-Fair
07/12/93	6261	69	18	6.17	3.80	Fair

Taxonomic Analysis

The 2008 sample is dominated by taxa that are pollution-tolerant. Abundant mayflies found here in 2008 included: *Pseudocloeon propinquum, Plauditus dubius* group, *Heterocloeon anoka, Isonychia,* and *Baetis flavistriga* . Other abundant taxa here that are considered generalists and are tolerant were the caddisfly *Cheumatopsyche* and the dragonfly *Calopteryx.*

Data Analysis

The South Fork New River at US 421/221 rated Fair in 2008, the same rating as in 2003. There have been eight samples collected here from 1984 through 2008. Of the seven summer samples (all Full Scale samples) this site rated Fair four times and Good-Fair thrice. This site is just downstream of the Boone WWTP. The 2004 Basinwide Assessment Report noted a gradual decrease in the Biotic Index here (indicating a slightly more pollution-sensitive benthic community) in relation to reductions in NH3 and TKN from effluent from the Boone WWTP beginning in 1998. Unfortunately this trend did not continue in 2008 and the Biotic Index is now back to the level it was in the mid 1990's which indicates a more pollution-tolerant benthic community. This watershed is also heavily agricultural. A large silt load covers 40% of the benthos of this reach limiting habitat for aquatic macroinvertebrates. There is very little substrate over 10 inches in length in this reach. Overall habitat quality here is low and has been since at least 2003 (scores of 58, 59 and 60).

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK NEW R	US 421	05/22/08	KF12	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.220736	-81.639974	10-1-(3.5)b	Southern Crystalline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C, +	34.2	3100	13	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	70	15	10	0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone WWTP (0.9 miles upstream)	NC0020621	4.8

Water Quality Parameters

Temperature (°C)	11.7
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	126
pH (s.u.)	6.0

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	5
Pool Variety (10)	4
Riffle Habitat (16)	10
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**63**

Site Photograph

Substrate gravel, sand, boulder, silt.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/08	2008-49	22	56	Good
06/08/98	98-51	20	52	Good

Most Abundant Species Western Blacknose Dace.

Exotic Species Rock Bass, Rainbow Trout, Brown Trout.

Species Change Since Last Cycle **Gains --** Kanawha Minnow, Greenside Darter, Kanawha Darter, Appalachia Darter. **Losses --** Bluegill.

Data Analysis

Watershed -- this large site is located in the northeast corner of Boone and drains the entire southern-most tip of the New River basin in Watauga County, including the catchments of Winkler Creek, Middle Fork South Fork New River, and East Fork South Fork New River. **Habitats** -- shallow runs, with a few large riffles, and a few shallow side pools; the canopy was open due to the river's width, but the banks were generally healthy; substrates were highly embedded in this reach of the river; conductivity was elevated because of Boone's WWTP. **2008** -- an extremely diverse and abundant (n=2058) community of fish was collected, including eight intolerant taxa, three of which were not previously collected; Western Blacknose Dace (n=524) comprised 25% of the sample, and Central Stoneroller represented 24% (n=484). **1998-2008** -- although many more fish were collected in 2008, little difference exists between the trophic structures and NCIBI values between samples, suggesting that little has changed in this watershed over a 10 year period (in spite of upstream fish kill in 2003); overall, the fish community continues to thrive here, and suggests good water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S FK NEW R	**SR 1169**	**KB2**	**08/18/08**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.299167	-81.468056	10-1-(20.5)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-V; HQW	143	2830	25	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone, Jimmy Smith WWTP	NC0020621	4.82

Water Quality Parameters

Temperature (°C)	23.4
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	105
pH (s.u.)	9.2
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	8
Pool Variety (10)	0
Riffle Habitat (16)	7
Left Bank Stability (7)	2
Right Bank Stability (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	42

Site Photograph

Substrate mix of cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10547	99	38	4.84	3.78	Good
08/21/03	9263	98	45	4.19	3.33	Excellent
08/18/98	7737	101	48	4.61	3.64	Excellent

Taxonomic Analysis

Small changes in rare and in some cases common taxa were the main differences between the 2008 collection and past collections. Only one taxonomic group showed any drastic changes: the dragonfly family Gomphidae. In both 1998 and 2003 four taxa were found in the samples but in 2008, this group was absent. One unusual chironomid taxa was found in 2008: *Polypedilum* sp. P. The infrequently collected caddisfly *Oecetis avara* was first collected here in 2008. There are only 37 BAU records of this species. Overall EPT and total diversity remains high here.

Data Analysis

This South Fork New River site rated Good in 2008, a decrease from Excellent in both 1998 and 2003. An increase in the Biotic Index indicates that a more pollution-tolerant community resides in this reach than did in previous years. The number of EPT taxa was also lower in 2008 compared with 1998 and 2003. This reach earned a low habitat scorce due to limited in-stream habitat including substrate sizes that consisted mostly of sand, silt and gravel. The water quality at SR 1169 is an improvement from the next site upstream of here (at US 421, approximately 20 miles upstream). That site rated Fair in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S FK NEW R	**NC 16/18**	**KB3**	**06/19/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.393056	-81.407222	10-1-(26)b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;HQW	205	2660	40	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone, Jimmy Smith WWTP	NC0020621	4.82

Water Quality Parameters

Temperature (°C)	23.1
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	66
pH (s.u.)	8.5
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	69

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/19/08	10474	106	54	4.26	3.48	Excellent
08/22/03	9271	104	58	3.67	3.12	Excellent
08/18/98	7742	95	48	4.01	3.44	Excellent
07/14/93	6270	104	51	3.41	2.75	Excellent
07/11/90	5375	97	50	3.79	3.11	Excellent

Taxonomic Analysis

A large number of taxa were collected here in 2008. The number of EPT taxa collected was 54, only 4 fewer than in 2003, but the total number of taxa collected was slightly higher in 2008 than 2003 (106 versus 104). A diverse aquatic macroinvertebrate community resides in this reach of the South Fork New River. Abundant taxa in past years were generally both collected again in 2008 and were also abundant. Some noteable taxa were first collected at the site in 2008, including: the mayflies *Drunella lata, Eurylophella aestiva* and *Anthopotamus* (all common in the sample); the stoneflies *Acroneuria mela* and *Agnetina annulipes* (both rare in the sample); and the caddisfly *Apatania* (common in the sample).

Data Analysis

This South Fork New River site rated Excellent again in 2008 as it has following each prior sampling event since 1987. The 2008 sample was collected one to two months earlier in the year than past samples, but still within the summer basinwide sampling window. This earlier sampling may have accounted for a few taxa not seen in previous samples (e.g. *Drunella lata, Eurylophella aestiva*). Though the total number of aquatic invertebrate taxa collected in 2008 was greater than in all previous years, the Biotic Index was also higher suggesting a slightly more pollution-sensitive community than in past years.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S FK NEW R	US 221 BELOW CRANBERRY CREEK	KB10	08/22/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.473889	-81.336944	10-1-(33.5)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;ORW	300	2545	25	0.4

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Boone, Jimmy Smith WWTP	NC0020621	4.82

Water Quality Parameters

Temperature (°C)	22.6
Dissolved Oxygen (mg/L)	7.2
Specific Conductance (µS/cm)	82
pH (s.u.)	8.1
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	11
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	3
Right Bank Stability (7)	6
Light Penetration (10)	0
Left Riparian Score (5)	1
Right Riparian Score (5)	4
Total Habitat Score (100)	63

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/22/08	10563	102	49	4.41	3.26	Excellent
08/23/03	9272	112	47	4.62	3.43	Excellent
08/20/98	7749	112	55	4.24	3.57	Excellent
07/15/93	6273	103	46	4.06	3.09	Excellent

Taxonomic Analysis

A large number of taxa continue to inhabit this downstream section of the South Fork New River. Many pollution-sensitive taxa are abundant here, including the mayflies: *Heterocloeon curiosum, Acerpenna macdunnoughi, Serratella serratoides, Stenacron pallidum,* and *Leucrocuta.* The pollution-sensitive stonefly *Acroneuria arenosa* and the caddisflies *Brachycentrus numerosus* and *Helicopsyche* were also abundant here in in 2008. Most taxa collected in 2008 were also collected in previous years.

Data Analysis

This site has consistently rated Excellent since 1990. A total of thirteen samples have been collected from this location since 1983. The number of Total Taxa and EPT Taxa have remained high and the Biotic Index has been consistent in showing a pollution-sensitive aquatic community residing here. The site upstream of here (NC 16-88, approximately 18 miles upstream) was also Excellent. The US 221 site is the farthest downstream basinwide site on the South Fork New River. The South Fork and North Fork New River converge approximately 15 miles downstream of this site and then flow northward to Virginia a further five miles downstream. There are no permitted discharges between the US 221 site and the North Carolina-Virginia border, suggesting that an Excellent water quality rating could continue downstream to Virginia.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
M FK S FK NEW R	SR 1522	KB1	08/19/08	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.201389	-81.650000	10-1-2-(15)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;CA:+	12	3100	5	0.2

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	0	0	0	100 (golf course/greenway trail)

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

Water Quality Parameters

Temperature (°C)	18.3
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	111
pH (s.u.)	6.9
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	6
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	2
Right Bank Stability (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	0
Right Riparian Score (5)	2
Total Habitat Score (100)	56

Site Photograph

Substrate mix of cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10550	---	27	---	4.19	Good-Fair
11/04/03	9307	---	29*	---	2.99	Good
08/20/03	9259	---	24	---	3.26	Good-Fair
08/17/98	7732	---	31	---	2.99	Good
07/12/93	6260	---	37	---	2.97	Excellent

*value corrected for seasonality

Taxonomic Analysis

In general, the EPT taxa found in the Middle Fork of the South Fork New River in 2008 were typical of previous collections. However, the most recent collection contained fewer EPT taxa than most of the past sampling efforts. This site supports an increasingly pollution-tolerant benthic community. Abundant taxa found in 2008 were cosmopolitan species (e.g. *Isonychia, Cheumatopsyche, Plauditus dubius* group) with few pollution-sensitve species.

Data Analysis

This site rated Good-Fair in 2008, the same rating it received in summer 2003. The four summer basinwide collections have seen this site go from Excellent and Good in 1993 and 1998 respectively, to Good-Fair in 2003 and 2008. The Biotic Index indicates that the benthic community is becoming more tolerant of aquatic pollution with sensitve species no longer residing in this reach. This site is located just downstream of Boone Golf Club, a large expanse of open area with only a narrow grass riparian zone and few trees. Silt and sand comprised 30% of the benthic area, limiting interstitial benthic habitats and increasing embeddedness. Additionally, there is a small reservior 1.6 miles upsteam of this site and three minor dischargers (>1.5 miles upstream) that may be affecting the benthic community here. In October 2003, one of these dischargers, Blowing Rock Water Treatment Plant (WTP), spilled approximately 3,000 gallons of sodium hydroxide into the Middle Fork South Fork New River (BAU memorandum B-20031113). There does not appear to be any long term effect of this event on the macroinvertebrate community at SR 1522.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
M FK S FK NEW R	SR 1522	05/22/08	KF8	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.20128	-81.649851	10-1-2-(15)	Southern Crystalline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV, CA, +	12	3100	5	0.5	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	50	20	10	20 (golf course)

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

Water Quality Parameters

Temperature (°C)	12.3
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	92
pH (s.u.)	6.4

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)	16
Left Bank Stability (7)	3
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**75**

Site Photograph

Substrate cobble, gravel, boulder, silt, sand.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/08	2008-50	14	38	Not Rated
06/09/98	98-53	16	58	Excellent

Most Abundant Species Mottled Sculpin.

Exotic Species Green Sunfish, Bluegill, Rainbow Trout, Brown Trout.

Species Change Since Last Cycle **Gains --** Green Sunfish, Rosyside Dace, Bluehead Chub, Creek Chub. **Losses** -- Rock Bass, New River Shiner, Kanawha Minnow, Longnose Dace, Greenside Darter, Kanawha Darter.

Data Analysis

Watershed - a large trib to the South Fork New River; drains the southern-most tip of the basin. **Habitats** - riffles, runs, swift chutes, and a few snag pools; high substrate embeddedness; bordered by a golf course (left) and a fenced cattle operation (right) with narrow riparian widths; the four NPDES facilities (combined discharge of 1.0 MGD, 1.9 to 7.0 miles above) may have elevated the instream waste concentration during droughts. **2008** - a diverse and abundant community of fish (n=803) was collected, including two intolerant taxa (Tounguetied Minnow, and Rainbow Trout); however six of ten NCIBI metrics fell during this assessment. **1998-2003** -- the decline in bioclassification, and particularly the loss of four sparsely populated intolerant species (Rock Bass, New River Shiner, Kanawha Minnow, and Kanawha Darter - 18 individuals combined) may be related to a 2003 spill of sodium hydroxide (3,000 gal.), that occurred in Blowing Rock. These losses may be explained by the combined effects of this spill, and the urban nature of this stream. In light of these extremes, this site was Not Rated; it has likely seen impressive recovery toward its previous bioclass and may continue to improve.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
E FK S FK NEW R	SR 1522	KB12	08/19/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.202222	-81.648889	10-1-3-(8)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;CA:+	7.2	3100	5	0.1

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

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

Water Quality Parameters

Temperature (°C)	18.5
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	61
pH (s.u.)	6.1
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	11
Bottom Substrate (15)	6
Pool Variety (10)	4
Riffle Habitat (16)	12
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	0
Total Habitat Score (100)	44

Site Photograph

Substrate mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10549	---	31	---	3.54	Good
11/04/03	9306	---	3	---	5.21	Poor
08/20/03	9258	---	31	---	3.06	Good
08/17/98	7731	---	32	---	3.29	Good
07/12/93	6259	---	37	---	3.34	Excellent

Taxonomic Analysis

The EPT taxa found in the East Fork of the South Fork New River in 2008 were similar to past basinwide collections. Some taxa were collected in lower abundances (e.g. *Isonychia*) and some have yet to reestablish (e.g. *Maccaffertium pudicum* and *Ceratopsyche sparna*) following an acute, unknown event that occurred in 2003 after the basinwide sampling event for that year. In terms of EPT richness the benthic community has recovered to summer 2003 levels. This site still supports a pollution-intolerant benthic community.

Data Analysis

This site rated Good in 2008, the same classification it received in summer 1998 and 2003. The loss of benthic fauna in late 2003 following an acute, unknown event does not appear to have been permanent. This site was sampled in November 2003 as a reference site after a spill in the Middle Fork South Fork New River (BAU memorandum B-20031113). This East Fork site has no dischargers upstream nor any larger reserviors which may have been the source of the problems seen in late 2003. Despite the ample evidence of being located just downstream of Boone Golf Club (e.g. grass clippings and golf balls in stream) the benthic fauna at this site appears less affected by the golf course in 2008 than the Middle Fork South Fork New River.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
WINKLER CR	**SR 1549**	**KB17**	**08/19/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.198333	-81.673611	10-1-4-(3.5)a	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	5.5	3145	6	0.2

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

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

Water Quality Parameters

Temperature (°C)	16.2
Dissolved Oxygen (mg/L)	9.6
Specific Conductance (µS/cm)	46
pH (s.u.)	6.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	76

Site Photograph

Substrate mix of mostly bedrock and boulder with some cobble and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10548	---	36	---	2.93	Excellent
08/21/03	9262	---	39	---	2.36	Excellent
08/17/98	7733	---	34	---	2.89	Good
07/12/93	6258	---	37	---	2.02	Excellent

Taxonomic Analysis

EPT taxa collected in 2008 were very similar to past samples here. Abundant taxa included the mayflies *Baetis pluto, Epeorus vitreus, Maccaffertium modestum, M. pudicum* and *Paraleptophlebia*. Six stonefly taxa were found at Winkler Creek with *Leuctra* and *Tallaperla* being dominant. Caddisflies were well represented with 12 taxa present, but only *Ceratopsyche sparna, Cheumatopsyche* and *Dolophilodes* were abundant. The less commonly collected caddisfly, *Mystacides* nr. *alafimbriata,* was found to be common here in 2008.

Data Analysis

The benthic site on Winkler Creek is near the headwaters of South Fork New River, and is located within and near the town limits of Boone. Much of the catchment upstream of the site is forested; only a very minor portion is urban.

Winkler Creek rated Excellent in 2008, the same as in 2003 and 1993. The number of EPT taxa collected here has remained stable since the first sampling effort in 1993. The low Biotic Index indicates a pollution-intolerant benthic community residing in this section of Winkler Creek.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HOWARD CR	SR 1306	05/21/08	KF6	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.241748	-81.66127	10-1-9-(6)	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,HQW	7.9	3198	7	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	15.1
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	45
pH (s.u.)	6.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	**91**

Site Photograph

Substrate abundant flat rocks, cobble, gravel, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/08	2008-48	17	--	Not Rated
06/08/98	98-52	12	--	Not Rated

Most Abundant Species Central Stoneroller.

Exotic Species Rock Bass, Redbreast Sunfish, Green Sunfish, Bluegill, Rainbow Trout, Brown Trout.

Species Change Since Last Cycle **Gains --** Green Sunfish, Bluegill, Tonguetied Minnow, Bluehead Chub, Longnose Dace, Appalachia Darter. **Losses** -- Creek Chub.

Data Analysis

Watershed -- a tributary to the North Fork New River located one watershed south of the Meat Camp Creek catchment in northeast Watauga County; drains the primarily forested area just north of Boone. **Habitats** -- high quality instream habitats consisting of excellent riffles, bedrock chutes, and pools; great canopy coverage offering abundant shade to the stream; very stable banks with a diverse mix of undisturbed vegetation in the riparian zones. **2008** -- a highly diverse mix of cold, cool, and warm water species was collected from this mountain stream, including four intolerant taxa (Rock Bass, Tonguetied Minnow, Appalachia Darter, and Rainbow Trout); Central Stonerollers represented 25% of the catch, and the six new species collected were represented by low abundances (maximum of 8 individuals). **1998-2008** -- a total of 18 fish species have been collected from this location, including two species of sucker, four species of sunfish (three of which are warm water exotics, suggesting alteration of the original population), six species of minnow, two darter species, and two trout species; overall, this stream appears healthy, and is supporting a rich community of fish through good quality water and habitats.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HOWARD CR	**SR 1328**	**KB18**	**08/19/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.244444	-81.650000	10-1-9-(6)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr;HQW	10	3128	6	0.1

	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)	19.6
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	100
pH (s.u.)	7.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	89

Site Photograph

Substrate mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10552	---	44	---	2.19	Excellent
08/20/03	9254	---	35	---	2.35	Good
08/17/98	7735	---	40	---	2.64	Excellent
07/13/93	6262	102	52	3.85	2.87	Excellent
07/26/88	4633	---	38	---	3.22	Excellent

Taxonomic Analysis

Howard Creek conatains a pollution-intolerant macroinvertebrate community dominated by taxa that one would expect to find in a minimally disturbed small mountain watershed (e.g. *Litobrancha recurvata, Neoephemera purpurea*). Shredders, such as the stoneflies *Tallaperla* and *Pteronarcys proteus,* were abundant in 2008.

Data Analysis

Howard Creek rated Excellent in 2008, an increase from Good in 2003. As noted in the 2003 report, the Good rating was one EPT taxon away from an Excellent rating. Data from 1988 to 2008 show consistently high water quality with a diverse and pollution intolerant macroinvertebrate community. Residential and commercial development appears to be increasing in this watershed but the sampled reach did not appear to be affected by this as of August 2008.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MEAT CAMP CR	**SR 1335**	**05/21/08**	**KF24**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.271611	-81.658809	10-1-10	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	10.7	3300	7	0.2	Yes

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	80	0	15	5 (road)

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

Water Quality Parameters

Temperature (°C)	13.2
Dissolved Oxygen (mg/L)	9.8
Specific Conductance (µS/cm)	42
pH (s.u.)	6.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	0
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**75**

Site Photograph

Substrate cobble, gravel, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/08	2008-47	10	--	Not Rated
06/09/98	98-54	11	--	Not Rated

Most Abundant Species Mottled Sculpin.

Exotic Species Rock Bass, Rainbow Trout, Brown Trout.

Species Change Since Last Cycle **Gains --** Bluehead Chub, Rainbow Trout. **Losses** -- White Sucker, Northern Hogsucker, Rosyside Dace.

Data Analysis

This site was moved about 2.7 miles upstream from the SR 1333 crossing (above Rittle Fork and Cobb Creek) to serve as a regional reference site. **Watershed** - a tributary to the South Fork New River that drains part of rural northeast Watauga County. **Habitats** - the 100% riffle habitats are high quality, but there are no functional pools in this 600 foot reach, and the lower 2/3 is completely without a canopy; however, bank stabilities are still good, and the substrates show relatively low levels of embeddedness, which suggests minor amounts of upstream sedimention. **2008** - a fairly diverse mix of cold and cool water species was collected, including three intolerant taxa (Rock Bass, Kanawha Darter, and Rainbow Trout) and almost four times the abundance was observed at this new location (n=1060 vs. 271); Mottled Sculpin (cold water benthic insectivore) represented 84% of the sample. **1998-2008** - although separated by a few miles and Not Rated, the fish taxa collected at these two locations reflect similar trophic structures (in spite of the high number of Mottled Sculpin at SR 1335); overall, the fish community suggests good water quality characteristics in this catchment.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
MEAT CAMP CR	**SR 1333**	**KB20**	**08/20/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.264444	-81.621944	10-1-10	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	20	3080	10	0.2

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

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

Water Quality Parameters

Temperature (°C)	15.2
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	57
pH (s.u.)	7.0
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	15
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	97

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10554	---	39	---	2.80	Excellent
08/20/03	9255	---	35	---	2.81	Good
08/17/98	7736	---	39	---	2.69	Excellent
07/13/93	6263	---	31	---	2.52	Good
03/05/90	5205	---	37	---	2.60	Good

Taxonomic Analysis

In 2008 Meat Camp Creek contained 39 EPT taxa, equaling the largest number of taxa collected from this stream. Many of the species collected in 2003 and previous samples were found in 2008. Most of these taxa are sensitive to aquatic pollution. Several taxa appeared for the first time here in 2008. These included the caddisflies *Neophylax consimilis* (abundant in the sample), *Goera fuscula* (common), *Ceratopsyche morosa,* and *Neureclipsis* (both rare in the sample). The pollution-sensitive mayfly *Stenacron pallidum* (common) and *Tricorythodes* (rare) also appeared at this site for the first time in 2008.

Data Analysis

Meat Camp Creek rated Excellent in 2008. The Good rating received in 2003 was only one EPT short of an Excellent bioclassification. The number of EPT collected here during the five collections since 1990 suggest a stable, pollution-sensitive macroinvertebrate community at the site. Riparian habitat along this reach shows little disturbance and a variety of in-stream microhabitats exist for macroinvertebrate colonization despite a large percentage of bedrock. Water temperatures in Meat Camp Creek were the lowest recorded for all sites in this part of the HUC in 2008.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NORRIS FK	SR 1337	KB21	08/19/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.280000	-81.676667	10-1-10-2	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	3.3	3320	3	0.2

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

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	36
pH (s.u.)	6.9
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	15
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Site Photograph

Substrate mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/19/08	10553	---	35	---	2.11	Good
08/20/03	9256	---	36	---	1.56	Excellent

Taxonomic Analysis

Taxa collected in 2003 that were not found in 2008 included the caddisflies *Fattigia pele, Parapsyche cardis, Brachycentrus spinae* and *Apatania*. New caddisflies for this site in 2008 included *Ceratopsyche bronta, Pycnopsyche gentilis* and a second (unidentified) species of *Pycnopcyshe, Polycentropus* and *Lype diversa.* The stoneflies *Suwallia* and *Isoperla* nr *holochlora* were present in 2003 though absent in 2008, while *Paragnetina immarginata* was absent in 2003 and present in 2008. These taxa differences resulted in a slightly higher EPT Biotic Index in 2008 compared with 2003. However, overall this site contains a pollution-intolerant macroinvertebrate community.

Data Analysis

Norris Fork at SR 1337 received a classification of Good in 2008, though the addition of a single EPT taxon would have pushed the classification up to Excellent. The difference in the number of EPT taxa between 2003 and 2008 is very small, but the difference in EPT Biotic Index values is relatively large. Many of the rare but highly intolerant taxa collected in 2003 were absent in 2008. Some recent development has occurred upstream of the site. Higher silt levels were seen in 2008 corresponding to ongoing land clearing activities here. A large number of lots were for sale at the time of sampling suggesting that development would continue in the watershed. Despite this, the EPT Biotic Index in Norris Fork was the second lowest in this part the HUC (formerly subbasin 1).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PINE ORCHARD CR	**SR 1369**	**KB22**	**08/20/08**	**Not Impaired**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
WATAUGA	1	05050001	36.313333	-81.617222	10-1-15-1	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	2.6	3080	4	0.2

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

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

Water Quality Parameters

Temperature (°C)	16.1
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	46
pH (s.u.)	6.5
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	2
Total Habitat Score (100)	83

Site Photograph

Substrate mix of boulder, cobble, and gravel with a large amount of silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10555	---	36	---	2.09	Not Impaired
08/21/03	9260	---	33	---	1.64	Excellent

Taxonomic Analysis

Small differences exist with the taxa collected at the site between 2003 and 2008, but overall the benthic community here remains diverse and pollution-sensitive. *Neophylax consimils* , a pollution-intolerant case-making caddisfly, was abundant in 2003 and absent in 2008. However, two other taxa, *N. mitchelli* and *N. oligius,* were common in 2008. Abundant taxa collected in 2008 included these pollution-sensitive taxa: the mayfly, *Drunella conestee* ; the stonefly *Malirekus hastatus* ; and the caddisfly *Dolophilodes.*

Data Analysis

Pine Orchard Creek had the lowest EPT Biotic Index of any stream in this part of the HUC (formerly subbasin 1) indicating a very pollution-intolerant benthic community here. The classification for the site in 2003 was derived using High Quality Small Mountain Stream (HQSMS) criteria, which are used for stream sites with undisturbed drainage areas under 3.5 square miles. Recent aerial photos and streamside observations show the presence of disturbance from residences, agriculture, and state roads and highways in the watershed, therefore HQSMS criteria can not be applied to the site for 2008. Additionally, since no criteria have been completed for stream sites with drainage areas under 3.0 square miles with disturbance present, this site is given a classification of Not Impaired for 2008 (it would have been classified as Good with large-stream criteria). One notable difference in habitat at the site was an increase in silt from 2003 to 2008 (40% in 2008 versus 0% in 2003 by visual estimation).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PINE SWAMP CR	**OFF SR 1179 AT MOUTH**	**KB108**	**08/18/08**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.312500	-81.464444	10-1-24	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	11	2820	8	0.3

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

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

Water Quality Parameters

Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	30
pH (s.u.)	6.4
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	2
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	66

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10546	---	34	---	3.82	Good
08/19/03	9253	---	30	---	3.14	Good

Taxonomic Analysis

Macroinvertebrates collected in Pine Swamp Creek differed slightly between 2003 and 2008, with four more EPT taxa collected in the latter year. Taxa abundant in the sample were similar between 2003 and 2008, but rare and common taxa varied. New taxa that appeared in 2008 included the caddisflies *Ceratopsyche bronta, C. morosa* and the mayfly *Ephoron leukon*. The stonefly *Isoperla*, common in 2003, was not collected in 2008. The macroinvertebrate community residing in Pine Swamp Creek in 2008 appears to be slightly more pollution-tolerant than in 2003.

Data Analysis

Pine Swamp Creek at SR 1179 rated Good in 2008 despite the lack of a healthy riparian zone upstream. Active cow pastures and tree farms constitute a sizeable portion of the visible watershed upstream of the sampling reach. A large amount of silt was visible in this stream (30% of the substrate by visual estimation). Though more EPT taxa were found in 2008 than 2003, the Biotic Index for these macroinvertebrates was higher, suggesting a response to either chemical or physical stressors at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S BEAVER CR	**SR 1147**	**KB5**	**08/18/08**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.354167	-81.468056	10-1-25-2a	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	3.0	3020	3	0.2

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

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

Water Quality Parameters

Temperature (°C)	16.3
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	48
pH (s.u.)	6.8
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	2
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	0
Total Habitat Score (100)	75

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/18/08	10411	---	35	---	2.83	Good
08/21/03	9264	---	31	---	2.68	Good

Taxonomic Analysis

The taxa collected in 2008 from South Beaver Creek were very similar to those collected in 2003. The list of abundant taxa in both years were nearly identical. Addional taxa seen in 2008 were mostly rare in abundance with a few exceptions, such as the mayflies *Stenacron pallidum, Maccertium modestum* and *Leucrocuta* (all common in the sample). Generally, the macroinvertebrate community residing in this reach is pollution-sensitive and diverse.

Data Analysis

South Beaver Creek rated Good in 2008, the same rating as in 2003. One additional EPT taxon would have resulted in an Excellent bioclassification. Based on only two samples, the macroinvertebrate community at this site appears stable, diverse and pollution-sensitive. Drought conditions in 2008 resulted in most of the root mats being exposed. Typically, this type of habitat is heavily colonized by aquatic macroinvertebrates.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
OBIDS CR	**SR 1192**	**KB6**	**08/08/08**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.345278	-81.404444	10-1-27-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;Tr:+	8.7	2700	5	0.2

	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)	18.5
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	38
pH (s.u.)	6.3
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	2
Right Bank Stability (7)	6
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	71

Site Photograph

Substrate mostly cobble with some boulder and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/08/08	10410	---	31	---	3.28	Good
08/19/03	9252	---	32	---	3.16	Good

Taxonomic Analysis

The EPT taxa collected from Obids Creek in 2008 are very similar to those from the 2003 collection. An exception to this was the baetid mayfly *Baetis tricaudatus* , which was abundant in 2003 and absent in 2008. Despite this, all six other taxa from the mayfly family Baetidae were found here in 2008. Other "missing" taxa in 2008 were the heptageniid mayflies *Maccaffertium pudicum* and *M. ithaca* , which were common and abundant respectively. One rare taxon, *Mystacides* nr *alafimbriata,* was found in 2008. Only 17 records of this species exist in the BAU database going back to 1985. Four of these records, however, are in the New River drainage. Overall, 31 EPT taxa were found in 2008, one fewer than the number in the 2003 collection.

Data Analysis

Obids Creek rated Good in 2008, the same rating as in 2003. The taxa collected in both years are generally intolerant to aquatic pollution. A slight increase in the EPT Biotic Index reflects the few taxonomic differences and abundances between 2003 and 2008. The open canopy here has resulted in a higher water temperature than other nearby sampled streams of similar size. Additionally, cattle appear to have direct access to the stream which could be limiting in-stream habitat quality.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
OBIDS CR	**SR 1192**	**05/09/08**	**KF13**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.345566	-81.4042353	10-1-27-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV; Tr:+	8.3	2710	6	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	15.5
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	37
pH (s.u.)	6.4

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	16
Left Bank Stability (7)	2
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	**84**

Site Photograph

Substrate Cobble, boulder, gravel, and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/09/08	2008-37	17	50	Good

Most Abundant Species Mottled Sculpin and Central Stoneroller

Exotic Species Warpaint Shiner, Brown Trout, Rock Bass, Redbreast Sunfish, and Smallmouth Bass

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains southeastern Ashe County; no municipalities within the watershed; tributary to South Fork New River, site is ~ 600 ft. upstream from the creek's confluence with the river. **Habitat** -- high gradient riffles and plunge pools; *Rhododendron* - and Eastern Hemlock-lined banks; grasses and pastures in the riparian zones; unstable left bank; livestock with access to the stream. **2008** -- diversity of cyprinids and intolerant species were slightly lower than expected; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass (n=124 collected) and Smallmouth Bass (n=26 collected); and two endemic species (Kanawha Darter and Appalachia Darter) were collected.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
ROAN CR	SR 1588	KB7	08/20/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.408056	-81.401944	10-1-31-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV; Tr; CA:+	7.0	2660	7	0.2

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

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

Water Quality Parameters

Temperature (°C)	21.9
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	41
pH (s.u.)	6.9
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	76

Site Photograph

Substrate mix of boulder, cobble, gravel and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10558	---	32	---	3.18	Good
08/18/03	9245	---	44	---	3.03	Excellent
08/18/98	7741	---	39	---	2.61	Excellent
07/14/93	6271	---	39	---	3.02	Excellent

Taxonomic Analysis

Most taxonomic differences between 2003 and 2008 pertained to rare taxa. Exceptions to this were: the stone-cased caddisfly *Glossosoma,* which was abundant in 2003 but absent in 2008; the stoneflies *Isoperla* and *Malirekus hastatus* and the caddisfly *Rhyacophila fuscula,* which were all common in 2003 though absent in 2008. The caddisfly *Triaenodes ignitus* appeared here in 2008 (and was common in the sample) but had not been found in previous collections.

Data Analysis

Roan Creek declined from Excellent in the first three samples collected here from 1993 through 2003, to Good in 2008. Four additional EPT taxa would be required for the site to attain a classification of Excellent in 2008. The EPT Biotic Index suggests a slightly more pollution-tolerant macroinvertebrate community than in past years. Overall however, the species residing in this reach contribute to a pollution-sensitive macroinvertebrate community. Noticeable amounts of silt in 2008, (30% by visual estimation compared to 0% in 2003) may have reduced the number of EPT taxa residing here by filling benthic interstitial habitat.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ROAN CR	SR 1588	05/19/08	KF20	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.407949	-81.401772	10-1-31-(2)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV, Tr, CA+	6.7	2694	5	0.3	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	30	15	55	0

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

Water Quality Parameters

Temperature (°C)	12.5
Dissolved Oxygen (mg/L)	10.4
Specific Conductance (µS/cm)	38
pH (s.u.)	6.1

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**77**

Site Photograph

Substrate gravel, cobble, sand, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/19/08	2008-41	14	48	Good

Most Abundant Species Mottled Sculpin

Exotic Species Rock Bass, Smallmouth Bass, Brown Trout.

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

Data Analysis

New basinwide site. **Watershed** -- a tributary to the South Fork New River that drains the southeastern central edge of Ashe County, located southeast of Jefferson. **Habitats** -- good riffles and runs, with one good pool that was holding trout; moderately embedded substrates, but cattle are fenced out of the stream, allowing generally healthy banks; narrow vegetated riparian widths on both sides of the stream and a canopy that provides equal amounts of sun and shade. **2008** -- a very abundant (n=1273), fairly diverse, and trophically balanced community of mostly cool and cold water fish species was collected, including four intolerant taxa (Rock Bass, Smallmouth Bass, Kanawha Darter, and Appalachia Darter); Mottled Sculpin represented 53% of the sample; in light of the agricultural land use in the watershed and lasting drought conditions, this stream appears fairly healthy as indicated by its instream habitats, water parameters, and its abundance of fish.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NAKED CR	NC 16/88	KB8	08/20/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.408889	-81.433333	10-1-32b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	7.1	2750	5	0.2

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

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

Water Quality Parameters

Temperature (°C)	24.4
Dissolved Oxygen (mg/L)	7.3
Specific Conductance (µS/cm)	122
pH (s.u.)	8.4
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	63

Site Photograph

Substrate a mix of boulder, cobble, gravel sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10557	---	34	---	4.37	Good
08/19/03	9250	70	30	4.92	4.11	Good-Fair
08/18/98	7739	71	32	5.16	4.18	Good-Fair
07/14/93	6269	84	36	4.65	3.77	Good

Taxonomic Analysis

Naked Creek at NC 16-88 contains a typical benthic fauna for this part of the New River Basin. Abundant taxa collected in 2008 (and in most previous years) included the mayflies *Acentrella, Baetis flavistriga, Maccaffertium ithaca,* and *M. modestum*. Abundant caddisflies were *Ceratopsyche sparna, Cheumatopsyche, Hydropsyche betten*i and *Leucotrichia pictipes*. A few more EPT taxa were collected in 2008 than in recent samples. New taxa to this location in 2008 were the caddisflies *Neureclipsis, Oligostomis, Hydatophylax argus* and the stonefly *Pteronarcys proteus*.

Data Analysis

The few additional EPT taxa found in 2008 elevated this sample from Good-Fair to Good. Though this stream reach is entirely within an agricultural area (corn production), the headwaters of some small tributaries to this stream originate in Mount Jefferson State Park. A forested riparian buffer along this section of stream could aid in maintaining the Good bioclassification or possibly improving it.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
NAKED CR	OFF SR 1589 140 METERS UPSTREAM OF MOUTH	KB139	08/21/08	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.412902	-81.406828	10-1-32b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	13	2650	7	0.2

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

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

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	140
pH (s.u.)	6.9
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	15
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	73

Site Photograph

Substrate: mix of boulder, cobble, gravel sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10559	79	23	5.44	4.43	Good-Fair

Taxonomic Analysis

A greater number of taxa were collected here in 2008 compared with the former basinwide site in 2003. Coleoptera (beetles) and Gastropoda (snails) were the most notable groups that reflected greater diversity in 2008, with increases of five and four taxa respectively. Overall, most taxa collected in 2003 at the former basinwide site were also found in 2008 at the new site.

Compared with the upstream basinwide site on Naked Creek (at NC 16-88, which received a classification of Good), there were nine fewer EPT taxa. All abundant taxa collected upstream were found here. However, five taxa that were common in the upstream sample were absent at this site off SR 1589: the caddisflies *Neophylax consimilis, N. oligus,* and *Glossosoma;* and the mayflies *Epeorus vitreus* and *Maccaffertium pudicum*. The beetle *Cymbiodyta* (Hydrophilidae) was collected here in 2008; this is the first BAU record of the taxon in the New River drainage. This uncommon beetle has only been collected in 25 BAU samples since 1985.

Data Analysis

This site replaces the former basinwide site at SR 1585, which is about one stream-mile upstream. The former site is within a recently established gated community.

Naked Creek off SR 1589 rated Good-Fair in 2008, the same rating received at the former basinwide site at SR 1585 in 2003. The upstream basinwide site on Naked Creek at NC 16-88 rated Good in 2008. A golf course and the outfalls from two minor dischargers (Town of Jefferson WTP, permit NC0083470; Town of Jefferson WWTP, permit NC0021709) are situated between the upstream and downstream basinwide sites, and appear to have an effect on water quality at the downstream site.

According to the 2004 Basinwide Assessment Report, upgrades to the WWTP were ongoing at the time of sampling. The specific conductance measured 140 µmhos/cm in 2008, higher than in 2004 at SR 1585 (102 µmhos/cm). Also, habitat issues remain a problem here with large amounts of silt covering benthic surface and ongoing water withdrawals for lawn and golf course irrigation. At the time of the 2008 sampling event new homes were being constructed on the left side of the stream.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
NAKED CR	off SR 1589	05/09/08	KF14	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.413027	-81.4070488	10-1-32b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;+	12.4	2670	8	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Jefferson WWTP	NC0021709	0.6

Water Quality Parameters

Temperature (°C)	15.6
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	104
pH (s.u.)	6.2
Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	6
Pool Variety (10)	4
Riffle Habitat (16)	7
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	5
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	**50**

Site Photograph

Substrate Cobble, boulder, gravel, and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/09/08	2008-36	20	36	Fair
06/09/98	98-55	12	34	Fair

Most Abundant Species Central Stoneroller

Exotic Species Warpaint Shiner, Brown Bullhead, Brown Trout, Rock Bass, Redbreast Sunfish, Pumpkinseed Sunfish, Smallmouth Bass, and Largemouth Bass

Species Change Since Last Cycle

Gains -- Spotfin Shiner, Warpaint Shiner, Spottal Shiner, Kanawha Rosyface Shiner, Brown Bullhead, Brown Trout, Redbreast Sunfish, Pumpkinseed Sunfish, Smallmouth Bass, Largemouth Bass, and Greenside Darter.
Losses -- Blacknose Dace, Creek Chub, and Bluegill.

Data Analysis

1998 site was ~2.2 miles upstream at NC 16/88. **Watershed** -- drains south-central Ashe County, including the Town of Jefferson; golf course residential community is within the immediate watershed; WWTP discharge is ~ 2 miles upstream; tributary to the South Fork New River; site is ~ 700 ft. upstream from the creek's confluencewith the river. **Habitat** -- lowest total habitat scores of any fish site in the basin in 2008; runs, riffles, slick periphyton; eroded vertical banks; open canopy within the golf course. **2008** -- diversities of darters, cyprinids, and intolerant species were lower than expected; the percentage of tolerant fish (primarily White Sucker and Redbreast Sunfish) was elevated for a mountain stream; high percentage of Omnivores+Herbivores; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass (n=250) and a source of temporary migrants (Spotfin Shiner, Warpaint Shiner, Spottail Shiner, Kanawha Rosyface Shiner, and Greenside Darter); and the most nonindigenous species and the second greatest conductivity at any fish site in the basin in 2008. **1998 & 2008** -- 23 species known from the stream, including 2 endemic and 9 nonindigenous species.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PEAK CR	OFF SR 1599 350 METERS UPSTREAM OF ORE KNOB BR	KB11	06/19/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.420833	-81.319444	10-1-35-(2)a	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr:+	9.0	2700	6	0.2

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

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

Water Quality Parameters

Temperature (°C)	18.0
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	38
pH (s.u.)	6.3
Water Clarity	clear

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)	6
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	93

Site Photograph

Substrate mix of bedrock, boulder, cobble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/19/08	10473	---	44	---	2.32	Excellent
08/18/03	9248	---	31	---	2.53	Good
08/19/98	7746	---	35	---	2.77	Good
04/08/96	7032	74	37*	4.01*	2.47	Excellent
07/15/93	6275	---	35	---	2.61	Good

* values corrected for seasonality

Taxonomic Analysis

A diverse and pollution-sensitive aquatic community resides in this section of Peak Creek (above the confluence of Peak Creek and Ore Knob Branch). In 2008, the number of EPT taxa was higher than in recent collections here (an April 1991 Full Scale sample yielded 50 EPT). Generally, the aquatic macroinvertebrate community was similar to past samples with abundant, pollution-sensitive taxa such as: the mayflies *Drunella cornutella, Paraleptophlebia, Stenacron pallidum,* and *Heptagenia*; and the caddisflies *Glossosoma, Ceratopsyche slossonae, Dolophilodes,* and *Neophylax oligius*. In 2008 an extremely rare caddisfly, *Hydropsyche carolina*, was found in Peak Creek. Only one other record exists for this taxon in the North Carolina BAU database going back to 1983.

Data Analysis

This section of Peak Creek rated Excellent in 2008. The second highest EPT totals and the lowest EPT Biotic Index summarize the 2008 sample here and highlight the high water quality conditions in this stream. An undisturbed riparian zone, diverse in-stream benthic surfaces and a mostly forested watershed have resulted in favorable conditions for macroinvertebrate colonization in this stream (as indicated by the high habitat score received).

The location name for this site was formerly "SR 1599."

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
PEAK CR	SR 1599 DOWNSTREAM OF ORE KNOB BRANCH	KB13	08/21/08	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.425000	-81.325000	10-1-35-(2)b	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr:+	11	2680	8	0.3

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

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

Water Quality Parameters

Temperature (°C)	19.3
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	170
pH (s.u.)	3.1

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	82

Site Photograph

Substrate: mix of bedrock, boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10561	---	3	---	2.62	Poor
08/18/03	9247	---	6	---	1.91	Poor
01/13/99	7798	---	5*	---	1.60	Poor
08/19/98	7747	---	23	---	3.10	Good-Fair
04/08/96	7026	30	14*	4.18*	2.10	Fair

* values corrected for seasonality

Taxonomic Analysis

In 2008 only three EPT taxa were collected: *Pycnopsyche gentilis* (one specimen), a second unidentified species of *Pycnopsyche* (three specimens), and *Hydropsyche venularis* (one specimen). Precipitate from acid mine drainage covered the caddisflies and/or their cases. It is quite apparent that the benthic community is very highly stressed at the site.

Data Analysis

This reach of Peak Creek, below the confluence of Ore Knob Branch, received the same classification of Poor in 2008 as in 2003. It appears that in both wet and dry years the highly stressed macroinvertebrate community here borders on extirpation. As seen in the photo, an orange precipitate covered all instream surfaces. The 2004 Basinwide Assessment Report stated that proposed mitigation efforts were planned (in 2004). Unfortunately that work was not initiated, though site stabilization efrorts continue at the mine site itself. Approximately one mile upstream of this site is station KB 11, which earned a classification of Excellent in 2008. Despite the diverse aquatic community residing just upstream, this reach continues to suffer from the acid mine drainage received from Ore Knob Branch.

The location name for this site was formerly "BIG PEAK CR RD."

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L PEAK CR	SR 1595	KB14	08/21/08	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.427778	-81.344444	10-1-35-4	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr:+	2.3	2615	3	0.1

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

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

Water Quality Parameters

Temperature (°C)	17.8
Dissolved Oxygen (mg/L)	7.7
Specific Conductance (µS/cm)	76
pH (s.u.)	5.9
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	86

Site Photograph

Substrate mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10560	---	7	---	2.12	Poor
08/19/03	9249	---	6	---	1.95	Poor
08/19/98	7744	---	7	---	2.02	Poor
04/08/96	7030	16	6*	3.58*	1.77	Poor
04/16/91	5551	---	5	---	2.01	Poor

*values corrected for seasonality

Taxonomic Analysis

Only seven EPT taxa were found in Little Peak Creek in 2008. Abundant taxa collected here were similar to previous samples (*Leuctra, Tallaperla*, and *Diplectrona modesta*). Three larger-bodied case caddisflies were present (all common in the sample): *Hydatophylax, Pycnopsyche gentilis,* and a second unidentifed species of *Pycnopsyche*. Acid mine drainage from Ore Knob continues to suppress macroinvertebrate diversity and densities here.

Data Analysis

Little Peak Creek rated Poor in 2008, the same rating that it has always received. Acid mine drainage creates a toxic situation for aquatic macroinvertebrates here.

By current BAU protocols this site would not be assigned a classification due to the small drainage area. However, due to the depauperate benthic community, in the judgment of BAU biologists the site is among the worst in the state and the classification is justified.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CRANBERRY CR	SR 1603	KB15	08/21/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.456389	-81.315000	10-1-37	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr:+	35	2585	13	0.2

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

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

Water Quality Parameters

Temperature (°C)	22.5
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	41
pH (s.u.)	6.9
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	11
Pool Variety (10)	6
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	75

Site Photograph

Substrate mix of boulder, cobble, gravel, sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10562	93	45	3.96	3.07	Excellent
08/18/03	9246	106	52	4.08	3.07	Excellent
08/19/98	7748	79	42	3.78	3.11	Excellent

Taxonomic Analysis

Cranberry Creek contained a large number of aquatic macroinvertebrate taxa in 2008. The species composition was similar to the 1998 and 2003 collections. Abundant taxa at this site in 2008 included: *Dolophilodes, Neophylax oligius, Paraleptophlebia,* and *Neoephemera purpurea*.

Data Analysis

Cranberry Creek rated Excellent in 2008. Total taxa and EPT taxa numbers were similar among all three samples collected here. The Biotic Index indicates a pollution-sensitive community residing in this lower section of Cranberry Creek. This watershed contains a large number of tree farms with some mixed agriculture and residences.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CRANBERRY CR	SR 1600	05/08/08	KF2	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.46944444	-81.32694444	10-1-37	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;+	36.8	2560	14	0.4	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	20	55	25	0

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

Water Quality Parameters

Temperature (°C)	15.4
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	39
pH (s.u.)	5.7

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	2
Right Bank Stability (7)	3
Light Penetration (10)	0
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	**53**

Site Photograph

Substrate Cobble, gravel, sand, and boulders

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/08	2008-33	22	56	Good
06/30/98	98-59	20	60	Excellent

Most Abundant Species Mottled Sculpin and Bluehead Chub

Exotic Species Warpaint Shiner, Redlip Shiner, Tennessee Shiner, Saffron Shiner, Rock Bass, and Smallmouth Bass

Species Change Since Last Cycle **Gains --** Tonguetied Minnow, Warpaint Shiner, Tennessee Shiner, Saffron Shiner, Kanawha Rosyface Shiner, and Creek Chub. **Losses --** Western Blacknose Dace, White Sucker, Brown Trout, and Greenside Darter.

Data Analysis

Watershed -- drains eastern Ashe County; no municipalities within the watershed; tributary to South Fork New River, site is ~ 1 mile upstream of the creek's confluence with the river. **Habitat** -- straight channel, stream widening is occurring; 100% open canopy; very narrow riparian zones; unstable banks with high erosion potential; and shallow pools; a popular fishing site. **2008** -- more total species, species of cyprinids (15), and intolerant species (9) were collected at this site than at any other site, except for at the South Fork New River (also 22 species). **1998 & 2008** -- twice as many fish collected in 2008 than in 1998; a very diverse fish community is present, 26 species known from the site, including 16 species of cyprinids, 4 species of darters, 6 endemic species (Tonguetied Minnow, New River Shiner, 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 1-5 fish/species.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
PRATHERS CR	off SR 1302	05/07/08	KF15	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALLEGHANY	1	05050001	36.4967511	-81.3205856	10-1-38	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
B;Tr	13.7	2520	7	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	17.2
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	42
pH (s.u.)	7.2

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	6
Riffle Habitat (16)	16
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	4
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**75**

Site Photograph

Substrate Cobble and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/07/08	2008-32	19	46	Good-Fair

Most Abundant Species Central Stoneroller

Exotic Species Warpaint Shiner, Redlip Shiner, Tennessee Shiner, Saffron Shiner, Brown Trout, Rock Bass, and Smallmouth Bass

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains western Alleghany County; no municipalities within the watershed; much of watershed is with livestock pasture, no riparian zones, and an open canopy; tributary to South Fork New River, site is ~ 750 ft. upstream from the creek's confluence with the river. **Habitat** -- high gradient stream, primarily riffles, runs, and some plunge pools; fairly open canopy; narrow riparian zones. **2008** -- Central Stoneroller accounted for 57% of all the fish collected; high percentage of Omnivores+Herbivores, indicative of nonpoint source nutrients and an open canopy; and two endemic species (Kanawha Rosyface Shiner and Kanawha Darter) were present.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
GRASSY CR	SR 1549	05/08/08	KF16	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.5522927	-81.355517	10-3	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr:+	10.6	2480	8	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	90	0	0	10 (South Fork New River)

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

Water Quality Parameters

Temperature (°C)	18.0
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	84
pH (s.u.)	7.7
Water Clarity	Very slightly turbid (easily silted)

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	14
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**95**

Site Photograph

Substrate Cobble, boulder, and silts on the rocks

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/08	2008-35	18	40	Good-Fair

Most Abundant Species Bluehead Chub and Central Stoneroller

Exotic Species Redlip Shiner, Saffron Shiner, Brown Trout, Rock Bass, Green Sunfish, and Smallmouth Bass

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains southern Grayson County, VA and northeast corner of Ashe County; no municipalities within the watershed; tributary to the New River, site is ~ 50 ft. from the creek's confluence with the river. **Habitat** -- greatest habitat score of any fish community site in the basin in 2008, although much of the watershed is without canopy cover in pasture with cattle; high gradient boulder plunge pools; site is atypical. **2008** -- 82% of all the fish collected were Bluehead Chub, Central Stoneroller, and Mountain Redbelly Dace; very high percentage of Omnivores+Herbivores were collected, indicative of nonpoint sources of nutrients and open canopy upstream of the reach; proximity to the river enables the site to serve as a nursery area for Age 1 Rock Bass and Smallmouth Bass; one endemic species (Appalachia Darter) was collected; and the greatest pH of any fish community site in the basin in 2008 due to photosynthetic activity by the upstream periphyton.

Appendix 2-C

Ambient Monitoring Systems
Station Data Sheets

Station ID	Waterbody	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K2100000	South Fork New R.	10-1-(3.5)	US 221/421 at Perkinsville	Fecal Coliform (10.9%)	---
K3250000	South Fork New R.	10-1-(26)	NC 16/88 near Jefferson	---	Fecal Coliform (7.1%)
K4500000	South Fork New R.	10-1-(33.5)	US 221 near Scottville	Copper (11.1%) Iron (22.2%) Zinc (11.1%)	---

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

Location: S FORK NEW RIV AT US 221 AND 421 AT PERKINSVILLE
Station #: K2100000 **Hydrologic Unit Code:** 05050001
Latitude: 36.22088 **Longitude:** -81.63978 **Stream class:** C +
Agency: NCAMBNT **NC stream index:** 10-1-(3.5)

Time period: 01/27/2005 to 12/16/2009

	# 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		7.6	8.2	8.5	9.8	11.8	13	13.7
	57	0	<5	0	0		7.6	8.2	8.5	9.8	11.8	13	13.7
pH (SU)	57	0	<6	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
	57	0	>9	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				86	101	118	156	179	219	310
Water Temperature (°C)	57	0	>29	0	0		1.8	3.5	6.9	14	19.1	20.8	25.7
Other													
TSS (mg/L)	18	10	N/A				2.5	2.5	3	5.5	6.2	24.8	68
Turbidity (NTU)	57	4	>50	2	3.5		1	1	1.5	2.3	4.5	9.9	150
Nutrients (mg/L)													
NH3 as N	57	38	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.08
NO2 + NO3 as N	57	0	N/A				0.24	0.98	1.3	1.7	2.15	3	3.9
TKN as N	57	15	N/A				0.2	0.2	0.2	0.24	0.28	0.38	0.89
Total Phosphorus	57	0	N/A				0.03	0.04	0.06	0.1	0.2	0.26	0.48
Metals (ug/L)													
Aluminum, total (Al)	10	2	N/A				50	50	60	83	114	206	210
Arsenic, total (As)	10	10	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	10	10	>2	0	0		1	1	1.8	2	2	2	2
Chromium, total (Cr)	10	10	>50	0	0		10	10	21	25	25	25	25
Copper, total (Cu)	10	7	>7	0	0		2	2	2	2	2	3	3
Iron, total (Fe)	10	0	>1000	0	0		190	191	230	265	325	487	500
Lead, total (Pb)	10	10	>25	0	0		10	10	10	10	10	10	10
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)	10	10	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	10	4	>50	0	0		10	10	10	11	16	21	21

Fecal Coliform Screening(#/100mL)

# results:	Geomean:	# > 400:	% > 400:	%Conf:
55	89.1	6	10.9	

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: S FORK NEW RIV AT NC 16 AND 88 NR JEFFERSON

Station #: K3250000 **Hydrologic Unit Code:** 05050001

Latitude: 36.39473 **Longitude:** -81.40750 **Stream class:** WS-IV HQW

Agency: NCAMBNT **NC stream index:** 10-1-(26)

Time period: 02/01/2005 to 12/17/2009

	# 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		7.6	8.3	8.5	9.8	11.5	13.1	14.6
	58	0	<5	0	0		7.6	8.3	8.5	9.8	11.5	13.1	14.6
pH (SU)	58	0	<6	0	0		6.7	7.1	7.4	7.7	8.1	8.6	9.4
	58	0	>9	2	3.4		6.7	7.1	7.4	7.7	8.1	8.6	9.4
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				45	61	68	73	80	100	656
Water Temperature (°C)	58	0	>29	0	0		2.3	4.7	8.2	15.4	21.9	24.4	27.1
Other													
TSS (mg/L)	18	9	N/A				2.5	2.5	3.9	6.2	6.6	68.4	576
Turbidity (NTU)	58	2	>50	3	5.2		1	1.2	1.7	2.8	5.2	22	380
Nutrients (mg/L)													
NH3 as N	58	40	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.12
NO2 + NO3 as N	58	0	>10	0	0		0.15	0.38	0.51	0.6	0.77	0.85	1
TKN as N	56	25	N/A				0.2	0.2	0.2	0.2	0.26	0.37	2.5
Total Phosphorus	58	11	N/A				0.02	0.02	0.02	0.02	0.03	0.05	3.8
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				110	110	120	150	200	310	310
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	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	9	0	>1000	0	0		200	200	220	280	380	480	480
Lead, total (Pb)	9	9	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	8	0	>200	0	0		14	14	16	18	22	29	29
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	9	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	9	8	>50	0	0		10	10	10	10	10	10	10

Fecal Coliform Screening(#/100mL)

# results:	Geomean:	# > 400:	% > 400:	%Conf:
56	21.8	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

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

Location: S FORK NEW RIV AT US 221 NR SCOTTVILLE
Station #: K4500000 **Hydrologic Unit Code:** 05050001
Latitude: 36.47378 **Longitude:** -81.33649 **Stream class:** B ORW
Agency: NCAMBNT **NC stream index:** 10-1-(33.5)

Time period: 02/01/2005 to 12/17/2009

	# 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		5.6	7.9	8.5	9.5	11.4	13.4	14.6
	58	0	<5	0	0		5.6	7.9	8.5	9.5	11.4	13.4	14.6
pH (SU)	58	0	<6	0	0		6.6	7	7.4	7.7	8	8.4	9
	58	0	>9	0	0		6.6	7	7.4	7.7	8	8.4	9
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				35	56	68	72	78	83	148
Water Temperature (°C)	58	0	>29	0	0		1.1	4	8	15.4	22.6	25.6	27
Other													
TSS (mg/L)	19	10	N/A				2.5	2.5	6.2	6.2	14	48	354
Turbidity (NTU)	58	3	>50	4	6.9		1	1.2	1.7	3.1	6.6	27.4	260
Nutrients (mg/L)													
NH3 as N	57	42	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.1
NO2 + NO3 as N	57	0	N/A				0.08	0.33	0.45	0.62	0.74	0.86	0.95
TKN as N	56	26	N/A				0.2	0.2	0.2	0.2	0.26	0.4	3
Total Phosphorus	57	10	N/A				0.02	0.02	0.02	0.02	0.04	0.08	0.8
Metals (ug/L)													
Aluminum, total (Al)	9	0	N/A				64	64	92	200	1765	17000	17000
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	6	>7	1	11.1		2	2	2	2	3	24	24
Iron, total (Fe)	9	0	>1000	2	22.2		280	280	335	470	1925	20000	20000
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	12	12
Zinc, total (Zn)	9	5	>50	1	11.1		10	10	10	10	13	71	71

Fecal Coliform Screening(#/100mL)

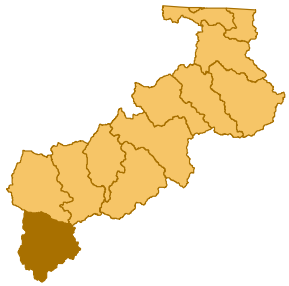
# results:	Geomean:	# > 400:	% > 400:	%Conf:
56	16.5	3	5.4	

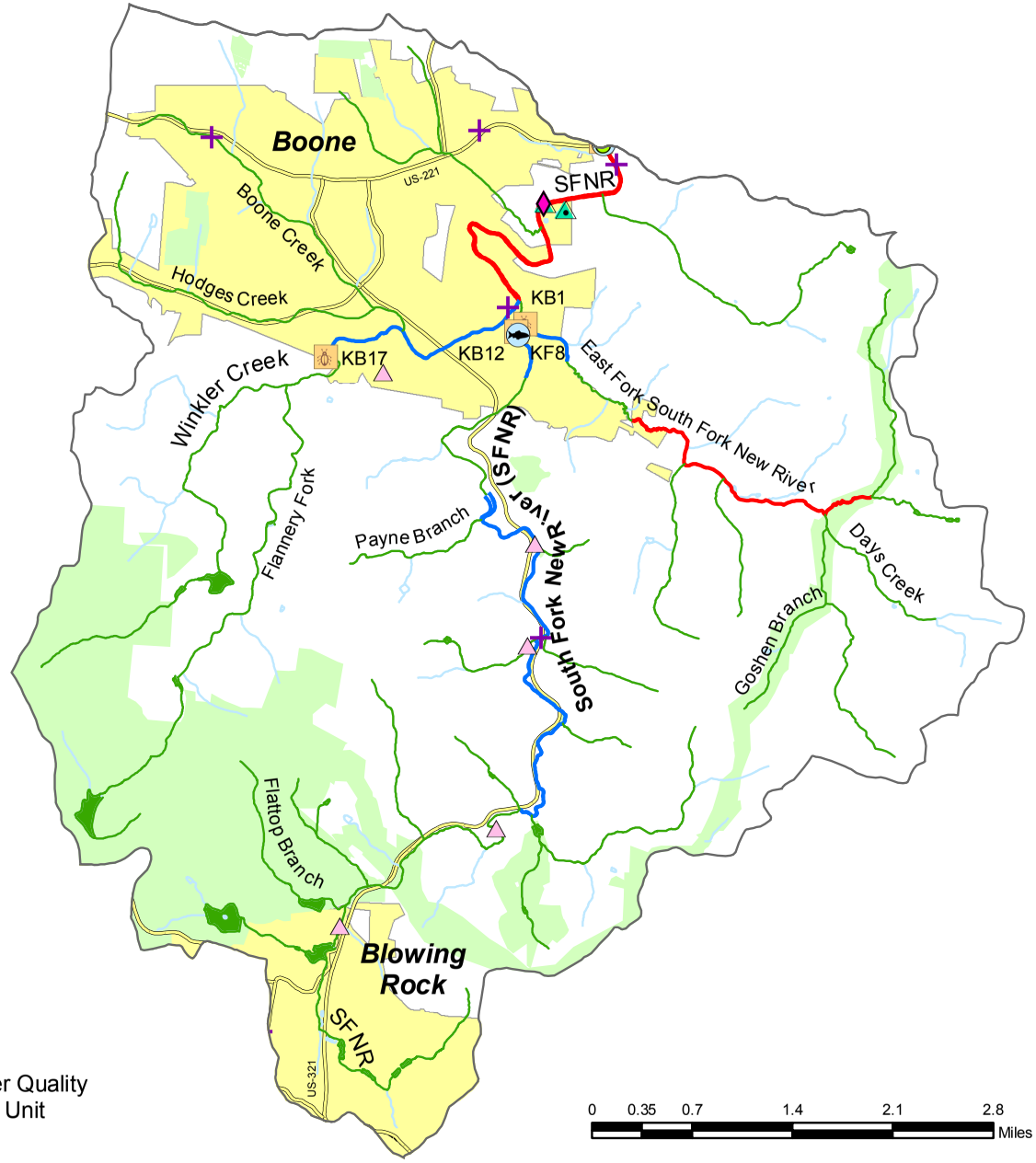
Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
%Conf : 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 2-D

12-DIGIT SUBWATERSHED MAPS

Headwaters South Fork New River Subwatershed (050500010201)





NC Division of Water Quality
Basinwide Planning Unit
January 2011

Legend

- 12-Digit HUCs
- County Boundary
- Municipalities
- Conservation Land
- Major Roads
- Hydrology

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

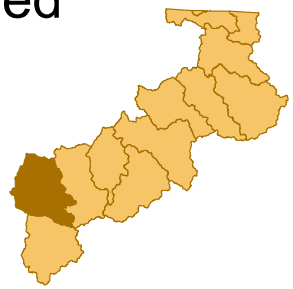
Monitoring Stations

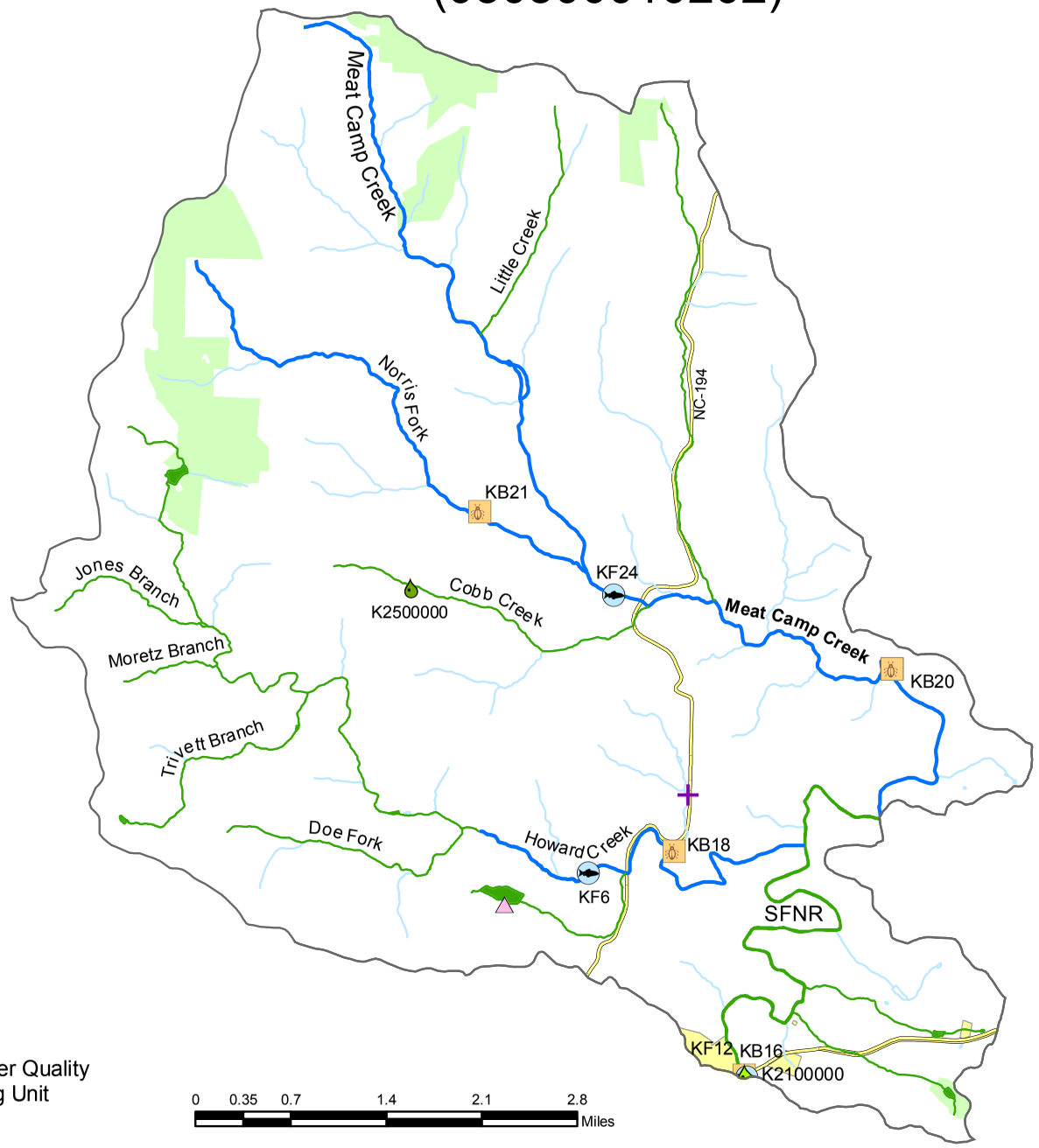
- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

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

Meat Camp Creek-South Fork New River Subwatershed (050500010202)





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

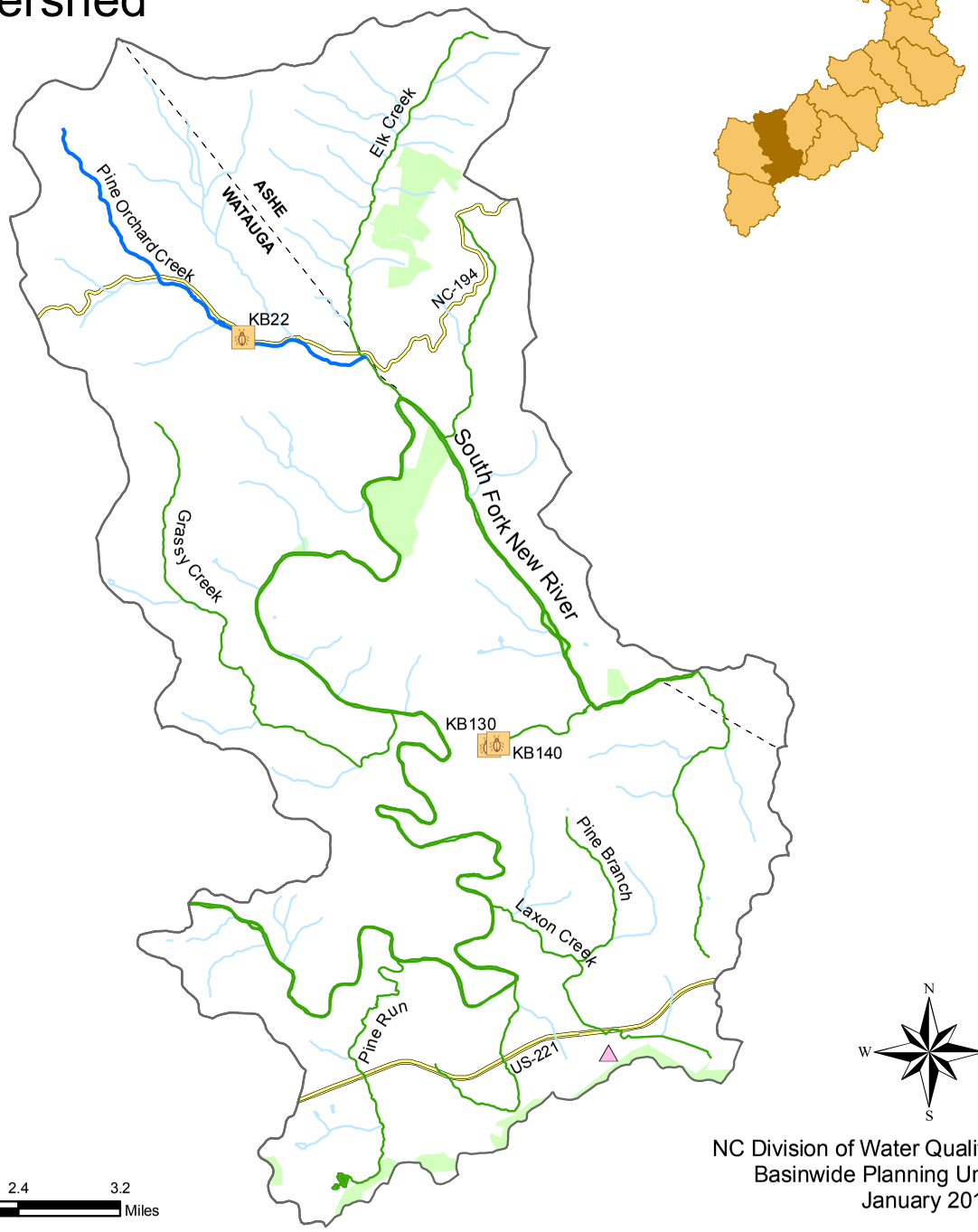
Permits

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

NC Division of Water Quality
Basinwide Planning Unit
January 2011

2-D.4

Elk Creek-SFNR Subwatershed (050500010203)



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

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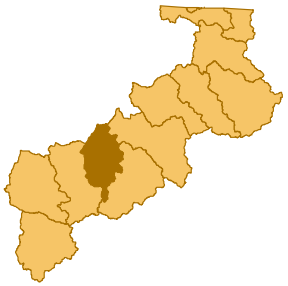
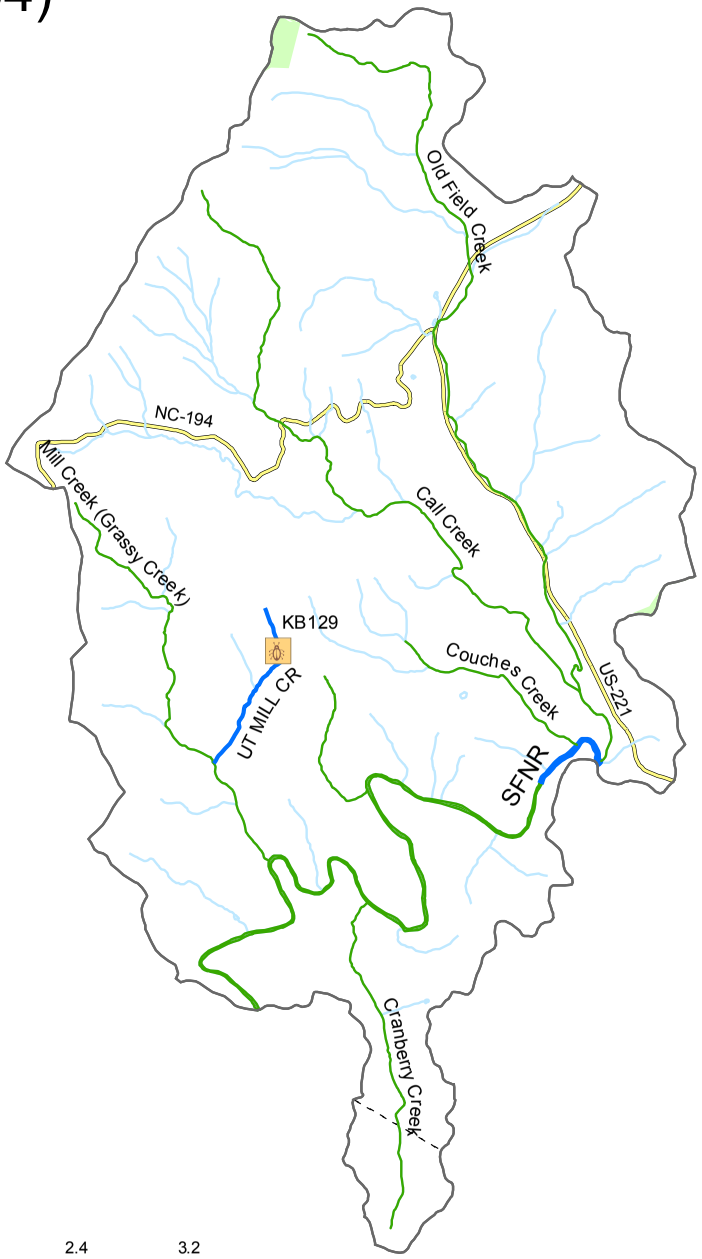
Basinwide Planning Unit
January 2011

Old Fields Creek-SFNR Subwatershed (050500010204)





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 0.4 0.8 1.6 2.4 3.2 Miles

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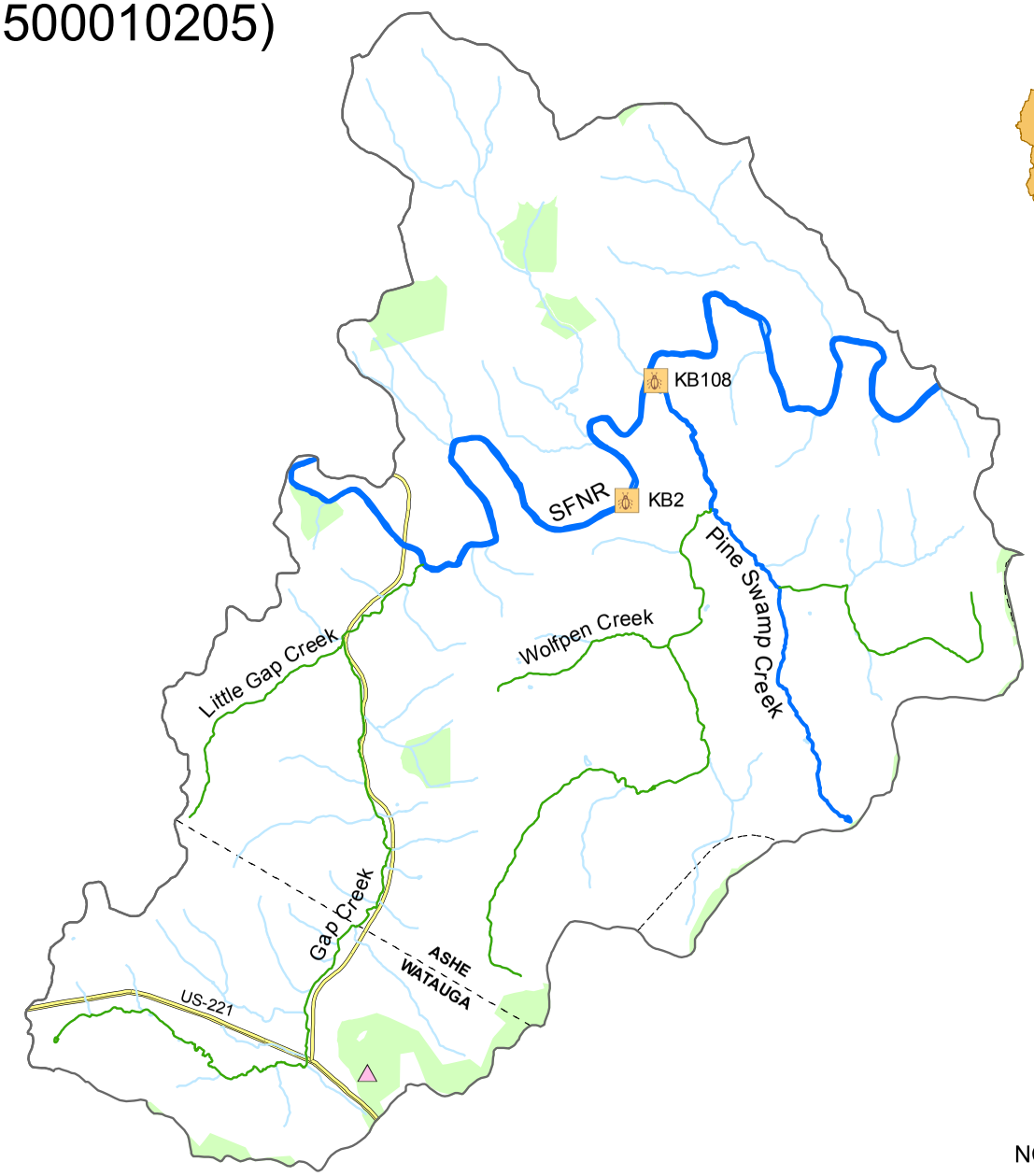
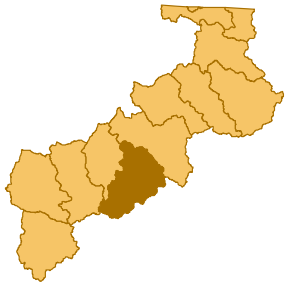
Basinwide Planning Unit
January 2011

2-D.6

Pine Swamp Creek-SFNR Subwatershed (050500010205)





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

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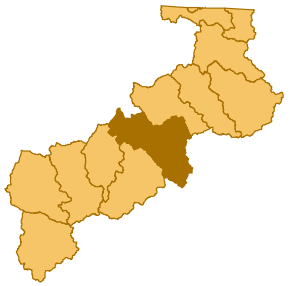
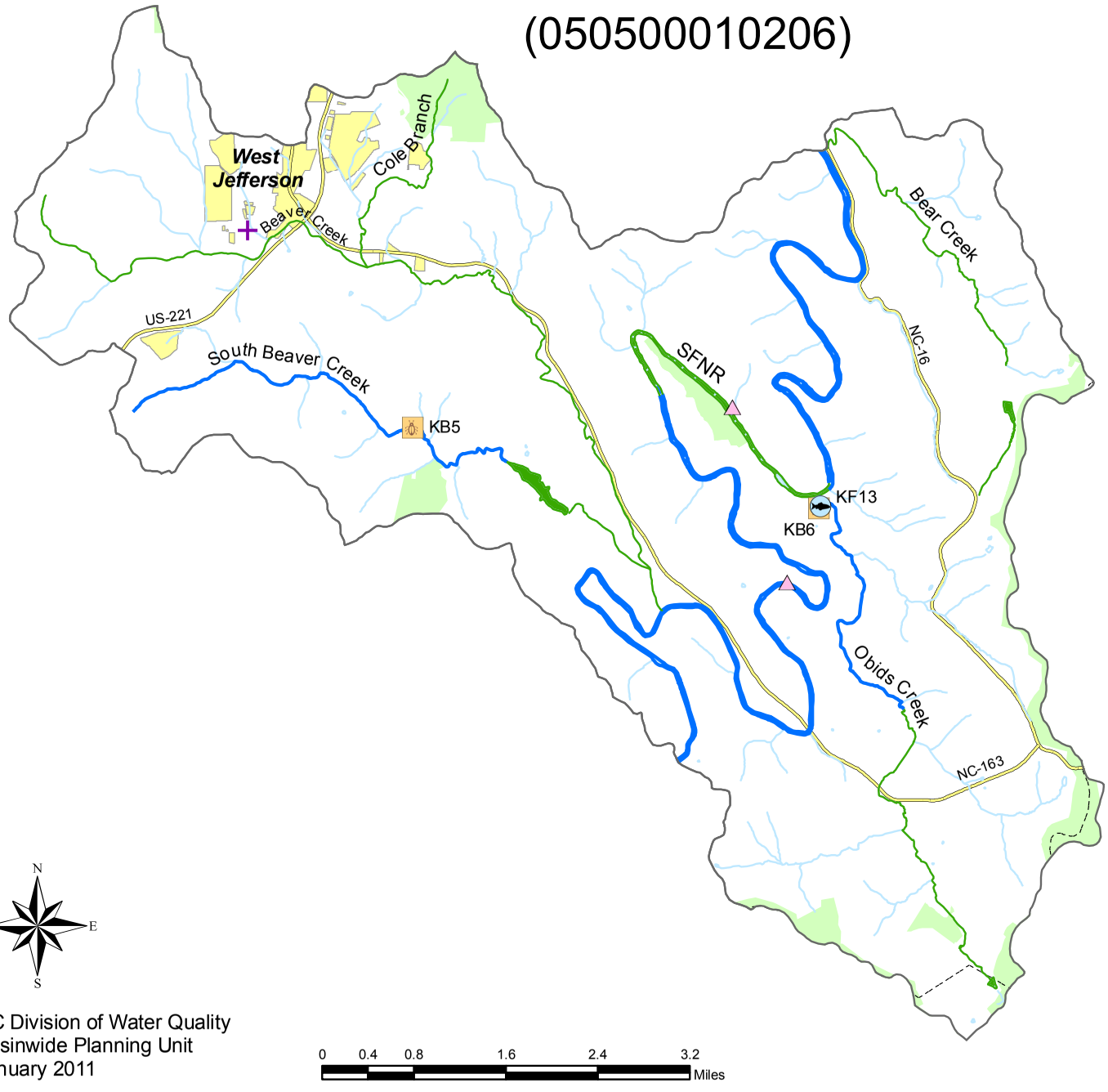
Basinwide Planning Unit
January 2011

Beaver Creek-SFNR Subwatershed (050500010206)





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

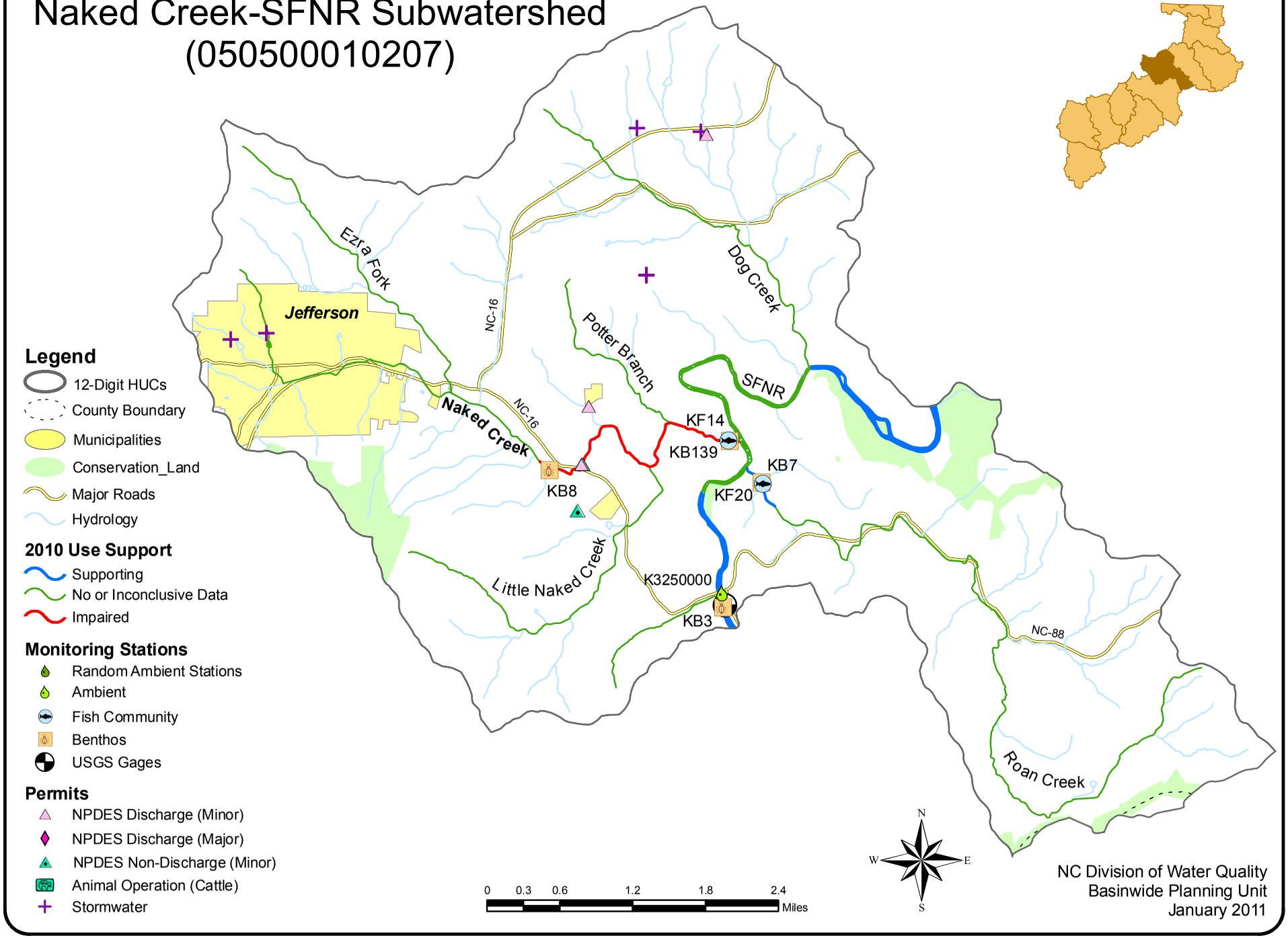
Permits

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

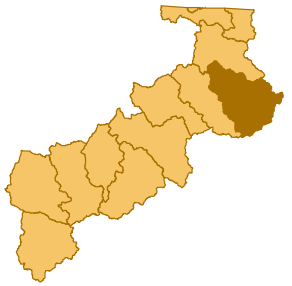
NC Division of Water Quality
Basinwide Planning Unit
January 2011

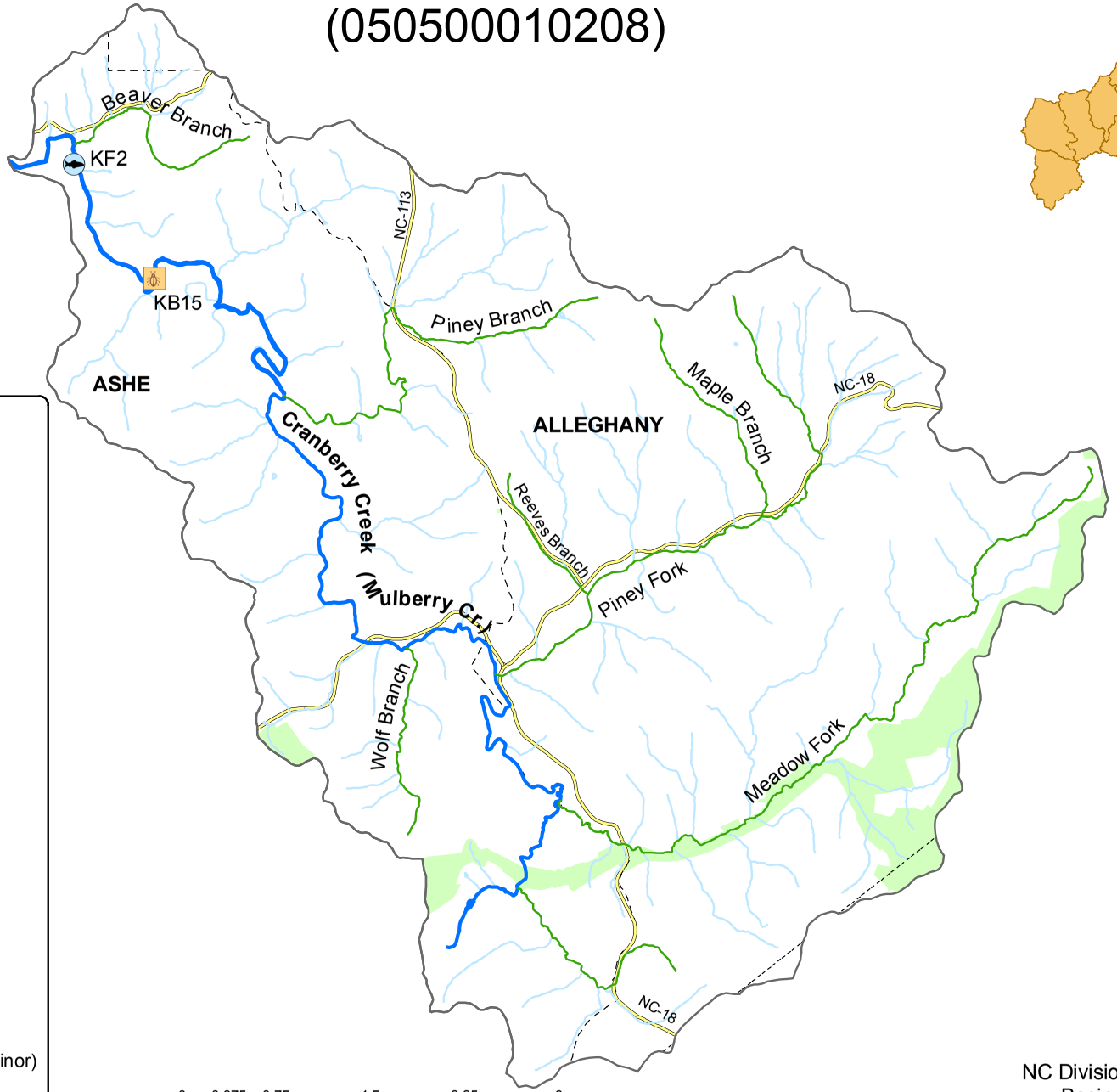
2-D.8

Naked Creek-SFNR Subwatershed (050500010207)



Cranberry Creek-SFNR Subwatershed (050500010208)





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

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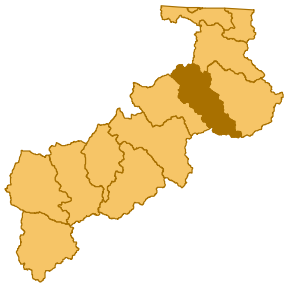
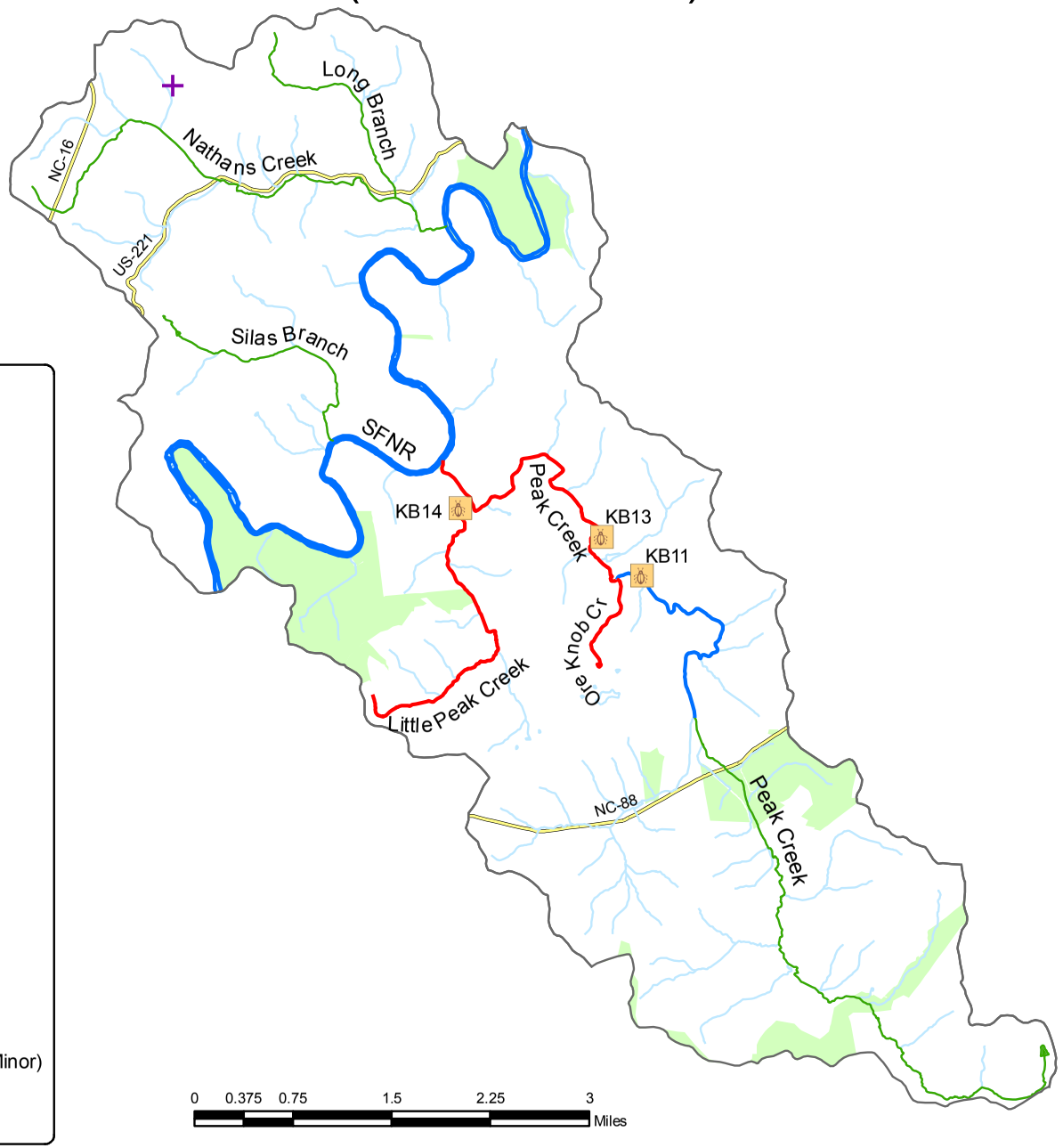
NC Division of Water Quality
Basinwide Planning Unit
January 2011

2-D.10

Peak Creek-SFNR Subwatershed (050500010209)





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

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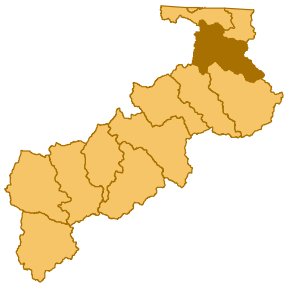
Basinwide Planning Unit
January 2011

Prather Creek-SFNR Subwatershed (050500010210)



South Fork New River

ALLEGHANY

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Crab Fork

KF15

US-221

NC-113

Prathers Creek

KB10

K4500000

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NC Division of Water Quality
Basinwide Planning Unit
January 2011

0 0.3 0.6 1.2 1.8 2.4
Miles

Legend

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

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

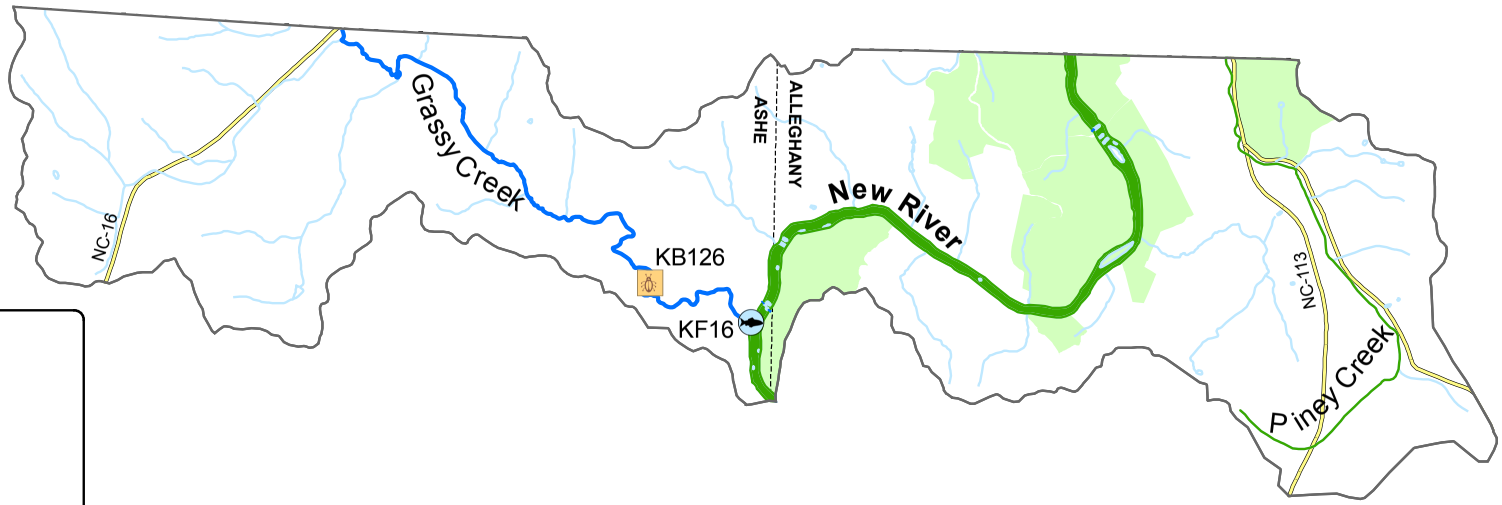
- Random Ambient Stations
- Ambient
- Fish Community
- Benthos
- USGS Gages

Permits

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

2-D.12

Grassy Creek-New River Subwatershed (050500010302)



Legend

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

2010 Use Support

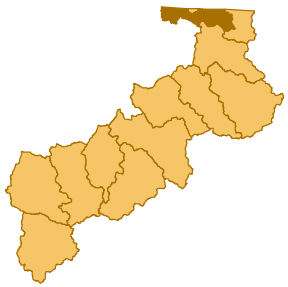
- Supporting
- No or Inconclusive Data
- Impaired

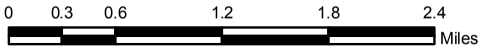
Monitoring Stations

- 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