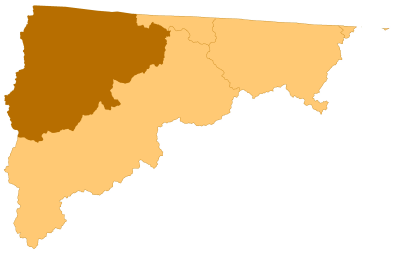
CHAPTER 1

North Fork New River Watershed



HUC 0505000101

Includes: Three Top Creek, Big Laurel Creek, Buffalo & Little Buffalo Creeks, Little & Big Horse Creeks & Helton Creek

General Watershed Description

This ten-digit hydrologic unit code (HUC) watershed, with an area of about 250 square miles, is the equivalent to DWQ's old subbasin 05-07-02 and contains the North Fork New River and its tributaries (See DWQ's Old Subbasins to New HUC Conversion map in the Maps Chapter). The majority of the watershed lies within Ashe County, with the headwaters of the North Fork New River beginning in Watauga County and the headwaters of Big Horse Creek and Helton Creek beginning in Virginia. The North Fork New River flows in an east-northeast direction before it converges with the South Fork New River to form the New River.

The land cover within this watershed is mostly forested (80%) with areas of agriculture (14%) and the least amount of developed land in the New River basin (3.7%). Rural residential properties and pasture lands are scattered throughout this watershed. Agricultural activities have historically consisted of pasture and cultivated croplands, but within the past 20 years has expanded to include Christmas tree farming. The majority of agricultural lands in this watershed are found along streambanks.

Roughly 16,000 acres of conservation land are found in this watershed and include easements held by local watershed groups (Elk Knob State Park, Cherokee National Forest and Blue Ridge Rural Land Trust).

This watershed's population is centered mostly around the towns of Lansing and West Jefferson. Lansing's population declined by 12% between 1990 and 2000, and was estimated to decline by another one percent by 2010 according to the 2000 census. West Jefferson's population increased by 8% in 2000 and was estimated to increase by another 12% by 2010.

Watershed at a Glance

Counties:

Ashe & Watagua

Municipalities:

Lansing & West Jefferson

Ecoregions:

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

Permitted Facilities:

NPDES WWTP: 6
- Major 0
- Minor 6

Non-Discharge Facilities: 3
Stormwater: 2
- General 2
- Individual 0

Animal Operations: 0

Population:

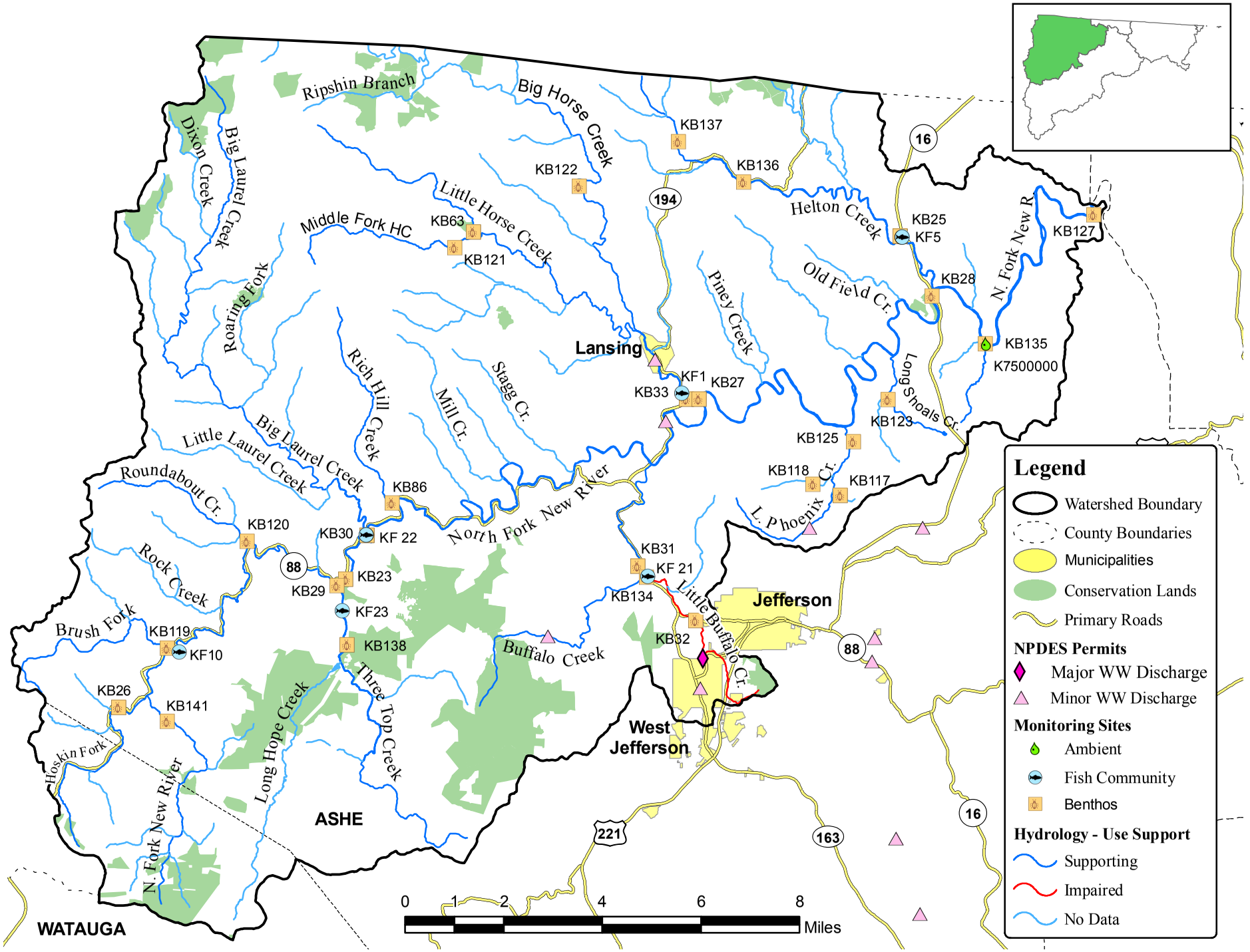
2010: ..... Coming Soon

2006 Land Cover:

Developed.....3.81%
Forest 81.1%
Agriculture.....14.98%
Wetlands.....0.11%

2001 Impervious Surface ..0.24%

FIGURE 1-1: NORTH FORK NEW RIVER WATERSHED (0505000101)



1.2

Watershed Water Quality Overview

The North Fork New River watershed has some of the best water quality in the basin and water quality has changed little in the five years since the last planning cycle. The large areas of forest and minimal agriculture and urban areas create only a minimal human impact to water quality. In DWQ's efforts to protect the pristine nature of this watershed, a watershed-wide study was conducted to determine if these waters could be reclassified as High Quality Waters (HQW) or Outstanding Resource Waters (ORW). As a result, almost the entire watershed was reclassified as ORW. For a map of the affected area and a more detailed discussion see the Additional Studies section below. Little Buffalo Creek, near West Jefferson, is the only Impaired water body in the watershed and was not included in the reclassification.

Water Quality Data Summary for this Watershed

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

Understanding the Data

Biological & Ambient Rating Converted to Use Support Category

Biological (benthic and fish community) samples are given a bioclassification/rating based on the data collected at the site by DWQs Environmental Sciences Section (ESS). These bioclassifications include Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair and Poor. For specific methodology defining how these rating are given see Benthic Standard Operating Procedures (SOP) or the Fish Community SOP. Once a rating is given, it is then translated into a Use Support Category (see Figure 1-2).

Figure 1-2: 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 1-3: Example of a Use Support and Monitoring Box

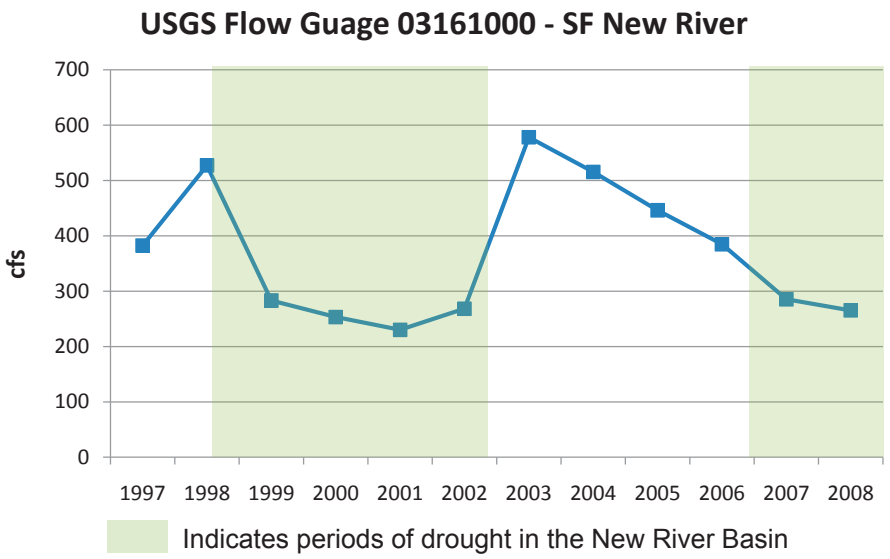
Use Support: **Impaired** (14 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB1)	Fair (2008)
Fish Com (CF1)	Good-Fair (2008)
AMS (C1234500)	Turbidity - 12% FCB - 48%

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 1-3, 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 1-4). During a three-week period in September 2004, the tropical storm remnants of Hurricanes Frances, Ivan, and Jeanne lead to wide-spread flooding throughout the central and northern mountains in the Catawba, French Broad, New, and Watauga River basins. Rainfall estimates for the combined three storms totaled more than 20-30 inches in certain watersheds. Runoff from the storms produced flash floods throughout the region, with peak flows in excess of 10,000 cfs (approximately 500 times median flows) in upper tributary streams; peaks flows in some tributary rivers exceeded 50,000 cfs. In the New River basin, the peak flow during Hurricane Frances (September 7th - 9th) was 14,700 cfs, which has an approximate recurrence interval of 10 to 25 years. During Hurricane Ivan (September 17th - 18th) the peak flow was 7,550 cfs, which has an approximate recurrence interval of 2 to 5 years. More detail about flows in the New River Basin can be found in the 2009 Basinwide Assessment Report: New River Basin produced by DWQ-Environmental Science Section.

FIGURE 1-4: YEARLY AVERAGE FLOW RATES (CFS) OF THE USGS GAGE STATION IN THE NEW RIVER BASIN BETWEEN 1997 & 2008



BIOLOGICAL DATA

Biological samples were collected during the spring and summer months of 2004 and 2008 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle, in addition to special studies. Overall, 30 biological sampling sites were monitored within the North Fork New River Watershed. The ratings for each station can be seen in Appendix 1-B.

Benthic Macroinvertebrate Sampling

Each benthic station monitored during the current cycle is shown in Figure 1-5 and color coded based on its current rating. As seen on the map, the majority of samples taken in this watershed received an Excellent rating. This is reflected in the reclassification of almost the entire watershed to either High Quality Waters or Outstanding Resource Waters. The recent reclassification is discussed in more detail in the Special Studies in this Watershed Section below.

BENTHIC SAMPLING SUMMARY

- Total Stations Monitored 25
- Total Samples Taken 30
- Stations Monitored Twice 4
- Number of New Stations 16

As seen in Figure 1-6, 90% of the 30 sampling events received a Supporting rating and only 3% received an Impaired rating. These ratings are very similar to the previous sampling cycle. Figure 1-7 is a comparison of benthic site ratings sampled during the last two cycles to determine if there are any overall shifts in ratings. Eight percent of the samples improved their rating from the previous cycle and four percent declined in rating. Twenty-four percent of the benthic ratings had no change, indicating a semi-stable community.

Figure 1-5: Benthic Stations Color Coded by Current Rating in the North Fork New River Watershed

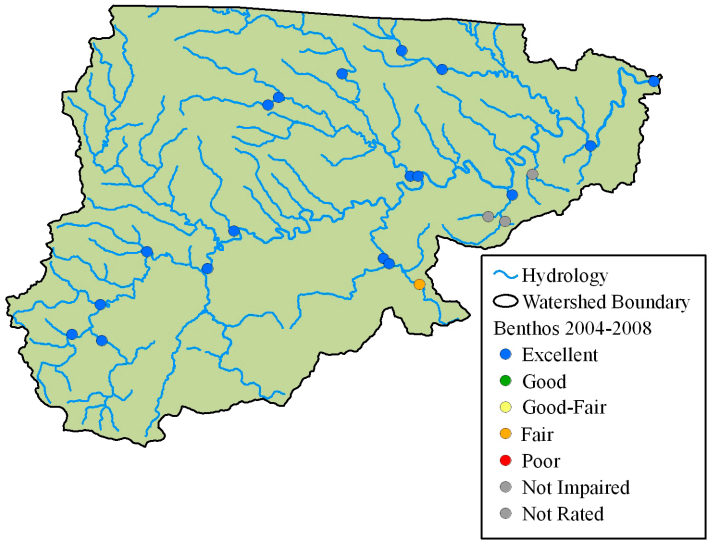


Figure 1-6: Current Benthic Site Ratings

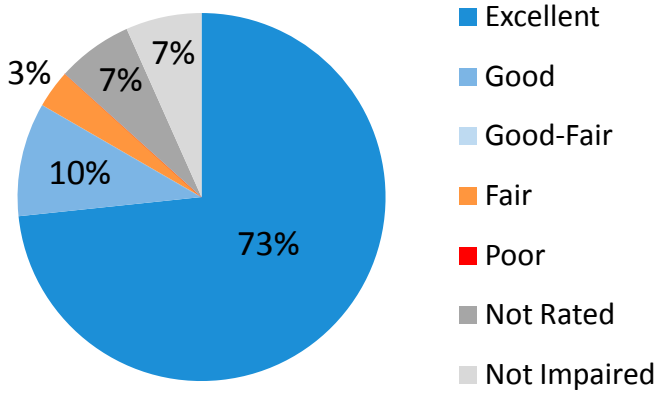
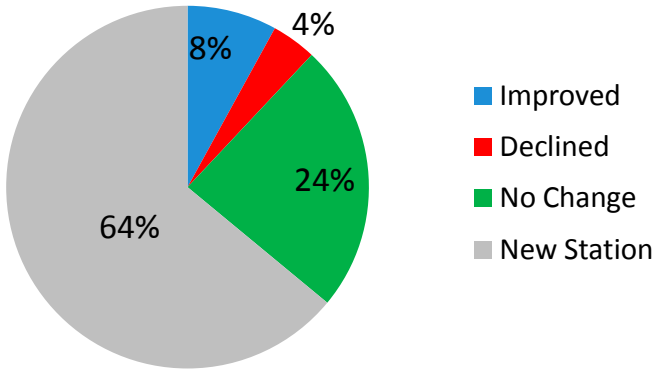


Figure 1-7: Change in Benthic Site Ratings



Fish Community Sampling

Each fish community station monitored during the current cycle is shown in Figure 1-8 and color coded based on their current rating. Two of the sites were new monitoring sites located in rural watersheds with no NPDES dischargers. These sites were selected to determine their potential for becoming fish community regional reference sites.

Fish Com. Sampling Summary

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

As shown in Figure 1-9, 60% of the five sampling events received a Supporting rating. Two of the samples were Not Rated; therefore, the segments are neither Impaired nor Supporting. Figure 1-10 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. The community has remained stable with no change in ratings between the last sampling cycle and the current cycle.

FIGURE 1-8: FISH COMMUNITY STATIONS COLOR CODED BY CURRENT RATING IN THE NORTH FORK NEW RIVER WATERSHED

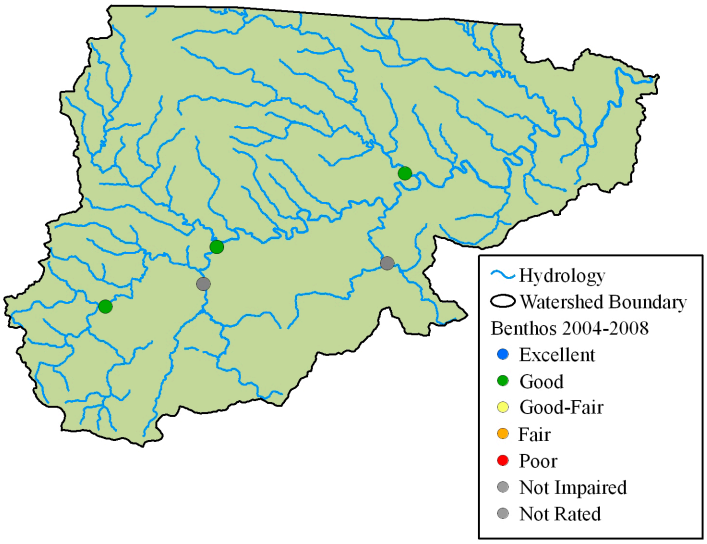


FIGURE 1-9: CURRENT FISH COMMUNITY SITE RATINGS

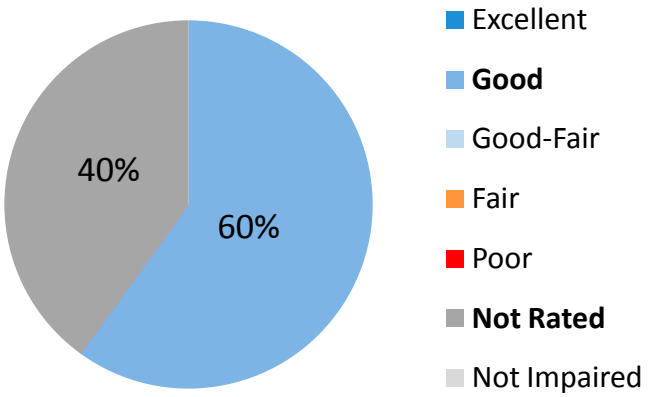
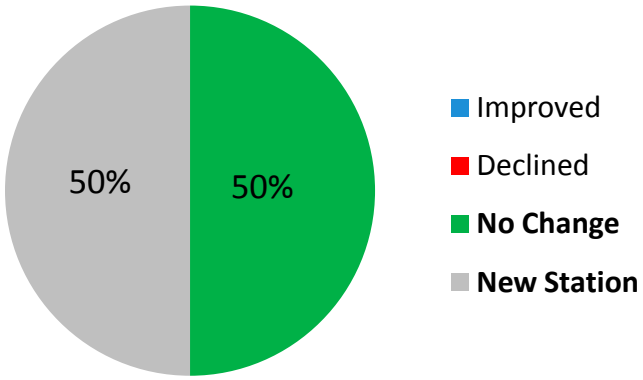


FIGURE 1-10: CHANGE IN FISH COMMUNITY SITE RATINGS



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 1-B.

Fish Kills/Spill Events

No fish kills were reported in this watershed during this planning cycle.

Ambient Data

Chemical and physical samples were taken by DWQ once a month at six sites throughout the New River basin. One Ambient Monitoring System (AMS) station is located in the North Fork New River watershed (see Figure 1-1 for the station location). 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.

The ambient data are used to develop use support ratings biannually, 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 1-A and statewide on the Modeling & TMDL Unit's website. Additional information about data from this cycle and seasonal variation in this basin can be found in the New River Basin Ambient Monitoring System Report.

Long Term Ambient Monitoring

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for ambient station K7500000 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 give 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 ESS and can be found in the New River Basin Ambient Monitoring System Report.

pH

AMS site K7500000 had no pH standard exceedances during this monitoring cycle, as shown in Figure 1-11 by a small green dot. Figure 1-12 shows the mean and median pH levels for all samples taken over the course of 13 years in the North Fork New River watershed. The pH pattern seen over these 13-years is a steady increase. This trend is seen in all three 10-digit watersheds in the New River Basin and is discussed further in the Executive Summary.

Figure 1-11: Percentage of Samples Exceeding the pH Standards (2003-2008)

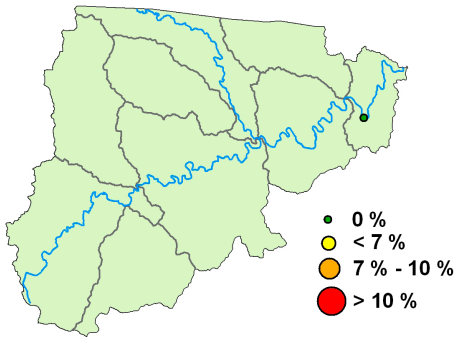
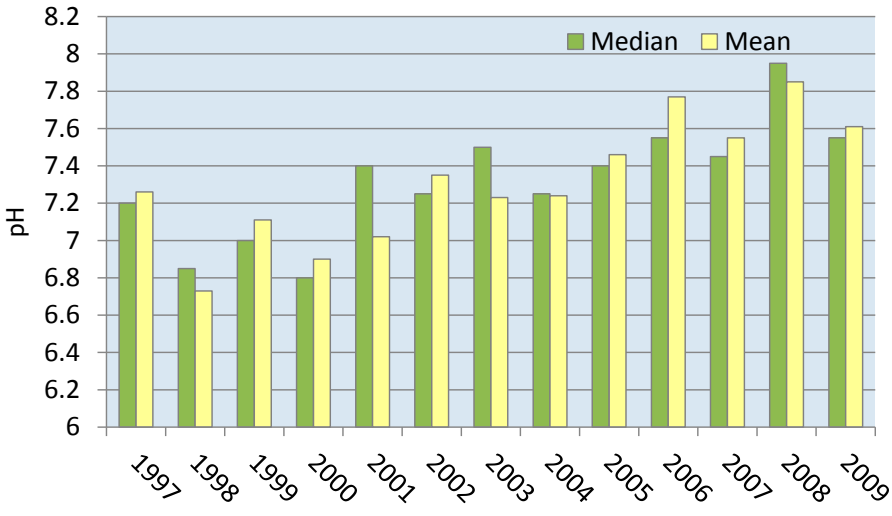


Figure 1-12: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101



* NC pH Standard: Between 6 and 9 su

Turbidity

As seen in Figure 1-13, AMS site K7500000 exceeded the turbidity standard in 8.8% of the samples collected during this cycle. Possible sources of the elevated turbidity levels are discussed in the 12-digit subbwatershed section. Figure 1-14 shows the mean and median turbidity levels for all samples taken over the course of 13 years in the North Fork New River watershed. The yearly averages are well below the state standard of 50 NTUs, with the exception of the 2007 mean. There were a few turbidity samples measuring between 100 and 300 NTUs in 2007 that were not seen in any other year.

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

FIGURE 1-13: PERCENTAGE OF SAMPLES EXCEEDING THE TURBIDITY STANDARD (2003-2008)

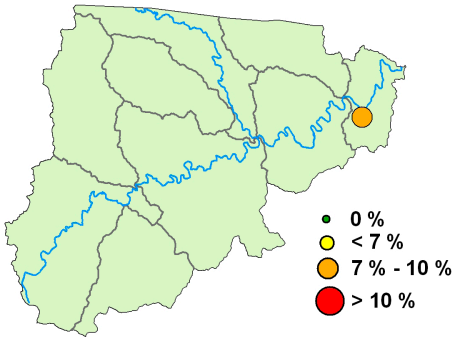
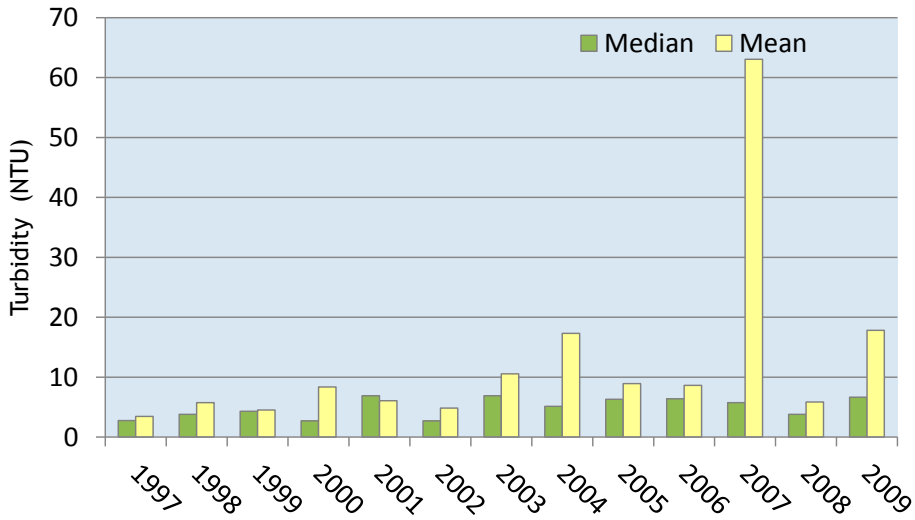


FIGURE 1-14: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000101



* NC Turbidity Standard: 50 NUT

Dissolved Oxygen

As seen in Figure 1-15, AMS site K7500000 had no DO standard exceedances during this monitoring cycle. Figure 1-16 shows the mean and median of DO levels for all samples taken over the course of 13 years in the North Fork New River watershed. DO at this station has been stable for the past 13 years and has seen little to no change.

FIGURE 1-15: PERCENTAGE OF SAMPLES EXCEEDING THE DO STANDARD (2003-2008)

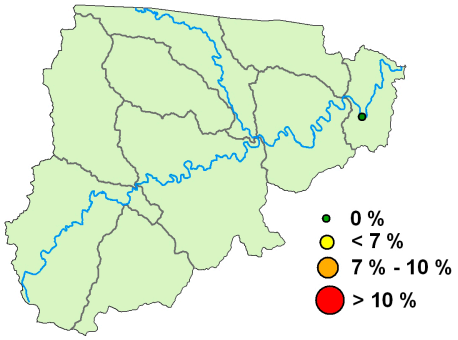
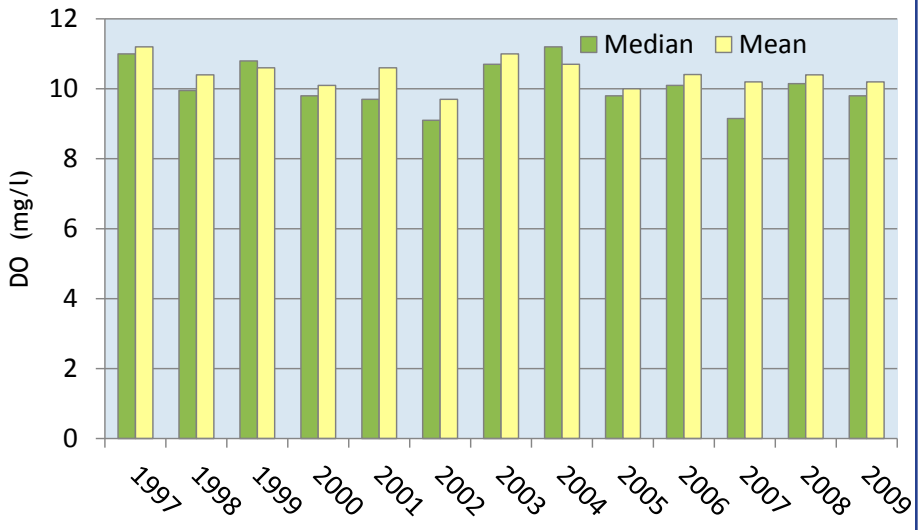


FIGURE 1-16: SUMMARIZED DO VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000101



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

Temperature

No stream segments in this watershed are Impaired or Impacted due to high temperatures (Figure 1-17). Figure 1-18 shows the mean and median of temperature levels for all samples taken over the course of 13 years in the North Fork New River watershed. The water temperature trend for this AMS station is closely linked to the stream flow levels. During low flow or drought periods, water can sit in small pools and become heated by the sun. This can especially be seen in Figure 1-18 between 2000 and 2002.

Figure 1-17: Percentage of Samples Exceeding Temperature Standard (2003-2008)

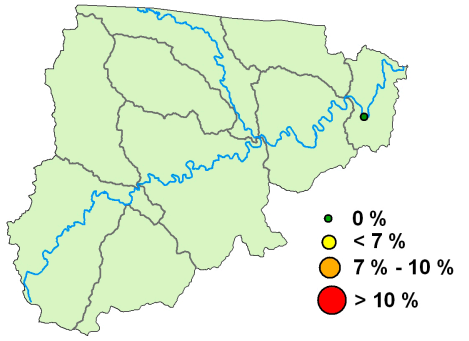
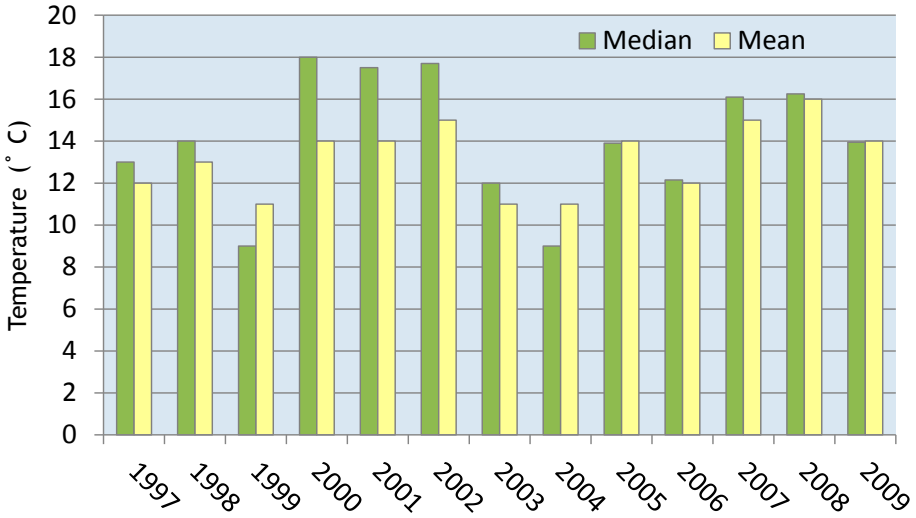


Figure 1-18: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 0505000101

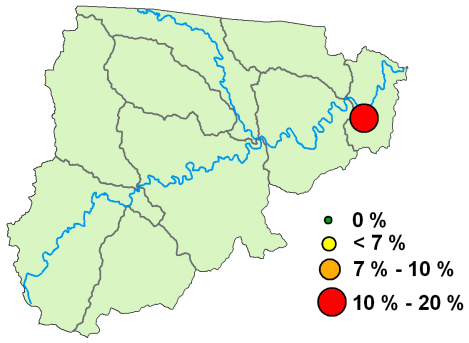


* NC Temperature Standard for Mountain/Upper Piedmont Region: 29˚C (84.2˚F)

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 a stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) receive priority for 5-in-30 studies. Other waters are studied as resources permit.

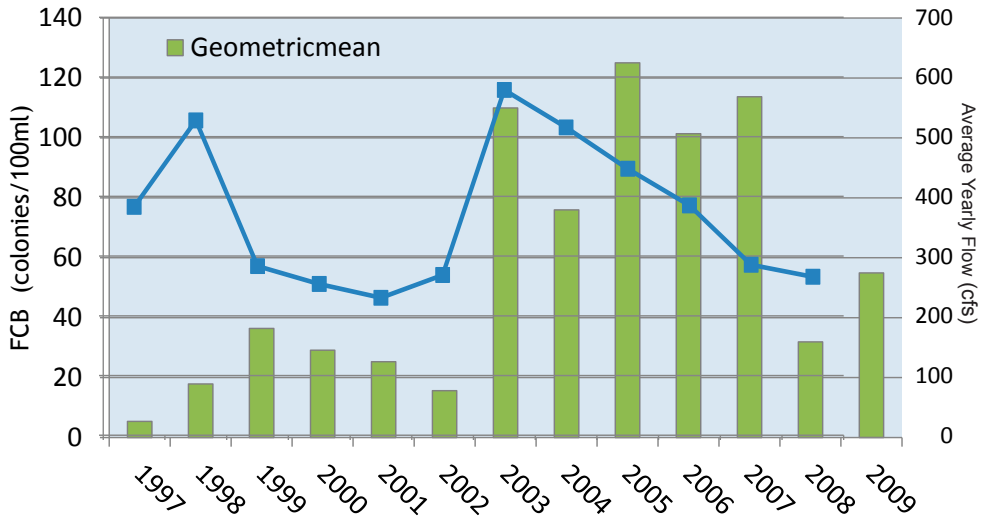
Figure 1-19: Percentage of Samples with Elevated FCB Levels (2003-2008)



As seen in Figure 1-19, 20% of samples taken at station K7500000 during this cycle, resulted in levels over 400 colonies/100 ml. However, the geometric mean (calculated average) was 82 colonies/100 ml, indicating only pulses of elevated levels. When the geometric mean breaches 200 colonies/100 ml at a station, it is likely a 5-in-30 study would result in an impairment. Possible sources of the short term elevated FCB levels at this station are discussed in the subwatershed section.

Figure 1-20 shows the geometric mean of FCB levels for all samples taken over the course of 13 years in the North Fork New River watershed. The geometric mean is a type of mean or average that indicates the central tendency or typical value of a data set. The highest yearly geometric mean for FCB was recorded in 2005 (125 colonies/100 ml). The figure also includes the yearly average stream flow, as seen in Figure 1-4, to show how flow can be closely linked to FCB levels. These slightly elevated FCB levels might have been caused by livestock with access to streams, failing septic systems or leaking municipal collection systems. For more specific information about AMS station K7500000 and its subwatershed see the subwatershed discussion below.

FIGURE 1-20: SUMMARIZED FECAL COLIFORM BACTERIA VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 0505000101 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.

ADDITIONAL STUDIES

North Fork New River Sampling to Support Potential Reclassification

Purpose of Study:

A request for benthic sampling was received by the DWQ Biological Assessment Unit (BAU) from staff in the WSRO to support the potential reclassification of streams in the North Fork New River 10-Digit Watershed to either High Quality Waters (HQW) or Outstanding Resource Waters (ORW) (BF-20090316). Six stream sites were selected for benthic sampling in addition to those sites already scheduled for sampling in the watershed for 2008. Reclassification of streams would lead to better protection of the high water quality exhibited in much of the North Fork New River Watershed. The watershed is home to the Kanawha Minnow (*Phenacobius teretulus*) which is listed as Vulnerable by the International Union for Conservation of Nature (IUCN), the Kanawha Darter (*Etheostoma kanawhae*) listed as Near Threatened by the IUCN, as well as many other endemic fish species.

Study Results:

Twenty-five benthic samples were collected from 24 sites in the North Fork New River watershed in 2008. Eleven of the 25 samples were collected as part of routine basinwide sampling that occurs every five years in the New River basin; seven were collected at the request of staff from DWQ's Planning Section, WSRO, or Soil and Water Conservation for various studies; and one was collected as part of an internal quality assurance procedure. The remaining six samples were collected specifically to help support potential reclassification of waters in the North Fork New River Watershed. Data from all 25 samples were considered in this special study. Geographic data, habitat conditions, and physical and chemical water data are provided in the special study document.

All but one of the 12 benthic sampling events at large-stream sites requested for special studies and nine of the eleven basinwide sampling events in the North Fork New River Watershed in 2008 resulted in classifications of Excellent. The two small-stream sites collected were assigned either Not Impaired or Not Rated (no DWQ criteria currently exist for classifying small-stream sites with drainage areas under 3.0 square-miles). All five benthic collections on North Fork New River proper, from the uppermost site near the headwater to the site furthest downstream one-quarter miles from the mouth, were among those resulting in classifications of Excellent.

Recommendations for HQW status were based upon classification of Excellent following benthic sampling during 2008. ORW recommendations are based upon brook trout and hellbender records in addition to biological classification of Excellent. The recommendations were generated by the Environmental Science Section to the Planning Section within DWQ. The Planning Section examined other variables, held public hearings and based the final recommendation to the Environmental Management Commission (EMC) on all available information.

Approval of Proposed Reclassification:

In preparation of the reclassification, DWQ held a public meeting, reviewed public comments and worked closely with local governments and environmental groups. The National Committee for the New River (NCNR) was instrumental in helping DWQ spread the reclassification notice to the public and organizing the public hearings in the area. Local governments, NCNR and DWQ worked together to ensure the reclassification would sufficiently protected water quality and aquatic life while not placing an economical burden on local municipalities. The results of the public comments and meetings were all taken into consideration by the hearing officers and compiled into a collaborative conclusion to be finalized by the EMC.

The reclassification was presented to the EMC in September 2010, and the rule went into effect December 1, 2010. The approved reclassifications can be seen in Figure 1-21. The majority of the North Fork New River Watershed received the ORW supplemental classification, which is shown in green on the map. Other portions of the watershed received the supplemental designation of HQW: Buffalo Creek; a portion of the North Fork New River from the confluence of Buffalo Creek to the confluence of Big Horse Creek; a portion of Big Horse Creek from the confluence of the North Fork New River to the confluence of Little Horse Creek; and Old Field Branch (Grass Branch). These HQW waters are shown in blue on the map. Claybank Creek and Little Buffalo Creek remain C Tr +, which is shown in yellow.

Special Management Strategy (+)

The “+” is a special management strategy that will comply with the HQW Rule (15A NCAC 02B .0224) to protect the excellent water quality downstream. Therefore, all waters designated as “+” in this watershed are regulated as if the waterbody was designated as HQW.

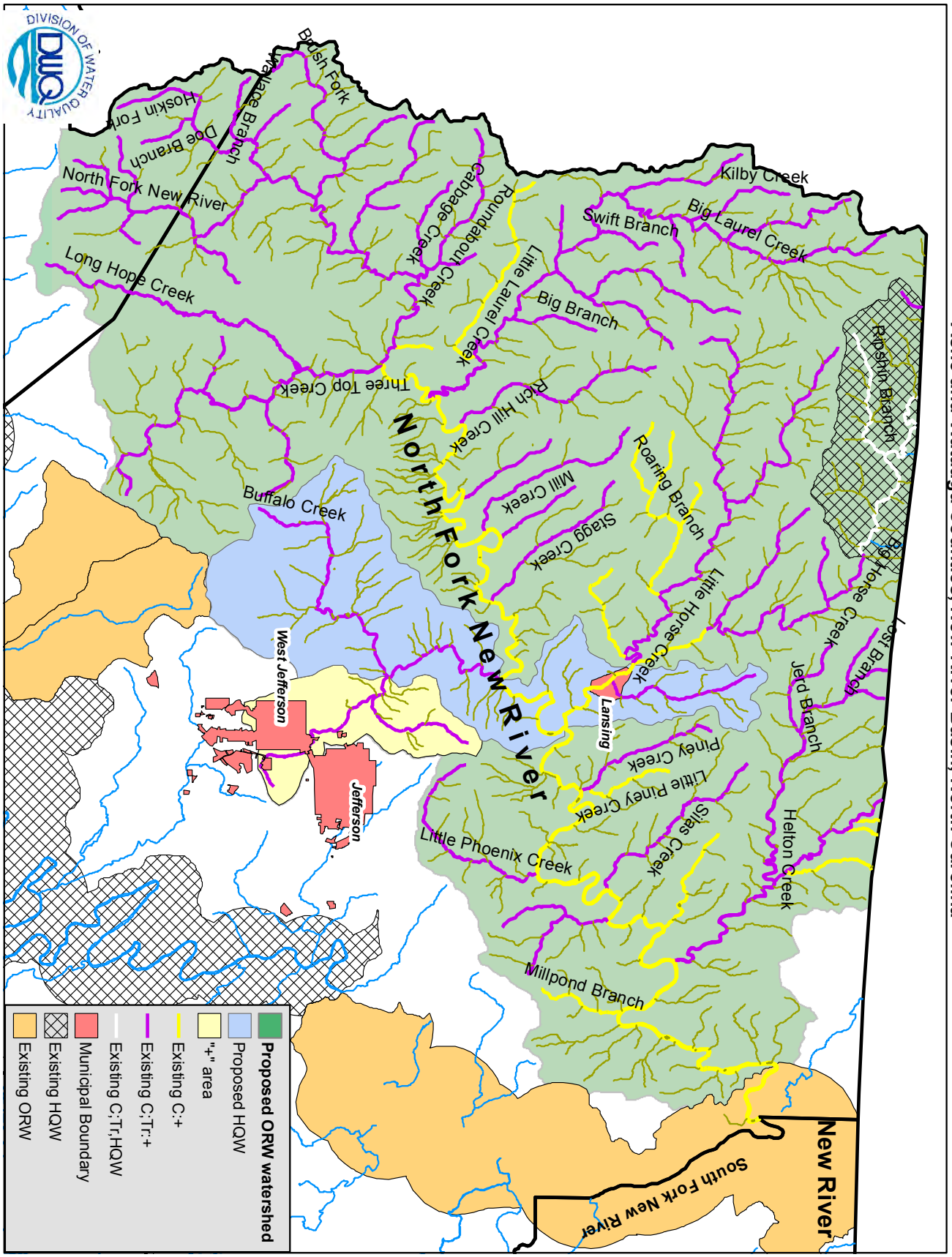
ORW Designation

The ORW supplemental designation does not allow any new NPDES discharges or expansion of existing discharges. It also requires more stringent stormwater management measures for development activities requiring sediment and erosion control plans (15A NCAC 02B.0225).

HQW Designation

The HQW supplemental designation does not permit single family discharges to surface waters, and any new or expanded dischargers must abide by more stringent waste treatment guidelines. More stringent stormwater management measures apply for waters that are draining to and within one mile of HQW waters (15A NCAC 02B.0224).

FIGURE 1-21: NORTH FORK NEW RIVER APPROVED ORW & HQW RECLASSIFICATION



Recommendations & Action Plans at the Watershed Scale

DWQ Priority Summary

Table 1-1 is a list of waters in the North Fork New River Watershed 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 1-1: Prioritization of Waters in the North Fork New River Watershed (Highest to Lowest Priority)

Stream Name	AU#	Class.	Potential Stressor(s)	Potential Source(s)	Status	Actions Needed
Little Buffalo Cr.	10-2-20-1	C;Tr:+	Habitat Degradation (Riparian Zones), Elevated Nutrients	WWTP, Urban Runoff, Piped Streams, Agriculture	**Impaired**	RBR, WRP, DS, E, Ag, NMC
Helton Cr.	10-2-27	C;ORW;Tr	Sediment, Elevated Nutrients, Over Stocking	Agriculture, Logging	**Impacted**	SS, Protection (Hellbender Sal.)
Three Top Cr.	10-2-13	C;ORW;Tr	Turbidity		Supporting	SEC, RBR, Protection (Hellbender Sal.)
Little Horse Cr.	10-2-21-8	C;ORW;Tr	Habitat Degradation	Upstream Erosion	Supporting	Ag, RBR
Middle Fork Little Horse Cr.	10-2-21-8-1	C;ORW;Tr	Habitat Degradation (Bank Erosion)		Supporting	RBR
Long Shoals Cr.	10-2-25	C;ORW;Tr			Supporting	M
Big Horse Cr.	10-2-21-(7), 10-2-21-(4.5) & 10-2-21-(1.5)	C;ORW C;ORW;Tr C;ORW;Tr	Habitat Degradation (Riparian Zones)		Supporting	RBR
North Fork New R. (NFNR)	10-2-(12)	C;ORW	Habitat Degradation, Turbidity		Supporting	Protection (Hellbender Sal.)
NFNR	10-2-(1)	C;ORW;Tr			Supporting	P
Big Laurel Cr.	10-2-14	C;ORW;Tr			Supporting	Protection (Hellbender Sal.)
Hoskin Fork	10-2-7	C;ORW;Tr			Supporting	None

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

NORTH FORK NEW RIVER (NFNR)

The North Fork New River flows through several 12-Digit subwatersheds. Each of the two segments are discussed below.

North Fork New River [AU#: 10-2-(1)]

The North Fork New River begins at the southern most tip of the Headwaters North Fork New River subwatershed (050500010103). The river flows 50 miles northeast, where it joins the South Fork New River to create the New River. This segment of the North Fork is approximately 14 miles long.

USE SUPPORT: **SUPPORTING** (14 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB141)	 Excellent (2008)
Fish Com (KF10)	 Good (2008)

Water Quality Status

The most upstream site (KB141) was sampled in 2008 as part of the North Fork New River Sampling to Support Potential Reclassification special study. Details about that study can be found above. The river received an Excellent rating at this site; however, one bank was moderately eroded. A large portion of this drainage area is forested, with some agriculture along the stream banks.

A fish community sample (KF10) was taken in 2008 just downstream of the confluence with Brush Fork. The last sample taken at this station was in 1998. Results of both samples were very similar and included intolerant cool and cold water species indicating little to no change in water quality over the past ten years.

Recommendations

Protection efforts should be taken for this section of the North Fork New River to ensure the continuation of good water quality.

North Fork New River [AU#: 10-2-(12)]

Use Support: Supporting (36.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB23)	Excellent (2008)
(KB27)	Excellent (2008)
(KB135)	Excellent (2008)
(KB127)	Excellent (2008)
AMS	
(K7500000)	No Exceedances

This segment of the North Fork New River stretches over 36 miles across three different subwatersheds (Upper North Fork New River: 050500010106; Middle North Fork New River: 050500010107; and Lower North Fork New River: 050500010109). Land use along this segment is a mixture of agriculture along the stream banks, forest and a few scattered urban residential and commercial areas.

Water Quality Status

A benthic site (KB23), located just downstream of Three Top Creek, was sampled in 2008. This basinwide site has been sampled four times since 1993 and has consistently received an Excellent rating. The latest sample showed no impacts to the river's stable macroinvertebrate community and received a high habitat score.

The second benthic monitoring station (KB27) is located at SR-1644 (McNeil Rd), just before the river crosses into the Middle North Fork New River subwatershed (050500010107). The site has been monitored and rated Excellent every cycle since 1993, including 2008. Even though the habitat score for this site was low (65 out of 100) due to low quality riparian buffers, there is a healthy and stable benthic community. *Helicopsyche paralimnella* was found for the first time at this site in the 2008 sample. This taxa has only been collected at five other sites within the entire state by DWQ. This and other taxa collected indicate an absence of stressors and healthy water quality for aquatic life along this segment.

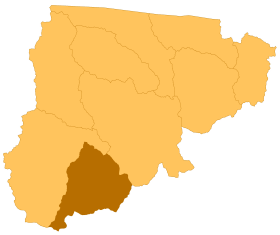
The third site (KB135) is located at the Millpond Branch confluence where it received an Excellent rating in 2008. Due to difficult access, this site replaces the site about two miles upstream at NC-16, which has had a long history of Excellent ratings. Even though habitat was not ideal for aquatic life (65 out of 100), the benthic community is healthy and stable.

The only AMS station in this watershed is located at the same spot on the river as benthic site KB135. Between 2004 and 2008, there were no major parameter exceedances; however, turbidity levels were elevated. Each parameter is explained in greater detail in the Ambient Data section above along with long term trends.

The fourth benthic site (KB127) is about a fourth of a mile upstream from where the North Fork and South Fork merge into the New River [AU#: 10a]. This site was specifically monitored as part of the North Fork New River Reclassification Study which is discussed in greater detail above. The benthic community and habitat were very similar to the KB135 site just upstream and resulted in an Excellent rating as well.

In September 2010, a survey was conducted to identify locations throughout the state where the Hellbender salamander is present. A population was found in the North Fork New River. More information about the Hellbender Salamander can be found on the NC National Heritage Program website.

THREE TOP CREEK (050500010101)



Includes: Three Top Creek [AU#: 10-2-13], Long Hope Creek [AU#: 10-2-13-3], & Ben Bolen Creek [AU#:10-2-13-2]

This subwatershed is mostly forested land with areas of agricultural activities scattered across the 24 square miles. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters. All streams in this 12-digit subwatershed drain to Three Top Creek.

Three Top Creek [AU#: 10-2-13]

Three Top Creek is approximately 13 miles from source to the North Fork New River [AU#: 10-2-(12)]. The majority of the drainage area is forested, with some areas of agriculture.

USE SUPPORT: SUPPORT (13 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB138)	Good (2008)
Fish Com (KF23)	Not Rated (2008)

Water Quality Status

All streams in this 12-digit subwatershed drain to Three Top Creek. The stream was sampled for both benthic and fish communities during this cycle. Both sites are new basinwide sampling stations.

The fish community sample contained a pollution intolerant population. The site was officially given a Not Rated due to absence of criteria for rating high gradient mountain trout waters. However, the combination of good habitat and a healthy stable fish population shows no indication of water quality issues.

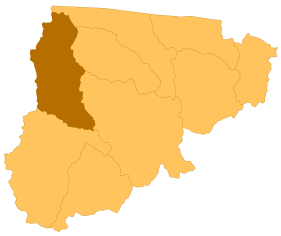
Two benthic samples were taken at the new monitoring station (KB138). The first sample was taken as part of the regular basinwide monitoring and received a Good rating. Biologists noted the sample may have been adversely affected by extreme low flow during a record drought at the time. The creek was part of the North Fork New River Reclassification Study (discussed above); therefore, the site was resampled to determine the bioclassification during normal flow level. The results of the July 2009 sample far exceeded the minimum requirements for an Excellent rating.

In September 2010, a survey was conducted to identify locations throughout the state of the Hellbender salamander. A small population was found in Three Top Creek. Surveyors talked to local land owners who explained the population of the salamanders used to be much larger over ten years ago. This could be an indication of water quality impacts in the drainage area. Surveyors noted the stream was moderately turbid and the substrate was covered in silt at the time of sampling. More information about the Hellbender Salamander can be found on the NC National Heritage Program website.

Recommendations

Due to the presence of the Hellbender salamander, it is recommended that extra precautions be taken in this drainage area to prevent sediment from reaching the stream. Riparian buffers along this stream should be of adequate width and contain trees and shrubs.

BIG LAUREL CREEK (050500010102)



Includes: Big Laurel Creek [AU#: 10-2-14], Roaring Fork [AU#: 10-2-14-7], & Dixion Creek [AU#: 10-2-14-1]

This subwatershed has mixed land use of forest and agriculture spread across the 29 square miles. Small Christmas tree farms are scattered across this area with larger tree farms in the northern headwaters. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

Big Laurel Creek [AU#: 10-2-14]

Use Support: Supporting (17.5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB30)	Excellent (2008)
Fish Com (KF22)	Good (2008)

Big Laurel Creek is approximately 18 miles long from source to the North Fork New River [AU#: 10-2-(12)]. The source of the creek is located near Ivy Hill Road and Three Top Road, and is the collecting stream for all waters in this subwatershed. Land use in this drainage area is a mixture of forest and agriculture, with the majority of the agricultural lands lining the streambanks.

Water Quality Status

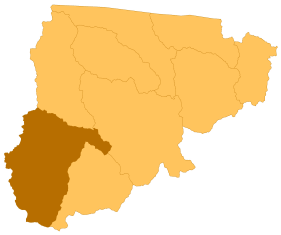
The creek was sampled for both benthic and fish communities about a tenth of a mile upstream of its confluence with the North Fork. All waters in this subwatershed pass through this point which gives a wholistic view of water quality for the subwatershed. The first set of samples taken during this cycle occurred in 2008, resulting in an Excellent benthic rating and a Good fish community rating. Both ratings were mimicked during the 2009 samples. Benthic samples from 1998 to 2008 indicate water quality slightly improving over the years. The fish station was a new basinwide site in 2008, and was noted as having a highly-diverse and trophically-balanced population. Aquatic habitat was over all in good condition with sufficient riparian buffers, but lacked riffle habitat and pool variety.

Two Hellbender salamanders were collected during the fish community sample; one of adult age and the other young-of-year. The presence of this particular salamander and their age difference suggests high quality water.

Recommendations

Due to the presence of the Hellbender salamander, it is recommended that extra precautions be taken in this drainage area to prevent sediment from reaching the stream. Riparian buffers along this stream should be protected.

Headwaters North Fork New River (050500010103)



Includes: North Fork New River [AU#: 10-2-(1) & (12)]**, Hoskin Fork** [AU#: 10-2-7]**, Brush Fork** [AU#: 10-2-8]**, Rock Creek** [AU#: 10-2-9] **& Roundabout Creek** [AU#: 10-2-10]

This subwatershed has mixed land cover of forest and agriculture spread across the 42 square miles. As seen in much of the New River Basin, agricultural lands are mostly located along the banks of major creeks. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

North Fork New River [AU#: 10-2-(1) & (12)]

Two segments of the North Fork New River flow through this subwatershed. Water quality status and other information about the full length of the river is discussed at the beginning of this section.

Hoskin Fork [AU#: 10-2-7]

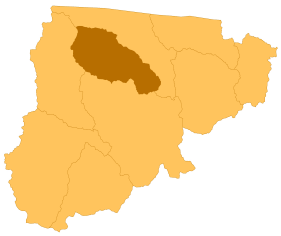
Use Support: Supporting (5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB26)	Excellent (2008)

Hoskin Fork is roughly five miles from source to the North Fork New River [AU#: 10-2-(2)], mostly flowing parallel to NC-88. The land use is a mix of agriculture and forest.

Water Quality Status

The benthic station located below Wilson Branch has been monitored during each five-year cycle since 1993. Each sample taken since 1993 has received a higher score than the last, suggesting water quality is gradually improving. The 2008 sample resulted in an Excellent rating as it did in 2003.

LITTLE HORSE CREEK (050500010104)



Includes: Little Horse Creek [AU#: 10-2-21-8], & Middle Fork Little Horse Creek [AU#: 10-2-21-8-1]

This subwatershed has mixed land use of forest and agriculture. As seen in much of the New River Basin, agricultural lands are mostly located along the banks of major creeks. There are no NPDES dischargers in this subwatershed and the majority of streams hold the secondary classification of Trout Waters.

Middle Fork Little Horse Creek [AU#: 10-2-21-8-1]

USE SUPPORT: SUPPORTING (4.5 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB121)	Excellent (2008)

Middle Fork Little Horse Creek is approximately four and a half miles from source to Little Horse Creek [AU#: 10-2-21-8]. Land use in this drainage area is mostly forest, with some agriculture along the streambanks.

Water Quality Status

Middle Fork Little Horse Creek was monitored as part of the North Fork New River Reclassification Study. There are no historical data for the stream. The stream substrate was covered in sand and silt and banks had noticeable erosion. Vegetation in the riparian zones consisted of only grasses and had little to no tree canopy. Despite the habitat deficiencies, the site (KB121) was among the sites with the most diverse pollution intolerant benthic populations within the study. Because of the Excellent rating given, the stream was recommended for a reclassification to HQW. Results of that study and reclassification are discussed above.

Recommendations

Riparian buffer restoration is suggested for Middle Fork Little Horse Creek. Establishment of shrubs and trees within the riparian buffer zone will assist with stabilizing banks and reducing the amount of sediment that reaches the stream bed. Additional trees will also provide a shaded canopy, keeping the water temperature cooler to support local trout populations.

Little Horse Creek [AU#: 10-2-21-8]

USE SUPPORT: SUPPORTING (10.9 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB63)	Excellent (2008)

Little Horse Creek is almost 11 miles from source to Big Horse Creek [AU#: 10-2-21-(7)]. This stream is the main receiving stream for this subwatershed. Land use is a mixture of forest in the head waters and agriculture along the streambanks.

Water Quality Status

Little Horse Creek has been monitored since 1998 just upstream on the Middle Fork Little Horse Creek confluence. In 1998 and 2003 the creek received a Good benthic rating and displayed a stable population. The 2008 sample increased a rating to an Excellent due to a more diverse community. A stonefly (*Isogenoides hansoni*), which has only been collected at 44 sites statewide, was present in the 2008 sample and had not been previously seen in this stream.

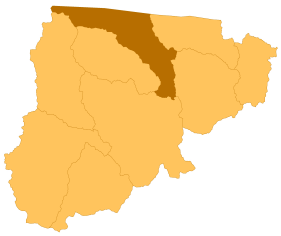
However, despite the current rating, habitat at the site was not ideal for a thriving benthic community. The lack of riparian zone, canopy cover and root mats are likely limiting fauna. Also, a layer of sand and silt indicates erosion issues upstream.

This sample was used for the North Fork New River Reclassification Study. Little Horse Creek was recommended to be reclassified as ORW. Results of that study and reclassification are discussed above.

Recommendations

In order to maintain the water quality in Little Horse Creek, DWQ recommends local agencies work with farm owners to install agricultural best management practices to reduce sedimentation and erosion.

Big Horse Creek (050500010105)



Includes: Big Horse Creek [AU#: 10-2-21-(7), (4.5) & (1.5)]

This subwatershed has a mixed land use of forest in the headwaters and agriculture scattered in the headwaters and along streambanks. There is one minor NPDES discharger in this subwatershed. Majority of streams in the subwatershed hold the secondary use classification of Trout Waters. The Town of Lansing is located in the southern portion.

Big Horse Creek [AU#: 10-2-21-(7), (4.5) & (1.5)]

Big Horse Creek is approximately 20 miles long from source to the North Fork New River [AU#: 10-2-(12)]. Shortly downstream of its source, the creek crosses the state line into Virginia for roughly two miles before flowing back into North Carolina. The creek is the major receiving stream of this subwatershed and provides a good representation of overall water quality for the area.

Use Support: Supporting (19.4 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB122) (KB33)	Excellent (2008) Excellent (2008)
Fish Com (KF1)	Good (2008)

Water Quality Status

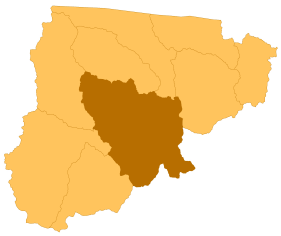
There is one benthic and one fish community basinwide sampling station on this creek, located just upstream of the North Fork confluence and downstream of the Town of Lansing. Both sites received relatively low habitat scores due to lack of pool variety and small riparian zones. The fish community received a Good rating and was noted as having a diverse and trophically-balanced community of cool and cold water fish species. The benthic sample resulted in an Excellent rating. This sample consisted of the most pollution tolerant taxa collected since sampling started at this site in 1993. However, many new taxa were collected and in greater abundance.

An additional benthic sample was collected at SR-1365 as part of the North Fork New River Reclassification Study. The sample resulted in an Excellent rating. The first two segments within North Carolina [AU#: 10-2-21-(1.5) & (4.5)] were recommended to be reclassified as ORW. Results of that study and reclassification are discussed above.

Recommendations

Riparian buffer restoration is recommended to increase tree canopy cover and to help filter pollutants in stormwater runoff.

Upper North Fork New River (050500010106)



Includes: North Fork New River [AU#: 10-2-(12)], Rich Hill Creek [AU#: 10-2-15], Buffalo Creek [AU#: 10-2-20] & Little Buffalo Creek [AU#: 10-2-20-1]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters and along streambanks. There is one major and four minor NPDES dischargers in this subwatershed. Majority of streams in the subwatershed, excluding the North Fork New River, hold the secondary use classification of Trout Waters. Majority of the Town of West Jefferson is located in the southeastern portion of this subwatershed.

Rich Hill Creek [AU#: 10-2-15]

Rich Hill Creek is approximately five miles from source to the North Fork New River [AU#: 10-2-(12)]. Land use in this drainage area is a mix of forest and agriculture in the headwaters and along streambanks with scattered residential areas.

Use Support: Supporting (4.9 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB86)	Excellent (2008)

Water Quality Status

Rick Hill Creek was specifically monitored as part of the North Fork New River Reclassification Study near the confluence of the North Fork. This site (KB86) was monitored once before in 1993; both events resulted in an Excellent rating. The stream was recommended for a reclassification to HQW. Results of that study and reclassification are discussed above.

Little Buffalo Creek [AU#: 10-2-20-1]

USE SUPPORT: IMPAIRED (4.4 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (KB32)	Fair (2008)

Little Buffalo Creek is approximately four and a half miles from its source within the Mt. Jefferson State Park, through the town of West Jefferson, to Buffalo Creek [AU#: 10-2-20]. Land use within this drainage area is a mixture of forest, agriculture, urban and residential. Portions of the stream that flow through urban areas of West Jefferson are piped underground. Little Buffalo Creek has been on the Impaired Waters List since 1998 when it was listed for impacts from urban runoff and municipal pretreatment. In 2006, impervious surfaces and the West Jefferson WWTP were added to the list of potential sources of impairment.

Water Quality Status

A benthic station (KB32) located at Doggett Road crossing has been sampled four times between 1993 and 2008, receiving either a Fair or a Poor rating each time. The site received a Fair rating in 2008, showing a slight increase in abundance and diversity from the 2003 Poor sample. Biologists noted each of the four samples greatly varied in types of taxa collected. High levels of specific conductivity indicate the presence of waterborne pollutants. The stream received a fairly low habitat score and portions of the stream not piped underground have little to no riparian zones.

An unnamed tributary which drains the majority of West Jefferson merges with Little Buffalo Creek near the West Jefferson WWTP. Large portions of this stream are also piped under commercial areas of West Jefferson. The majority of the town's stormwater runoff flows into this unnamed tributary with little to no natural filtering, such as a riparian buffer.

There are many possible sources for this impairment which have varied over the years. The West Jefferson WWTP was noted in the previous basin plan as having several discharge permit violations. Between 2003 and 2005, the Town had a few violation causing issues, including discovering a local industry knowingly discharging mercury and cadmium into the towns collection system. After confirming with samples, West Jefferson worked with the WSRO to conduct an unannounced inspection resulting in further confirmation of the illegal discharging. The Town issued civil penalties and pretreatment permit resolving the problem. West Jefferson also had operational issues where they failed to properly remove and land apply solids. The WSRO took enforcement actions and held meetings with the Town. The Town responded by hiring a contractor and a new operator. Discharge from the facility has been considered outstanding by the WSRO since that time. However the facility remains a possible source of Little Buffalo Creek's Impairment during this cycle. The WWTP will be removed as a possible source, providing the facility stays in good standing during the upcoming monitoring cycle.

Another possible source of impact is urban stormwater runoff. Much of West Jefferson's stormwater runoff drains into portions of the unnamed tributary which has been piped underground. Bypassing natural riparian buffer zones, which can absorb waterborne pollutants, the contaminated runoff has little to no opportunity to be filtered before reaching Little Buffalo Creek. This concentration of stormwater runoff can be toxic to aquatic life.

Downstream of West Jefferson, land use transitions to pasture land and Christmas tree farms. Agriculture is often a source of excess nutrients if proper BMPs are not utilized. Nutrients were added to the list of possible causes of impairment in 2000.

Drought-like conditions in 2007 and 2008 likely increased the impacts of the pollutants listed above on aquatic life. Samples taken during the previous cycle were also impacted by a similar drought. The slight increase in bioclassification rating (Poor in 2003 to Fair in 2008) indicates somewhat of an improvement in water quality. This is likely due to upgrades made to the WWTP, which can be seen in the few violations the facility received as compared to the previous cycle.

Recommendations

DWQ recommends developing a local stakeholder group to determine the possibility of day-lighting the full length of the creek. DWQ supports the need for funding a project of this nature that would include a Watershed Restoration Plan (WRP), as well as follow up monitoring. The WRP should also include planning for implementation of proper riparian buffers, determining the best locations for additional stormwater control measures and efforts to educate affected property owners and the local community about the purpose of this work.

Buffalo Creek [AU#: 10-2-20]

Use Support: Supporting (9.7 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (KB134) (KB31)	Excellent (2008) Excellent (2008)
Fish Com (KF21)	Not Rated (2008)

Buffalo Creek is approximately ten miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forest with agriculture clustered along streambanks. Headwaters of Buffalo Creek and a few upstream tributaries are within the Bluff Mountain Preserve and Three Top Mountain Game Land.

Water Quality Status

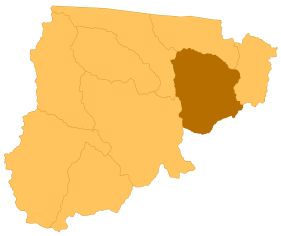
In 2008, two benthic samples, including one above and below the Little Buffalo Creek confluence, were collected and rated as Excellent. The sample above Little Buffalo Creek (KB134) was collected as part of the North Fork New River Reclassification Study, with the purpose of assessing conditions in the catchment without the urban influence of West Jefferson. There was little difference between the two benthic sites. The downstream site (KB31) had a slightly higher specific conductivity and pH level, as well as a more pollution tolerant population. However, the site received a higher habitat score due to larger, more stable riparian buffers.

A fish community sample (KF21) was also collected at the same location as the upstream benthic sample. This new basinwide site was given a Not Rated due to lack of criteria for high gradient mountain trout waters. This stretch of Buffalo Creek provides excellent habitat for a diverse and fairly trophic balance mix of cool and cold water fish. Fifty-nine percent of species collected were pollution intolerant, indicating the stream supports a reasonably healthy population and appears to have no obvious water quality issues.

North Fork New River [AU#: 10-2-(12)]

A portion of this segment 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.

Middle North Fork New River (050500010107)



Includes: North Fork New River [AU#: 10-2-(12)], Little Phoenix Creek [AU#: 10-2-23] & Long Shoals Creek [AU#: 10-2-25]

This subwatershed has mixed land use of forest in the headwaters, with some residential and agriculture scattered in the headwaters and along streambanks. There is one minor NPDES discharger in this subwatershed. Majority of streams in the subwatershed, excluding the North Fork New River, hold the secondary use classification of Trout Waters.

Long Shoals Creek [AU#: 10-2-25]

Use Support: Supporting (2.7 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB123)	Not Impaired (2008)

Long Shoals Creek is approximately three miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forested area with agriculture clustered along streambanks.

Water Quality Status

A one time benthic sample was taken in June 2008 to determine if the stream was being impacted by recent development. The site KB123 is located a mile upstream of the confluence with the North Fork New River and had overall good habitat; however, pools were infrequent and filling with silt and sand. The stream's drainage area is less than 3.0 square miles. The site would have received a classification of Good if criteria for larger stream sites were used. Because, criteria for small streams are still in development, the site is currently classified as Not Impaired.

Recommendations

The benthic site is located just upstream from its confluence with Foster Springs Branch [AU#: 10-2-25-1] and therefore does not reflect influences from that drainage area. An additional site will be considered on Foster Springs Branch for benthic sampling to assess conditions prior to further development (DWQ, B-20081007). If resources are limited, DWQ will consider moving the current site below the confluence.

Little Phoenix Creek [AU#: 10-2-23]

Little Phoenix Creek is approximately five miles long from source to the North Fork New River [AU#: 10-2-(12)]. The drainage area consists of mostly forested area with agriculture and residential areas clustered along streambanks.

USE SUPPORT: SUPPORTING (4.6 MI)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (KB125)	Excellent (2008)

Water Quality Status

A one time benthic sample was taken in June 2008 to determine if upstream land clearing activities in 2006 had any long-term impacts on the community downstream. The site was given an Excellent bioclassification and had no signs of impacts from sediment on the benthic community. However, the site was somewhat deficient of available macroinvertebrate habitat, pool frequency and riparian zone condition along one bank. (DWQ, B-20081007)

DWQ Special Study (B-20070904):

Approximately 85 acres of land in the headwaters of the unnamed tributary (UT) had been cleared for planting of Christmas trees and pasture in 2006. The resulting runoff from the steep slopes of the cleared land had caused extreme scouring of the UT, resulting in large rocks blocking a downstream culvert over a driveway. This caused flooding and sediment deposition on the property of the downstream landowner. DWQ took benthic samples at two locations to determine the water quality impacts of this land clearing activity. One sample location was just below the impacted area and the second site was located on a comparable site draining to the opposite side of Little Phoenix Creek.

The impacted sampling site (KB117) was a little over a tenth of a mile upstream of the culvert, in a heavily wooded area. Massive rocks and other debris had been washed downstream and extreme scouring, roughly five meters in height, can be seen in photos taken by biologists in the special study document. The stream wetted width was about one meter where as the channel had been scoured out to four and five meters wide. The habitat still received a relatively good score (78 out of 100); however, the bottom substrate consisted of bedrock, boulders, rubble, no leaf packs and exposed tree roots. The control site (KB118) had similar slope and substrate as the impacted site. However, K118 had no scouring and a channel with similar width as the streams wetted width (one meter) and included leaf packs and other characteristics of a small mountain stream.

Sample results from KB117 indicated the majority of the benthic community had been washed away. Only 24 total individual organisms were found at the site and none of the taxa were found in abundance. However, the control site, had 36 total taxa that were found to be in abundance. The majority of these diverse taxa were intolerant species, commonly found in small mountain streams.

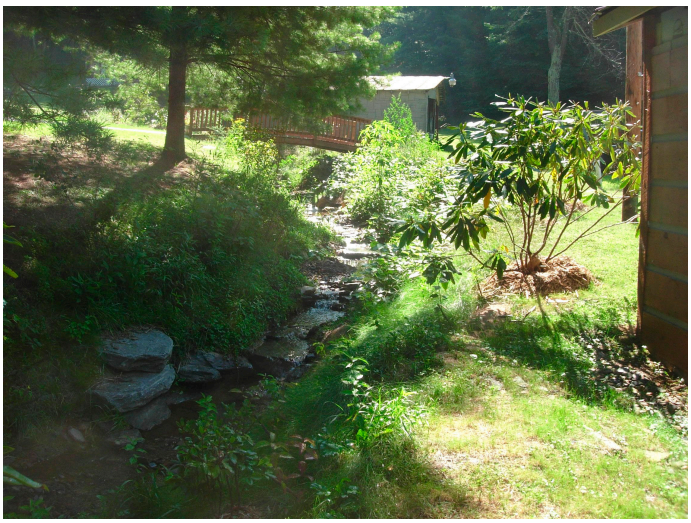
The study indicated a devastating impact to the benthic community due to the recent complete rearrangement of the stream bed and the extreme streambank erosion from unusually high flow levels. Recovery of the impacted UT will be slowed by the fact that the entire stream, including the headwaters, have been scoured.

This leaves recolonization of the stream primarily to aerial recolonization as adults emerge from Little Phoenix Creek and lay eggs in the UT, rather than downstream drift of individuals from headwater fauna because that fauna has been severely reduced both in diversity and abundance.

Basinwide Planning staff visited the impacted property a month prior to the sampling event. The pictures below show the impacts on the downstream property during a light to moderate rain event which occurred at the time of the visit.

Figure 1-22: Impacts from Improper Land Clearing Activity Upstream. Looking Upstream (Left), Looking Downstream (Right).

Figure 1-23: Post Streambank Stabilization Restoration Project. Looking Upstream (Left), Looking Downstream (Right).



UT Little Phoenix Creek Stream Restoration & Success Story:

In 2007, the National Committee for the New River (NCNR) was awarded a Federal 319 Grant in the amount of $65,400 for restoring an unnamed tributary to Little Phoenix Creek (Figure 1-22). The purpose of this project was to repair 315 feet of a UT- Little Phoenix Creek which was severely damaged by excessive flooding as the result of upstream land clearing activities.

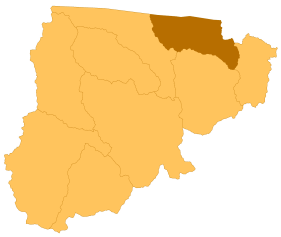
The stream restoration was based on natural channel design concepts. Rock step-pool structures were installed in the impacted reach and streambanks reshaped to the proper profile. Once the work was completed, native riparian vegetation was planted along the streambanks to aid in bank stability and to lessen the impacts of thermal pollution on this small headwater stream.

An existing culvert was removed since it acted as a dam, interfering with proper sediment transport. A bridge that spans the entire flood plane was built that allowed the stream profile to be maintained through the reach.

The goal of the project, to stabilize the lower reach of UT Little Phoenix Creek at the property, was met. DENR officials worked with the landowner at the top of the mountain to stabilize the 85 acres that had been cleared. NCNR worked with both upstream and downstream landowners to develop and implement a site plan. The result is a functional, stable stream that is also attractive.

See the project's **Final Report** for more detailed information about the purpose, restoration details and final results.

HELTON CREEK (050500010108)



Includes: Helton Creek [AU#: 10-2-27]

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

Helton Creek [AU#: 10-2-27]

Helton Creek is approximately 19 miles from the NC/VA state line to the North Fork New River [AU#: 10-2-(12)]. This is the main receiving creek for this subwatershed. Land use is a mixture of mostly forest on the south side of the stream and agriculture and residential on the north side.

USE SUPPORT: SUPPORTING (19 MI)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
(KB25)	Good (2008)
(KB136)	Excellent (2008)
(KB137)	Excellent (2008)
Fish Com	
(KF5)	Not Rated (2008) Good-Fair (2009)

Water Quality Status

Helton Creek was monitored at four biological sites during 2008 and 2009. Five benthic samples were taken at three locations along the creek. Two of the three sites were sampled for purposes of a special study. The most downstream benthic site (KB25) is a basinwide site and has been sampled since 1998. Each sample since 1998 has resulted in an Excellent rating, indicating the stream has a stable benthic community. The rating at this site dropped to a Good when it was sampled a second time in 2008 and maintained that Good rating when sampled again in 2009.

The fish community site, which is in the same location as KB25 and is a fish community reference site, was monitored in 2008 and received a Not Rated. This rating was given due to unexpected nature of the number and the type of species collected until further sampling could be completed. None of the trout species were native or wild and all appeared to be stocked. The 2009 sample showed similar results and was rated Good-Fair. The large number of stocked species is either an indication of nutrient inputs upstream from nonpoint sources, or the managed trout fishery is affecting the natural fish predators so that prey species are not being controlled. The specific cause of the drop in rating is not known at this time and the stream is considered to be impacted.

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

DWQ Special Study - Helton Creek (B-20081202):

A request for benthic sampling was received from the WSRO for three sites on Helton Creek in Ashe County. Sediments from logging, farming, and other agricultural activities in the watershed have filled in the stream above a small low-head dam upstream of SR 1526/Ashe County (KB136), causing a shift in the stream channel. The banks of the new channel are unstable and are a source of additional sediments to the stream. Benthic sampling was requested to assess potential effects of the sediments on the benthic community.

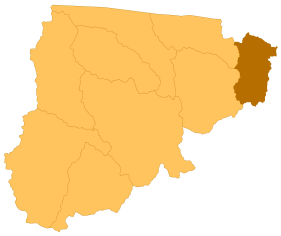
The locations of the three benthic sites sampled on 13 October 2008 can be seen in Figure 1-1 (KB137, KB136 & KB25). The quarter mile segment of Helton Creek where the stream channel had shifted is located just above the middle site (KB136) and is the source of increased sedimentation. One site was selected upstream of the altered channel, one directly downstream, and a third site near the confluence with North Fork New River.

The two upstream sites rated Excellent and the downstream site rated Good. It was concluded that the benthic data did not indicate impacts to the benthic community downstream of the new channel. A more detailed summary of the biological data and resultant bioclassifications can be found in the Special Study document.

Recommendations

A stressor study is recommended to determine the source of the large amount of stocked fish.

Lower North Fork New River (050500010109)



Includes: North Fork New River [AU#: 10-2-(12)] **& Millpond Branch** [AU#: 10-2-28]

This subwatershed has mixed land use of forest in the headwaters, some residential and agriculture scattered in the headwaters and along streambanks. There are no NPDES dischargers in this subwatershed.

North Fork New River [AU#: 10-2-(12)]

A portion of this segment 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.

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

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____. *DWQ. ESS. BAU. October 2008. (B-20081007) *Results from benthic sampling of eight sites requested by DWQ Planning Section and Division of Soil and Water Conservation in HUCS 06010103 (Watauga River Basin) and 05050001 (New River Basin) during summer 2008*. Raleigh, NC.

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____. *DWQ. ESS. BAU. March 2009. (B-20070904) *Benthos Sampling below Shatley Farm land clearing, Ashe County, New River Subbasin 02, August, 2007.* Raleigh, NC.

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

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

Appendix 1-A

Use Support Ratings for All Monitored Waters In the North Fork New River Watershed

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

NC 2010 Integrated Report

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

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

New River Basin — **North Fork New River Watershed** **0505000101**

New River Basin — Upper New River Subbasin 05050001

New River Basin — **North Fork New River Watershed** **0505000101**

10-2-21-(4.5)	**Big Horse Creek**	From SR#1362 to SR#1353 (Tuckerdale)	**5.5 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
10-2-21-(7)	**Big Horse Creek (Horse Creek)**	From SR#1353 (Tuckerdale) to North Fork New R	**6.5 FW Miles**	C:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008	
10-2-14	**Big Laurel Creek**	From source to North Fork New River	**17.5 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2008	
10-2-8	**Brush Fork**	From source to North Fork New River	**5.1 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
10-2-20	**Buffalo Creek**	From source to North Fork New River	**9.7 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	
10-2-27	**Helton Creek**	From NC-VA State Line to North Fork New River	**19.0 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	
10-2-7	**Hoskin Fork**	From source to North Fork New River	**5.2 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
10-2-20-1	**Little Buffalo Creek**	From source to Buffalo Creek	**4.4 FW Miles**	C;Tr:+	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2008	2000
10-2-21-8	**Little Horse Creek**	From source to Big Horse Creek	**10.9 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
10-2-23	**Little Phoenix Creek**	From source to North Fork New River	**4.6 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
10-2-25	**Long Shoals Creek**	From source to North Fork New River	**2.7 FW Miles**	C;Tr:+	
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2008	

NC 2010 Integrated Report

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

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

New River Basin — **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	

APPENDIX 1-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE DATA SHEETS

Station ID*	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
Benthic Sample Sites						
KB117	Ut. L. Phoenix Cr.	10-2-23ut5	Source to L Phoenix Cr.	Ashe	Old NC 16	08 - Not Rated 07 - Not Rated
KB118*	Ut. L. Phoenix Cr.	10-2-23ut6	Source to L Phoenix Cr.	Ashe	SR 1649	07 - Not Impaired
KB119*	Brush Fk.	10-2-8	From source to North Fork New River	Ashe	NC 88	08 - Excellent
KB120*	Roundabout Cr.	10-2-10	From source to North Fork New River	Ashe	SR 1308	08 - Excellent
KB121*	M. Fk. Little Horse Cr.	10-2-21-8-1	From source to Little Horse Cr.	Ashe	SR 1334	08 - Excellent
KB122*	Big Horse Cr.	10-2-21-(4.5)	From SR 1362 to SR 1353 (Tuckerdale)	Ashe	SR 1362	08 - Excellent
KB123*	Long Shoals Cr.	10-2-25	From source to North Fork New River	Ashe	SR 1574	08 - Not Impaired
KB125*	L. Phoenix Cr.	10-2-23	From source to North Fork New River	Ashe	SR 1513	08 - Excellent
KB127*	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1549	08 - Excellent
KB129*	Ut. Mill Cr.	10-1-18ut4	Source to Mill Cr.	Ashe	SR 1111	07 - Not Impaired
KB134*	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 194-88	08 - Excellent
KB135*	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	Old NC 16	08 - Excellent
KB136*	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1526	08 - Excellent
KB137*	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1370	08 - Excellent
KB138*	Three Top Cr.	10-2-13	From source to North Fork New River	Ashe	SR 1100	09 - Excellent 08 - Good
KB141*	N. Fk. New R.	10-2-(1)	From source to Three Top Creek	Ashe	SR 1118	08 - Excellent
KB23	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1100	08 - Excellent 03 - Excellent
KB25	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1536	08 - Excellent 03 - Excellent
KB26	Hoskin Fk.	10-2-7	From source to North Fork New River	Ashe	NC 88	08 - Excellent 03 - Excellent
KB27	N. Fk. New R.	10-2-(12)	From Three Top Creek to New River	Ashe	SR 1644	08 - Excellent 03 - Excellent
KB30	Big Laurel Cr.	10-2-14	From source to North Fork New River	Ashe	NC 88	08 - Excellent 03 - Excellent
KB31	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 194-88	08 - Excellent 03 - Excellent
KB32	L. Buffalo Cr.	10-2-20-1	From source to Buffalo Creek	Ashe	SR 1153	08 - Fair 03 - Poor
KB33	Big Horse Cr. (Horse Cr.)	10-2-21-(7)	From SR#1353 (Tuckerdale) to North Fork New R	Ashe	NC 194	08 - Excellent 03 - Excellent
KB63	L. Horse Cr.	10-2-21-8	From source to Big Horse Creek	Ashe	SR 1334	08 - Excellent 03 - Good
KB86*	Rich Hill Cr.	10-2-15	From source to North Fork New River	Ashe	NC 88	08 - Excellent
Fish Community Sample Sites						
KF21*	Buffalo Cr.	10-2-20	From source to North Fork New River	Ashe	NC 88/194	08 - Not Rated
KF2	Cranberry Cr.	10-1-37	From source to South Fork New River	Ashe	SR 1600	08 - Good 98 - Excellent
KF16*	Grassy Cr.	10-3	From North Carolina-Virginia State	Ashe	SR 1549	08 - Good-Fair
KF1	Big Horse Cr.	10-2-21-(7)	From SR#1353 (Tuckerdale) to North Fork New R	Ashe	SR 1350	08 - Good 98 - Good

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

Station ID*	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
KF22*	Big Laurel Cr.	10-2-14	From source to North Fork New River	Ashe	NC 88	08 - Good
KF5	Helton Cr.	10-2-27	From NC-VA State Line to North Fork New River	Ashe	SR 1536	08 - Not Rated 98 - Good
KF10	N. Fk. New R.	10-2-(1)	From source to Three Top Creek	Ashe	SR 1119	08 - Good 98 - Good
KF23*	Three Top Cr.	10-2-13	From source to North Fork New River	Ashe	SR 1123	08 - Not Rated

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

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N FK NEW R	**SR 1119**	**05/21/08**	**KF10**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.407098	-81.681014	10-2-(1)	Southern Crystalline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,+	23.9	3118	9	0.5	No

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	60	5	35	0

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

Water Quality Parameters

Temperature (°C)	11.2
Dissolved Oxygen (mg/L)	10.2
Specific Conductance (µS/cm)	59
pH (s.u.)	6.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	4
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**71**

Site Photograph

Substrate cobble, gravel, sand, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/08	2008-46	15	48	Good
06/29/98	98-56	14	50	Good

Most Abundant Species Western Blacknose Dace.

Exotic Species Brown Trout.

Species Change Since Last Cycle **Gains --** Bluehead Chub, Bigmouth Chub. **Losses** -- Rosyface Shiner.

Data Analysis

Watershed -- located along the rural west-central edge of the New River basin where Watauga and Ashe Counties meet; this catchment drains the North Fork New River's headwaters plus the main tributaries of Pine Mountain Branch, Brush Fork, and Hoskin Fork. **Habitats** -- primarily riffles and runs with some chutes that were holding trout, and a few silt bottom pools; the reach is mostly sunlit because of the vegetation type along the banks and in the riparian corridor (majority of shrubs and grasses vs. trees); substrates exhibited moderate to high embededdness. **2008** -- a diverse and abundant population of cool and cold water fish species were present, including three intolerant taxa (New River Shiner, Tonguetied Minnow, and Kanawha Darter); more than twice the total abundance was collected than in 1998 (1368 vs. 552); Western Blacknose Dace (n=553) represented 40% of the sample. **1998-2008** -- very similar species compositions were observed and nearly identical NCIBI metrics were calculated for both monitoring years, indicating that water quality in this headwater catchment has remained good over a ten year period.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N FK NEW R	**SR 1100**	**KB23**	**07/31/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.430000	-81.620833	10-2-(12)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	62	2845	13	0.3

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

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

Water Quality Parameters

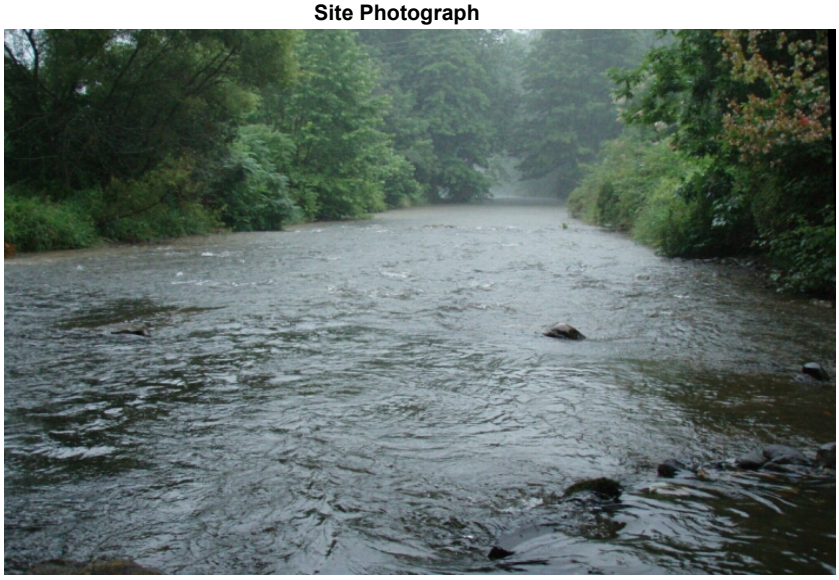
Temperature (°C)	20.3
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	61
pH (s.u.)	6.5

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	81

Site Photograph



Substrate mix of boulder, cobble, gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/08	10517	119	57	3.67	2.73	Excellent
08/19/03	9222	81	44	3.96	3.51	Excellent
08/17/98	7710	96	52	4.05	3.23	Excellent
07/29/93	6296	102	50	3.95	3.01	Excellent

Taxonomic Analysis

The greatest number of EPT taxa collected at the site occurred in 2008. A few EPT taxa were collected for the first time, including: *Acroneuria carolinensis, Hydroptila,* and *Nectopsyche exquisita* .

Data Analysis

The site is 8.2 miles west of Jefferson. This is the site furthest upstream of the three basinwide sites on North Fork New River.

The site has consistently received classifications of Excellent following each summer sampling event (a Good was received after a non-summer sampling event in March 1989). No indications of impact are exhibited by the benthic community.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N FK NEW R	**SR 1644**	**KB27**	**08/20/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.485556	-81.493889	10-2-(12)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	144	2630	18	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
United Chemi-Con, Inc.	NC0000019	1.018

Water Quality Parameters

Temperature (°C)	24.1
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	80
pH (s.u.)	8.0

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	12
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	0
Total Habitat Score (100)	65

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10541	99	49	3.93	3.31	Excellent
08/21/03	9234	72	45	3.66	3.31	Excellent
08/19/98	7719	87	50	3.77	2.91	Excellent
07/28/93	6294	93	46	4.00	2.94	Excellent

Taxonomic Analysis

EPT Richness at the site has shown very little change for the four summer sampling events between 1993 and 2008. *Helicopsyche paralimnella* has been recorded for the first time from the site; this is only one of five sites in the state so far at which the species has been found by BAU, though undoubtedly more sites will be found.

Data Analysis

The site is 4.6 miles NNW of Jefferson and is directly upstream of the mouth of Big Horse Creek. The town of West Jefferson is almost entirely included in the catchment above the site.

Consistently high EPT Richness and low NCBI values have resulted in classifications of Excellent for each sampling event between 1993 and 2008. The healthy benthic community indicates an absence of stressors at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N FK NEW R	OLD NC 16	KB135	08/20/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.503889	-81.390278	10-2-(12)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	277	2525	33	0.3

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

0

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
United Chemi-Con, Inc.	NC0000019	1.018

Water Quality Parameters

Temperature (°C)	22.2
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	73
pH (s.u.)	7.4

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	10
Pool Variety (10)	5
Riffle Habitat (16)	5
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	1
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	65

Site Photograph

Substrate primarily cobble and gravel; some sand, silt, boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10539	108	55	4.08	3.07	Excellent

Taxonomic Analysis

There is little difference between this new basinwide site and the former upstream basinwide site in terms of richness within the major groups; the number of taxa collected within each group at the new site is within the range of taxa collected at the upstream site with the exception of Lepidoptera (one taxon collected at this site; never collected at the former site) and Oligochaeta (only lumbriculids collected at this site in 2008; at least two taxa collected upstream). However, there were a few EPT taxa collected at Old NC 16 that have not been collected at NC 16 over eight sampling events, including (all rare within the sample except as noted): *Acerpenna pygmaea, Heterocloeon anoka* (common)*, Anthopotamus distinctus, Agnetina, Hydroptila,* and *Pycnopsyche lepida* group.

Data Analysis

The site is 7.4 miles northeast of Jefferson and six stream-miles above the confluence with South Fork New River. This is the furthest downstream site of the three basinwide sites on North Fork New River. The town of West Jefferson is almost entirely included in the catchment above the site. This site replaces the basinwide site at NC 16, which is about two stream-miles upstream of this site, due to difficult access to the river at NC 16.

The four summer sampling events in 1989, 1993, 1998, and 2003 resulted in classifications of Excellent at the former basinwide site. There appears to be little difference in water quality either temporally or longitudinally between sampling events on this lower segment of North Fork New River.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HOSKIN FK	OFF NC 88 BELOW WILSON BR	KB26	07/31/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.390480	-81.702190	10-2-7	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	6.7	3125	3	0.3

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

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

Water Quality Parameters

Temperature (°C)	17.9
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	85
pH (s.u.)	7.0

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	19
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	75

Site Photograph

Substrate mix of cobbole, gravel, boulder; some sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/08	10514	---	38	---	3.18	Excellent
08/19/03	9221	---	37	---	2.92	Excellent
08/17/98	7709	---	35	---	3.59	Good
07/23/93	6299	---	30	---	3.56	Good

Taxonomic Analysis

The number of EPT taxa identified from the site has increased with each successive sampling event since 1993. A few taxa were collected for the first time at the site, including: *Ephemerella subvaria, Serratella deficiens, Hexagenia, Acroneuria carolinensis,* and *Leucotrichia pictipes*.

Data Analysis

The site is about 1.5 miles east of the closest point on the Tennessee Valley Divide and 0.8 stream-miles from the confluence with North Fork New River.

Increasing EPT richness with each successive sampling event since 1993 is suggestive of improving water quality at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
THREE TOP CR	OFF SR 1100 BELOW LONG HOPE CR	KB138	08/21/08	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.410710	-81.619600	10-2-13	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	22	2915	8	0.4

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

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

Water Quality Parameters

Temperature (°C)	18.8
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	48
pH (s.u.)	---
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	86

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10545	---	35	---	2.60	Good

Taxonomic Analysis

A fairly diverse EPT community exists at the site. There are no historical data for the site, so trends in community composition can not be analyzed. A few taxa were collected here that have not been collected at the former basinwide site downstream, including: *Procloeon, Maccaffertium pudicum, Diplectrona modestum, Ceraclea,* and *Chimarra*.

Data Analysis

The site is 8.1 miles west of Jefferson. This new basinwide site is 1.3 stream-miles upstream of the former site at SR 1100. The site was moved to remove the influence of development directly upstream of the old basinwide site, and to locate it in the Amphibolite Mountains ecoregion so that a potential reference site for the ecoregion could be established.

The same number of EPT taxa were recorded for this site in 2008 as were for the former site in 2003. In both cases the additional of a single EPT taxon would have resulted in a classification of Excellent.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
THREE TOP CR	**SR 1123**	**05/20/08**	**KF23**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.420699	-81.621819	10-2-13	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	23.1	2900	10	0.4	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	65	15	5	15 (lumber mill)

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

Water Quality Parameters

Temperature (°C)	14.4
Dissolved Oxygen (mg/L)	9.5
Specific Conductance (µS/cm)	38
pH (s.u.)	6.4

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)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	**85**

Site Photograph

Substrate flat cobble, boulder, bedrock, gravel, sand.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/20/08	2008-45	15	--	Not Rated

Most Abundant Species Fantail Darter.

Exotic Species Rock Bass, Brown Trout.

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

Data Analysis

New basinwide site. **Watershed** -- a tributary to the North Fork New River that flows north, draining part of west-central Ashe County. **Habitats** -- high quality instream habitats consisting of riffles and runs with deep chutes that were holding trout, and some small side pools; roads on both sides of the stream prevent broad riparian widths, but the stream's banks were very stable, with some Mountain Laurel on the right bank; the tree canopy provides about 50% shading to the stream. **2008** -- a diverse assemblage of cool and cold water fish fauna were collected from the stream, including four species that are considered to be intolerant to pollution (Rock Bass, Tonguetied Minnow, Kanawha Darter, and Appalachia Darter); Fantail Darters represented 36% of the sample and Mottled Sculpin comprised 29%; overall, the fish community of Three Top Creek appears to be healthy, and suggests no obvious water quality issues.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BIG LAUREL CR	**NC 88**	**KB30**	**06/19/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.443056	-81.613611	10-2-14	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	29	2805	8	0.4

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

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

Water Quality Parameters

Temperature (°C)	14.1
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	42
pH (s.u.)	7.1
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/19/08	10468	---	53	---	2.62	Excellent
08/19/03	9225	---	38	---	2.92	Excellent
07/17/98	7712	---	40	---	3.49	Excellent
07/29/93	6298	---	48	---	3.29	Excellent

Taxonomic Analysis

The greatest number of EPT taxa collected from the site occurred in 2008. Taxa collected for the first time included: *Eurylophella verisimilis, Ephemera, Anthopotamus distinctus, Brachycentrus appalachia, Ceratopsyche slossonae, Oecetis persimilis,* and *Triaenodes ignitus*.

Data Analysis

The site is near the confluence with North Fork New River and about eight miles west of Jefferson.

The highest EPT richness and the lowest EPT BI values were recorded for the site in 2008. Each time the site has been sampled it has received a classification of Excellent. The benthic community does not exhibit signs of impact.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG LAUREL CR	**NC 88**	**05/20/08**	**KF 22**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.443095	-81.613795	10-2-14	Southern Crystaline Ridges & Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	29	2835	10	0.8	Yes

	Forested/Wetland	Rural Residential	Agriculture	Other (describe)
Visible Landuse (%)	85	10	5	0

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

Water Quality Parameters

Temperature (°C)	13.8
Dissolved Oxygen (mg/L)	9.9
Specific Conductance (µS/cm)	42
pH (s.u.)	6.4

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	8
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)	4
Total Habitat Score (100)	**71**

Site Photograph

Substrate sand, gravel, cobble, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/20/08	2008-44	19	52	Good

Most Abundant Species Mountain Redbelly Dace.

Exotic Species Rock Bass, Brown Trout.

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

Data Analysis

New basinwide site. **Watershed** -- a tributary to the North Fork New River that drains the northwestern-most edge of Ashe County. **Habitats** -- good instream habitat qualities in this large mountain stream, consiting primarily of runs and some riffles; moderate to high embeddedness of substrates; good bank stabilities and vegetated riparian widths, but shading is limited to the stream's edges. **2008** -- a highly diverse and trophically balanced population of mostly cool and cold water fish species was collected, including seven taxa that are considered intolerant to pollution (Rock Bass, Tonguetied Minnow, New River Shiner, Rosyface Shiner, Kanawha Minnow, Kanawha Darter, and Appalachia Darter); Mountain Redbelly Dace represented 47% of the sample (n=350); two Hellbenders (one adult and one young-of-year) were also collected, suggesting high quality water.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BUFFALO CR	NC 88/194 ABOVE LITTLE BUFFALO CREEK	KB134	08/20/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.432880	-81.511380	10-2-20	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	13	2785	5	0.2

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

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

Water Quality Parameters

Temperature (°C)	21.6
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	70
pH (s.u.)	6.7
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	14
Pool Variety (10)	5
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	6
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	82

Site Photograph

Substrate mix of cobble, gravel, boulder; some sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10542	---	39	---	2.51	Excellent

Taxonomic Analysis

The EPT portion of the benthic community at the site is diverse. *Baetisca berneri* , a mayfly often collected in the New River basin but uncollected at the prior basinwide site on Buffalo Creek, was abundant at this site. The low EPT BI indicates a community intolerant to the presence of pollutants.

Data Analysis

The site is about 2 miles west of Jefferson. The basinwide site for Buffalo Creek was relocated to above the mouth of Little Buffalo Creek to assess conditions in the catchment without the influence of West Jefferson WWTP; the original basinwide site is about 0.4 stream-miles downstream of the present site. At the new location the catchment is mostly forest and pasture with no urban influence.

The high EPT Richness and low EPT BI value indicates a healthy benthic community and the absence of stressors.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BUFFALO CR	NC 88/194	05/19/08	KF 21	Not Rated

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	1	05050001	36.433146	-81.511071	10-2-20	Amphibolite Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	12.6	2833	7	0.4	Yes

	Forested/Wetland	Residential/Commercial	Agriculture	Other (describe)
Visible Landuse (%)	50	30	5	15 (road - NC 88 and 194)

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

Water Quality Parameters

Temperature (°C)	17.0
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	62
pH (s.u.)	6.9

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	20
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	**83**

Site Photograph

Substrate flat cobble, gravel, boulder.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/19/08	2008-42	15	--	Not Rated

Most Abundant Species Fantail Darter.

Exotic Species Rock Bass, Bluegill, Saffron Shiner, Rainbow Trout, Brown Trout.

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

Data Analysis

New basinwide site. **Watershed** -- a tributary to the North Fork New River that drains part of central Ashe County, just to the west of Jefferson. **Habitats** -- high quality instream habitats including swift riffles and runs with a few chutes and a few shallow side pools that were holding trout; good bank stabilities and vegetated riparian widths; the canopy was providing equal amounts of shade and sunlight to the stream; low to moderate embeddedness of substrates; the Buffalo Meadows WWTP (<1MGD, 100% domestic) located 2.8 miles upstream may be contributing to the slightly elevated conductivity. **2008** -- a diverse and fairly trophically balanced mix of mostly cool and cold water fish taxa was collected, including three species that are considered intolerant to pollution (Rock Bass, Kanawha Darter, and Rainbow Trout); Fantail Darters (intermediately tolerant insectivores) represented 59% of the collected sample; overall, this stream is supporting a reasonably healthy fish population and appears to have no obvious water quality issues.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L BUFFALO CR	OFF SR 1153	KB32	08/21/08	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.420480	-81.493220	10-2-20-1	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	3.0	2865	2	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
West Jefferson WWTP	NC0020451	0.5

Water Quality Parameters

Temperature (°C)	18.1
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	276
pH (s.u.)	---
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	18
Bottom Substrate (15)	9
Pool Variety (10)	4
Riffle Habitat (16)	15
Left Bank Stability (7)	5
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	66

Site Photograph

Substrate mix of boulder, gravel, cobble; some sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10543	63	13	6.00	5.00	Fair
08/20/03	9228	22	6	6.40	4.11	Poor
08/18/98	7713	39	14	7.07	5.28	Fair
07/13/93	6265	24	0	8.31	---	Poor

Taxonomic Analysis

The EPT portion of the benthic community has differed significantly with each sampling event. Even for the two sampling events with similar EPT richness (1998 and 2008) only four taxa were in common. In 2008 four EPT taxa were collected that had not been collected during prior sampling events, and three of those (*Maccaffertium pudicum, Hydropsyche betteni,* and *Leucotrichia pictipes*) were abundant in the sample.

Data Analysis

The site is one mile west of downtown Jefferson and within 0.9 stream-miles downstream of the West Jefferson WWTP. The stream is on the state's 303(d) list for nutrients and impaired biological integrity.

For the four sampling events since 1993 the lowest NCBI value is shown for 2008, and EPT Richness is close to the high value from 1998. Of the four years that benthic sampling was performed 2008 exhibited the lowest flows for area streams. Dry conditions should increase instream effluent concentrations from the WWTP upstream; the benthic community does not reflect this.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BIG HORSE CR	SR 1350	05/20/08	KF1	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.487395	-81.500386	10-2-21-(7)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,+	56.2	2681	13	0.7	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Town of Lansing WWTP (<1MGD - 1.1 miles upstream)	NC0066028	0.05

Water Quality Parameters

Temperature (°C)	12.5
Dissolved Oxygen (mg/L)	9.7
Specific Conductance (µS/cm)	46
pH (s.u.)	6.0
Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate sand, cobble, boulder, gravel.

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/20/08	2008-43	15	48	Good
06/29/98	98-57	13	48	Good

Most Abundant Species Fantail Darter.

Exotic Species Rock Bass, Smallmouth Bass, Brown Trout.

Species Change Since Last Cycle **Gains --** White Sucker, Mottled Sculpin, Kanawha Darter, Smallmouth Bass, Kanawha Minnow, Longnose Dace, Brown Trout. **Losses** -- Rosyside Dace, Bigmouth Chub, Saffron Shiner, New River Shiner, Rosyface Shiner.

Data Analysis

Watershed -- a tributary to the North Fork New River that drains a good portion of the northwestern tip of Ashe County; the site is located just southeast of Lansing. **Habitats** -- low quality instream habitats composed of wide and swift sandy runs with some boulder and cobble, few pools, and very few riffles for a mountain stream; the banks were generally healthy except for a 25 foot area on the right bank that was sloughng into the stream; riparian zones vegetated with mostly grasses, shrubs and very few trees; full sun over most of the stream due to its' width and the lack of canopy trees. **2008** -- a diverse and trophically balanced community of cool and cold water fish species was collected, including six intolerant taxa (Rock Bass, Smallmouth Bass, Tonguetied Minnow, Silver Shiner, Kanawha Minnow, and Kanawha Darter); almost three times the total abundance than in 1998 (652 vs. 242). **1998-2008** -- a total of 20 fish species have been collected from this site; in spite of some habitat issues, this stream is supporting a healthy assemblage of fish, and continues to exhibit good water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
BIG HORSE CR	**NC 194**	**KB33**	**06/10/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.485556	-81.498611	10-2-21-(7)	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C:+	56	2635	7	0.4

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

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

Water Quality Parameters

Temperature (°C)	17.7
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	57
pH (s.u.)	7.6

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	13
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	4
Total Habitat Score (100)	75

Site Photograph

Substrate mix of cobble, gravel, boulder; some sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
06/10/08	10470	123	60	4.33	2.84	Excellent
08/19/03	9226	89	50	3.95	3.42	Excellent
08/18/98	7715	103	56	4.18	3.14	Excellent
07/28/93	6293	129	56	4.10	2.78	Excellent

Taxonomic Analysis

A large number of EPT taxa have always been collected from the site; the highest number was in 2008. Many taxa were recorded for the first time, including: *Brachycercus, Dannella simplex, Ephemerella dorothea, Eurylophella aestiva, Rhithrogena uhari, Ceraclea enodis,* and *Neophylax fuscus*. There were several highly tolerant taxa (i.e. with a tolerance value of 8.0 or greater) either common or abundant that helped to drive the NCBI value up: Corixidae; the midges *Chironomus, Polypedilum illinoense* group, *Procladius, Thienemannimyia* group; and *Nais*, an oligochaete.

Data Analysis

The site is about 4.7 miles NNW of Jefferson and about 0.25 stream-miles above the confluence with North Fork New River.

The site has received a classification of Excellent during each summer sampling event since 1993, in most cases driven by high EPT abundance and richness.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L HORSE CR	SR 1334	KB63	08/21/08	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.533056	-81.577778	10-2-21-8	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	4.4	2940	2	0.2

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

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

Water Quality Parameters

Temperature (°C)	17.9
Dissolved Oxygen (mg/L)	8.0
Specific Conductance (µS/cm)	47
pH (s.u.)	---

Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	15
Left Bank Stability (7)	2
Right Bank Stability (7)	4
Light Penetration (10)	2
Left Riparian Score (5)	0
Right Riparian Score (5)	0
Total Habitat Score (100)	61

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/21/08	10544	---	38	---	2.92	Excellent
08/19/03	9227	---	33	---	3.03	Good
08/18/98	7716	---	35	---	3.62	Good

Taxonomic Analysis

EPT Richness was higher in 2008 than for previous years, improving the classification for the site from Good to Excellent. *Isogenoides hansoni* was identified from the site for the first time in 2008; this is one of 44 sites from which the BAU has collected the stonefly. Leptocerids have not been collected from the site, reflecting the paucity of root mat habitat.

Data Analysis

The site is about 9.7 miles northwest of Jefferson and 3.6 miles south of the Virginia border.

The site attained a classification of Excellent for the first time in 2008. Though the benthic community does not reflect stress, the lack of a riparian zone at the reach sampled is likely limiting the fauna. A canopy over the stream would increase the presence of coldwater stenotherms, root mats provided by trees would diversify benthic habitat, and streamside vegetation would filter pollutants from runoff.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HELTON CR	**SR 1536**	**KB25**	**08/20/08**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.535000	-81.422222	10-2-27	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr:+	44	2575	8	0.3

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

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

Water Quality Parameters

Temperature (°C)	16.0
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	69
pH (s.u.)	5.9
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	14
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	0
Right Riparian Score (5)	5
Total Habitat Score (100)	82

Site Photograph

Substrate mostly boulder, cobble; some gravel, sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/20/08	10538	---	37	---	2.93	Excellent
08/18/03	9220	---	40	---	3.12	Excellent
08/18/98	7718	---	37	---	3.14	Excellent

Taxonomic Analysis

Though abundant and common in the sample in 1998 and 2003 respectively, *Tallaperla* was uncollected in August 2008 in spite of ample leafpacks for habitat. The only leptocerid collected during summer sampling was *Setodes* (rare in the sample) in 1998, reflecting the paucity of root mats at the site. *Glossosoma* , which was abundant in 2003, was uncollected in both 1998 and 2008. Otherwise the EPT portion of the benthic community was similar among the three summer sampling events at the site, primarily with taxa rare at the site dropping in and out.

Data Analysis

The site is 8.4 miles NNE of Jefferson, and 1.7 stream-miles from the confluence with North Fork New River.

There has been little change in the benthic community among the three summer sampling events, suggesting stable conditions at the site since 1998.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HELTON CR	**SR 1536**	**05/08/08**	**KF5**	**Not Rated**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ASHE	2	05050001	36.53472222	-81.42138889	10-2-27	New River Plateau

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr,+	43.7	2580	10	0.4	Yes

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

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

Water Quality Parameters

Temperature (°C)	14.9
Dissolved Oxygen (mg/L)	9.7
Specific Conductance (µS/cm)	57
pH (s.u.)	7.4
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	13
Pool Variety (10)	4
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**80**

Site Photograph

Substrate Cobble, boulder, gravel, and detritus

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/08/08	2008-34	15	---	Not Rated
06/30/98	98-58	15	52	Good

Most Abundant Species Mountain Redbelly Dace

Exotic Species Saffron Shiner

Species Change Since Last Cycle

Gains -- Kanawha Minnow, Mottled Sculpin, and Kanawha Darter. **Losses** -- Bluntnose Minnow, Rainbow Trout, and Rock Bass.

Data Analysis

Watershed -- drains southern Grayson County, VA and northern Ashe County; no municipalities within the watershed; tributary to the N Fk New River, site is ~ 2 miles from the creek's confluence with the river. **Habitat** -- runs, riffles, shallow uniform pools, narrow riparian zone on the right; total score in 1998 was 88; bank stability and quality of pools appeared to have declined. **2008** -- Rock Bass+Smallmouth Bass+Trout absent; ~ 60% of the fish were Mountain Redbelly Dace, Bluehead Chub, and Central Stoneroller; Mountain Redbelly Dace were extremely abundant along the stream margins; community is Not Rated pending an evaluation in 2009. **1998 & 2008** -- 18 species known from the site, including the endemic Kanawha Minnow and Kanawha Darter and the nonindigenous Saffron Shiner, Rainbow Trout, and Rock Bass; 2.4 times more fish collected in 2008 than in 1998 (1,388 vs. 581); 10 times more Mountain Redbelly Dace were collected in 2008 than in 1998; species absent in 2008 were represented by 2-4 fish/species in 1998; and fishery is managed by NCWRC as Delayed Harvest Waters, within the reach, eight 230-389 mm TL stocked Brook Trout and Rainbow Trout were collected.

Appendix 1-C

Ambient Monitoring Systems
Station Data Sheets

Station ID	Waterbody	AU#	Location	Impaired (By Parameter)	Impacted (By Parameter)
K7500000	North Fork New R.	10-2-(12)	SR 1573 at Crumpler	Fecal Coliform (20%)	Turbidity (7%)

Location: N FORK NEW RIV AT SR 1573 AT CRUMPLER

Station #: K7500000 **Hydrologic Unit Code:** 05050001

Latitude: 36.50403 **Longitude:** -81.39004 **Stream class:** C +

Agency: NCAMBNT **NC stream index:** 10-2-(12)

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)	57	0	<4	0	0		7	8	8.6	9.9	11.4	13.4	14.3
	57	0	<5	0	0		7	8	8.6	9.9	11.4	13.4	14.3
pH (SU)	57	0	<6	0	0		6.8	7.1	7.4	7.6	8	8.2	8.6
	57	0	>9	0	0		6.8	7.1	7.4	7.6	8	8.2	8.6
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				54	58	61	66	72	79	100
Water Temperature (°C)	57	0	>29	0	0		0.8	3.6	7.2	14.3	20.8	24.2	25.6
Other													
TSS (mg/L)	18	4	N/A				6	6.2	6.2	11.5	22.2	262.6	268
Turbidity (NTU)	57	2	>50	4	7		1	1.5	3.1	6.3	13.5	28.2	330
Metals (ug/L)													
Aluminum, total (Al)	8	0	N/A				82	82	262	330	518	610	610
Arsenic, total (As)	8	8	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	8	8	>2	0	0		1	1	1.2	2	2	2	2
Chromium, total (Cr)	8	8	>50	0	0		10	10	14	25	25	25	25
Copper, total (Cu)	8	8	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	8	0	>1000	0	0		260	260	478	575	922	1000	1000
Lead, total (Pb)	8	8	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	6	6	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	8	8	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	8	7	>50	0	0		10	10	10	10	10	33	33

Fecal Coliform Screening(#/100mL)

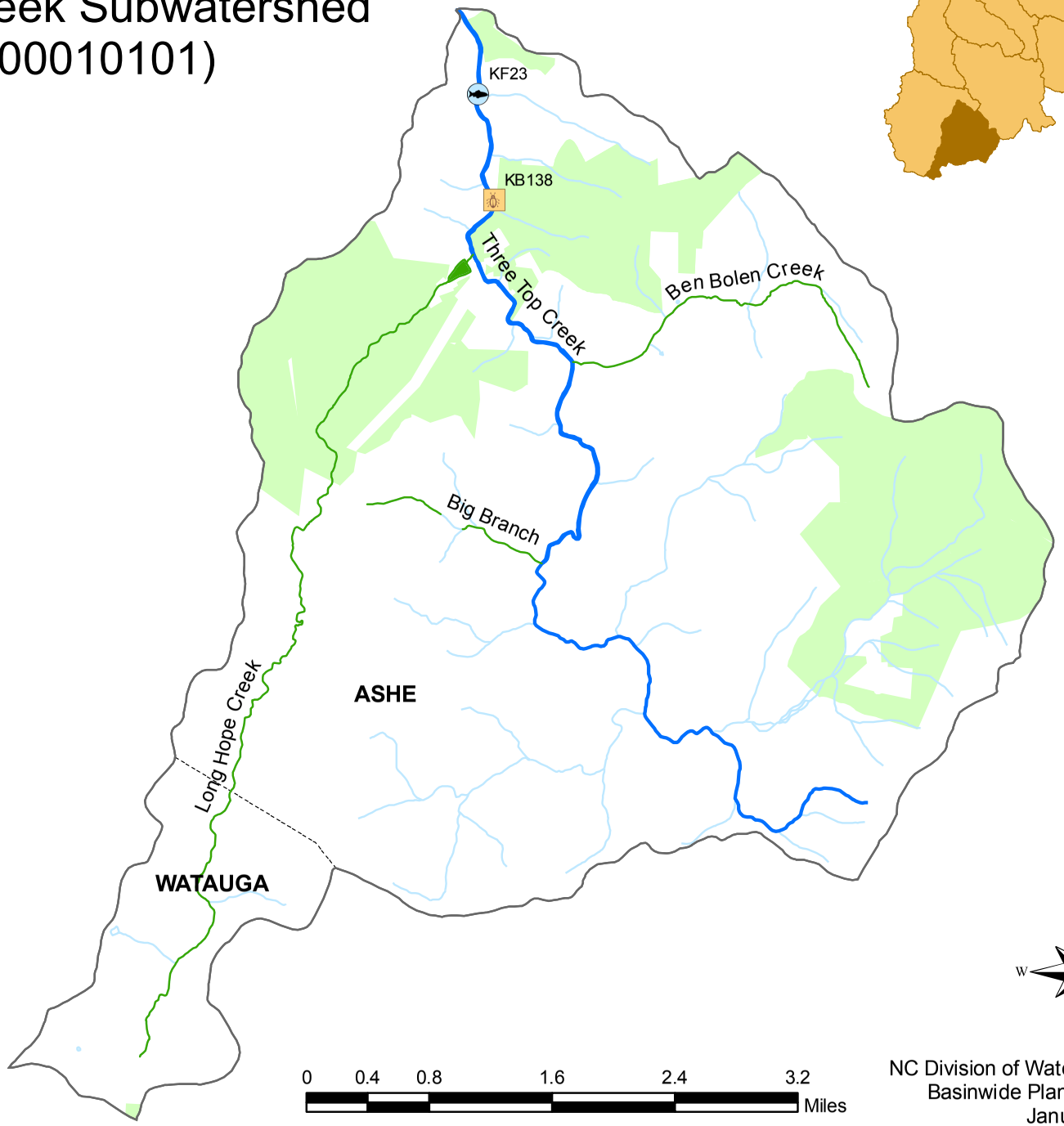
# results:	Geomean:	# > 400:	% > 400:	%Conf:
55	73.7	11	20	

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 1-D

12-Digit Subwatershed Maps

Three Top Creek Subwatershed (050500010101)



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

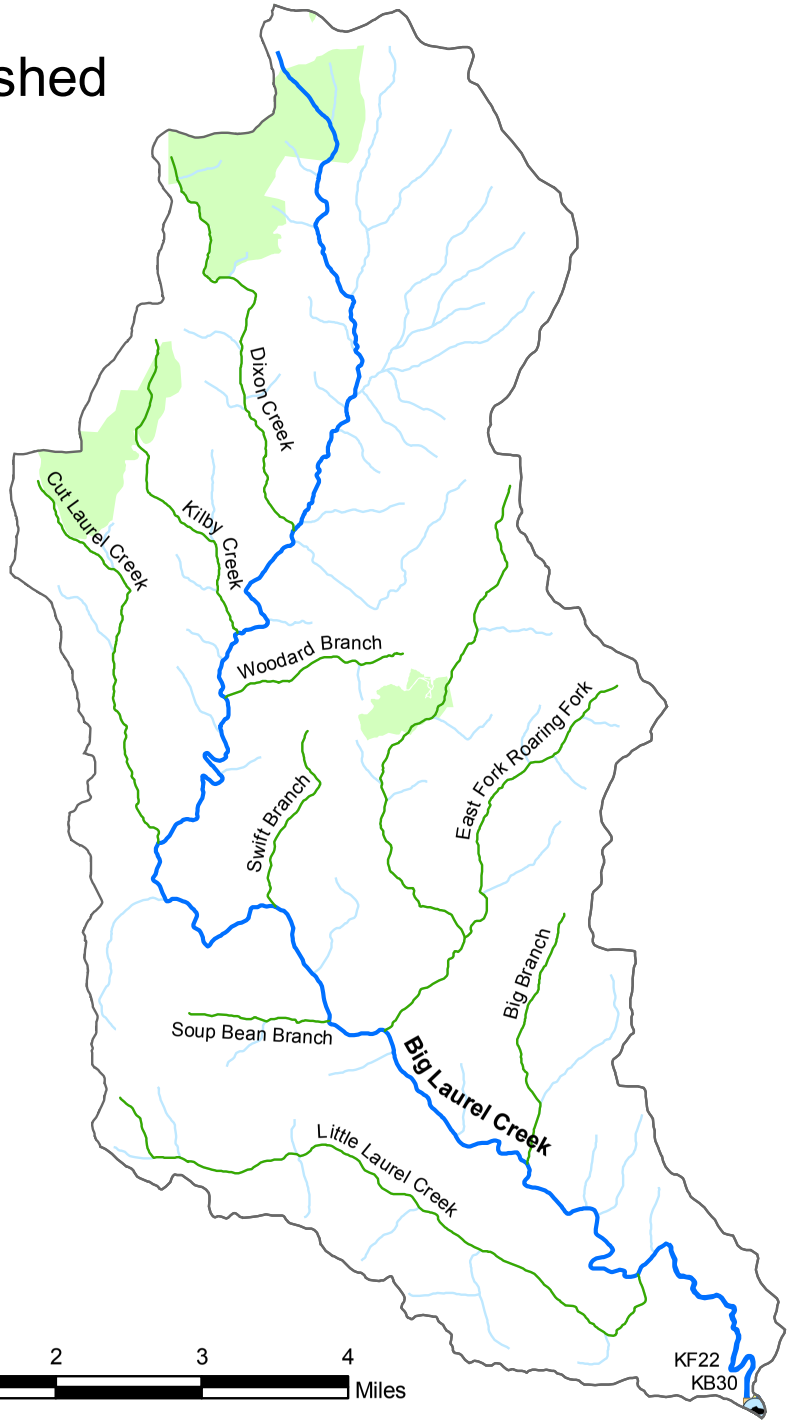
Permits

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

NC Division of Water Quality
Basinwide Planning Unit
January 2011

1-D.2

Big Laurel Creek Subwatershed (050500010102)



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

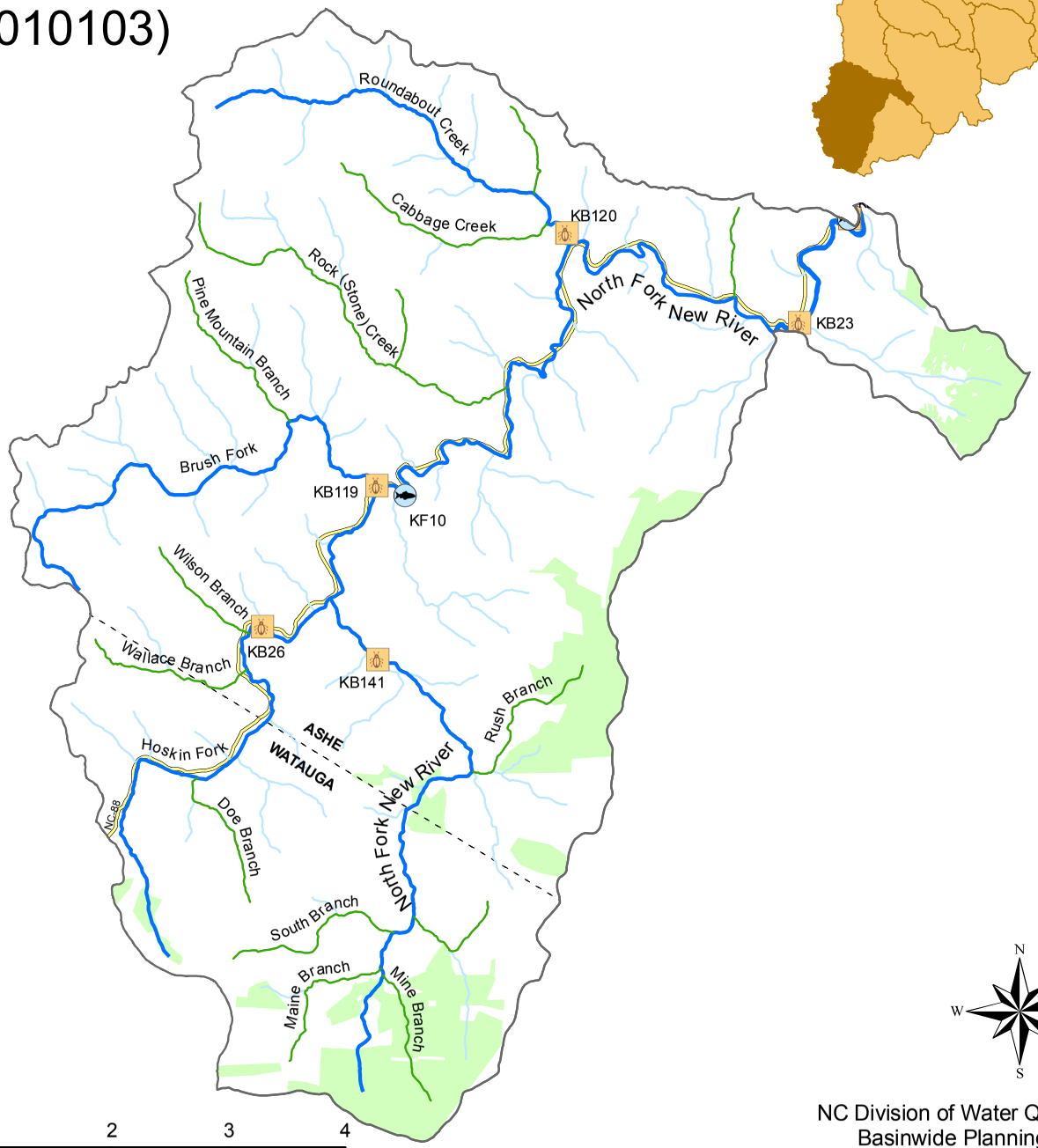
- NPDES Discharge (Minor)
- NPDES Discharge (Major)
- NPDES Non-Discharge (Minor)
- Animal Operation (Cattle)
- Stormwater

0 0.5 1 2 3 4 Miles

N W E S

NC Division of Water Quality
Basinwide Planning Unit
January 2011

Headwaters North Fork New River Subwatershed (050500010103)



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

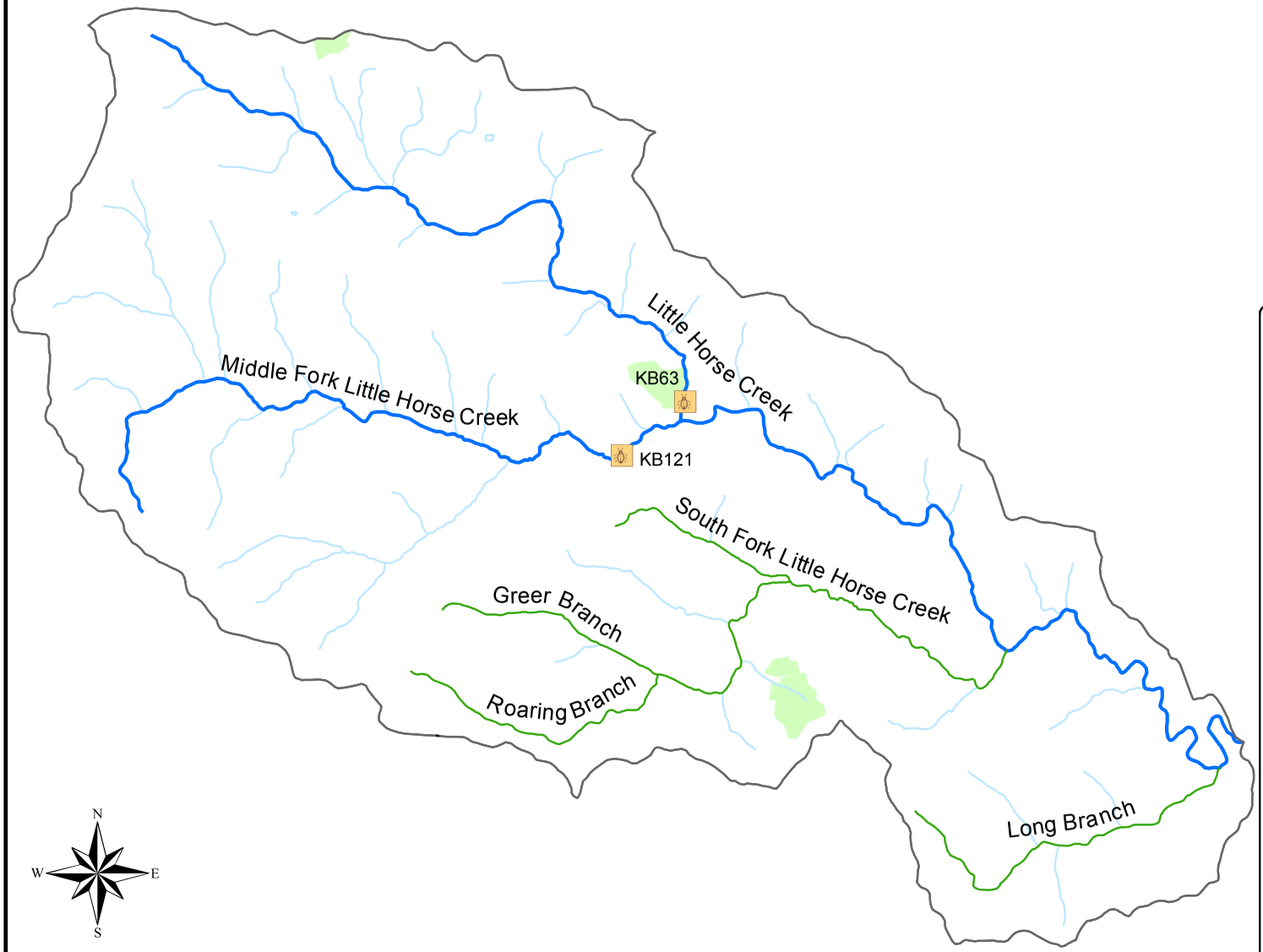
Permits

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

NC Division of Water Quality
Basinwide Planning Unit
January 2011

1-D.4

Little Horse Creek Subwatershed (050500010104)



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

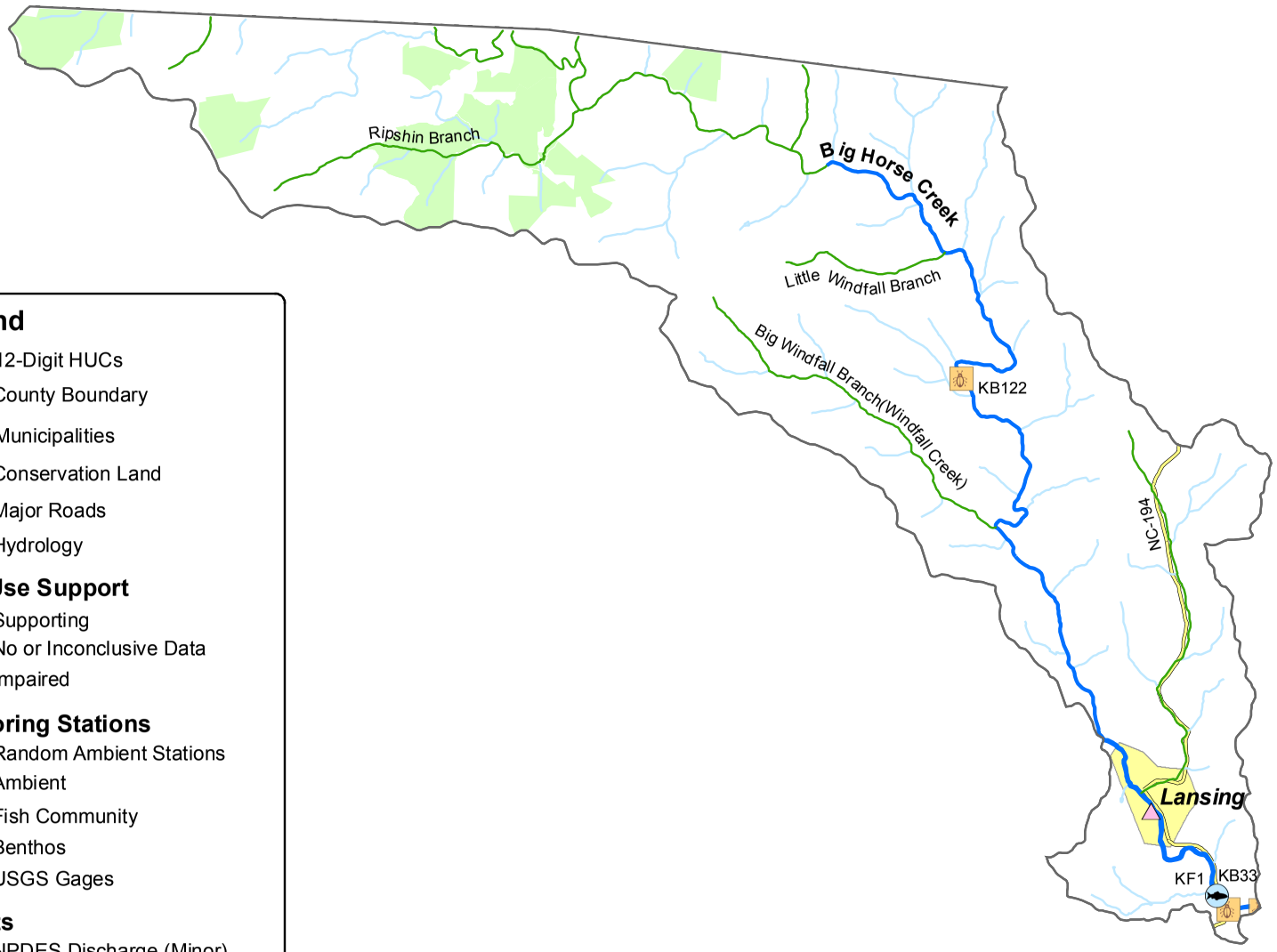
Permits

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

NC Division of Water Quality
Basinwide Planning Unit
January 2011

1-D.5

Big Horse Creek Subwatershed (050500010105)



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 0.5 1 2 3 4 Miles

N W E S

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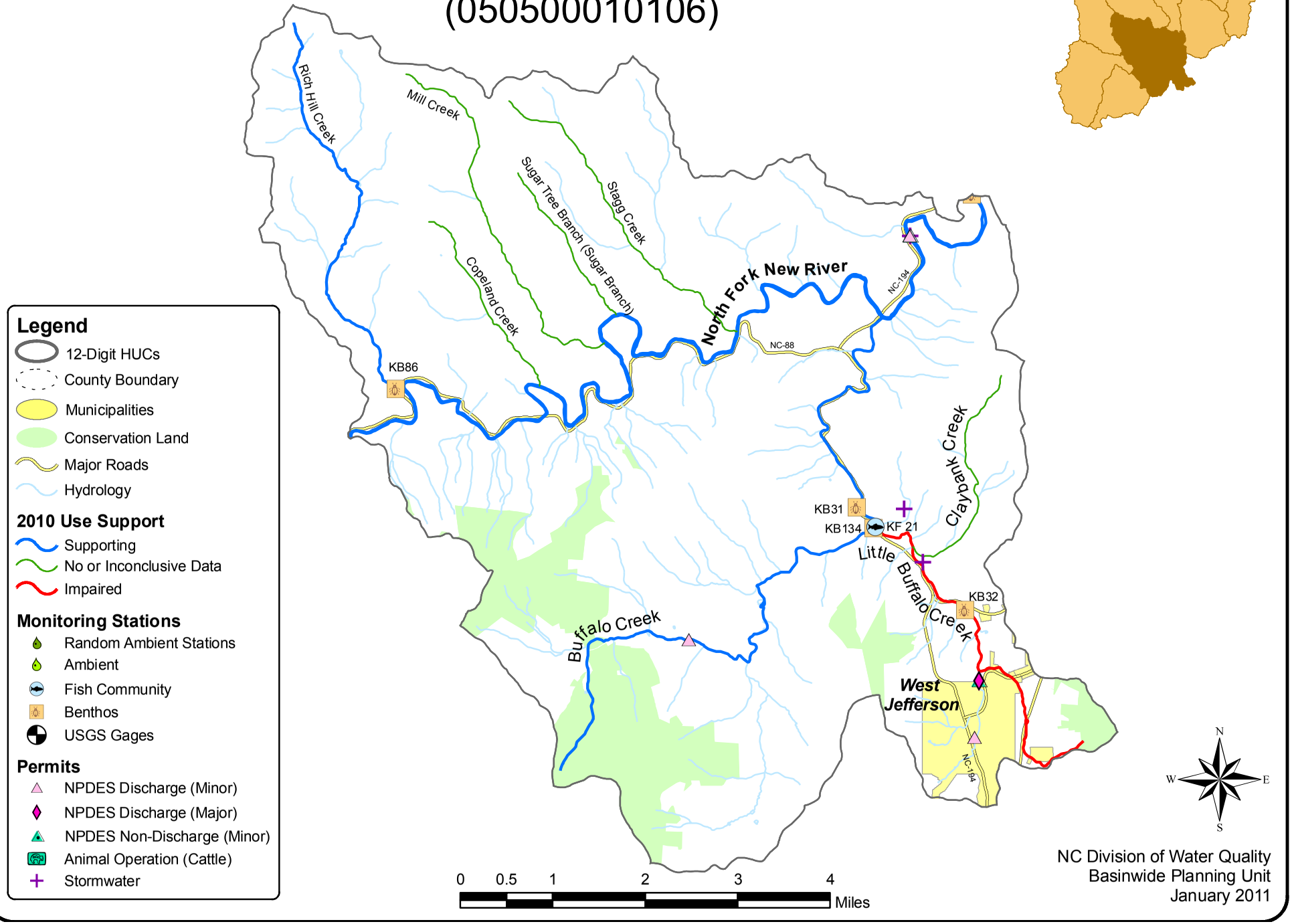
Basinwide Planning Unit
January 2011

1-D.6

Upper North Fork New River Subwatershed (050500010106)



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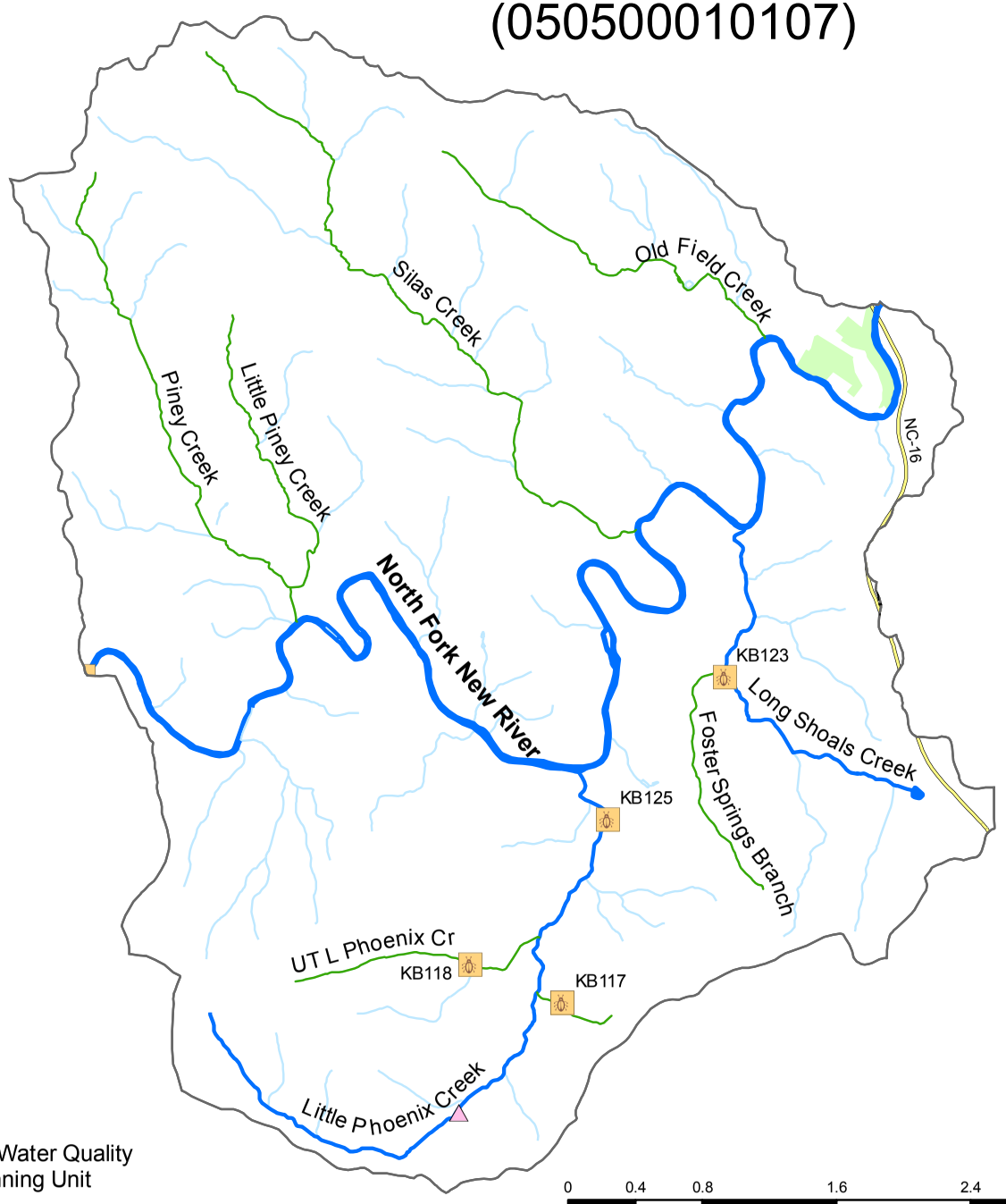
Basinwide Planning Unit
January 2011

Middle North Fork New River Subwatershed (050500010107)



Legend

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

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

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

Permits

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

N W E S

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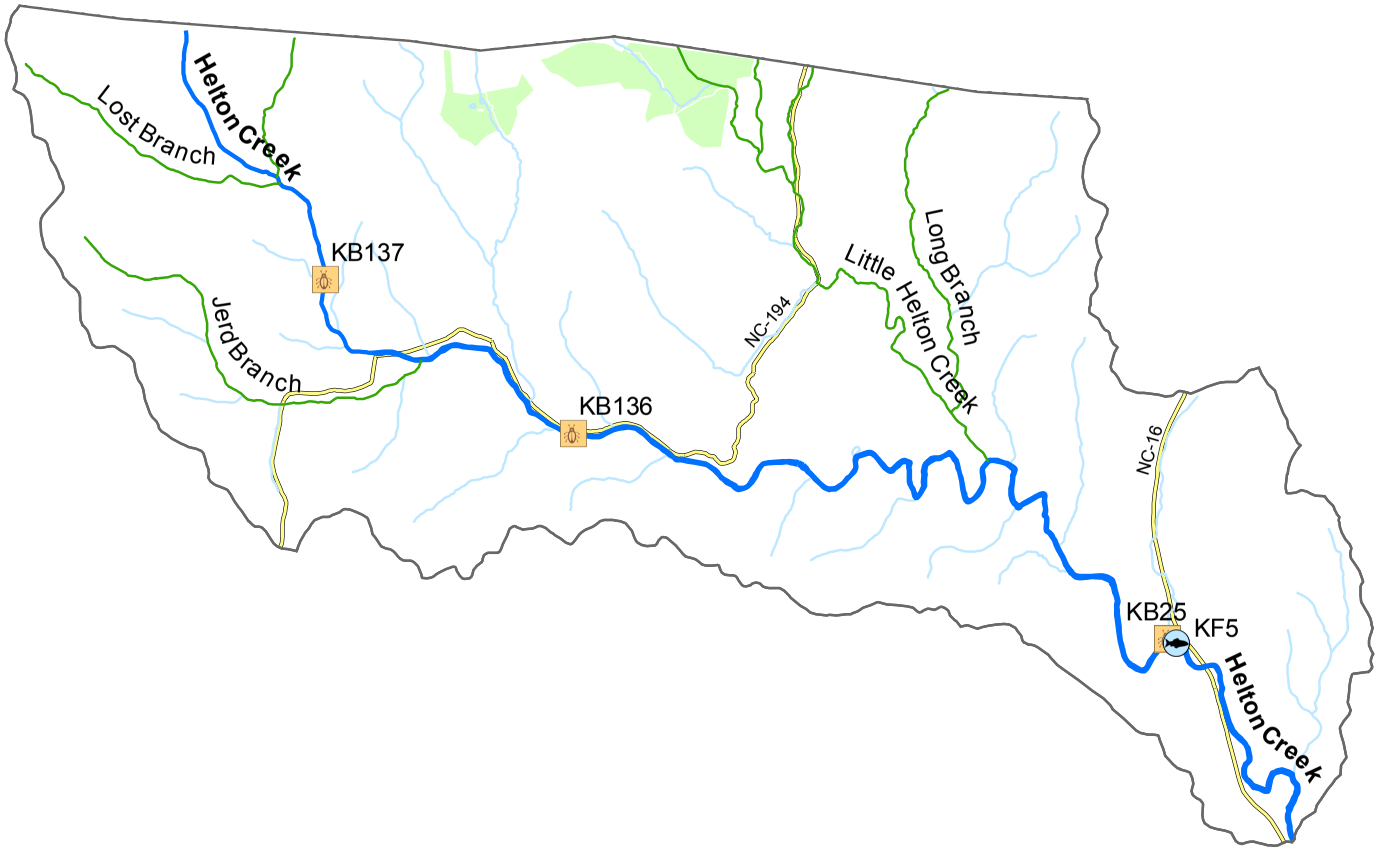
Basinwide Planning Unit
January 2011

1-D.8

Helton Creek Subwatershed (050500010108)



Legend

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

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

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

Permits

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

N W E S

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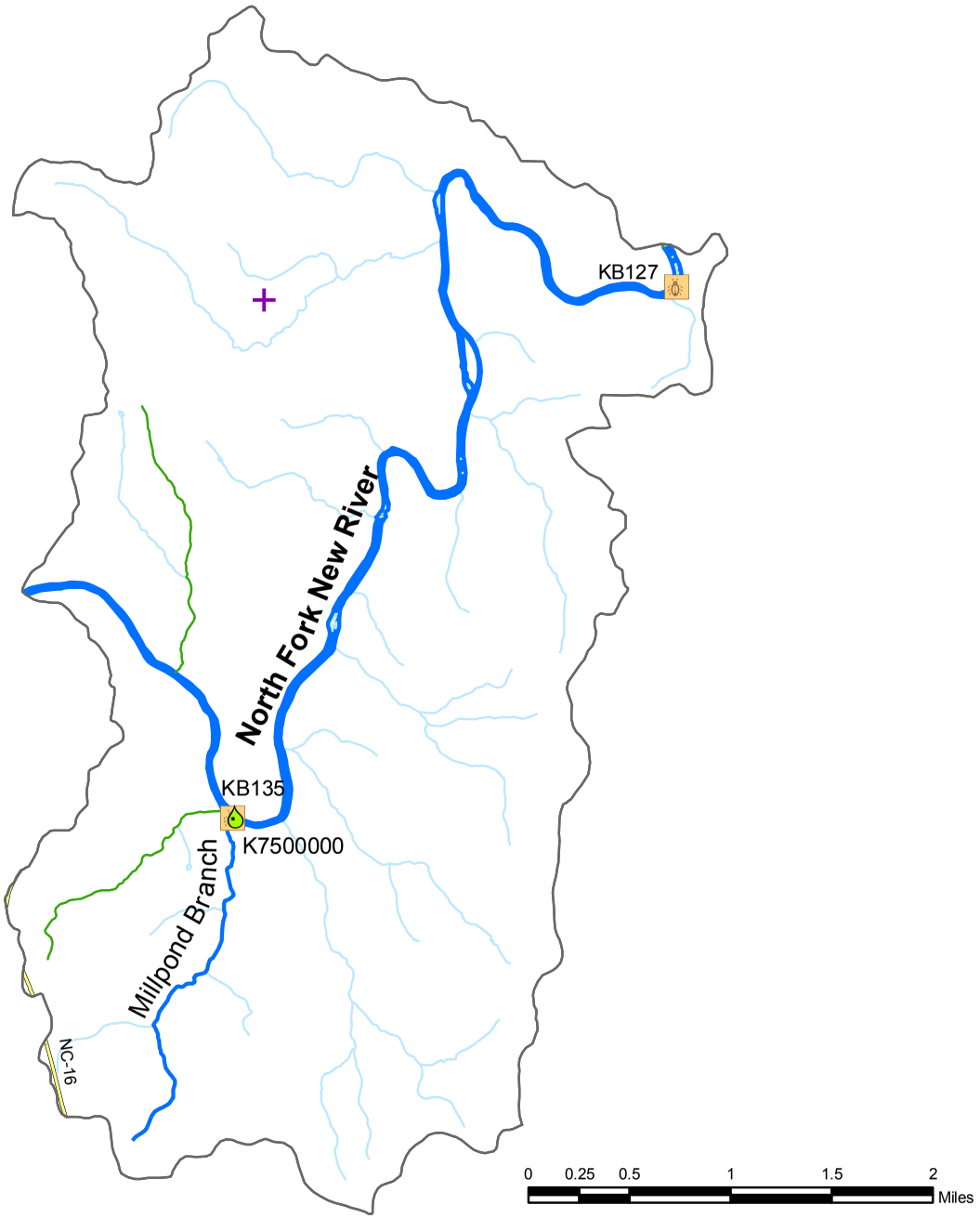
Basinwide Planning Unit
January 2011

0 0.4 0.8 1.6 2.4 3.2 Miles

1-D.9

Lower North Fork New River Subwatershed (050500010109)



Legend

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

2010 Use Support

- Supporting
- No or Inconclusive Data
- Impaired

Monitoring Stations

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

Permits

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

N W E S

NC Division of Water Quality
Basinwide Planning Unit
January 2011

1-D.10