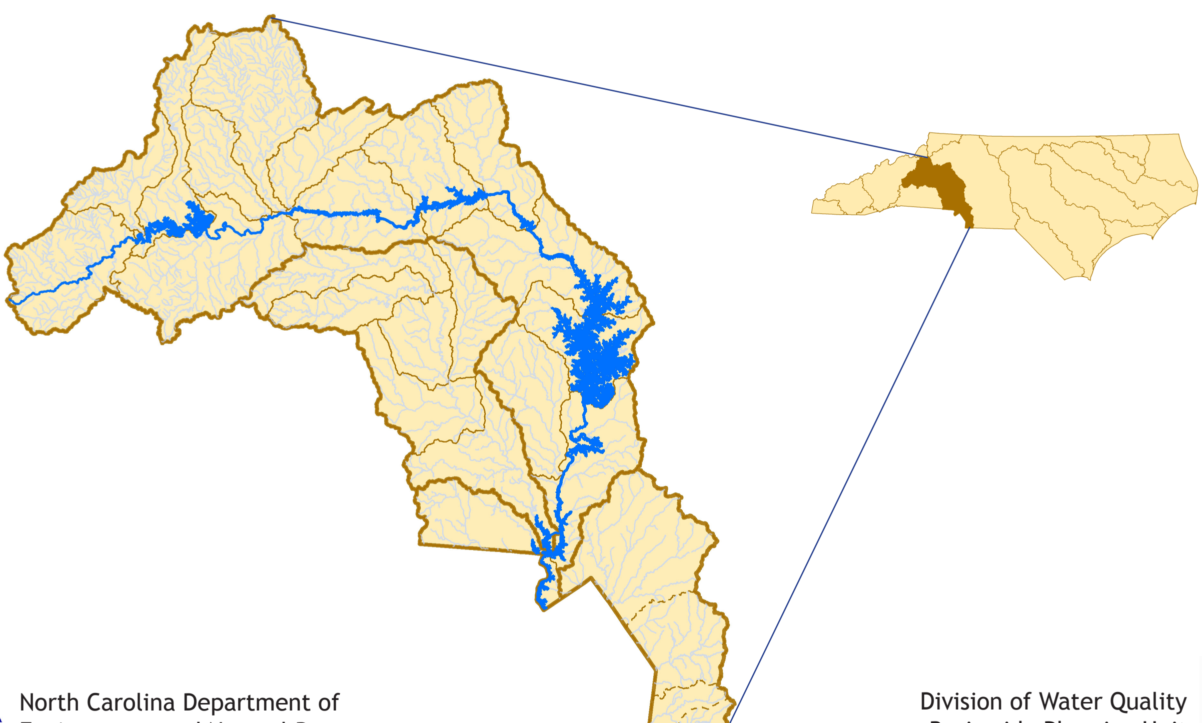
Catawba River Basinwide Water Quality Plan

September 2010



NCDENR
North Carolina Department of
Environment and Natural Resources

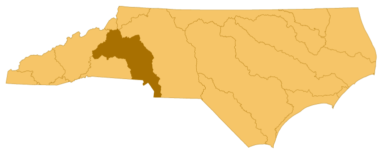
Division of Water Quality
Basinwide Planning Unit

Basin Overview

Of The Catawba River Basin

Chapter Topics

- Water Quality Data
- Basin Water Quality Assessment
- Basin Issues
- Population & Land Cover
- Recommendations
- Impaired Waters List



River Basin Description

The Catawba River Basin, along with the Broad River Basin, forms the headwaters of the Santee-Cooper River system. This river system begins on the eastern slopes of the Blue Ridge Mountains in NC, flows through the NC piedmont to the NC-SC border near Charlotte, and continues to flow through South Carolina to the Atlantic Ocean.

The mainstem of the Catawba River is regulated by a series of seven hydropower reservoirs: Lake James, Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake, and Lake Wylie. Lake Wylie crosses the border of NC and SC. There are 3,005 miles of named and classified freshwater streams and over 60,000 freshwater impoundment acres within the NC portion of the Basin.

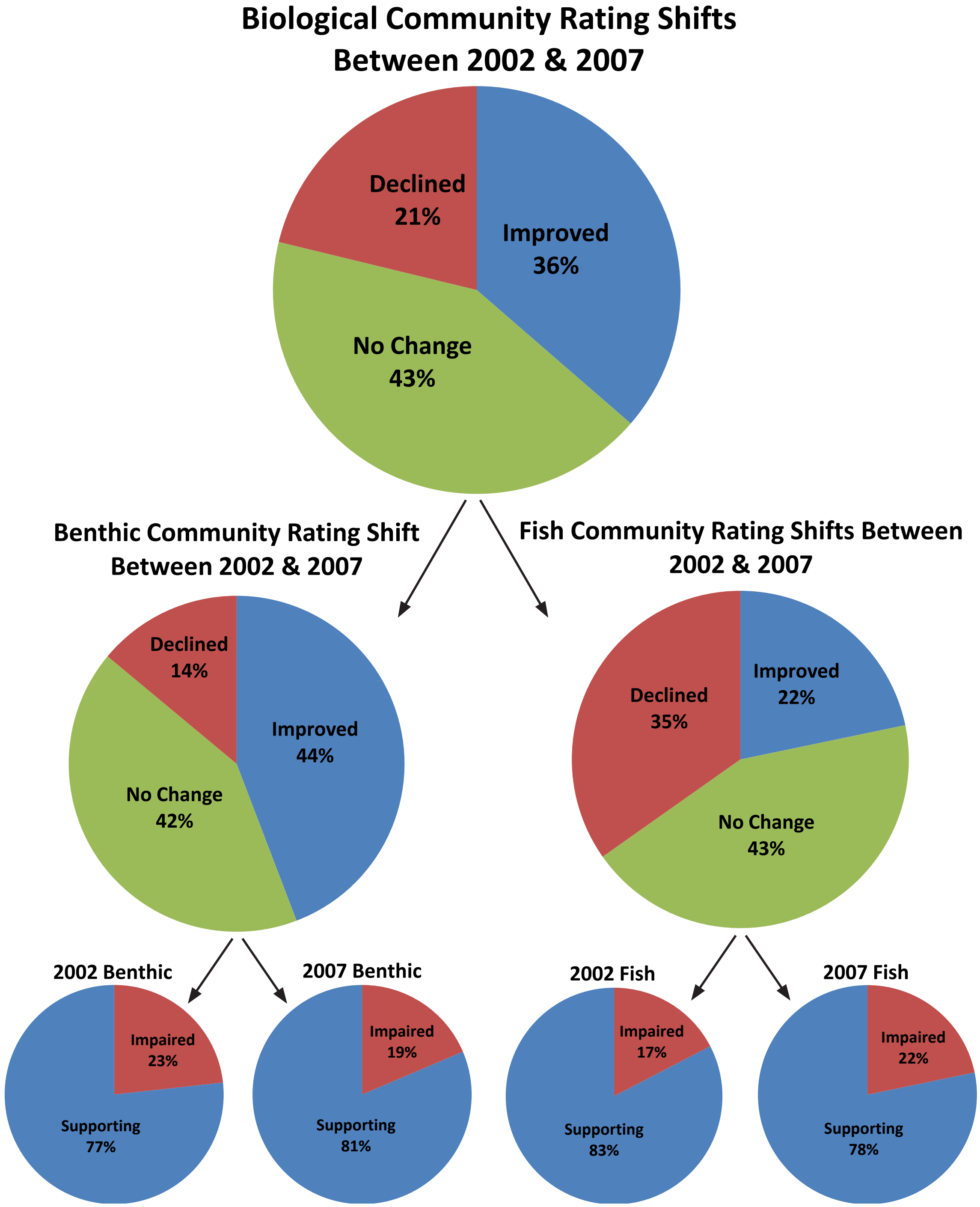
Water Quality Data Overview

Biological Monitoring

Biological samples were collected during the spring and summer months from 2003 and 2007 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle. Overall, 91 biological sampling sites were monitored within the Catawba River Watershed. Of those 91 sites, 47 were benthic stations and 44 were fish community stations. Twenty-one of the biological sites were sampled for the first time during this cycle. Each site is given a rating or bioclassification of Excellent, Good, Good-Fair, Fair, Poor or Not Rated. Excellent, Good, Good-Fair, and Not Rated are ratings given to streams that are Supporting aquatic life. Streams that are given a Fair or Poor rating are Impaired and do not support aquatic life. A table listing each biological monitoring station and its respective ratings for the current cycle (2003-2007) and the previous sampling cycle (1998-2002) can be found in each Subbasin Chapter.

Figure 10 shows a comparison of biological ratings for sites monitored during both the current and past sampling cycles. The majority (43%) of biological sites were given the same rating during the current cycle as they had in the past cycle. Thirty-six percent of the biological sites improved their rating by one or more level(s) (e.g.: Poor to Fair or Good-Fair to Good) and 21% decreased in rating between cycles. The last row of pie charts in Figure 1 gives a comparison of the percent of sites that were deemed Supporting or Impaired based on the biological rating for each of the two cycles. The only sites compared for this analysis were ones sampled during both cycles.

Figure 1: Biological Rating Shifts for Sites Monitored During This Sampling Cycle & the Previous

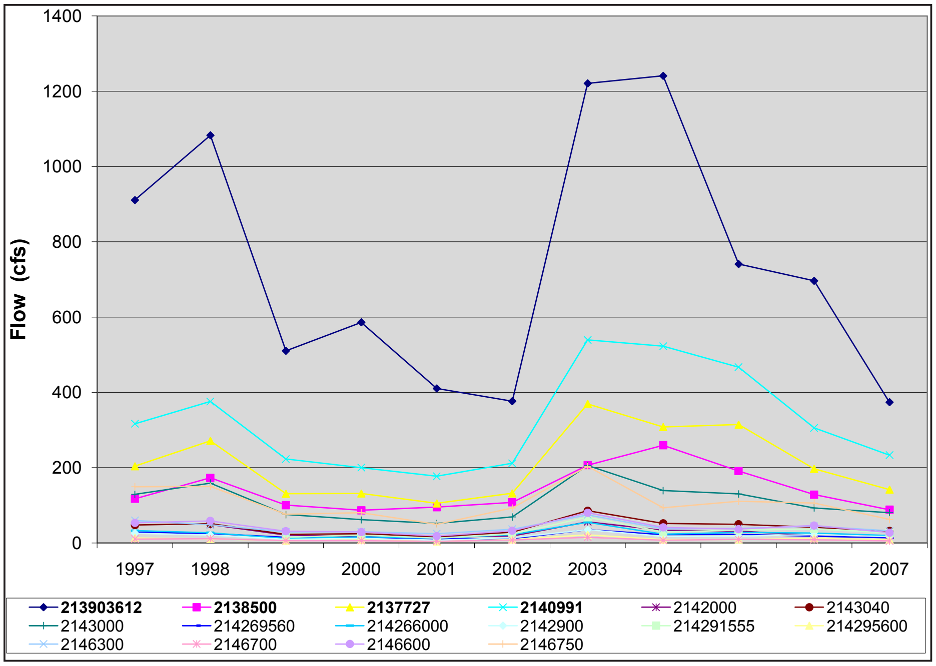


Stream Flow & Drought

The rate at which a volume of water moves through a stream (the flow rate) can have a negative impact on water quality. In particular, droughts can have major effects on water quality parameters such as dissolved oxygen, turbidity, pH, and other parameters due to extremely low stream flow. Therefore, it is useful to track changes in stream flow over the course of the assessment period to see when drought or high flow events might be present. A significant drought affected the Catawba River Basin from spring 2007 to fall 2008.

Figure 2 shows the yearly averages for the USGS gage stations spread through the basin between 1997 and 2007. It can be seen in this graph how the 1999 to 2002 drought, heavy rain events in 2003 and the three hurricanes that occurred from 2004 to 2005 effected streams across the Catawba River Basin during this time period.

Figure 2: Yearly Average Flow Rates of USGS Gage Stations in the Catawba River Basin, 1997 - 2007



Station Locations:
213903612: Catawba River at Calvin NC
2138500: Linville River near Nebo, NC
2137727: Catawba River near Pleasant Gardens, NC
2140991: Johns River at Arneys Store, NC
2142000: Lower Little River near All Healing Springs, NC
2143040: Jacobs Fork at Ramsey
2143000: Henry Fork near Henry River
214269560: Killian Creek near Mariposa
214266000: McDowell Creek near Charlotte
2142900: Long Creek near Paw Creek
214291555: Long Creek near Rhyne
214295600: Paw Creek at Wilkinson Blvd near Charlotte
2146300: Irwin Creek near Charlotte
2146700: McMullen Creek at Sharon View Rd.
2146600: McAlpine Creek at Sardis Rd near Charlotte
2146750: McAlpine Creek Below McMullen Creek near Pineville

Chemical/Physical Monitoring

Chemical and physical samples are taken by DWQ throughout the basin once a month. A majority of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities. Parameters collected at each site depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrient measurements, metals, and fecal coliform bacteria. Each classification has an associated set of standards the parameters must meet in order to be considered as supporting its designated uses. For more information on waterbody classifications, see Section 2.2 of the *Supplemental Guide to North Carolina's Basinwide Planning*. Ten sample results are required within the five-year data collection window in order to evaluate a water quality parameter and compare it to the water quality standards. For more information about ambient monitoring and seasonal variation in this basin, see the *Catawba River Basin Ambient Monitoring System Report*.

In the present sampling cycle (2004 - 2008), 32 Ambient Monitoring System (AMS) stations collected ten or more samples and were used for use support assessment. Six of those stations were discontinued at the beginning of 2007 to allow for the addition of Random Ambient Monitoring System (RAMS) stations. There were four RAMS stations sampled within the basin between 2007 and 2008, two located in subbasin 03050103, one in 03050102 and one in 03050101.

Twenty-one of the ambient stations are rated Impaired for exceedances of state standards (See Figure 16 through Figure 21 at the end of this Chapter). A station is rated Impaired if 10.1% of the samples collected in a given sampling cycle are over the State's standards for any given parameter. For example, if 10.3% of samples taken between 2004 and 2008 are over the 50 NTU standard for turbidity, that stream segment is then rated as Impaired and placed on the 303(d) Impaired Waters List.

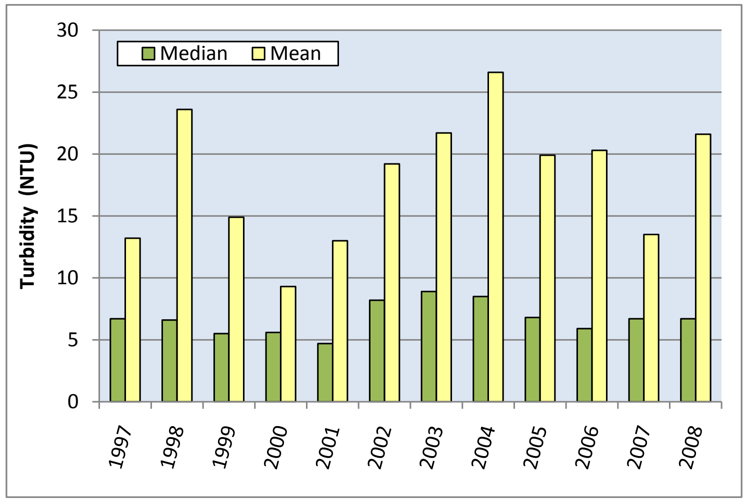
Three major parameters of concern for the Catawba River Basin are turbidity, low pH, and copper. Each of these parameters as well as dissolved oxygen (DO), temperature, and fecal coliform bacteria (FCB) are discussed below to show changes over the course of 12 years. Each parameter discussion includes graphs showing the median and mean concentration values for all ambient stations in the basin from 1997 to 2008. These graphs are not intended to provide statistically significant trend information, but rather to demonstrate how changes in land use conditions or climate conditions can impact parameters 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 2002 and 2007 by DWQ and can be found in the *Ambient Monitoring Report*.

Turbidity

The NC standard for turbidity in freshwater streams is 50 NTUs. Twelve stream segments are Impaired for turbidity in the basin. The highest percents of samples exceeding the standard during this cycle are located around developing areas (Figure 16 at the end of this Chapter).

Figure 3 shows the mean and median of turbidity levels for all samples taken over the course of 12 years in the Catawba River basin. The highest turbidity average was measured in 2004 when stream flow was highest as well. Peaks in turbidity levels are closely related to stream flow peaks. The heavier the rain event, the more sediment is washed off the land and into the streams. Therefore, extra precautions should be taken during heavy rain events to recapture sediment before it leaves a property or reaches a stream.

Figure 3: Summarized Turbidity Values for All AMS Data Collected in the Catawba Basin

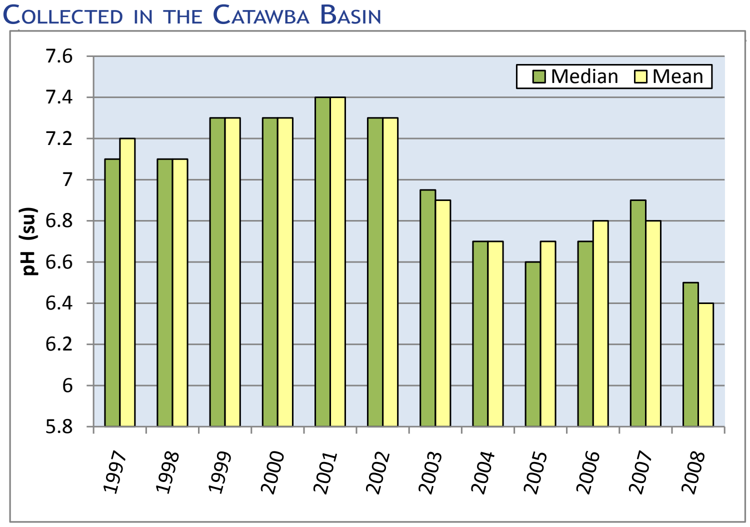


pH

The water quality standard for pH in surface freshwater is 6.0 to 9.0 su. Ten stream segments are Impaired for low pH in the basin. The stations with samples exceeding the standard during this cycle are scattered throughout the basin and not located in any one particular area (Figure 17 at the end of this Chapter).

Figure 4 shows the mean and median of pH levels for all samples taken over the course of 12 years in the Catawba River basin. The overall basin trend appearing during this 12 year period is a significant decrease in pH beginning in 2003. The lowest pH yearly average for the basin (between 1997-2008) occurred in 2008. During that year the lowest values were sampled in subbasin 03050102. The causes of the dramatic decline in pH value is discussed further in the *Basinwide Low pH Trend* below.

Figure 4: Summarized pH Values for All AMS Data Collected in the Catawba Basin



Copper

The NC standard for copper in freshwater is 7 µg/l. Eight stream segments are Impaired for copper in the basin. Copper and zinc were recently added to the list of parameters for which a stream may be designated as Impaired if exceeding a standard and placed on the 303(d) Impaired Waters list. Therefore, those streams added to the 2008 or draft 2010 Impaired Waters list may have been exceeding the standard previously. The highest percents of samples exceeding the standard during this cycle are located in the lower portions of the basin around urban centers (Figure 18 at the end of this Chapter).

Figure 5: Summarized Copper Values for All AMS Data Collected in the Catawba Basin

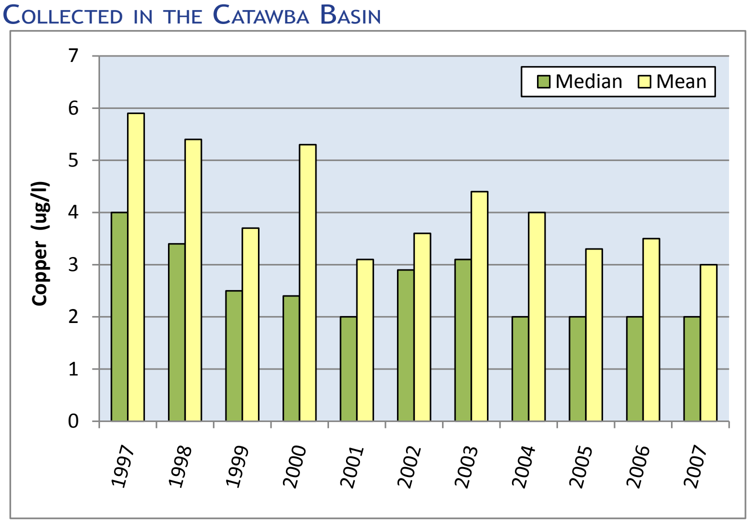


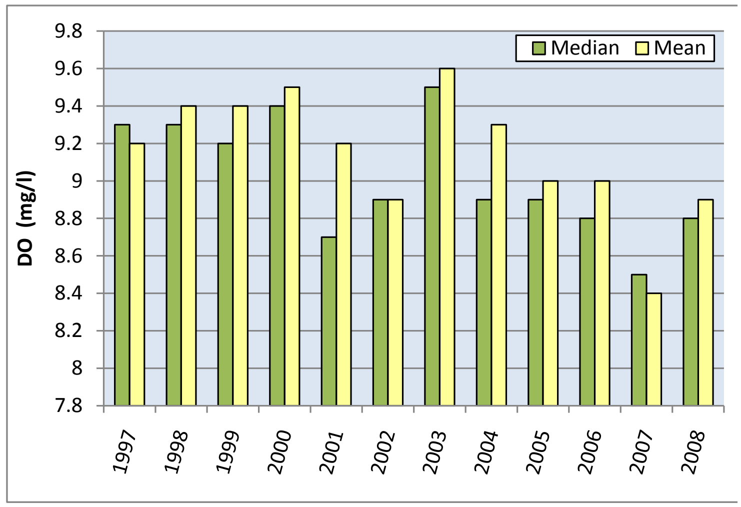
Figure 5 shows the mean and median of copper levels for all samples taken over the course of 11 years in the Catawba River basin. The highest copper average was in 1997. The levels of exceedances between 1997 and 2007 have almost been cut in half. In September of 2000, metals sampling decreased in frequency from monthly to quarterly and the use of a more sensitive instrument to measure copper was implemented which may explain the downward trend between 1999 and 2001. Metals sampling was temporarily suspended in May 2007. When comparing this graph to the stream flow averages for these 11 years, copper appears to be closely linked to stream flow. The trend seen in Figure 5 shows the average copper levels throughout the basin have declined over time.

Dissolved Oxygen

The NC standard for DO in freshwater is no less than a daily average of 5.0 mg/l with a minimum instantaneous value of no less than 4 mg/l. No stream segments are Impaired for DO in the basin. The stations with only a few samples not meeting the standard during this cycle are seen around the major urban centers in the lower parts of the basin (Figure 19 at the end of this Chapter).

Figure 6 shows the mean and median of DO levels for all samples taken over 12 years in the Catawba River basin. The lowest DO average was recorded in 2007. When comparing this graph to the stream flow averages for these 12 years, DO appears to be closely linked to stream flow. The trend in this graph shows the average DO levels in the basin are normal.

FIGURE 6: SUMMARIZED DO VALUES FOR ALL AMS DATA COLLECTED IN THE CATAWBA BASIN



Temperature

NC water quality standards state that discharge from permitted facilities should not exceed the natural temperature of the water by more than 2.8°C (5.04°F) and that waters should never exceed 29°C (84.2°F) for the mountain and upper piedmont regions. The discharge of heated liquids to trout waters (Tr) should not increase the natural water temperature by more than 0.5°C (0.9°F), and in no case, exceed 20°C (68°F). The only station in this watershed to exceed state standards during this cycle was C7000000 - South Fork Catawba River. The stations with samples exceeding the standard during this cycle are mostly seen in the lower portion of the basin (Figure 20 at the end of this Chapter).

FIGURE 7: SUMMARIZED TEMPERATURE VALUES FOR ALL AMS DATA COLLECTED IN THE CATAWBA BASIN

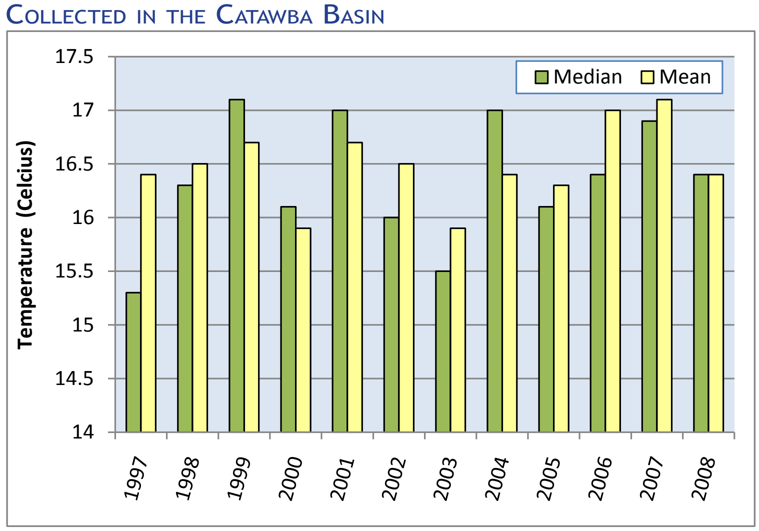


Figure 7 shows the mean and median of temperature levels for all samples taken over 12 years in the Catawba River basin. The highest temperature average is seen in 2007, which was a year of severe drought. During years with severe drought and high summer air temperatures, standard exceedances are to be expected.

Fecal Coliform Bacteria

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 over a span of 30 days. Only results from five samples in 30 days (5-in-30) are to be used to indicate whether the stream is Impaired or Supporting. Fifteen out of the 32 ambient monitoring stations in the basin recorded FCB levels above a geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of AMS samples taken between 2004 and 2008 (not based on 5-in-30's). The stations with the highest percentage of samples exceeding the standard during this cycle are scattered throughout the basin and are not localized to any one particular area (Figure 21 at the end of this Chapter).

Figure 8: Summarized FCB Geometric Means for All AMS Data Collected in the Catawba Basin

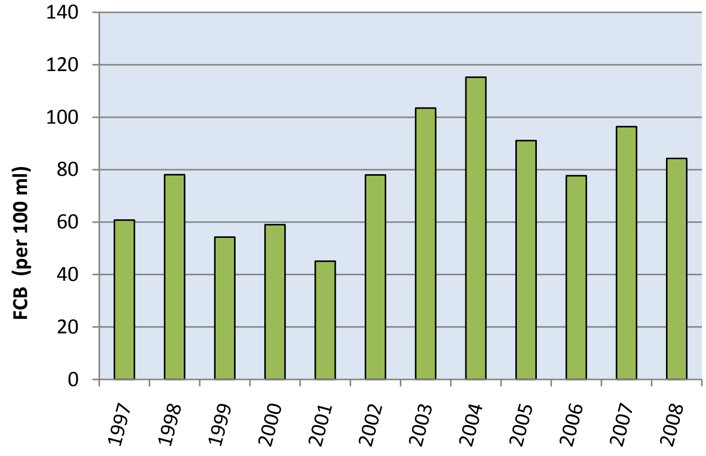


Figure 8 shows the geometric mean of FCB levels each year for all samples taken over 12 years in the Catawba River basin. The highest FCB geometric mean is seen in 2004 which was a year with above average flows. Peaks in FCB levels are closely related to stream flow peaks, as was the case in 2004.

Subbasin Overview

Catawba River Headwaters - 03050101

Water quality within this subbasin is influenced by land use and population. Water quality is generally better in the upper non-developed regions and more impacted in the lower portion of this subbasin near urban centers. Due to its large size, there are multiple overall water quality issues impacting this subbasin. The upper headwaters are facing development pressure from the increasing demand for second homes and golf club communities. The Lake Rhodhiss and Hickory watersheds are experiencing impacts mostly from converting agricultural lands to urban areas, livestock operations, row crop and ornamental nurseries, stormwater runoff, and point source pollutants. The lower portions of this subbasin are impacted by stormwater runoff from densely populated areas, failing septic systems, and out-dated wastewater treatment facilities.

Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess the extent of certain issues, developing implementation plans as well as making necessary upgrades to out-of-date WWTP's. Many of these efforts are currently on-going; however, others have already resulted in measurable water quality improvements. Refer to the *Chain of Lakes Chapter* for information about the past and present water quality of the lakes and current management strategies.

Success Story

The Left Prong Catawba River [AU#: 11-6] was being threatened by sediment-laden runoff from two large home construction projects during the 2004 plan assessment period. One project was found to be operating without the proper permits. As recommended in the 2004 plan, DWQ and Division of Land Resources (DLR) worked with the land owners to bring both properties into compliance with proper permits and properly constructed erosion control measures. The Left Prong was given an Excellent benthic rating in 2007.

South Fork Catawba River - 03050102

Water quality within the South Fork Catawba River Subbasin is influenced by population and land use. Water quality is generally better in the upper non-developed regions and degraded in the lower portion of this subbasin near the urban centers. The major water quality issues in this subbasin include urban development, excess nutrient loading and nonpoint source runoff. The subbasin headwaters are experiencing impacts from urban and agricultural stormwater runoff, excess fecal coliform bacteria levels and low pH. These impacts accumulate as water flows downstream with additional impacts from WWTPs as well as failing septic systems. The lower South Fork Catawba River, as it flows into Lake Wylie, receives nutrient enriched discharge from point sources and agricultural runoff. Fecal coliform bacteria and turbidity levels increase in the lower portion of the subbasin where urban sprawl consumes agricultural and forested areas.

Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess certain watersheds and develop implementation plans to deal with these issues. Many of these efforts are currently on-going and others are already resulting in measurable water quality improvements. The Soil & Water Conservation Districts have installed numerous best management practices mostly between NC-10 and NC-150 to address many of the agricultural impacts. The Ecosystem Enhancement Program has also focused efforts in that area on monitoring and restoration projects.

Catawba River - 03050103

Water quality within the Catawba River Subbasin is influenced by land use practices and densely populated areas with large amounts of impervious surfaces which are focused in the upper portion of this subbasin. This subbasin had the highest levels of nutrients and fecal coliform bacteria measured within the Catawba River basin. These impacts as well as high turbidity levels are common for large urban areas. The lower portion of this subbasin had high levels of turbidity due to increasing development. This portion also includes the Waxhaw Creek watershed which DWQ has recognized as one of the most biologically important aquatic habitats in the basin due to the presences of the endangered Carolina Heel Splitter mussel.

Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess some of these issues and develop implementation plans to deal with these impacts. Many of these efforts are currently on-going and others have been completed and resulted in measurable water quality improvements.

Success Story

Little Sugar Creek, which runs through downtown Charlotte, once was covered by parking lots, but has steadily been uncapped and daylighted by Charlotte-Mecklenburg's Stormwater Services and EEP. The section that has been uncapped is now lined with trees and native grasses to create a buffer effect, preventing erosion and filtering pollution. Once this project is completed, Little Sugar Creek will be daylighted from 7th Street to Morehead Street and will include a new greenway which will follow the entire portion of the newly restored creek.

Catawba Chain of Lakes

Five lakes (James, Rhodhiss, Hickory, Norman and Wylie) out of the seven within the chain of lakes were sampled by DWQ-ESS in 2007 as per the regular five year lake sampling cycle. The entire chain is located within the 03050101 Catawba River Headwater Subbasin. Water quality within the chain of lakes is influenced by land use practices in each of the watersheds draining to the lake as well as point sources near the lakes. The 2007 drought also had an effect on water quality in the small lakes along the chain. Parameters of concern in three out of five of the lakes include pH and chlorophyll *a*. Elevated nutrient levels from point and nonpoint sources are impacting Lakes Rhodhiss, Hickory and Wylie.

Recommendations for the Chain of Lakes includes increased educational efforts about the Catawba River basin buffers, additional agricultural BMPs for nearby farms, and voluntary nutrient monitoring for point sources with discharge pipes in or near the lakes. A monitoring coalition, similar to the Upper Cape Fear, would be beneficial to this area. Action plans were developed for Lake Rhodhiss and Lake Wylie to assist with the reduction of nutrients reaching the lakes. More detailed information about water quality in the chain can be found in the *Chain of Lakes Chapter.*

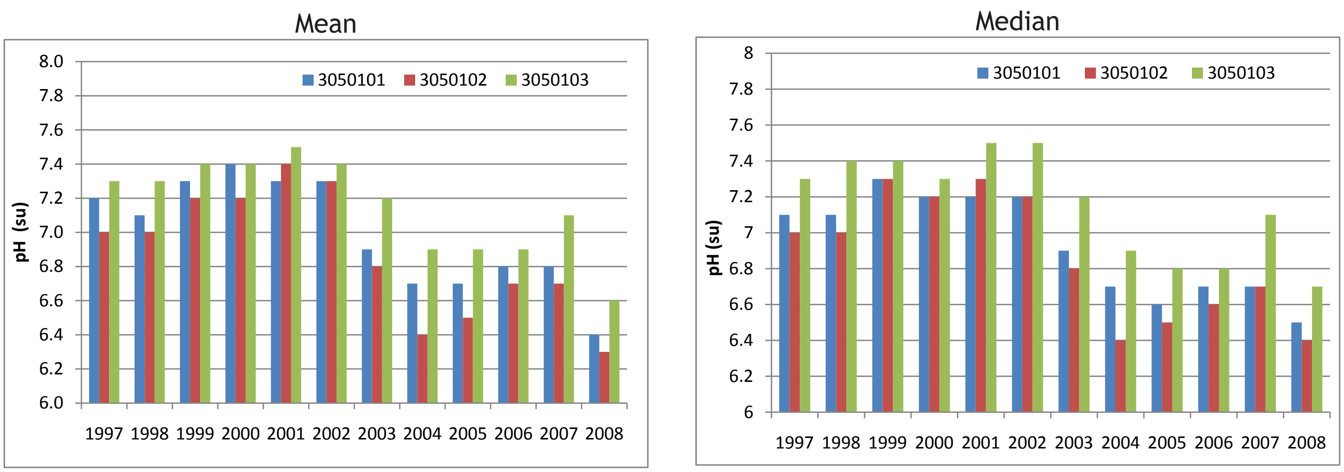
Basin Issues

This section contains discussion of issues impacting water quality across the Catawba River Basin. Topics presented here are intended to stimulate discussion among environmental professionals and other interested parties as to what additional studies (if any) need to be done and to begin planning restoration efforts, if possible. These issues are also presented to inform those within the basin of the big-picture impacts that effect basinwide water quality. This should assist local stakeholders and champions in focusing efforts on what will not only improve water quality in their area but throughout the basin. (Some recommendations are included but most topics are informational items at this time.)

Basinwide Low pH

Throughout the basin, pH levels have noticeably dropped, beginning in 2002 (see Figure 9). This decrease might have been caused by one or more factors or a combination of factors such as stream flows, atmospheric deposition, development impacts, or decreased buffering capacity. Figure 10 shows this drop in pH for each ambient monitoring station in the Catawba River basin over a 12 year period. Equipment malfunctions are currently being evaluated by DWQ and are not expected to be the cause for all observed low measurements. Other State and Federal agencies have also found low pH levels throughout the western portion of the state and Tennessee. This indicates the issue is not basin specific and may be a larger scale concern.

Figure 9: pH Annual Means (Left) & Medians (Right) by Subbasin between 1997 & 2008

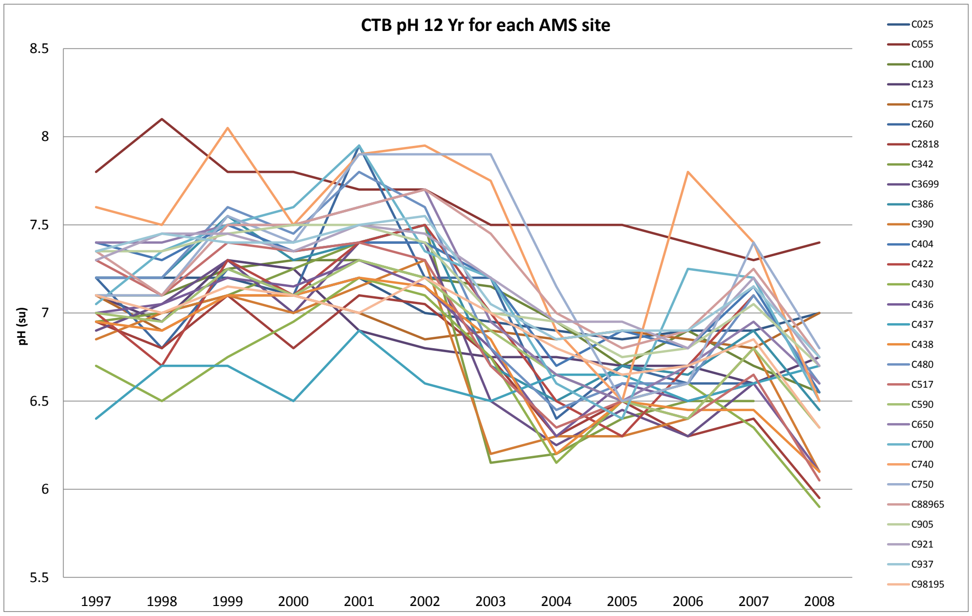


DWQ has recently formed a partnership with Tennessee, the National Park Service (NPS) and the US Forest Service (USFS) to begin discussions of low pH levels emerging in the southeast. The National Park Service is working with the Tennessee Department of Environment & Conservation and the EPA to develop a TMDL for pH impaired streams in the Great Smoky Mountains National Park. The Great Smoky Mountains Air & Water Quality Program has established a baseline of air and water conditions using 20 to 30 years of monitoring data that will be compiled and used for model development and implementation plans. The Program will be determining status and trends of the data, compliance with air and water quality standards, and identifying any links to biological effects. Through this process the Program hopes to determine the sources of pollution and provide early warning signs of abnormal conditions or trends. Analysis thus far has shown that areas with higher elevations typically have the lowest pH averages and the highest nitrogen and sulfur deposition levels. Over 50% of the park's streams have an average pH of less than 6.5 su. Levels in streams above 3,500 feet are projected to continue to decline in the future based on early modeling.

USFS has been evaluating sulfur deposition for three national forests in the southern Appalachians. Areas with the most risk from sulfur deposition are based on: 1) geology which influences the amount of bases available in the soil; 2) elevation which determines microbial activity levels, soil depth and amount of cloud deposition; and 3) if sulfur is present in the rock that is being weathered into soil or if sulfur is being retained in soils as it is deposited from the atmosphere. USFS has collected data along the western edge of North Carolina. The data trends have shown, like the NPS' findings, that the chronically acidic streams are in the higher elevations.

DWQ will continue working with Tennessee, EPA, NPS and the USFS in efforts to find sources of the low pH and develop an implementation plan. Tennessee's Acid Neutralizing Capacity TMDL will be on public notice April - June 2010. The NPS is funding air modeling to aid in the TMDL implementation. Both the NPS and USFS will be submitting data for DWQ to consider for use support assessments for the 2012 303(d) Impaired Waters list.

Figure 10: pH Yearly Medians for Each AMS Station Within the Catawba River Basin Between 1997 & 2008



Additional ambient monitoring station information can be found in the back of each subbasin chapter of this document.

Effects of Stormwater Volume & Velocity

It is widely known that stormwater can have severe impacts on surface water quality; however, the impacts that most focus on are pollutants and excess nutrients that the stormwater transports. DWQ Regional Office staff have become increasingly concerned with the volume of stormwater within receiving streams and the increased stream flow velocity the extra volume can cause.

As impervious surface coverage increases with development, the amount of stormwater quickly begins to increase as well. In many areas of the state, stormwater flows directly off the land and into stormwater drainage pipes, which diverts the runoff through the pipes and into the nearest stream. This can cause the volume and velocity of some receiving streams to double within a matter of minutes after the start of a rain event. The high volume can increase the chances of flooding and when combined with a faster flow can cause severe streambank and aquatic life damage. High velocities can strip streambanks of vegetation, critical habitat and large amounts of sediment.

When stormwater is captured on site through a rain garden, stormwater runoff ponds or other methods and is allowed to drain into

Figure 11: Impacts of High Volume & Velocity Stormwater on Urban Streams (McDowell Creek)

the soil, the amount that reaches the stream nearest to that site is decreased and is that much less likely to cause further damage. Reducing stormwater runoff in this way not only helps reduce volume and velocity during storm events, it also assists in keeping the pollutants and excess nutrients out of the surface water.

Impacts From Poultry Farm Construction

As seen in *Section A: Chapter 2* of the 2004 *Catawba River Basinwide Water Quality Plan*, there has been a shift in animal operations from cattle to poultry within the basin since the mid 1990's. Impacts being seen by biologist, environmental professionals and local citizens from this shift to poultry farms is sediment filling in nearby streams. Agricultural practices are exempt from having to complete a sediment and erosion control plan which is a state requirement for any land disturbing activity over an acre; however, if the operation participates in any federal farm government program, they may be required to meet soil erosion control goals or lose their program benefits. Poultry houses that are not participating in federal farm programs are not required to implement sediment and erosion controls and some are being constructed without proper controls in place to trap sediment on the property before it reaches the stream. Many of these poultry houses are located in the headwaters of the Catawba River Basin where high quality waters (HQW), outstanding resource waters (ORW) and trout waters (Tr) are also found. These water are usually very sensitive to the impacts of sedimentation.

At the urging of the NC Agriculture Task Force and NC Soil & Water Conservation Commission, the NC Poultry Federation is establishing operating guidelines and standards to address setbacks, site stabilization and other environmental concerns related to the construction of new poultry production facilities. It is recommended that poultry farmers voluntarily install sediment and erosion controls on the property during construction activities to reduce impacts from sedimentation. For more information about agricultural in the Catawba River Basin, see the *Agriculture Chapter*.

Septic Systems

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin (Pradhan et al., 2007). In 1990, the Catawba River basin had the highest septic system density average (53 systems/mi^2) on a river basin scale of all other basins (Figure 12). This is the only basin in NC exceeding the EPA suggested threshold of 40 systems/mi^2. The portion of subbasin 03050101 on the western side of the South Fork Catawba River had the highest septic system density of 96 septic systems per square mile. The study projected that the septic system density basinwide will continue to increase mostly around the fringes of large urban areas, major highways, waterfronts, and active recreational areas. Even though the amount of systems per square mile is high, the number of houses with systems verses houses connected to municipal treatment plants in the same area is relatively low.

The potential nitrogen loading has a particular importance to watersheds with elevated nutrient levels. The study found the basin to have the lowest percentage of septic systems per housing units (39%) of all 17 basins, it has the highest cumulative potential nitrogen loading on a unit area basis (lb N/yr/mi^2) of any other basin.

Figure 12: Density of Septic Systems for 17 NC River Basins, 1990 Census Block Group Data.

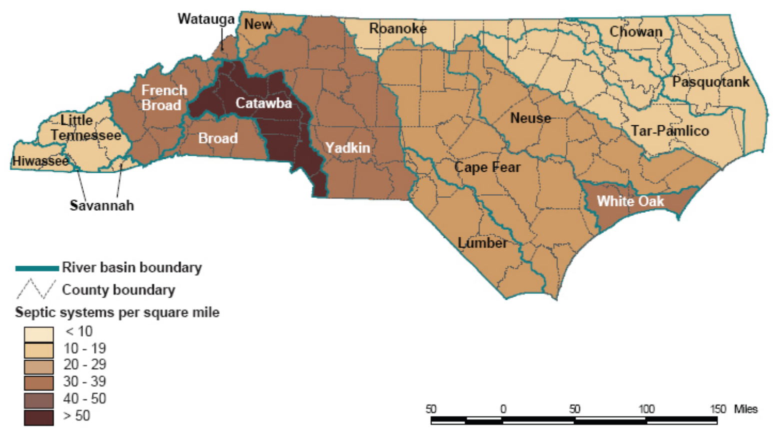
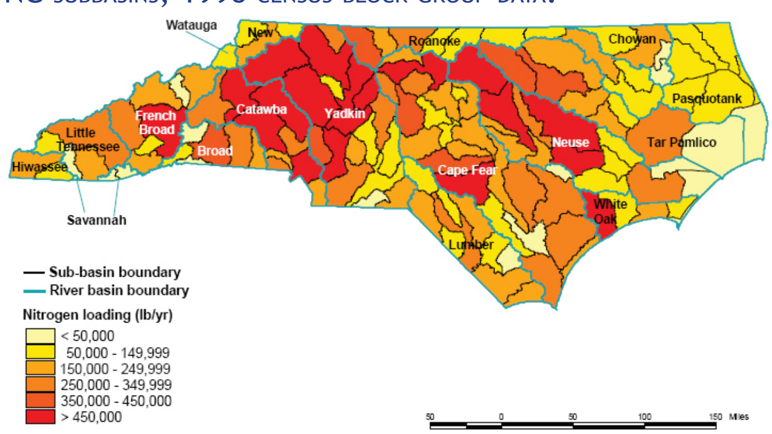


Figure 13: Cumulative Potential Nitrogen Loading for 134 NC subbasins, 1990 census block group data.



The results for this basin, based on 1990 census data, indicate a population of 406,797 people using septic systems resulting in a nitrogen loading of 4,067,971 lbs/yr and nitrogen loading rate of 1,272 lbs/mi^2/yr. These numbers reflect the total nitrogen discharged to the soil from the septic system and does not account for nitrogen used because of soil processes and plant uptake. For more information about this study on a subbasin scale, see the Subbasin Chapter related to your area of concern. The full study (*Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*) can be viewed on the North Carolina State University website or the link above.

Buffers in the Catawba River Basin

There are many different types of buffers within the Catawba River Basin, but they all have the same purpose: to reduce the amount of pollutants and excess nutrients running off the land and into surface waters. The types of buffers include trout, water supply, High Quality Waters, Outstanding Resource Waters and the Chain of Lakes buffers. The first four are based off of Primary and Secondary Use Classification. The Chain of Lakes buffers were initiated by the Environmental Management Commission to help protect the lakes against sedimentation and excess nutrients. These buffer types vary in width and have differing rules and regulations. These differences are described in their respective sections along with maps indicating locations within the basin.

DWQ recommends local governments take voluntary action to increase buffer requirements, as appropriate for that area; local requirements should be assessed with long term plans. As a community grows and the demand on water increases, whether for recreation, drinking or aesthetic purposes, the quality of the water will become more critical. By reducing the pollutants and nutrients entering a waterbody, municipalities will be able to spend less on filtering drinking water and keeping aquatic weeds from clogging intake pipes. Reducing nutrients will also reduce the chances of algal blooms which can impact recreational uses and discourage return visits. Another essential element of implementing successful buffers is public education. DWQ highly recommends and supports (where possible) educational efforts by local watershed groups and governments and agencies. For more information on buffers in the basin and further recommendation information, see the *Buffer Rules Chapter*.

Coal Ash Ponds

In June of 2009, EPA posted a list of potential "high hazard" impoundments containing coal combustion residuals (coal ash). These impoundments (ponds or basins) are used by electric utility facilities to hold power plant residuals. Of the 44 power plants on EPA's list as having a high hazard potential, three facilities with a total of five ponds are in the Catawba River basin. This designation indicates these facilities have the potential of causing human and environmental harm if the dams fail. Criteria for this designation include being near densely populated areas, downstream water supplies, or important public utilities, or primary highways.

The structures of these ponds has been previously regulated by the NC Utility Commission; however due to changes in regulations, the dams are now regulated and inspected by the DLR – Dam Safety Section. Now, the high hazard dams are inspected by the State every two years and low hazard dams are inspected every five years (Senate Bill 1004). DLR recently reported the findings of their most current inspection of the dams to the Environmental Management Commission. DLR inspected three facilities in the Catawba River basin which include the Allen Steam Station, Marshall Steam Station, and the Riverbend Steam Station; none of these facilities or any others in the state showed any signs of failure. Recommendations were made for voluntary actions that the facilities could take to ensure safety of the ponds. When DLR returned for a second round of inspections, the majority of recommendations had been completed and plans were made for further implementation of State recommendations.

In terms of water quality protection, DWQ regulates discharges from power company fly ash disposal ponds through out National Pollutant Discharge Elimination System (NPDES) permitting program. In addition, DWQ has gathered facility site information form the 14 power company locations in the state that have fly ash ponds. Included in the information are disposal areas for fly ash and other waste products, the location of compliance boundaries associated with activities that have the potential to impact groundwater, and proposed and existing groundwater monitoring well locations. DWQ is in the process of assessing the information received to determine what additional actions, if any are appropriate to ensure the protection of surface and groundwater resources at these sites.

South Carolina's Impaired Waters List

The Catawba River basin begins in NC but ends in South Carolina. It is not only important to know what is on North Carolina's 303(d) Impaired Waters list but also surrounding states which share our water. There is one major distinction between NC's Impaired Waters list and SC's, which is that SC impairs monitoring stations where NC impairs waterbodies based on monitoring station results. Table 1 lists each station, location, use and cause of Impairment for waters with significant portions in NC. Some of the SC stream segments have similar causes of Impairment as the corresponding NC segments; however, some are quite different. Please note that the table only lists a portion of the SC Catawba River Basin 2008 Impaired Waters List. The complete list can be found on the *SC Department of Health and Environmental Control*.

Table 1: South Carolina's 2008 Impaired Waters List of Streams Within the Catawba River Basin that are Monitored in North Carolina

Stream Name	Location	Station ID	Use[1]	Cause[2]
Lake Wylie	Above Mill Cr at end of S-46-557	CW-197	AL	Copper
Beaverdam Cr	At S-46-152, 8 miles east of Clover	CW-153	AL	Turbidity
Crowders Cr	at S-46-564 northeast of Clover	CW-023	AL	Copper
Crowders Cr	at S-46-1104	CW-024	AL	Biological
Lake Wylie	Crowders Cr arm at SC-49 and SC-274	CW-027	REC	Fecal Coliform Bacteria
Sugar Cr	Upstream of its confluence with McAlpine Cr	CW-246	AL	Biological
McAlpine Cr	at S-49-64	CW-064	AL	Biological
McAlpine Cr	at S-49-64	CW-064	REC	Fecal Coliform Bacteria

1. Use: use support category. AL - Aquatic Life; REC - Recreational. 2. Cause: is referred to in NC as Parameter of Impairment or POI.

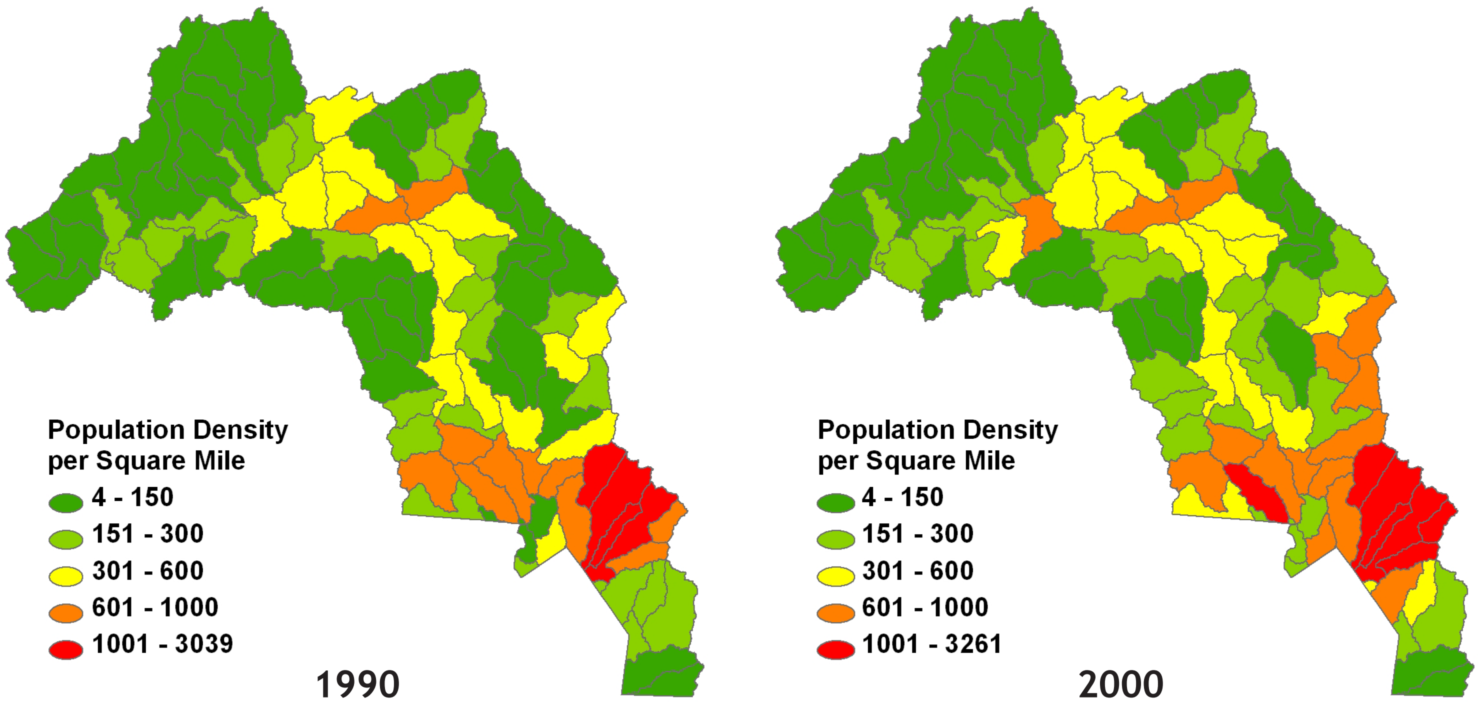
Population & Land Cover

Urbanization poses one of the greatest threats to aquatic resources. Small towns and communities are usually not considered urban centers, but even small concentrations of urbanization can have significant impacts on local waterways. For example, a one-acre parking lot produces 16 times more runoff than a one-acre meadow (Schueler and Holland, 2000). A wide variety of studies over the past decade converge on a central point: when more than 10 percent of the acreage in a watershed is covered in roads, parking lots, rooftops, and other impervious surfaces, the rivers and streams within the watershed become seriously degraded. Studies show that if urbanized areas cover more than 25 percent of a watershed, there is a point where the decline in the health of the ecosystem is irreversible (Beach, 2002; Galli, 1991).

Population

The 2000 census estimated population for this basin is 1,314,897 and this number is estimated to increase to 1,912,098 (18%) by 2020 (Pate, 2009). As population increases, so does the demand for clean water from aquifer and surface water sources and for the land and water to assimilate wastes. Figure 14 shows how population per square mile changed on the 12-Digit subwatershed scale between 1990 and 2000. This figure also shows most growth is occurring around urban centers. For more information on how population impacts water quality, see *Chapter 12 of the Supplemental Guide to NC's Basinwide Planning*. A full page basin population map can be seen in the *Maps Chapter*.

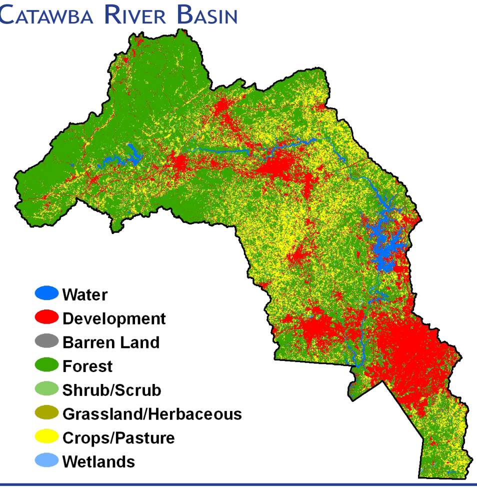
Figure 14: Population Density in the Catawba River Basin in 1990 (left) & 2000 (right)



Land Cover

Land cover across this basin is diverse in nature. The mountainous headwater region of the basin, which includes 223,500 acres of the Pisgah National Forest, is dominated by forested land. Moving south, the percent of agricultural land increases and urban areas are dominant in the lower portions of the basin. Overall, 55% of the basin is forested, 21% is developed, 19% is used for agriculture and 0.5% of the land cover is wetland area. The last 4.5% of land cover is scrub/shrub, grasslands or bare earth. Figure 15 shows the clustering of developed and forested areas and the scattered nature of agricultural areas within the basin (Homer, 2004). More information on land cover by subbasin can be found in each subbasin chapter. A full page basin land cover map can be seen in *Maps Chapter*.

Figure 15: 2001 Land Cover in the Catawba River Basin



Recommendations & Goals

Stream or watershed specific recommendations can be found in the respective Subbasin Chapters.

Table 2: Recommendations & Goals for the Upcoming Catawba River Basinwide Planning Cycle in Which DWQ Will Act as the Lead Agency

Recommendations/Goals	Responsible Parties	Action	By When
Source Study for Nutrients in the South Fork	ESS, MRO, BPU, etc.	DWQ will be working with other agencies to reevaluate the nutrient loading on the South Fork Catawba River to determine if the Lake Wylie TMDL should be altered.	November 2012
Additional Lake Monitoring	ESS	DWQ will continue current lake monitoring which consists of five sampling events per lake per cycle. When resources become available, DWQ will obtain an additional five samples starting with Lake Wylie and Rhodhiss.	October 2012
Investigate occurrence and cause(s) of low pH in Catawba River Basin.	Planning Section - Modeling & Basinwide, ESS, Regional Offices	Continue partnership with Tennessee, National Park Service & US Forest Service in efforts to find sources of low pH levels in the southeast and develop an implementation plan.	June 2013
Use fecal coliform bacteria exceedances to target management strategies including BMPs to reduce stream access by livestock and proper maintenance of septic systems	Planning Section - Basinwide & Regional Offices	Work with Soil and Water Conservation Districts and the Division of Environmental Health on identification and implementation.	July 2013
Implementation of the Lake Rhodhiss (Point source side) Nutrient Management Action Plan	NPDES, MTU, BPU, ARO, & specific WWTPs	DWQ will implement weekly effluent nutrient monitoring in the NPDES permits of the Morganton, Lenoir and Marion WWTPs within this permitting cycle. These facilities with addition of the Valdese WWTP should make all efforts to reduce nutrient loading to the lake. DWQ will then re-sample the lake for pH and nutrients to develop a TMDL for high pH if needed.	Summer 2011 December 2013
Evaluate need for additional protection of Lake Norman	CSU, BPU	DWQ will evaluated whether Lake Norman need additional protection to prevent degradation of the States largest lake or determine if local efforts are sufficient.	April 2011
Additional Sampling of Mountain Island Lake	ESS	DWQ will conduct additional sampling within the lake to determine the severity of the low pH impairment.	December 2010
Update implementation strategy for Lake Wylie Chlorophyll-*a* TMDL	Planning Section - Basinwide & Modeling along with ESS, Permitting & Regional Offices	Review status of Lake Wylie water quality and determine how implementation strategy is working and any modification that might be appropriate	December 2013
Assign Permit Limits per Lake Wylie TMDL	NPDES	The Mount Holly and Belmont WWTP's will be receiving NPDES permit limits as per the TMDL during the next permitting cycle.	Next Permitting Cycle
Consider expansion of Lake Wylie TMDL Management Area	MTU, BPU, NPDES	DWQ will consider whether the management area of the Lake Wylie TMDL should be expended to include Long Creek which flows into the South Fork Catawba River.	December 2013
Improve implementation of buffer rules through education and enforcement	Planning Basinwide Section & Regional Offices	Continued targeting of education efforts towards buffer rule implementation and understanding along with response to buffer violations.	On-going

Table 3: Non-DWQ Recommendations & Goals for the Upcoming Catawba River Basinwide Planning Cycle in Which DWQ will provide support efforts as needed

Recommendations/Goals	Responsible Parties	Action
Lower Creek TMDL Implementation	Lower Creek Advisory Team, EEP, DWQ	DWQ will work with parties involved to ensure implementation of BMPs which include educational efforts, sediment and nutrient reductions, erosion reductions, stream restorations, as well as many others to address reductions required in 2005 Turbidity TMDL.
Reduce high levels of fecal coliform bacteria in Lower Creek	EEP, ARO, Caldwell County SWCD, BPU, City of Lenoir	DWQ's Asheville Regional Office will be conducting a routine inspection of the City of Lenoir's wastewater collection system in coordinated efforts with the city to assist in finding leaks and pipe failures. DWQ, along with EEP and the City of Lenoir, will also be working with Caldwell County SWCD to find additional solutions for excess FCB within this system.
Organize stakeholder group with a purpose of reducing high levels of fecal coliform bacteria in Crowders Creek	Local Agencies, BPU	DWQ will work with local governments to organize a stakeholder group to begin implementation efforts and assist in finding additional sources of FCB.
Gaston County Water Quality Recovery Program	Gaston County	The City of Gastonia will be required to develop a Water Quality Recovery Program as a result of the Gastonia's Crowders Creek WWTP (NC0074268) being listed in the TMDL as a major source contributor.
Gaston County On-site Wastewater Treatment Analysis	Gaston County Health Department	The Gaston County Health Department should do a full assessment of septic systems throughout the Crowders Creek watershed to locate failing systems and assist with making necessary repairs in efforts to reduce sources of excess FCB.
Develop a Watershed Restoration Plan for Clark Creek	Local Agencies, BPU-URW	The Clark Creek Watershed Restoration Plan will confirm sources of impairment as well as design an implementation plan. DWQ will assist with this restoration effort and supports the need for funding to develop and implement the Watershed Restoration Plan.
Implementation of the Indian/Howard Creek Watershed Management Plan	EEP, Lincoln and Gaston County Stakeholders	Implementation of the Indian/Howard Creek Watershed Management Plan is critical to began addressing the sources of impairment in these two creeks.
Implement the Lake Rhodhiss Watershed Restoration Plan (Nonpoint source side of nutrient management action plan)	WPCOG, Stakeholders, BPU	DWQ will work with the WPCOG and other active watershed partners to ensure practices identified in the restoration plan are implemented where they will be most effective during the upcoming planning cycle. DWQ supports the need for funding of this implementation restoration plan.
Development of a Lake Hickory Watershed Management Plan	Local Agencies	A Watershed Management Plan, similar to the Lake Rhodhiss plan, should be developed in preparation for possible nutrient problems. DWQ supports the need for funding of this plan development.
Formation of a Catawba River Basin Discharger Coalition		The formation of a Catawba River basin coalition is recommended to assist NPDES Dischargers in collecting more valuable instream data at specific locations in a more cost efficient manner. There are many benefits of a coalition such as reduction in sampling costs, networking/collaboration between facilities, more reliable data, monitoring flexibility, permit benefits and environmental stewardship.

Recommendations for Further Basinwide Study

- A watershed stressor study is needed in Gunpowder Creek to determine the cause of a significant decline in the biological community. This study should be conducted on a local level; however, DWQ will also support other agency's efforts to identify the cause.
- Further study is needed on Lower Little River to identify sources of excess fecal coliform bacteria. Even though Lower Little River is not a primary recreational waterbody, it flows into Lookout Shoals Lake which is used for recreation and is classified as such.
- A watershed stressor study should be conducted on Middle Little River to identify sources of habitat degradation to assist in restoration planning. Proper restoration could prevent this creek from being listed as impaired.
- Further study is needed on Lyle Creek to determine the sources of the chlorine odor and other in-stream pollutants.
- Watershed stressor study for Gar Creek and urban restoration efforts are needed to keep the creek from becoming impaired.
- Toxics Review/Stressor Study: It is suggested that a watershed stressor study be conducted to not only determine if copper is negatively impacting the South Fork Catawba River and its tributaries, but also to help pinpoint the source of the excessive levels.
- The impacts of multiple small dams located throughout the basin on water quality and aquatic life conditions during periods of drought.
- Effects of large number of septic systems on groundwater and surface water nutrient levels within a lake watershed.
- Coal Ash Ponds: Determining the effects on ground and surface water.
- Better understanding of impact to water quality due to proliferation of poultry operations throughout the state.
- Identification of nutrient sources which drain into the chain of lakes below Lake James.

Statewide Recommendations

- It is important that 7Q10 flow values be updated to include changing climatic conditions and water withdrawals that impact stream flow conditions. All NPDES permitted facilities use 7Q10's as critical flow in determining permit limits for toxicants. These critical flow values used to determine permit limits for all NPDES facilities may need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions induced by drought impacts the health of aquatic life as demonstrated in this basin for roughly seven of the ten years between 1997 and 2007 (see Figure 2: stream flow graph). Droughts as well as the demand on water resources are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with Division of Water Resources and other divisions and agencies to discuss the need and resource availability to update 7Q10 values.

The table below lists all waterbodies discussed within this plan and includes the 2010 DRAFT Integrated Report category and which section (Restoration, Protection and/or Success) each waterbody discussion can be found.

Table 4: Current Water Quality Conditions of Waters Monitored Within the Catawba River Basin

Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/Success[2]
03050101 - CATAWBA RIVER HEADWATER SUBBASIN				
Catawba R	11-(8)	0305010101	3a	Protection/Success
Crooked Cr	11-12	0305010101	2	Protection
Left Prong Catawba R	11-6	0305010101	2	Success
Mackey Cr	11-15-(3.5)b	0305010101	2	Success
Catawba R	11-(1)	0305010101	2	Success
N Fk Catawba R	11-24-(1), (2.5)a, (2.5)b, & (13)	0305010102	2	Protection
Pepper Cr	11-24-10	0305010102	2	Protection
Honeycutt Cr	11-24-8	0305010102	2	Protection
White Cr	11-30	0305010103	5	Restoration
Paddy Cr	11-28	0305010103	2	Protection
Linville R	11-29-(4.5) & (19)	0305010103	2	Protection
Irish Cr	11-35-3-(2)b	0305010104	2	Success
Parks Cr	11-38-35	0305010105	5	Restoration
Wilson Cr	11-38-34	0305010105	2	Protection
Stack Rock Cr	11-38-34-5	0305010105	2	Protection
Franklin Br	11-38-31	0305010105	2	Protection
Johns R	11-38-(1), (28), & (35.5)	0305010105	2	Success
Youngs Fk/Corpening Cr	11-32-1-4a & b	0305010106	5	Restoration
Canoe Cr	11-33-(2)	0305010106	5	Restoration
Hunting Cr	11-36-(0.7)	0305010106	5	Restoration
N Muddy Cr	11-32-(0.5)	0305010106	2	Protection
Jacktown Cr	11-32-1-4-1	0305010106	3a	Protection
Silver Cr	11-34-(0.5)	0305010106	2	Protection/Success
Catawba R	11-(32.7)	0305010106	2	Protection
S Muddy Cr	11-32-2	0305010106	2	Success
Lower Cr	11-39-(0.5)b, (6.5) & (9)	0305010107	4	Restoration
Spainhour Cr	11-39-3	0305010107	5	Restoration
Blair Fk	11-39-3-1	0305010107	3a	Restoration
Greasy Cr	11-39-4b	0305010107	5	Restoration
Bristol Cr	11-39-8	0305010107	5	Restoration
Lower Cr	11-39-(0.5)a	0305010107	2	Protection
Zacks Fk	11-39-1	0305010107	2	Protection
Greasy Cr	11-39-4a	0305010107	2	Protection
McGalliard Cr	11-44-(3)	0305010108	5	Restoration
Gunpowder Cr	11-55-(1.5)	0305010108	5	Restoration
Horseford Cr	11-54-(0.5)	0305010108	5	Restoration
Smoke Cr	11-41-(1)	0305010108	2	Protection

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Integrated Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality.

Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/Success[2]
Silver Cr	11-56-(2)	0305010108	2	Protection
Drowning Cr	11-52-(1)	0305010108	2	Protection
Upper Little R	11-58 & 11-58-(5.5)	0305010109	2	Protection
Middle Little R	11-62a & b	0305010109	2	Protection
Duck Cr	11-62-(1) & (4)	0305010109	2	Protection
Lower Little R	11-69-(0.5)	0305010110	5	Restoration
Muddy Fk	11-69-4	0305010110	5	Restoration
Lambert Fk	11-69-3	0305010110	2	Protection
Elk Shoal Cr	11-73-(0.5)	0305010110	2	Protection
McLin Cr	11-76-5-(0.7)	0305010111	5	Restoration
Lyle Cr	11-76-(4.5)	0305010111	2	Protection
Forney Cr	11-119-2-3	0305010113	5	Restoration
Dutchmans Cr	11-119-(0.5)	0305010113	5	Restoration
Leepers Cr	11-119-1-(1)	0305010113	2	Protection
Killians Cr	11-119-2-(0.5)a & b	0305010113	2	Protection
McDowell Cr	11-115-(1), (1.5)a, (1.5)b & (5)	0305010114	4	Restoration
Long Cr	11-120-(2.5)	0305010114	5	Restoration
Gar Cr	11-116-(1)	0305010114	2	Protection
McGill Cr	11-135-2	0305010115	5	Restoration
Crowders Cr	11-135a-f	0305010115	5	Restoration
Crowders Cr	11-135g	0305010115	4t	Restoration
Catawba Cr	11-130a-c	0305010115	5	Restoration
S Crowders Cr	11-135-10-1	0305010115	5	Restoration
S Fk Catawba Cr	11-135-10	0305010115	2	Protection
Abernethy Cr	11-135-4b	0305010115	2	Success
03050102 - SOUTH FORK CATAWBA RIVER SUBBASIN				
Henry Fk	11-129-1-(12.5)b & c	0305010201	5	Restoration
Henry Fk	11-129-1-(12.5)a	0305010201	2	Success
Jacobs Fk	11-129-2-(4)	0305010202	2	Protection
Maiden Cr	11-129-5-7-2-(1)	0305010203	5	Restoration
Clark Cr	11-129-5-(0.3)b & (9.5)	0305010203	5	Restoration
Town Cr	11-129-5-4	0305010203	2	Protection
Potts Cr	11-129-3-(0.3) & (0.7)	0305010204	5	Restoration
S Fk Catawba R	11-129-(0.5)	0305010204	5	Restoration
Howard Cr	11-129-4	0305010204	2	Protection
Indian Cr	11-129-8-(6.5)	0305010205	5	Restoration
Beaverdam Cr	11-129-9-(0.7)	0305010205	2	Protection
Hoyle Cr	11-129-15-(6)	0305010206	5	Restoration
Mauney Cr	11-129-15-5	0305010206	5	Restoration
Long Cr	11-129-16-(4)	0305010206	5	Restoration
Dallas Br	11-129-16-7b	0305010206	5	Restoration

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Integrated Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality.

Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/ Success[2]
S Fk Catawba R	11-129-(10.5) & (14.5)	0305010206	5	Restoration
S Fk Catawba R	11-129-(15.5)	0305010206	5	Restoration
03050103 - CATAWBA RIVER SUBBASIN				
Irwin Cr	11-137-1	0305010301	5	Restoration
Little Sugar Cr	11-137-8a, b, & c	0305010301	5	Restoration
Sugar Cr	11-137a, b, & c	0305010301	5	Restoration
McCullough Br	11-137-7	0305010301	5	Restoration
McAlpine Cr	11-137-9a, b, c, & d	0305010301	5	Restoration
Sixmile Cr	11-138-3	0305010302	5	Restoration
Twelvemile Cr	11-138	0305010302	5	Restoration
Waxhaw Cr	11-139	0305010303	2	Protection

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Integrated Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality.

Figure 16: Turbidity Exceedances Between 2004 & 2008

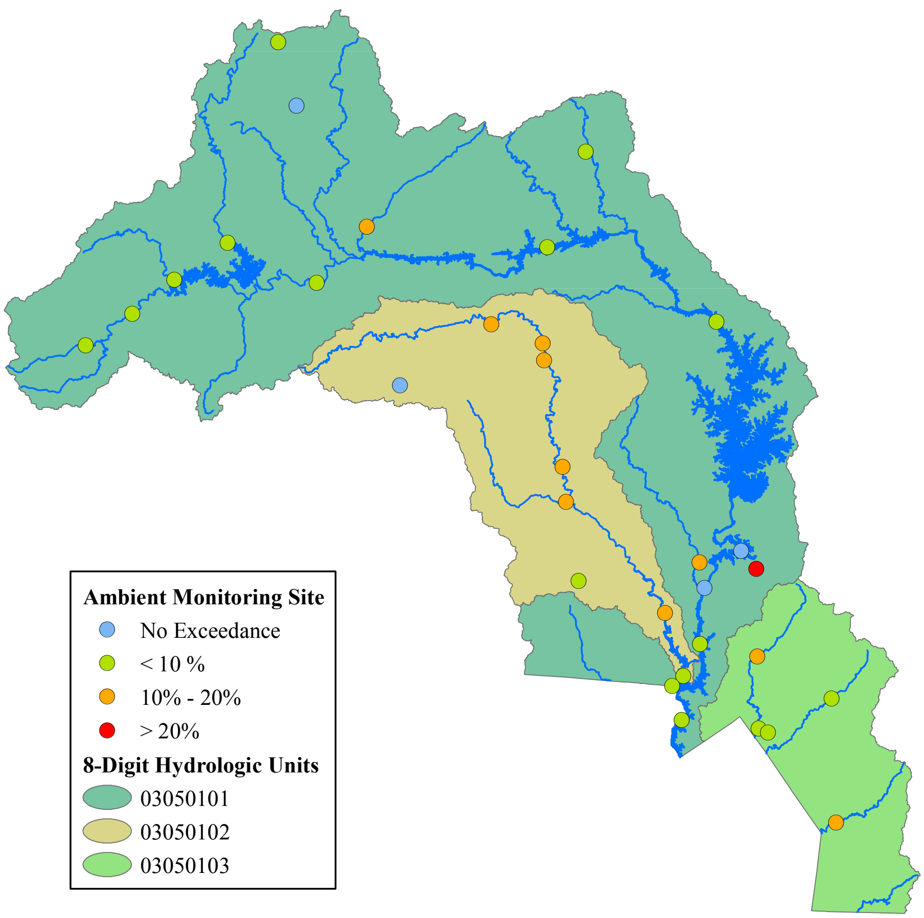


Figure 17: pH Exceedances Between 2004 & 2008

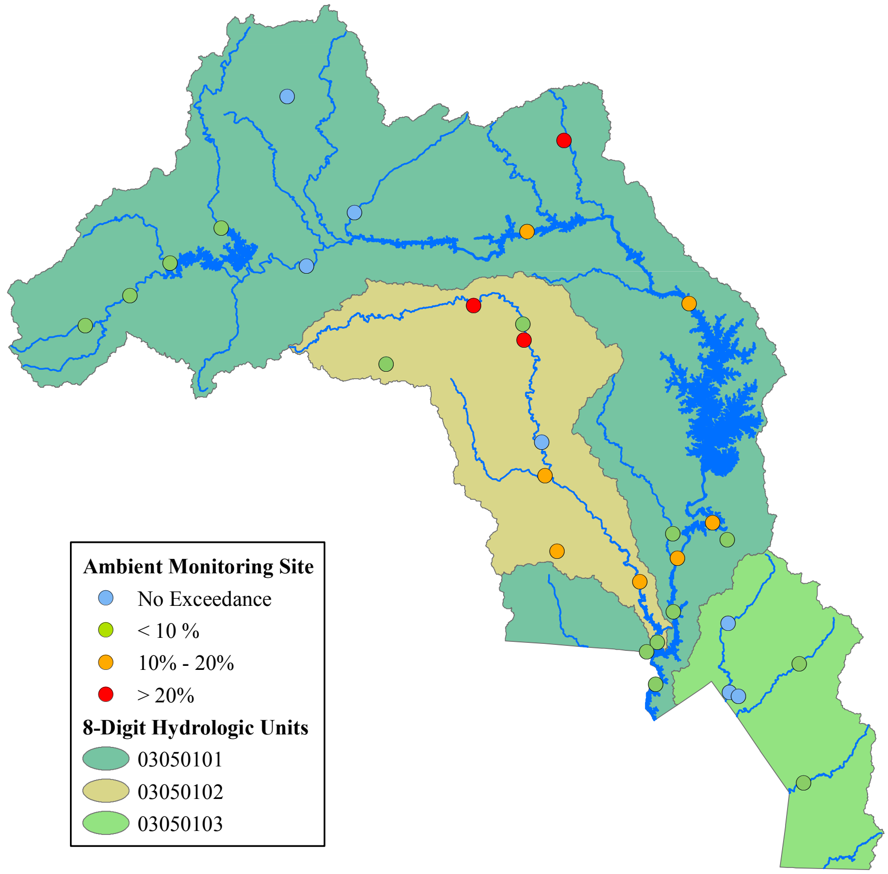


Figure 18: Copper Exceedances Between 2004 & 2008

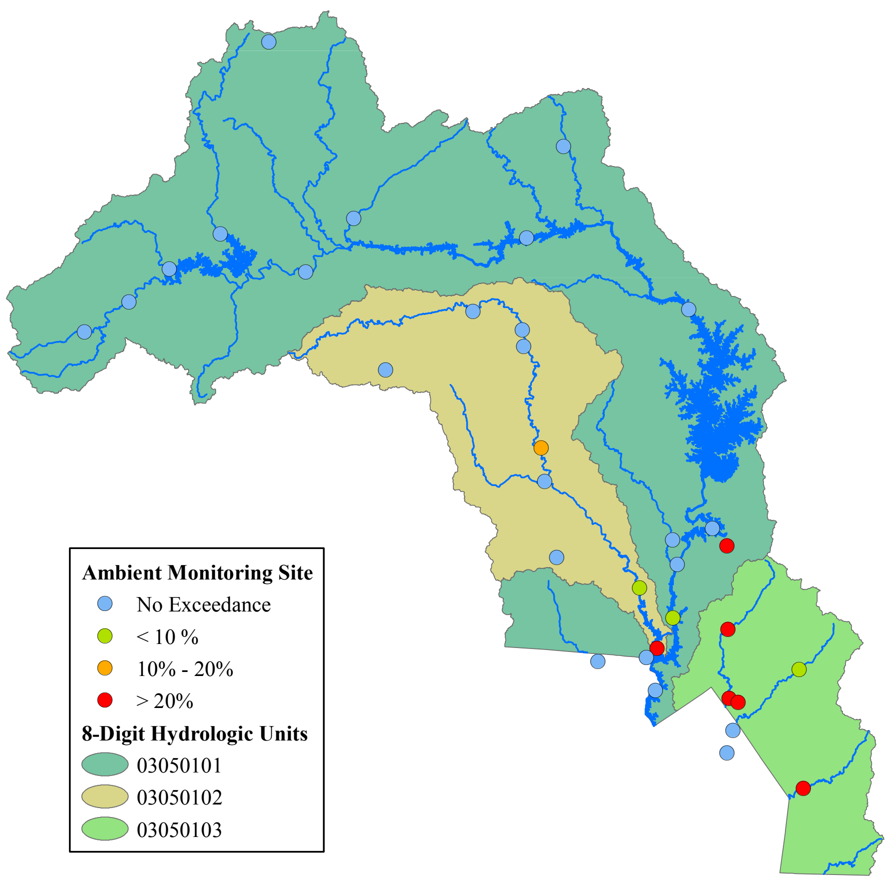


Figure 19: DO Exceedances Between 2004 & 2008

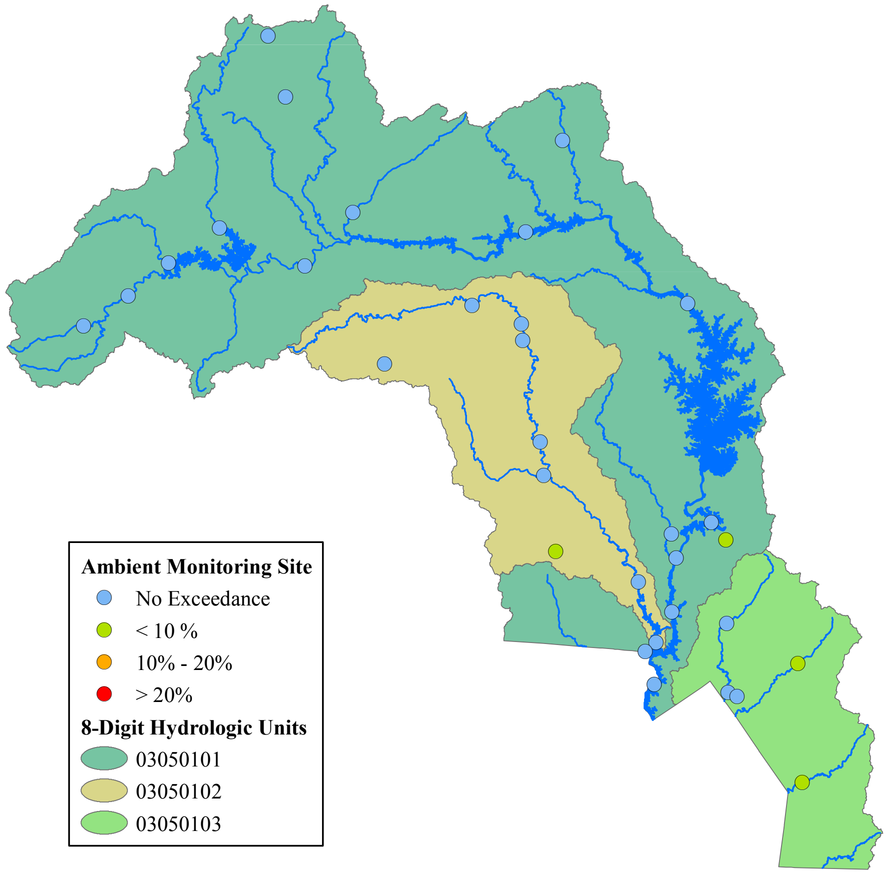


Figure 20: Temperature Exceedances Between 2004 & 2008

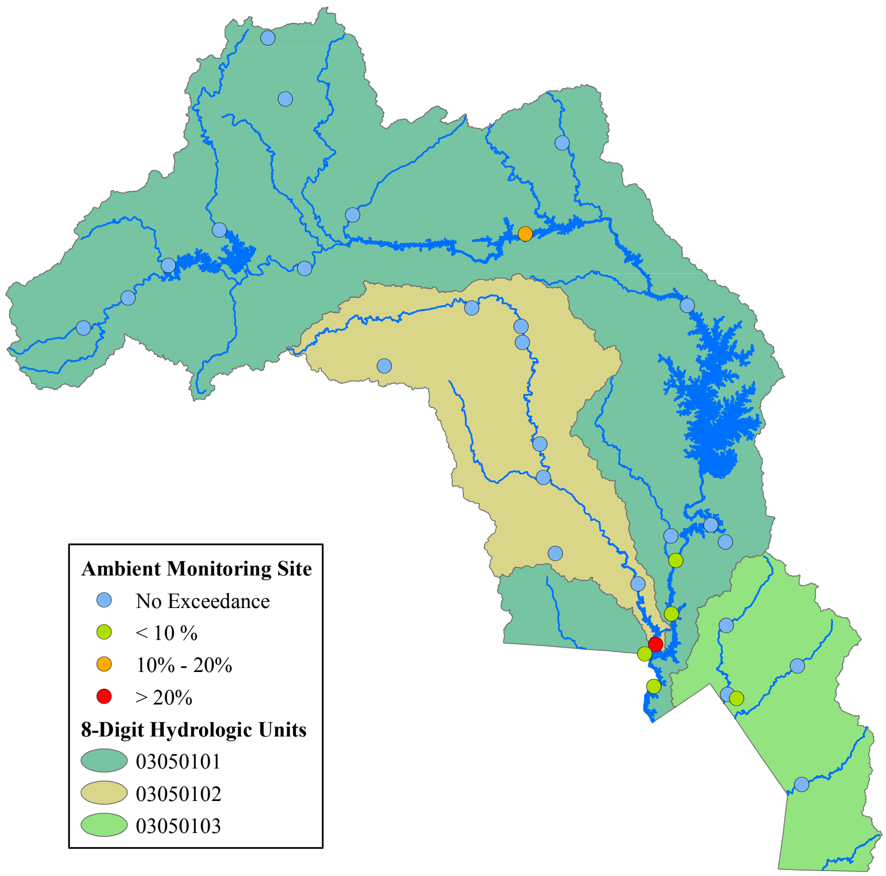
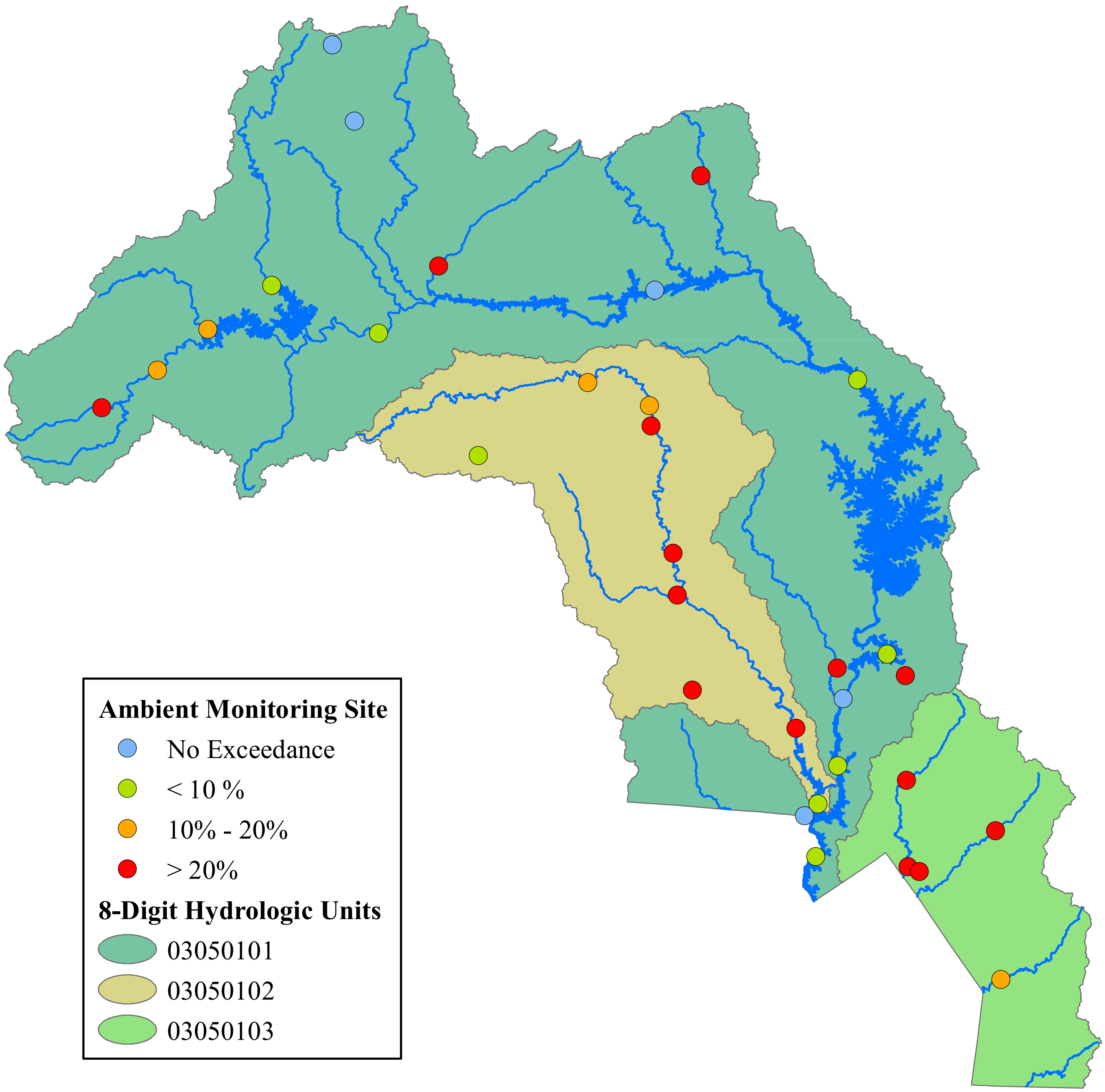


Figure 21: FCB Exceedances Between 2004 & 2008



References

Beach, D. 2002. *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States*. Pew Oceans Commission, Arlington, VA.

Galli, J. 1991. *Thermal Impacts Associated with Urbanization and Stormwater Management Best Management Practices*. Metropolitan Washington Council of Governments, Maryland Department of Environment: Washington, D.C.

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. www.mrlc.gov.

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.

Pradhan, S. S., M. T. Hoover, R. E. Austin, and H. A. Devine. May 2007. *Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*. North Carolina State University, Raleigh, North Carolina. North Carolina Agricultural Research Service. Technical Bulletin 324.

Schueler, T., and H.K. Holland. 2000. *The Practice of Watershed Protection*. Center for Watershed Protection, Ellicott City, Maryland.

CHAPTER ONE

Catawba River Headwaters Subbasin

HUC 03050101

Includes: Dutchmans Creek, Johns River, Linville River, Lower Creek, North Fork Catawba River, Silver Creek & Warrior Fork
&
The Chain of Lakes: Lake James, Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake & Lake Wylie

General Subbasin Description

This eight-digit hydrologic unit code (HUC) subbasin, with an area of 2200 square miles, is the largest eight-digit HUC in the Catawba River basin and includes DWQ subbasins 03-08-30 through 03-08-33, the northwest portion of subbasin 03-08-34, and subbasin 03-08-37 (See map in *Appendix 1-D*). Almost the entire mainstem of the Catawba River is impounded in a series of seven lakes from Lake James to Lake Wylie. It stretches from the basin's mountainous headwaters east of the Tennessee Valley Divide to the South Carolina border. The subbasin also contains Crowders and Catawba Creek watersheds in southern Gaston County, which also drain into South Carolina.

The land cover within the HUC is mostly forested (62%) with significant areas of agriculture (17%) and developed land (16%). Much of the forested areas are found in the upper portions of this subbasin which include roughly 223,500 acres of the Pisgah National Forest. Agriculture is spread out across the subbasin and the largest urban areas include Morganton, Lenoir, the northern portion of Hickory, Huntersville, Gastonia, and outlying areas northwest of Charlotte.

This subbasin's population is centered mostly around the major recreational lakes. The watersheds surrounding lakes Rhodhiss, Hickory and Norman have the largest population density per square mile and have the largest estimated growth in the coming years. See the *Population & Land Cover Section* of this chapter for additional information.

Subbasin at a Glance

Counties:

Avery, Caldwell, McDowell, Burke, Alexander, Catawba, Iredell, Lincoln, Gaston, and Mecklenburg

Municipalities:

Belmont, Bessemer City, Blowing Rock, Cajah's Mountain, Catawba, Cedar Rock, Charlotte, Claremont, Connelly Springs, Conover, Cornelius, Cramerton, Crossnore, Davidson, Drexel, Gamewell, Gastonia, Glen Alpine, Grandfather Village, Granite Falls, Hickory, Hildebran, Hudson, Huntersville, Kings Mountain, Lenoir, Lincolnton, Long View, Marion, Mooresville, Morganton, Mount Holly, Newton, Old Fort, Rhodhiss, Rutherford College, Sawmills, Stanley, Sugar Mountain, Taylorsville, Troutman, Valdese

Ecoregions:

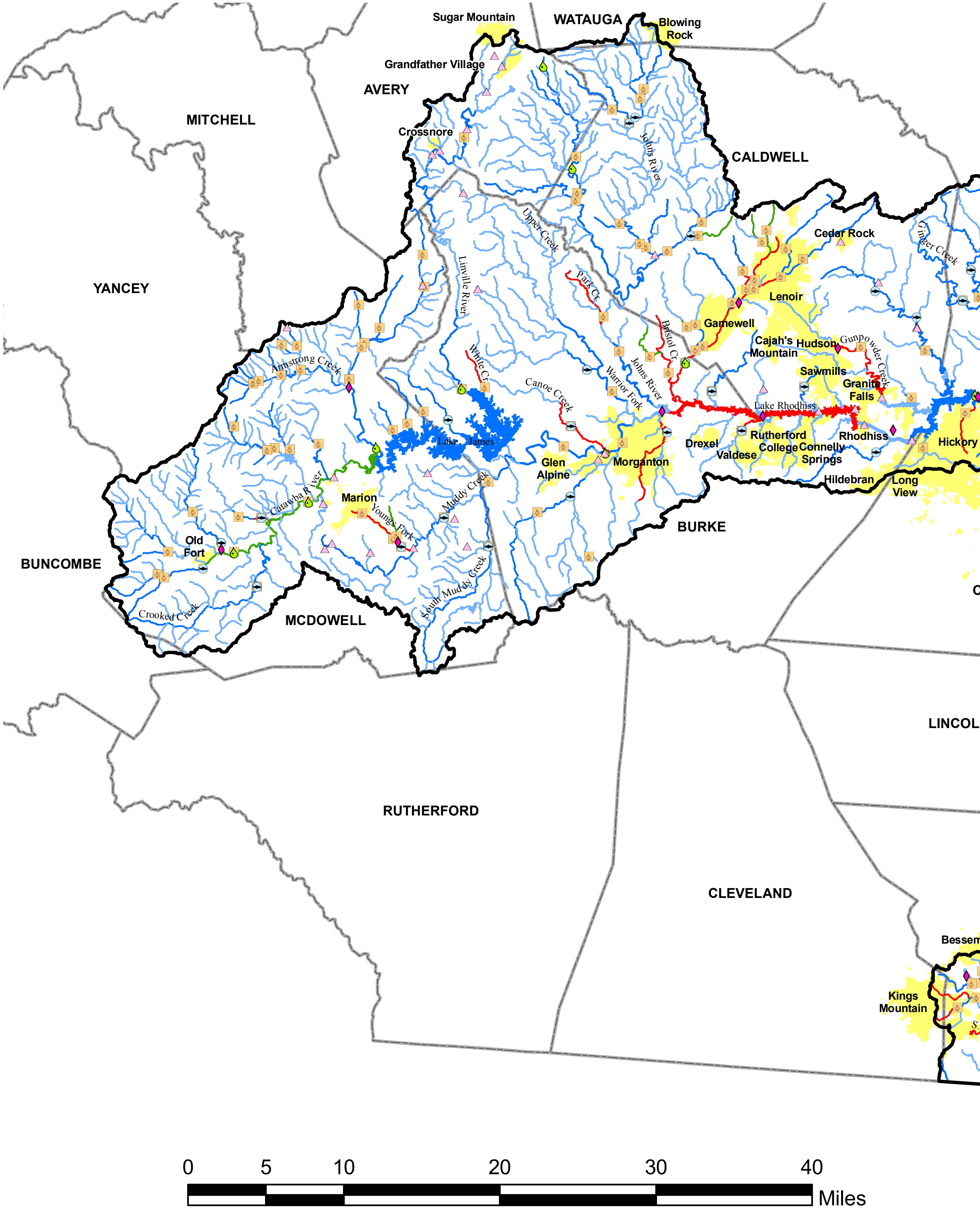
Southern Crystalline Ridges & Mountains, Southern Metasedimentary Mountains, High Mountains, Eastern Blue Ridge Foothills & Northern Inner Piedmont

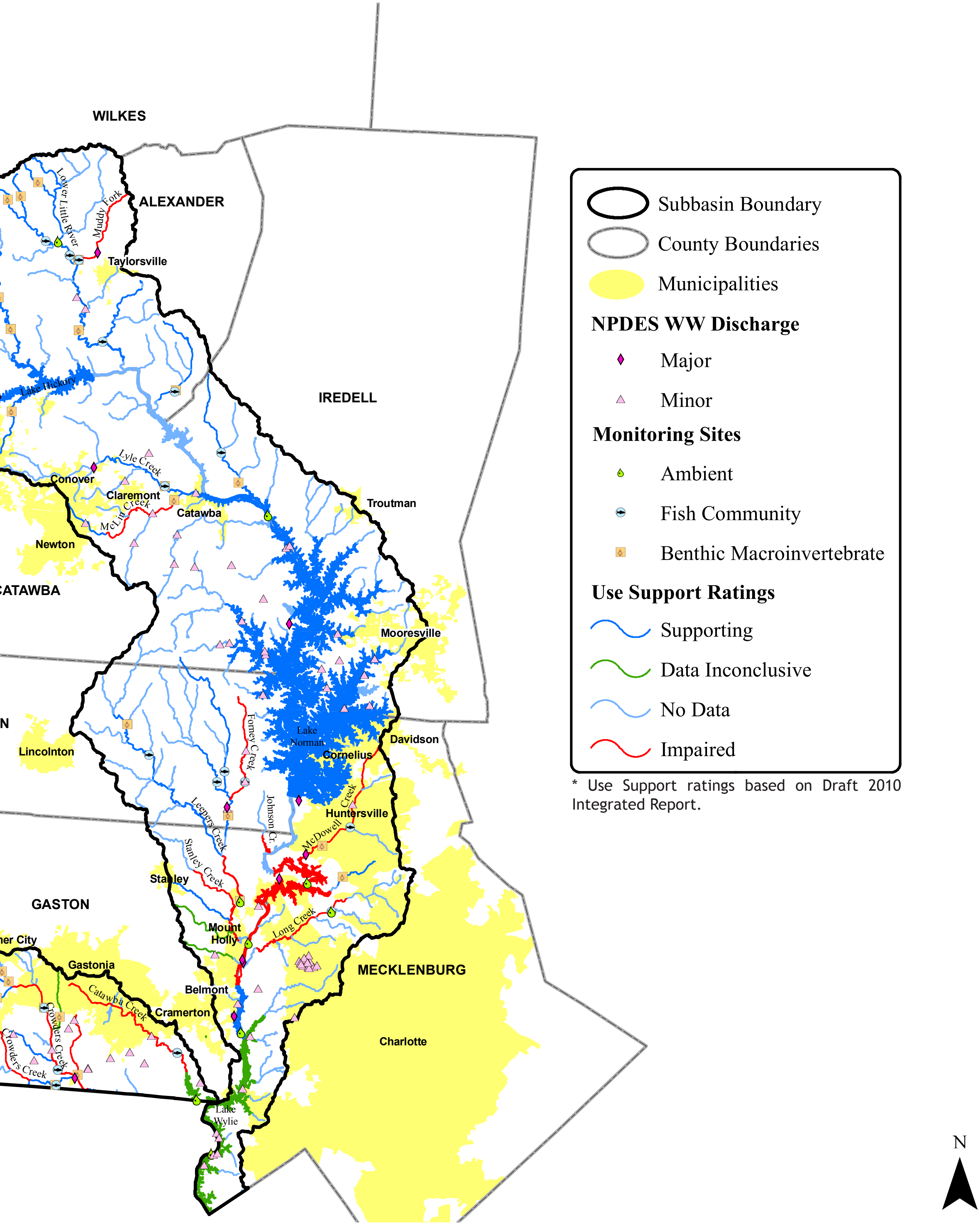
Permitted Facilities:

NPDES WWTP: 128
Major 21
Minor 107
NPDES NonDischarge:.........................35
Stormwater: 343
General 297
Individual..46
Animal Operations: 13

Population: 555,543

% of Impervious Surface: 3.1%


Sugar Mountain
WATAUGA
Blowing Rock
Grandfather Village
AVERY
MITCHELL
Crossnore
CALDWELL
YANCEY
Johns River
Upper Creek
Linville River
Park Cr.
Cedar Rock
Gingercreek
Lenoir
Gamewell
Bristol Cr.
Cajah's Mountain
Hudson
Gunpowder Creek
Sawmills
Granite Falls
Armstrong Creek
White Cr.
Canoe Creek
Warrior Fork
Johns River
Lake Rhodhiss
Lake James
Drexel
Rutherford College
Connelly Springs
Rhodhiss
Hickory
Valdese
Glen Alpine
Morganton
Hildebran
Long View
Catawba River
Marion
Youngs Fork
Muddy Creek
BURKE
Old Fort
BUNCOMBE
South Muddy Creek
Crooked Creek
MCDOWELL
LINCOL
RUTHERFORD
CLEVELAND
Bessem
Kings Mountain
0
5
10
20
30
40
Miles



* Use Support ratings based on Draft 2010 Integrated Report.

Water Quality Overview

Water Quality within this subbasin is influenced by ecoregions, land use and population. Water Quality is generally better in the upper non-developed regions and more impacted in the lower portion of this subbasin near urban centers. Due to its large size, there are multiple water quality issues impacting this subbasin. The upper headwaters are facing development pressure from the increasing demand for second homes and golf club communities. The Lake Rhodhiss and Hickory watersheds are experiencing impacts mostly from converting agricultural lands to urban areas, livestock operations, row crop and ornamental nurseries, stormwater runoff and point source pollutants. The lower portions of this subbasin are impacted by stormwater runoff from densely populated areas, failing septic systems and out-dated wastewater treatment facilities.

Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess the extent of certain issues, developing implementation plans as well as making necessary upgrades to out-of-date WWTP's. Many of these efforts are currently on-going; however, others have resulted in measurable water quality improvements. These topics are discussed in greater detail throughout this Chapter. Refer to the *Chain of Lakes Chapter* for information about the past and present water quality of the lakes and current management strategies.

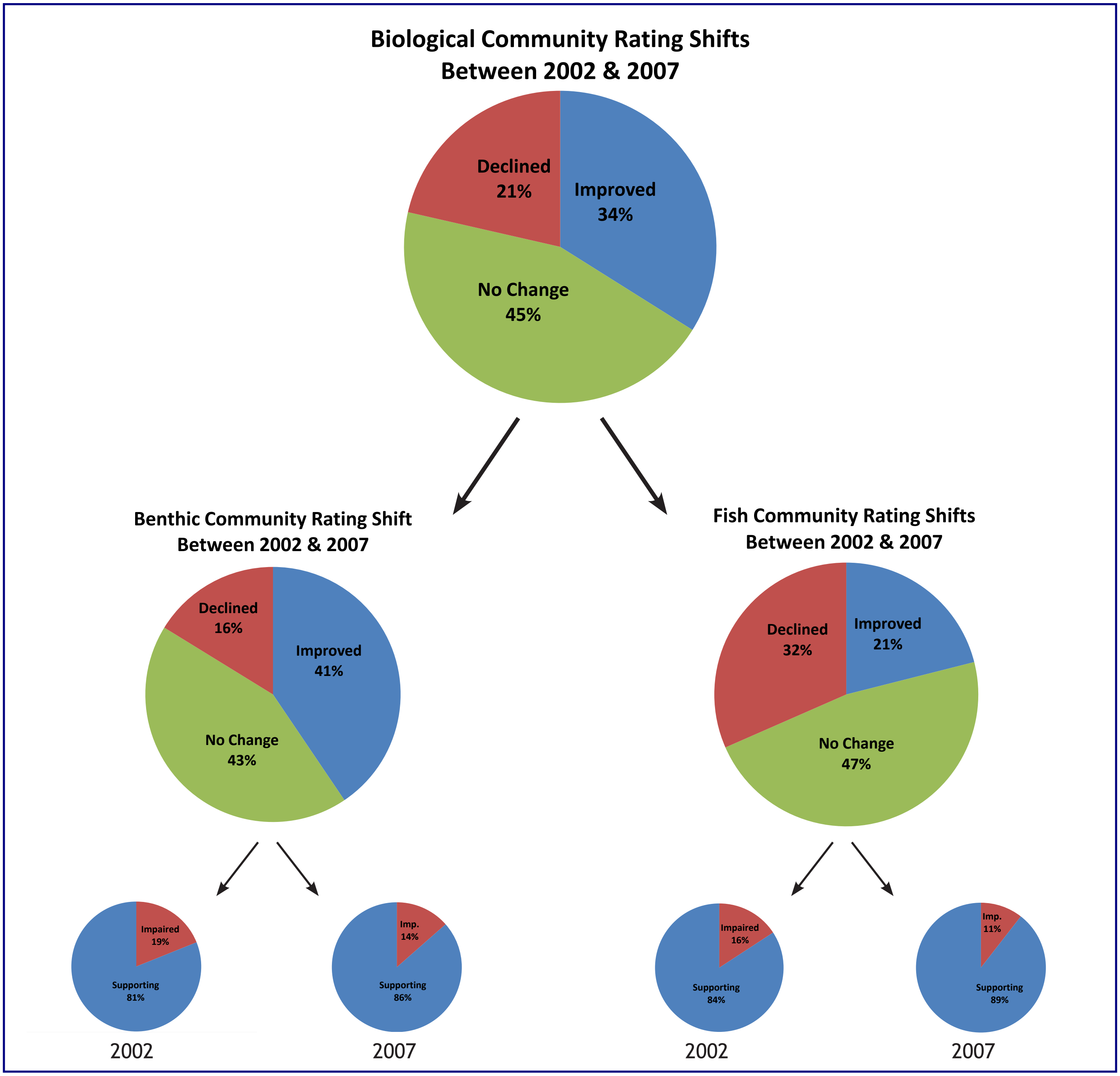
Biological Data

Biological samples were collected during the spring and summer months of 2004 and 2007 by DWQ-Environmental Sciences Section as part of the five year basinwide sampling cycle, with exception of special studies. Overall, 68 biological sampling sites were monitored within the Catawba River Headwaters. Of those 68 sites, 39 were benthos stations and 29 were fish community stations. Eleven of those sites (one benthos and ten fish) were sampled for the first time. Each site is given a rating or bioclassification of Excellent, Good, Good-Fair, Fair, Poor or Not Rated. The Excellent, Good, Good-Fair and Not Rated are ratings given to streams which are Supporting aquatic life. Streams that are given a Fair or Poor rating are Impaired and do not support aquatic life. The ratings for each five year sampling cycle station can be seen in Table 1-1. The last column of this table includes the results of the current cycle (2003-2007) and the results of the previous sampling cycle (1998-2002) taken.

Figure 1-2 above shows a comparison between 2002 and 2007 sample cycle data. The graphs compare all biological samples taken as part of the past two five year sampling cycles. Forty-five percent of samples tested in both cycles received the same rating; 22% received lower ratings than its previous sample and 33% received higher ratings. The second row of graphs split the biological samples into fish and benthic communities. Of these two, the fish community had the largest decline (32%) in ratings and benthic community had the largest improvement (41%) in ratings. The third row breaks the fish and benthic graphs into Supporting or Impaired for each sample cycle. Benthic samples which are Supporting gained 8% and fish samples gained 3% of Supporting samples.

For more information about biological data in this watershed, see *pages 8-24* of the 2008 Catawba Basinwide Assessment Report. A more detailed look at each sampling site can be found in *Appendix 1-B*.

Figure 1-2: Shifts in Biological Ratings Between 2002 & 2007 for 03050101



* Numbers in this figure represent biological samples taken in both the last and current sampling cycles. Results of first time samples can be found in Table 1-1.

TABLE 1-1: BIOLOGICAL SAMPLING LOCATIONS AND RATINGS FOR 03050101, 2002 - 2007

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
			BENTHOS SAMPLE SITES			
CB14	Catawba R.	11-(1)	From source to Old Fort Finishing Plant Water Supply Intake	McDowell	SR-1274	`07 - Good `07 - Excellent `02 - Good-Fair
CB12	Catawba R.	11-(8)	From Dam at Old Fort Finishing Plant Water Supply Intake to North Fork Catawba River	McDowell	SR-1234	`07 - Good `02 - Good
CB11	Catawba R.	11-(8)	From Dam at Old Fort Finishing Plant Water Supply Intake to North Fork Catawba River	McDowell	SR-1221	`07 - Good `02 - Good-Fair
CB10	Catawba R.	11-(31.5)	From a point 0.6 mile upstream of Muddy Creek to a point 1.2 mile upstream of Canoe Creek	Burke	SR-1147	`07 - Good `02 - Good
CB22	Curtis Cr.	11-10	From source to Catawba River	McDowell	SR-1227	`07 - Excellent `02 - Good
CB20	Crooked Cr.	11-12	From source to Catawba River	McDowell	SR-1135	`07 - Good-Fair `02 - Good
CB34	Mackey Cr.	11-15-(3.5)b	From US-70 to Catawba River	McDowell	US-70	`07 - Good `02 - Good
CB6	Buck Cr.	11-19-(1)	From source to Dam at Lake Tahoma	McDowell	NC-80	`07 - Excellent `02 - Good
CB27	Little Buck Cr..	11-19-11	From source to Lake Tahoma, Buck Creek	McDowell	SR-1436	`07 - Excellent `02 - Good
CB42	N Fork Catawba R.	11-24-(2.5)a	From mouth of Laurel Branch to Stillhouse Branch	McDowell	SR-1573	`07 - Good `02 - Good
CB41	N Fork Catawba R.	11-24-(2.5)b	From Stillhouse Branch to Armstrong Creek	McDowell	SR-1560	`07 - Good-Fair `03 - Good `02 - Fair
CB1	Armstrong Cr.	11-24-14-(1)	From source to Hickory Botton Creek	McDowell	Armstrong Creek Rd	`07 - Excellent `02 - Excellent
CB33	Linville R.	11-29-(4.5)	From Grandmother Creek to Linville Falls	Avery	US-221	`07 - Good-Fair `02 - Good
CB32	Linville R.	11-29-(19)	From southern Boundary of Daniel Boone Wildlife Management Area to Lake James, Catawba River	Burke	NC-126	`07 - Excellent `02 - Excellent
CB44	N Muddy Cr.	11-32-(0.5)	From source to a point 0.5 mile upstream of mouth	McDowell	SR-1760	`07 - Good-Fair `02 - Good-Fair
CB17	Corpening Cr. - Youngs Fork	11-32-1-4b	From Marion WWTP to North Muddy Creek	McDowell	SR-1819	`07 - Poor `02 - Fair
CB51	S Muddy Cr.	11-32-2	From source to Muddy Creek	McDowell	SR-1764	`07 - Good `02 - Good-Fair
CB8	Canoe Cr.	11-33-(2)	From Burke County SR-1248 to Catawba River	Burke	SR-1250	`07 - Good-Fair `02 - Good
CB86	Silver Cr.	11-34-(0.5)	From source to a point 1.3 miles downstream of Clear Creek	Burke	SR-1127	`07 - Excellent `02 - Good
CB102	Warrior Fk	11-35-(1)	From source to a point 0.6 mile upstream of City of Morganton water supply intake	Burke	SR-1440	`07 - Excellent `02 - Good
CB73	Johns R.	11-38-(28)	From Reids Creek to Wilson Creek	Caldwell	SR-1356	`07 - Excellent `02 - Excellent

* = New station location; therefore, no data for 2002.
** = See Figure 1-1 for locations on map

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
CB269	Johns R.	11-38-(35.5)	From a point 0.5 mile upstream of Sims Branch to a point 0.7 mile downstream of NC. Hwy. 18	Burke	SR-1438	`07 - Excellent `02 - Good
CB88	Smoky Cr.	11-41-(1)	From source to a point 0.6 mile upstream of mouth	Burke	SR-1515	`07 - Good `02 - Good-Fair
CB82	McGalliard Cr.	11-44-(3)	From a point 0.6 mile upstream of mouth to Rhodhiss Lake, Catawba River	Burke	SR-1538	`07 - Good-Fair `03 - Fair `02 - Fair
CB114	Gunpowder Cr.	11-55-(1.5)	From a point 0.5 mile downstream of Caldwell County SR-1127 to a point 0.8 mile downstream of Billy Branch	Caldwell	SR-1718	`07 - Fair `02 - Good-Fair
CB130	Upper Little R.	11-58-(5.5)	From Morris Creek to a point 0.5 mile upstream of mouth	Caldwell	SR-1740	`07 - Excellent `02 - Good
CB123	Middle Little R.	11-62	From source to Duck Creek	Alexander	SR-1153	`07 - Good-Fair `03 - Good-Fair `02 - Fair
CB112	Duck Cr.	11-62-2-(4)	From N.C. Highway 90 to Middle Little River	Alexander	NC-127	`07 - Good `02 - Good
CB120	Lower Little	11-69-(5.5)	From a point 0.5 mile upstream of of mouth Stirewalt Creek to a point 0.8 mile upstream of mouth	Alexander	SR-1131	`07 - Good-Fair `02 - Good-Fair
CB127	Muddy Fork	11-69-4	From source to SR-1409	Alexander	SR-1313	`07 - Fair `03 - Good-Fair `02 - Fair
CB113	Elk Shoal Cr.	11-73-(0.5)	From source to a point 1.4 miles upstream of mouth	Alexander	SR-1605	`07 - Good-Fair `02 - Good-Fair
CB122	Lyle Cr.	11-76-(3.5)	From Bakers Creek to U.S. Hwys. 64 & 70	Catawba	US-64/70	`07 - Good-Fair `02 - Good-Fair
CB124	McLin Cr.	11-76-5-(3)	From a point 0.2 mile upstream of Catawba County SR-1722 to Lyle Creek	Catawba	SR-1722	`07 - Fair `02 - Good-Fair
CB139	Mc Dowell Cr.	11-115-(1.5)b	From SR-2136 Mecklenburg Co. to a point 0.7 mile upstream of mouth	Mecklenburg	SR-2128	`07 - Fair `02 - Fair
CB133	Gar Cr.	11-116-(1)	From source to a point 0.6 mile upstream of mouth	Mecklenburg	SR-2074	`07 - Good-Fair `97 - Good
CB132	Dutchmans Cr.	11-119-(0.5)	From source to a point 0.8 mile downstream of Taylors Creek	Gaston	SR-1918	`07 - Good-Fair `02 - Good-Fair
CB134	Killian Cr.	11-119-2-(0.5)b	From Anderson Creek to a point 1.2 miles upstream of mouth	Lincoln	SR-1511	`07 - Good-Fair `02 - Not Rated
CB234	Crowders Cr.	11-135g	From SR-2424 to NC-SC State Line	York, SC	SC-564	`07 - Good-Fair `02 - Fair
FISH COMMUNITY SAMPLE SITES						
CF112	Curtis Cr.	11-10	From source to Catawba River	McDowell	US-70	`07 - Excellent `02 - Excellent
CF9	Crooked Cr.	11-12	From source to Catawba River	McDowell	SR-1135	`07 - Good `02 - Excellent
CF47	Paddy Cr.	11-28	From source to 1.5mi upstream of Lake James	Burke	NC-126	`07 - Good-Fair `02 - Good-Fair
CF46	N Muddy Cr.	11-32-(0.5)	From source to a point 0.5 mile upstream of mouth	McDowell	SR-1760	`07 - Excellent `02 - Good

* = New station location; therefore, no data for 2002.
** = See Figure 1-1 for locations on map

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
CF50	S Muddy Cr.	11-32-2	From source to Muddy Creek	McDowell	SR-1764	\`07 - Good \`02 - Good
CF51	Silver Cr.	11-34-(0.5)	From source to a point 1.3 miles downstream of Clear Creek	Burke	SR-1149	\`07 - Good \`02 - Excellent
CF22	Irish Cr.	11-35-3-(2)b	From Roses Creek to Warrior Fork	Burke	SR-1439	\`07 - Excellent \`02 - Fair
CF73*	Johns R.	11-38-(1)	From source to Gragg Prong (previously called Anthony Creek)	Caldwell	off SR-1367	\`07 - Excellent
CF16	Gragg Pr	11-38-10	From source to Johns River	Caldwell	SR-1367	\`07 - Excellent \`99 - Excellent
CF45	Mulberry Cr.	11-38-32-(15)	From Dam at Mulberry Beach to Johns River	Caldwell	NC-90	\`07 - Excellent \`99 - Excellent
CF53	Smoky Cr.	11-41-(1)	From source to a point 0.6 mile upstream of mouth	Burke	SR-1515	\`07 - Excellent \`02 - Excellent
CF72*	Drowning Cr.	11-52-(1)	From source to a point 0.6 mile upstream of mouth	Burke	SR-1647	\`07 - Good-Fair
CF66*	Upper Little R.	11-58	From source to Morris Creek	Caldwell	SR-1712	\`07 - Good-Fair
CF42	Middle Little R.	11-62	From source to Duck Creek	Alexander	SR-1002	\`07 - Good \`02 - Excellent
CF13	Duck Cr.	11-62-2-(1)	From source to N.C. Highway 90	Alexander	NC-90	\`07 - Good \`02 - Good
CF65*	Lambert Fk	11-69-3	From source to Lower Little River	Alexander	SR-1317	\`07 - Good-Fair \`02 - *
CF44*	Muddy Fk	11-69-4	From source to SR-1409	Alexander	SR-1313	\`07 - Good-Fair
CF64*	Glade Cr.	11-69-7-(0.7)	From Alexander County SR-1604 to Lower Little River	Alexander	SR-1610	\`07 - Excellent
CF35	Lyle Cr.	11-76-(4.5)	From U.S. Hwys.-64 & 70 to Lake Norman, Catawba River	Catawba	US-70	\`04 - Excellent \`97 - Good
CF3	Buffalo Shoals	11-78-(0.5)	From source to a point 0.2 mile downstream of Broad Meadow Creek	Iredell	SR-1503	\`07 - Good \`97 - Excellent
CF27	Leepers Cr.	11-119-1-(1)	From source to a point a point 0.8 mile upstream of mouth	Lincoln	NC-73	\`07 - Good-Fair \`97 - Good
CF25	Killian Cr.	11-119-2-(0.5)a	From source to Anderson Creek	Lincoln	NC-73	\`07 - Good \`02 - Good-Fair
CF62*	Anderson Cr.	11-119-2-2	From source to Killian Creek	Lincoln	SR-1383	\`07 - Good
CF63*	Forney Cr.	11-119-2-3	From source to Killian Creek	Lincoln	SR-1386	\`07 - Fair
CF30*	Long Cr.	11-120-(2.5)	From a point 0.6 mile downstream of Meck Co SR-2074 to a point 0.4 mile upstream of Meck Co SR-1606	Mecklenburg	SR-2042	\`04 - Good
CF5	Catawba Cr.	11-130c	From SR-2439 to Lake Wylie	Gaston	SR-2435	\`07 - Poor \`02 - Fair
CF11*	Crowders Cr.	11-135c	From SR-1122 to SR-1131	Gaston	SR-1131	\`04 - Poor
CF10	Crowders Cr.	11-135d	From SR-1131 to SR-1108	Gaston	SR-1108	\`07 - Fair \`02 - Fair
CF49	S Crowders Cr.	11-135-10	North Carolina Portion	Gaston	SR-1109	\`07 - Good-Fair

* = New station location; therefore, no data for 2002.
** = See Figure 1-1 for locations on map

Fish Kills in the Catawba River Headwaters

Between 2003 and 2007, three fish kills were investigated within the Catawba River Headwaters Subbasin. Below is a brief description of each investigation. For more detailed information see *pages 76 & 77* of the 2008 Catawba Basinwide Assessment Report.

Lake Norman:

In July of 2004, the first fish kill of this planning cycle reported 2,500 dead Striped Bass in Lake Norman. As water temperatures began to rise in late spring, the lake naturally separated into three thermal layers. A group of Striped Bass were in lower level (hypolimnion) of the water column where pockets of cooler temperatures, forage and sufficient oxygen were found and were trapped by the middle layer (metalinmion) which was depleted of oxygen. Duke Power personnel reported the fish kill after observing an abnormally high number of dead Strip Bass during a weekly survey of the lake. Duke's personnel continued to assist state biologists with data collection throughout the event. Their facilities were within the limits of their permit and the tested effluent was similar to previous years. Nearly all Striped Bass collected were infected by a parasitic copepod; however, after further lab studies there was no indication that the copepod was responsible for the kill.

Hunting Creek:

An explosive fire at the Synthron chemical manufacturing facility in Morganton on February 2, 2006 was responsible for a fish kill of at least 1,000 Chubs, Sunfish, Darters, Stonerollers and Suckers in a two miles stretch of Hunting Creek. During the initial investigation by NC Wildlife Resource Commission and the Catawba River Keeper Foundation, no live fish were observed in the portion of the creek directly below the Synthron input. The extent of the fish kill did not appear to reach the confluence of Hunting Creek and the Catawba River. Further examination was halted due to on-going chemical fires at the facility. The impairment of Hunting Creek is not related to this fish kill event.

Paw Creek:

In late November of 2006, a gasoline release from the BP Delivery Line caused a fish kill of 180 Suckers, Sunfish, Minnows, and Bass in Northwest Charlotte.

Stream Flow & Drought

The rate at which a volume of water moves through a stream (the flow rate) can have a negative impact on water quality. In particular, droughts can have major effects on water quality parameters such as dissolved oxygen, turbidity, pH, and others due to extremely low stream flow. Therefore, it is useful to track changes in stream flow over the course of the assessment period to see when drought or high flow events might be present. A significant drought affected the Catawba River Basin from March 2007 to beyond the end of the assessment period.

Figure 1-3: Yearly Average Flow Rates of Three USGS Gage Stations in HUC 03050101 Between 1997 & 2007

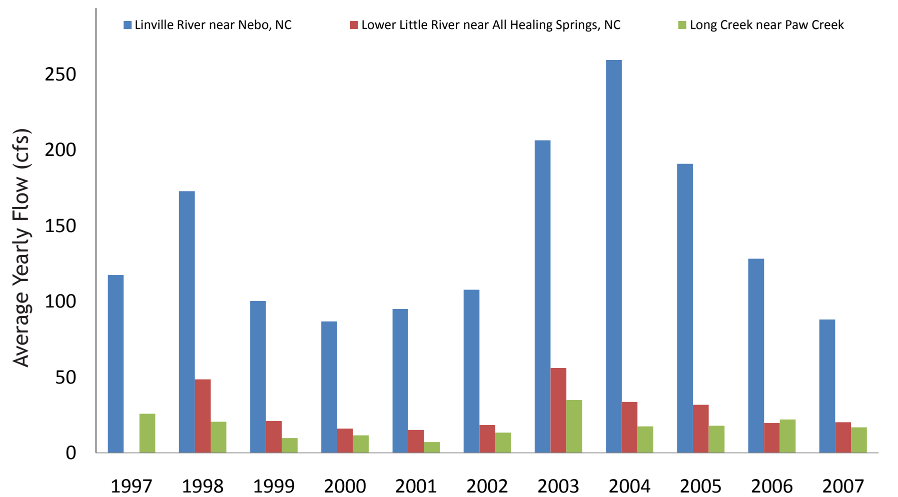


Figure 1-3 shows the yearly averages for three different USGS gage stations spread through the 03050101 HUC between 1997 and 2007. The figure also shows the drought that impacted the basin between 1999 and 2002 as well as the impact from heavy rain events in 2003 and the three hurricanes that occurred between mid 2004 to mid 2005.

Ambient Data

Chemical and physical samples are taken by DWQ throughout the basin once a month. A majority of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities and are not random. There are also portions of the watershed where no water quality data is collected; therefore, conclusions can not be drawn on the value of water quality in those areas. Parameters collected at each site depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrient measurements, metals, and fecal coliform bacteria. Each classification has an associated set of standards the parameters must meet in order to be considered as supporting its designated uses. For more information on waterbody classifications, see Section 2.2 of the *Supplemental Guide to North Carolina's Basinwide Planning*. Ten sample results are required within the five year data collection window in order to evaluate the water quality parameter and compare it to the water quality standards. For more information about ambient monitoring and seasonal variation in this basin, see the *Catawba River Basin Ambient Monitoring System Report*.

The ambient data is used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2008 version and is based on data collected between 2002 and 2006. The ambient data reported in this basin plan was collected between 2004 and 2008 and will be used for the 2010 IR. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The Catawba portion of the Draft 2010 IR can be found in *Appendix 1-A* and the Final 2008 IR can be found on the *Modeling & TMDL Unit's* website.

During the current sampling cycle (January 2004 and January 2008), 18 Ambient Monitoring System (AMS) stations collected ten or more samples and were used for use support assessment (see Figure 1-1 for station locations). Six of those stations were discontinued at the beginning of 2007 to allow for the addition of Random Ambient Monitoring System (RAMS) stations. There were four RAMS stations sampled within the basin between 2007 and 2008, one of which was located in this subbasin and is listed at the bottom of Table 1-1.

Table 1-2: Ambient Monitoring Stations in HUC 03050101

Station ID	Current Status	Waterbody	AU#	Location	Impaired* (by Parameter)	Impacted (by Parameter)
C0145000	Discontinued (12/`06)	Catawba R.	11-(8)	SR-1234 near Greenlee	---	---
C0250000	Active	Catawba R.	11-(8)	SR-1221 near Pleasant Gardens	---	---
C0550000	Active	N Fk Catawba R.	11-24-(13)	SR-1552 near Hankins	---	Turbidity (7.4%)
C1000000	Active	Linville R.	11-29-(19)	NC-126 near Nebo	---	---
C1230000	Active	Catawba R.	11-(32.7)	SR-1304 near Calvin	---	---
C1370000	Active	Wilson Cr.	11-38-34	US-221 near Gragg	---	---
C1750000	Active	Lower Cr.	11-39-(6.5)	SR-1501 near Morganton Marion	Turbidity (11.5%)	---
C2600000	Discontinued (1/`07)	Lake Hickory	11-(59.5)	NC-127 near Hickory	Low pH (11.4%)	
C2818000	Active	Lower Little R.	11-69-(0.5)	SR-1313 near Healing Springs	Low pH (22.4%)	---
C3420000	Discontinued (1/`07)	Lake Norman	11-(75)	SR-1004 near Mooresville	Low pH (11.4%)	---
C3699000	Discontinued (1/`07)	Mt. Island Lake	11-(114)	Above Gar Cr.. near Croft	Low pH (11.8%)	---
C3860000	Active	Dutchmans Cr.	11-119-(0.5)	SR-1918 at Mountain Island	Turbidity (10.2%)	Low pH (8.5%)
C3900000	Active	Catawba R.	11-(117)	NC-27 near Thrift	Low pH (16.9%)	---
C4040000	Active	Long Cr.	11-120-(2.5)	SR-2042 near Paw Cr..	Turbidity (20.3%) Copper (23.1%)	---
C4220000	Discontinued (1/`07)	Catawba R.	11-(122)	Powerline crossing at S Belmont	---	Turbidity (8.6%)
C7400000	Active	Lake Wylie	11-(123.5)a	SR-2302 at SC state line	---	Low pH (8.3%)
C7500000	Discontinued (1/`07)	Lake Wylie	11-(123.5)a	NC-49 near Oak Grove	---	Turbidity (8.6%) Manganese (7.7%)
C8660000	Active	Crowders Cr.	SC	SC-564 Ridge Rd near Bowling Green, SC	---	---
C2044000	`07-`08 RAMS	Freemason Cr.	11-47-(1)	SR-1123 near Baton	---	---

* Data collected between 2004-2008 and will be reflected on the 2010 Draft Integrated Report. Impaired segments may be seen as category 4 or 5. For more details about the Integrated Report and category definitions see the *Methodology Chapter.*

Eight of the ambient stations are rated Impaired for exceeding low pH, high temperature, copper and/or turbidity standards (See Table 1-1). A station is rated Impaired if 10.1% of the samples collected in a given sampling cycle are over the State's standards for any given parameter. For example, if 10.3% of samples taken between 2004 and 2008 are over the 50 NTU standard for turbidity, that stream segment is then rated as Impaired and placed on the 303(d) Impaired Waters List.

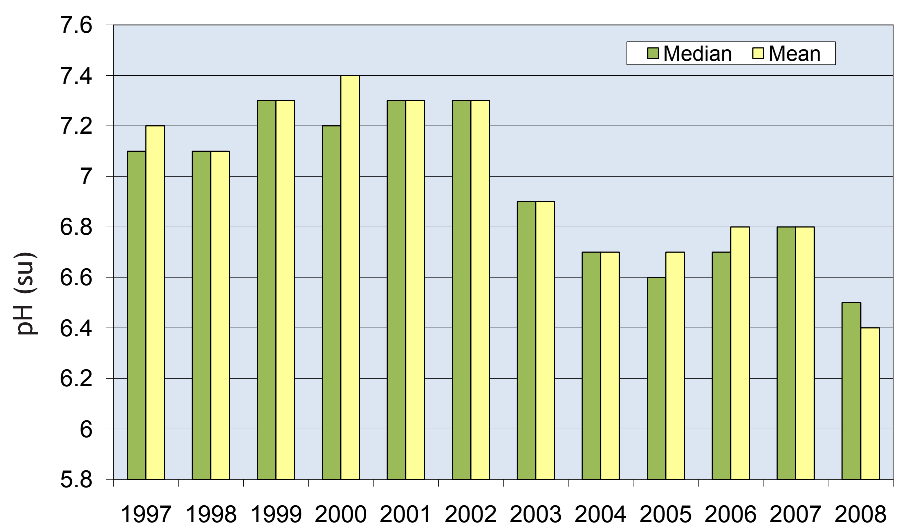
Three of the stations are Impacted for low pH, manganese and/or turbidity (Table 1-2). For the purposes of this plan, any site with 7.1% to 10.0% of samples not meeting a parameter's standard will be considered Impacted. The term *Impacted* is not an official rating by DWQ and is used to indicate streams with potential of becoming impaired in the near future. These impacted waters are identified to allow targeting of resources to prevent further degradation.

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for all ambient stations in this watershed for a specific parameter over a 12 year period (1997-2008). Each major parameter is discussed in this Section even if no current impairment exists. These graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use conditions or climate conditions can effect 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 2002 and 2007 by DWQ's Environmental Sciences Section (ESS) and can be found in the *Catawba River Basin Ambient Monitoring System Report*.

pH

pH is a measure of hydrogen ion concentration that is used to express whether a solution is acidic or alkaline (basic). Lower values can have chronic effects on the community structure of macroinvertebrates, fish and phytoplankton. Changes in the pH of surface waters occur primarily through point source discharges and natural fluctuations. Changes can also occur during accidental spills, acid deposition (i.e.; rain, snow) and algal blooms.

Figure 1-4: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 03050101



The water quality standard for pH in surface freshwater is 6.0 to 9.0su. Low pH was the most common reason for Impairment in this watershed. Five stream segments are Impaired and two stream segment are Impacted from low pH levels. See Table 1-2 for the percent of samples not meeting the standard for each station in this subbasin. For more specific station information, see *Appendix 1-C*.

Figure 1-4 shows the mean and median of pH levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The lowest pH yearly average recorded and the year with the most standard violations was 2008. The overall basin trend during this 12 year period is a significant decline in pH levels. In this subbasin, yearly averages dropped from low 7's to high 6's starting around 2003. For a more detailed discussion of what may be causing this trend basinwide, see the *Basin Overview Chapter*.

Turbidity

Turbidity is a measure of cloudiness in water and is often accompanied by excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), reduce fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can make it more difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can cause taste and odor problems, block water supply intakes, foul water treatment systems, and fill reservoirs (USEPA, 1999 and Waters, 1995).

The NC standard for turbidity in freshwater streams is 50 NTUs. As seen in Table 1-2, three stream segments are Impaired and three segments are Impacted for turbidity in this subbasin. The most severe turbidity violation can be seen at site C4040000 (Long Creek) with 20% of samples exceeding the State's standard. For more specific information about this sample site, see *Appendix 1-C*. The standard for a stream which holds a secondary classification of Trout Water (Tr) is ≤10 NTUs. There is one ambient station located on a stream with this Tr classification (C1370000 - Wilson Creek), and it is not impacted by turbidity. For more information on Trout water classifications and where they are located in the Catawba River basin, see the Trout water map in *Appendix 1-D*.

FIGURE 1-5: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050101

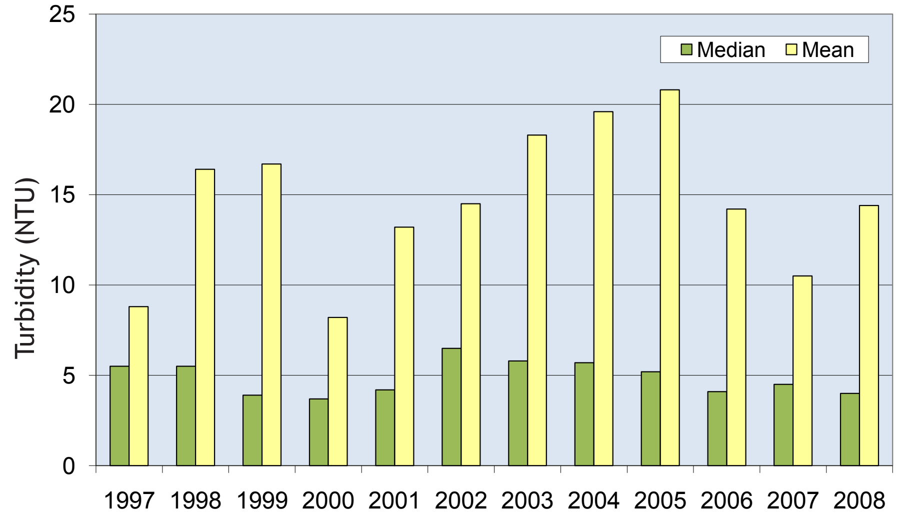
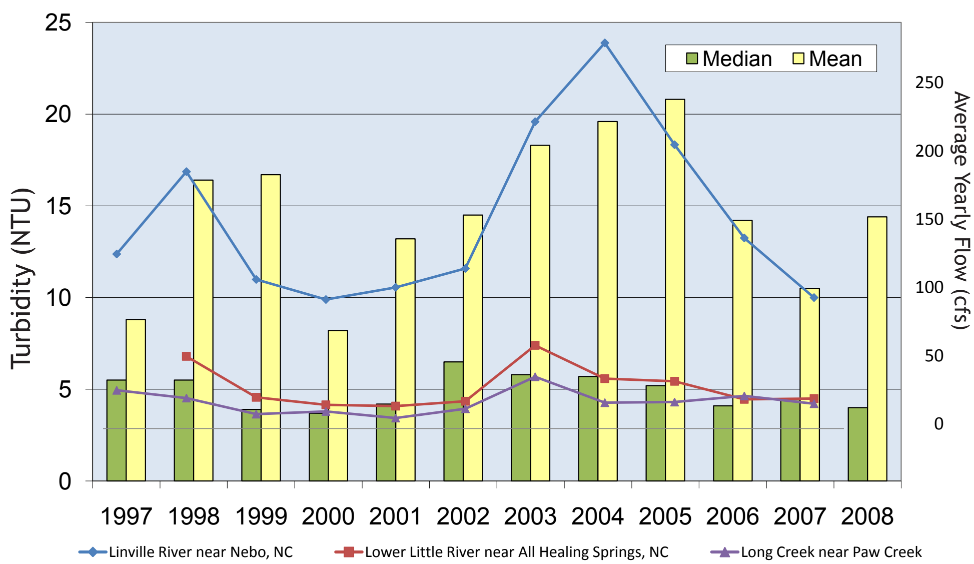


Figure 1-5 shows the mean and median of turbidity levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The highest yearly averages for turbidity were recorded between 2003 and 2005 which were also the three years with the most turbidity standard violations (8%, 5% and 8% respectively).

Peaks in turbidity levels are closely related to stream flow peaks. In Figure 1-6, the USGS flow gage data of the yearly averages for the three sites in this HUC (Figure 1-3) are imposed onto the turbidity graph. Here, the relationship between turbidity levels and flow rates are apparent. The heavier the rain event, the more sediment is washed off the land and into the streams. Therefore, extra precautions should be taken during heavy rain events to recapture sediment before it leaves a property or reaches the stream.

FIGURE 1-6: COMPARING FLOW RATES & TURBIDITY LEVELS IN HUC 03050101



Soil erosion is the most common source of turbidity and sedimentation and, 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, excessive stormwater flow off impervious surfaces are all potential sources. The distribution of turbidity violations and sample locations make it difficult to isolate a single source of erosion in the Catawba River Headwaters. It appears, however, violations are highest near urban areas and transitional suburban areas. Violations are lowest in the upper watershed where land cover is predominantly forest. This trend demonstrates the importance of *protecting and conserving stream buffers and natural areas*.

Dissolved Oxygen

Dissolved Oxygen (DO) can be produced by turbulent actions, such as waves, rapids or waterfalls that mix air into the water. High levels are found mostly in cool swift moving waters and low levels are found in warm slow moving waters. In slow moving waters, such as reservoirs and estuaries, depth is also a factor. Wind action and plants can cause these waters to have a higher dissolved oxygen concentration near the surface and decline to as low as zero at the bottom.

The NC standard for DO in freshwater is no less than a daily average of 5.0 mg/l (milligrams per liter of water) with a minimum instantaneous value of no less than 4mg/l. Trout waters (Tr) should not have less then 6.0 mg/l DO. For more information on Trout water classifications and where they are located in the Catawba River basin, see the Trout water map in *Appendix 1-D*. As seen in Table 1-2, no stream segments in this subbasin are Impaired or Impacted due to DO levels.

Figure 1-7: Summarized DO Values for All Data Collected at Ambient Sampling Stations in HUC 03050101

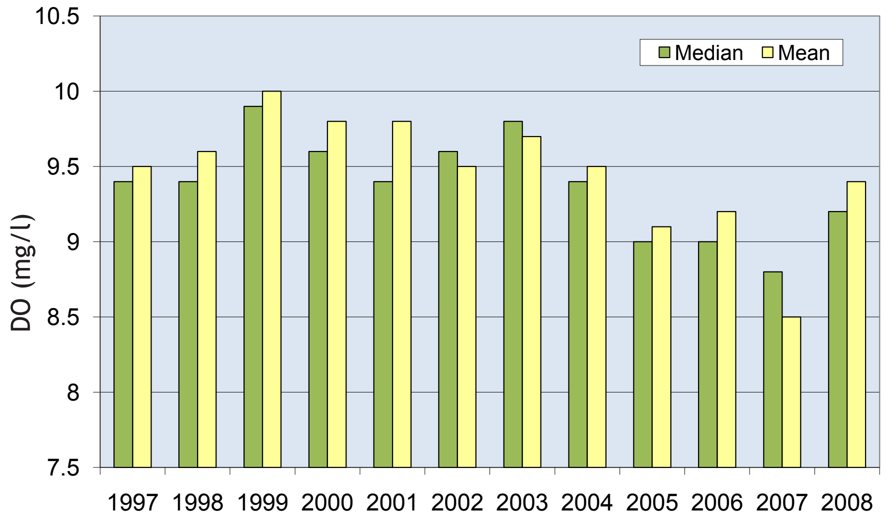


Figure 1-7 shows the mean and median of DO levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The lowest yearly average for DO was recorded in 2007 which was the same year with the most DO standard violations (7%). Dissolved Oxygen can be strongly influenced by water temperature and drought. The low yearly average was likely caused by drought.

Temperature

All aquatic species require specific temperature ranges in order to be healthy and reproduce. An aquatic species becomes stressed when water temperatures exceed their preferred temperature range, and stressed fish are more susceptible to injury and disease.

The NC standard for temperature is not to exceed 29°C in the mountains/upper piedmont and not to exceed 32°C in the lower piedmont/coastal plains. The line between the upper and lower piedmont region is the Lookout Shoals Dam. The discharge of heated liquids to trout waters (Tr) should not increase the natural water temperature by more than 0.5°C (0.9°F), and in no case, exceed 20°C (68°F). For more information on Trout water classifications and where they are located in the Catawba River basin, see the Trout water map in *Appendix 1-D*. As seen in Table 1-2, no stream segments in this subbasin are Impaired or Impacted due to DO levels.

Figure 1-8: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 03050101

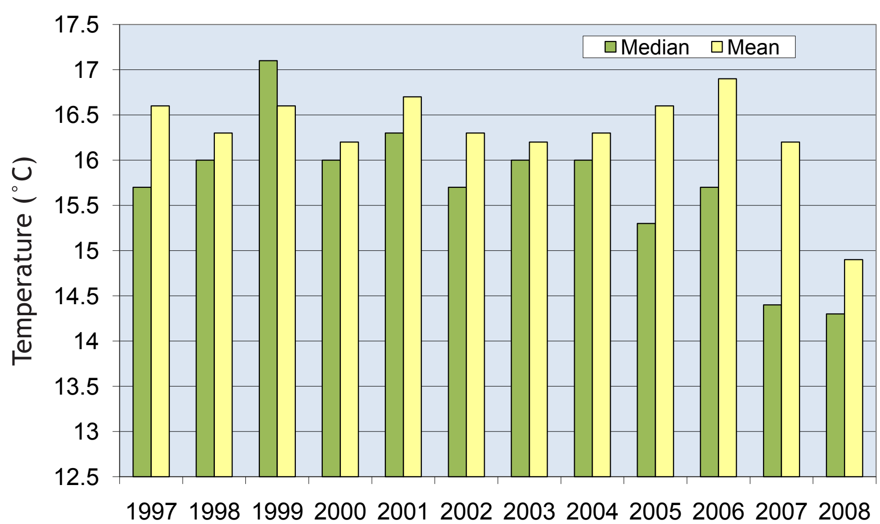


Figure 1-8 shows the mean and median of temperature levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The highest yearly average for temperature was recorded in 2006. However, the year with the most temperature standard violations occurred in 2005 (3%). Violations in 2005 were likely caused by severe drought throughout the basin.

Fecal Coliform Bacteria

The presence of fecal coliform bacteria (FCB) in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other warm blooded animals and its associated pathogens or disease producing bacteria or viruses. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals.

The FCB standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are to be used to indicate whether the stream is Impaired or Supporting. Waters with a classification of B (primary recreational waters) will receive priority for 5-in-30 studies. Other waters will be studied as resources permit. Six out of the 18 ambient stations in the Catawba River Headwaters subbasin recorded FCB levels above a geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of samples taken between 2004 and 2008 (Table 1-3). However, since none of the stations received a 5-in-30 study during this time period, none will be Impaired for FCB on the 2008 or 2010 Impaired Waters List. For additional information about these sample sites, see *Appendix 1-C*.

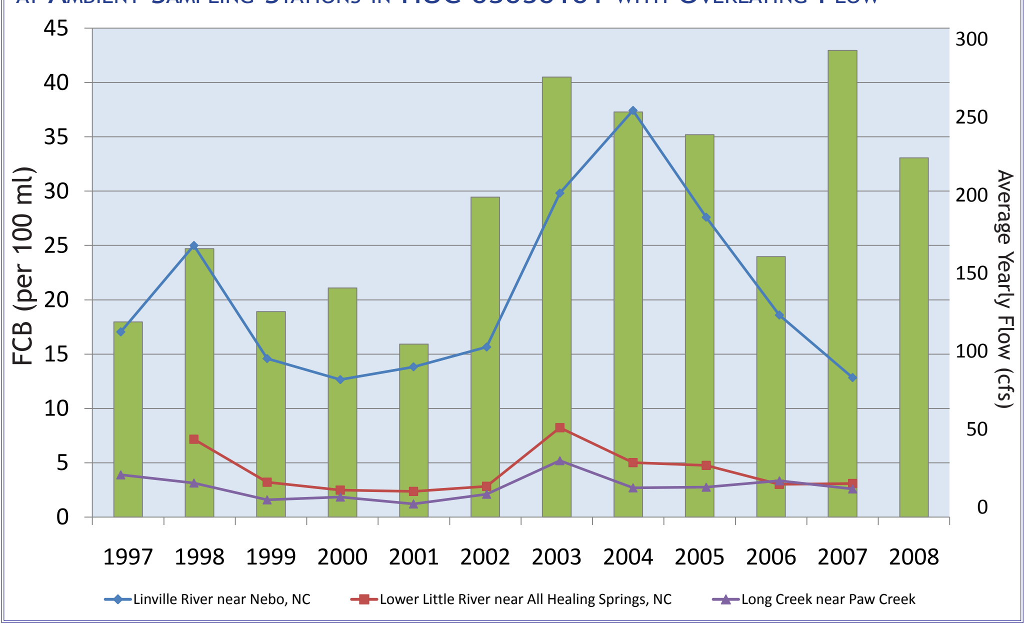
Table 1-3: Waters with Elevated FCB Levels & Without 5-in-30 Studies.

Station ID	Waterbody	Class.	AU#	Location	Geometric Mean	# of Samples Above 400 colonies/100ml	% of Samples Above 400 colonies/100ml
C0145000	Catawba R.	C	11-(8)	SR-1234 near Greenlee	219	10 out of 34	29%
C1750000	Lower Cr.	WS-IV	11-39-(6.5)	SR-1501 near Morganton Marion	438	25 out of 52	48%
C2818000	Lower Little R.	C	11-69-(0.5)	SR-1313 near Healing Springs	367	28 out of 59	47%
C3860000	Dutchmans Cr.	WS-IV	11-119-(0.5)	SR-1918 at Mountain Island	208	17 out of 59	29%
C4040000	Long Cr.	WS-IV	11-120-(2.5)	SR-2042 near Paw Cr.	270	15 out of 59	25%
C8660000	Crowders Cr.	FW	--	South Carolina	277	16 out of 59	27%

It should be noted that two 5-in-30 studies were completed in 2009 in the Hunting Creek and Lower Creek watersheds. Information on each of those studies can be found in the corresponding 10-digit watershed discussions (Lower Creek-0305010107 & Hunting Creek-0305010106). The results of these studies will be reflected on the 2012 Impaired Waters List.

Figure 1-9 shows the geometric mean of FCB levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers.

Figure 1-9: Summarized Fecal Coliform Bacteria Values for All Data Collected at Ambient Sampling Stations in HUC 03050101 with Overlaying Flow



The highest yearly geometric mean for FCB was recorded in 2007 (43 colonies/100 ml). The figure also includes the yearly average stream flow, as seen in Figure 1-3, to show how flow can be closely linked to FCB levels.

For more information regarding any of the parameters listed above, see Section 3.3 of the *Supplemental Guide to North Carolina's Basinwide Planning*.

Lake and Reservoir Data

Five lakes (James, Rhodhiss, Hickory, Norman and Wylie) were all sampled by DWQ-ESS in 2007. These five lakes, including Lookout Shoals and Mountain Island Lake, are often referred to as the Catawba Chain of Lakes. The entire chain is located within this 8-digit HUC. Each of the lakes holds a water supply designation of either WS-IV or WS-V and is classified as a Class B water (primary recreation). A brief description and assessment of each lake can be found in the *Chain of Lakes Chapter* of this plan.

10-Digit HUC Watershed Breakdown

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 10-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 subbasin can be seen in Figure 1-1, and a Use Support list of all monitored waters in this basin can be found in *Appendix 1-A*. Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories and then by 12-digit subwatersheds. The three designations are described below. These designations do not indicate the Use Support rating (Supporting, Impaired or No Data) for a waterbody. The Use Support rating can be found at the top of the *Use Support and monitoring box* (Figure 1-11) which is provided for each waterbody to the right of the waterbody discussion, as described below.

Hydrologic Unit Codes (HUC):

DWQ has recently made a change from the State designated subbasin lines (e.g., 03-08-30) to the nationally recognized HUC lines. This Plan is organized by HUCs to provide, not only a detailed look at a particular waterbody, but also how that waterbody fits into the larger watershed picture. Table 1-4 provides a brief description of the different HUC sizes and names. There are three 8-digit subbasins within the Catawba River Basin (03050101, 03050102 & 03050103). Due to the large size of these 8-digit subbasins, each chapter is broken down even further into 10-digit watersheds for a more local water quality analysis. Within each 10-digit watershed section of the Chapter, waterbodies are grouped by 12-digit subwatershed to better identify specific stressors and sources. A comparison map of the State designated subbasin lines used in the past verses the new nationally recognized HUC lines is included in *Chapter 11*.

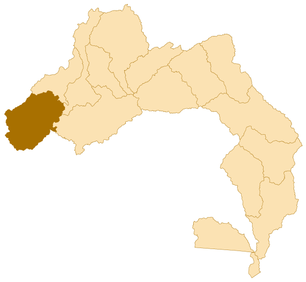
Table 1-4: HUC Quick Reference

HUC Digit	HUC Name	Average Size[1]
2-digit	Region	177,560
4-digit	Subregion	16,800
6-digit	Basin	10,596
8-digit	Subbasin	700
10-digit	Watershed	227
12-digit	Subwatershed	40

[1] In approximate square miles

The 10-Digit Watershed Map:

Figure 1-10: Example of the 10-Digit HUC Map



At the beginning of each 10-digit watershed section is a small reference map as seen in Figure 1-10. **These maps are also a hyperlink to a full page detailed map of that particular watershed.** Click on the map to view the full page map, then when you wish to return back to the text, click the inset map on the full page map. If you are viewing a hardcopy version of this Plan, these maps can be found at the end of this document or in *Appendix 1-D*. **Interactive elements** have been incorporated within all 10-digit watershed maps. To use the new features click on the *Layers* tab on the left side of the Adobe Reader window. Expand the folder tree by clicking on the (+) sign to the left of the map name. Each item in the subsequent folder tree is a layer on the map. These layers can be turned on or off by clicking the  symbol to the left of the layer name. This allows you to view all layers or select only layers of interest and decrease the amount of symbols and labels for a cleaner look. Reminder: to return to your previous place within the text, just click the smaller map in the upper left hand corner of the 10-digit watershed map.

Restoration Opportunities, Protection Priorities & Success Stories:

Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories. This grouping is used to provide a better understanding of what types of actions, if any, need to be taken for a particular body of water based on known water quality information.

Restoration Opportunities:
The term *Restoration Opportunities* refers to waters which are degraded and are in need of restoration to return the water quality back to natural conditions. This designation is given to not only waters already on the Impaired Waters List, but also waters that are predicted to be on the Impaired Waters List in the future if no restoration action is taken. Impacted waters, as defined by the DWQ Planning Section (see Acronyms & Definitions), are often included in this group. Restoration efforts may include development and implementation of a watershed restoration plan, installation of appropriate best management practices (BMPs), implementation of local ordinances, educational efforts and/or extending monitoring efforts among many others.

Protection Priorities:
The term *Protection Priorities* refers to waters which are in need of protection to keep it from becoming impacted or Impaired in the future. This includes waters that are currently supporting aquatic life, but are within watersheds that have recently undergone a land use change or other changes that may have a negative impact on water quality in that stream. This designation is given to assist DWQ and other water quality agencies in being more proactive about protecting water quality and minimize stream degradation. Protection efforts may include among others, finding the sources of degradation, educating local communities of water quality concerns, developing and implementing an action plan and developing a local ordinance that requires environmentally sound development and land use changes. Protecting these waterbodies not only ensures continued stability of aquatic life and associated habitat, but also saves local, state and federal agencies from a costly and time consuming restoration effort after the waterbody has become Impaired.

Success Stories:
The term *Success Stories* refers to waters that have shown long term improvement for a known reason. This includes improvements on all levels, whether it's a stream that has been removed from the Impaired Waters List or that a source of pollution, which may have been negatively impacting the stream, has been removed or no longer has an impact. However, not all streams that have been removed from the Impaired Waters List are listed in this Plan as a success due to the fact that the reasons for some improvements are not known and may be due to temporary changes in the watershed. This designation is also used to discuss streams that have undergone restoration or protection efforts that have resulted in measured water quality improvements or are expected to in the near future. Not all efforts show instantaneous results and may be designed for gradual long term improvement. However, those efforts should be recognized to increase awareness of what other water quality groups and agencies are doing and to promote cooperation among those groups and agencies with the same goal.

Assessment Unit Numbers [AU#]:

Each waterbody throughout the state is given one or more assessment unit (AU) number(s). These identification numbers are assigned to a particular stream or portion of a stream for many reasons. One of those reasons is to reduce confusion when different streams have the same name. For example, there are five different streams in different parts of the Catawba River Basin named Big Branch. Another reason is to identify a particular segment of a stream. A longer stream may be split into multiple segments to provide more accurate assessments, classifications and reporting of a particular portion of that stream.

These AU numbers are indicated at the beginning of each new waterbody discussion following the stream name in [brackets]. If multiple segments of a stream are included in that discussion, each AU# will be listed. To reduce space, some AU numbers may be abbreviated. For example, the North Fork Catawba River is split into four segments, 11-24-(1), 11-24-(2.5)a, 11-24-(2.5)b, and 11-24-(13). This is then abbreviated to 11-24-(1), (2.5)a, (2.5)b & (13) where the common numbers are removed from the first part of the AU.

Use Support & Monitoring Box:

Figure 1-11: 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%

To reduce confusion and provide a quick reference, each waterbody discussed in the Restoration Opportunities and Protection Priorities sections have a corresponding Use Support and Monitoring Box (Figure 1-11). The top row indicates the draft 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 draft 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 Figure 1-11 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.

Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Figure 1-11) 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.

Table 1-5: Waterbodies & the Section(s) Where Discussed Within This Subbasin Chapter

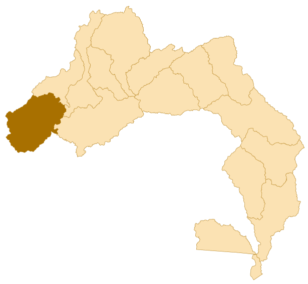
Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/Success[2]
Catawba R	11-(8)	0305010101	3a	Protection/Success
Crooked Cr	11-12	0305010101	2	Protection
Left Prong Catawba R	11-6	0305010101	2	Success
Mackey Cr	11-15-(3.5)b	0305010101	2	Success
Catawba R	11-(1)	0305010101	2	Success
N Fk Catawba R	11-24-(1), (2.5)a, (2.5)b, & (13)	0305010102	2	Protection
Pepper Cr	11-24-10	0305010102	2	Protection
Honeycutt Cr	11-24-8	0305010102	2	Protection
White Cr	11-30	0305010103	5	Restoration
Paddy Cr	11-28	0305010103	2	Protection
Linville R	11-29-(4.5) & (19)	0305010103	2	Protection
Irish Cr	11-35-3-(2)b	0305010104	2	Success
Parks Cr	11-38-35	0305010105	5	Restoration
Wilson Cr	11-38-34	0305010105	2	Protection
Stack Rock Cr	11-38-34-5	0305010105	2	Protection
Franklin Br	11-38-31	0305010105	2	Protection
Johns R	11-38-(1), (28), & (35.5)	0305010105	2	Success
Youngs Fk/Corpening Cr	11-32-1-4a & b	0305010106	5	Restoration
Canoe Cr	11-33-(2)	0305010106	5	Restoration
Hunting Cr	11-36-(0.7)	0305010106	5	Restoration
N Muddy Cr	11-32-(0.5)	0305010106	2	Protection
Jacktown Cr	11-32-1-4-1	0305010106	3a	Protection
Silver Cr	11-34-(0.5)	0305010106	2	Protection/Success

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality. For more information on these designations see *Understanding This Section*.

Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/ Success[2]
Catawba R	11-(32.7)	0305010106	2	Protection
S Muddy Cr	11-32-2	0305010106	2	Success
Lower Cr	11-39-(0.5)b. (6.5) & (9)	0305010107	4	Restoration
Spainhour Cr	11-39-3	0305010107	5	Restoration
Blair Fk	11-39-3-1	0305010107	3a	Restoration
Greasy Cr	11-39-4b	0305010107	5	Restoration
Bristol Cr	11-39-8	0305010107	5	Restoration
Lower Cr.	11-39-(0.5)a	0305010107	2	Protection
Zacks Fk	11-39-1	0305010107	2	Protection
Greasy Cr	11-39-4a	0305010107	2	Protection
McGalliard Cr	11-44-(3)	0305010108	5	Restoration
Gunpowder Cr	11-55-(1.5)	0305010108	5	Restoration
Horseford Cr	11-54-(0.5)	0305010108	5	Restoration
Smoke Cr	11-41-(1)	0305010108	2	Protection
Silver Cr	11-56-(2)	0305010108	2	Protection
Drowning Cr	11-52-(1)	0305010108	2	Protection
Upper Little R	11-58 & 11-58-(5.5)	0305010109	2	Protection
Middle Little R	11-62a & b	0305010109	2	Protection
Duck Cr	11-62-(1) & (4)	0305010109	2	Protection
Lower Little R	11-69-(0.5)	0305010110	5	Restoration
Muddy Fk	11-69-4	0305010110	5	Restoration
Lambert Fk	11-69-3	0305010110	2	Protection
Elk Shoal Cr	11-73-(0.5)	0305010110	2	Protection
McLin Cr	11-76-5-(0.7)	0305010111	5	Restoration
Lyle Cr	11-76-(4.5)	0305010111	2	Protection
Forney Cr	11-119-2-3	0305010113	5	Restoration
Dutchmans Cr	11-119-(0.5)	0305010113	5	Restoration
Leepers Cr	11-119-1-(1)	0305010113	2	Protection
Killians Cr	11-119-2-(0.5)a & b	0305010113	2	Protection
McDowell Cr	11-115-(1), (1.5)a, (1.5)b & (5)	0305010114	4	Restoration
Long Cr	11-120-(2.5)	0305010114	5	Restoration
Gar Cr	11-116-(1)	0305010114	2	Protection
McGill Cr	11-135-2	0305010115	5	Restoration
Crowders Cr	11-135a-f	0305010115	5	Restoration
Crowders Cr	11-135g	0305010115	4t	Restoration
Catawba Cr	11-130a-c	0305010115	5	Restoration
S Crowders Cr	11-135-10-1	0305010115	5	Restoration
S Fk Catawba Cr	11-135-10	0305010115	2	Protection
Abernethy Cr	11-135-4b	0305010115	2	Success

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality. For more information on these designations see *Understanding This Section*.

Catawba River Headwaters (0305010101)



Protection Priorities

Mackey Creek & Toms Creek (HUCs 030501010105 & 030501010106)

Use Support: Supporting (24 mi)	
2008 IR Cat.	5
2010 IR Cat.	3a
Benthos (CB11) (CB12)	 Good (2007) Good (2007)
AMS (C0145000) (C0250000)	 No Exceedances No Exceedances

Catawba River [AU: 11-(8)]:
The headwaters of the Catawba River begin southwest of the Town of Old Fort and flows through both of the Mackey and Toms Creek HUCs. In the past, this section of the Catawba River had experienced a decrease in water quality due to excess turbidity and fecal coliform bacteria within the water column. According to data collected between 2004 and 2008, the elevated turbidity levels had significantly improved as there were only 5.6% of samples with turbidity exceedances during that time at station C0250000. Fecal coliform bacteria (FCB) levels have also decreased; however, this parameter continues to somewhat impact the water quality in this watershed. Cattle pastures with direct access to the creeks are scattered throughout the watershed and could be the source of this impact. DWQ will work with Soil & Water Conservation District (SWCD) to determine the priority and best locations for livestock exclusion best management practices (BMPs). This segment of the river is listed as a category 3a on the Draft 2010 Integrated Report due to inconclusive instream data for FCB. The ambient station C0145000 was discontinued in December of 2006.

Crooked Creek (HUC 030501010103)

Use Support: Supporting (16 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB20)	 Good-Fair (2007)
Fish Com (CF9)	 Good (2007)

Crooked Creek [AU: 11-12]:
Crooked Creek was sampled in 2007 as part of a HQW/ORW Reclassification Study[1]. Biological sampling in this subwatershed slightly decreased from previous sampling years. Both benthic and fish communities dropped a rating. Data shows impacts are most likely due to non-point source runoff from residential and agricultural areas. DWQ will continue to monitor this segment during the next sampling cycle to better understand the impacts to this watershed and help prevent further degradation.

Water Quality Improvements & Success Stories

Catawba River [AU: 11-(8)]:
The Catawba River will be removed from the 2010 Impaired Waters list for turbidity. The percent of turbidity violations were reduced from 10.3% of samples exceeding standard between 2002-2006 to only 5.6% sample exceedance between 2004-2008.

Left Prong Catawba River [AU: 11-6]:
The Left Prong Catawba River was being threatened by sediment-laden runoff from two large home construction projects during the 2004 plan assessment period. One project was found to be operating without the proper permits. As recommended in the 2004 plan, DWQ and Division of Land Resources (DLR) worked with the land owners to bring both properties into compliance with proper permits and properly constructed erosion control measures. The Left Prong was given an Excellent benthic rating in 2007.

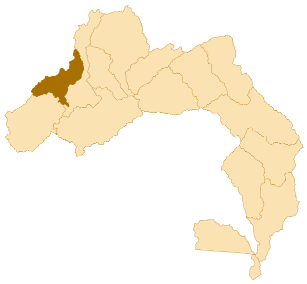
Mackey Creek [AU: 11-15-(3.5)b]:
Mackey Creek was placed on the Impaired Waters list for toxic impacts in 2000 based on a benthic sample taken in 1998 resulting in a Fair bioclassification. In July of 2002, a small industrial metals facility ceased its 0.01MGD discharge just up stream of the benthic sampling site. The elimination of the small discharger made a significant difference to the biological community. When the site was sampled a month later in August of 2002, it received a Good bioclassification rating due to the increase in number of present taxa and taxa diversity. The site was also sampled in 2007 resulting in another Good rating. Even though the ratings are the same, the results show continued improvement. This improvement is an example of how even the smallest water quality impacts can have a powerful effect on the biological community.

Catawba River [AU: 11-(1)]:
Catawba River is a seven and a half mile stretch that marks the beginning of the Catawba River. The first four and a half miles (from source to the Left Prong Catawba River confluence) are designated as Trout Waters (Tr). This designation holds more strict rules and guidelines to ensure the waterbody will continue to support the trout population. In 2002, this

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

portion of the river was sampled and received a Good-Fair rating for both benthic (CB14) and fish (CF6) communities. In 2007, the benthic community was sampled twice resulting in a Excellent rating in July and a Good rating in August. The sample taken in August was greatly affected by the drought, significantly lowering water levels which is most likely the cause of the drop in rating. The increase in rating between 2002 and 2007 may be a result of a stream protection project completed in 2004 by the local SWCD. The project included over 2,000 feet of livestock exclusion BMPs. This segment of the Catawba River was also included in the HQW/ORW Reclassification Study[1] and is now qualified to be reclassified as a HQW stream. For more information on the Trout Water designation and a map of other Trout waters within this basin, *see the Buffers Chapter*.

North Fork Catawba River (0305010102)



Protection Priorities

North Fork Catawba River (030501010202)

North Fork Catawba River [AUs: 11-24-(1), (2.5)a, (2.5)b & (13)]:
This subwatershed contains the entire 23.5 mile length of the North Fork Catawba River which drains directly into Lake James. The first 19.5 miles of the river are designated Trout Waters (Tr) with a portion of that designated as primary recreational waters (B). For more information about the Tr designation, *see the Buffers Chapter*. These two supplemental classifications boost the importance of protection for this subwatershed. Historically, the river has received excellent biological ratings; however, sections have started experiencing a drop in the health of aquatic life and have become impacted by turbidity and fecal coliform bacteria. This is discussed in greater detail in the following paragraphs. The protection of the river and surrounding small tributaries are considered high priorities for protection to assist in restoring the impacted segment of the river back to fully supporting its designated use.

The North Fork Catawba River is split into four segments which are discussed in the bullet list below starting at the headwaters down to its confluence with Lake James.

Use Support: Supporting (6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB40)	Good (2007)

- North Fork Catawba River [AU: 11-24-(1)]: This portion begins at the source of the North Fork Catawba River to Laurel Branch and holds a Tr secondary classification. Samples taken in 2007 showed the segment had a stable benthic community; however, there were signs indicating instream water quality pollutants. The high specific conductance level (125 µmhos/cm) measured at this location in 2007 is most likely due to stormwater runoff and new development in and around the Linville Falls area in the river headwaters. A rare mayfly population (*Ephemerella berneri*), which is on the Natural Heritage Program's Significantly Rare species list, was collected at benthic site CB40 in 1991. This species was not collected during the 2007 sample.

Use Support: Supporting (7 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB42)	Good (2007)

- North Fork Catawba River [AU: 11-24-(2.5)a]: The second segment of the North Fork Catawba River flows from Laurel Branch to Stillhouse Branch. As of 2007, this segment was supporting the supplemental classifications of B and Tr. However, the segment has slowly decreased in the amount, quality, and diversity of taxa since 1991. New pollution tolerant species found during benthic sampling indicates either a new source of pollution or the benthic community can no longer handle the current pollution loading. This segment has a high conductivity (107 µmhos/cm) level which could be caused by farms that line almost the entire length of the segment and an upstream golf course located on the western bank.

  In efforts to ensure no additional agricultural pollutants are impacting the river, the local SWCD installed five best management practices (BMPs) along this portion in 2004 and 2005. The three projects completed in 2004 were stream protection and livestock exclusion BMPs. The two 2005 BMP projects included stream restoration and planting of a critical area to reduce erosion.

Use Support: Supporting (4 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB41)	Good-Fair (2007)

- North Fork Catawba River [AU: 11-24-(2.5)b]: The third segment of the North Fork Catawba River flows from Stillhouse Branch to Armstrong Creek. Of the four river segments, this one received the lowest biological rating for this sample period; however, it showed some improvement from previous cycles. In 2002, this segment was rated Fair due to excess oil and grease being discharged by the Baxter Healthcare

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

facility (NC0006564). The facility has since made efforts to reduce the amount of oil and grease from their effluent. Specific conductivity levels have dropped from 576 µS/cm to 206 µS/cm as a result of these efforts. The 2002 and 2007 drought may have caused the conductance levels to appear higher than it would during normal flows and are expected to reduce further in the future. The habitat was not affected by the drought and the segment is currently supporting both designated uses of B and Tr secondary classifications.

North Fork Catawba River [AU: 11-24-(13)]: The fourth segment of the North Fork Catawba River flows from Armstrong Creek to Lake James. Ambient sampling of this segment shows slightly elevated levels of turbidity and fecal coliform bacteria (FCB). The excess FCB is likely due to failing septic systems and livestock with access to the river. Development upstream could cause these elevated turbidity levels. Neither FCB nor turbidity values were high enough to cause an impairment.

Use Support: Supporting (13 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
AMS (C0550000)	No Exceedances

This segment is mostly contained within the Pisgah National Forest. However, agricultural lands and new development are found along either side of the rivers banks, especially along the US-221 corridor and just north of Lake James. It is critical that this river and its tributaries are protected to maintain adequate habitat for the rare mayfly found in 1991 as well as trout populations and to ensure safe recreational use.

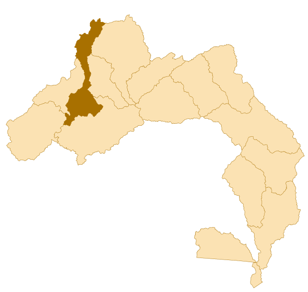
Pepper Creek [AU: 11-24-10] & Honeycutt Creek [AU: 11-24-8]:
Pepper Creek (4 mi) and Honeycutt Creek (5 mi) flow into the North Fork Catawba River within the 030501010202 subwatershed. Both creeks were sampled in 2007 as part of a HQW/ORW Reclassification Study[1]. Neither creek qualified for the more protective HQW/ORW secondary classifications. The creeks are experiencing similar water quality issues due to minimal to no riparian buffers and low stream flows which are causing poor habitat ratings. Even though this subwatershed is mostly forested, there are developmental and agricultural activities surrounding both creeks. Land disturbing activities are causing the instream and bank habitats to become smothered by sediment, which is negatively impacting the biological community. The Tr designation held by both creeks requires, at minimum, a 25 foot trout buffer along the creeks during any land disturbing activities over one acre in size. For more information on trout buffers in the Catawba River basin, *see the Buffers Chapter*.

Use Support: Supporting (4 mi) & (5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos	
Pepper Cr. (CB47)	Good-Fair (2007)
Honeycutt Cr. (CB316)	Good-Fair (2007)

Watershed Recommendations

North Fork Catawba River: The discovery of the rare mayfly population (*Ephemerella berneri*) in 1991 increased the need to protect this subwatershed to ensure the population can continue to survive. Stormwater runoff from agricultural lands, golf courses, and construction sites are major stressors for the river. Riparian buffers along the full length of the river and its tributaries would assist in filtering stormwater before it reaches the river. These buffers are especially needed around golf courses to prevent excess fertilizers from running off directly into the river and potentially causing algal blooms or other undesirable effects from excess nutrients. New construction within this subwatershed should be inspected frequently by local agencies to ensure all sediment and erosion control BMP's are installed and maintained properly through the duration of the project. Additional information about riparian buffers and proper golf course maintenance to prevent water quality degradation can be found on the *Basinwide Planning Unit website*.

Linville River-Lake James (0305010103)



Restoration Opportunities

Lake James - Catawba River (030501010303)

White Creek [AU: 11-30]:
This subwatershed contains White Creek which flows directly into Lake James. White Creek drains a small section of the Pisgah National Forest and is almost completely forested with little to no development. The short 3.1 mile creek has recently become impaired due to a benthic sample taken during the HQW/ORW Reclassification Study[1] in 2007 that resulted in a Fair rating and will appear on the 2010 Impaired Waters List. The substrate in 2007 was found to be composed of fine silt, which is uncommon for this subwatershed suggesting the low benthic rating

Use Support: Impaired (3 mi)	
2008 IR Cat.	--
2010 IR Cat.	5
Benthos (CB309)	Fair (2007)

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

is likely due to land disturbing activities sending sedimentation downstream and smothering habitat. Recent low flows could also be a contributing factor to this new impairment. DWQ will add this sample location to the five year sampling cycle to help further understand what is causing this impairment.

Protection Priorities

Lake James - Catawba River (030501010303)

Paddy Creek [AU: 11-28]:

Use Support: Supporting (5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Fish Com (CF47)	Good-Fair (2007)

This subwatershed includes Paddy Creek which drains forested land for the first two miles then flows through agricultural land for the next three miles before it empties into Lake James. The fish community rating in this creek has improved since it was impaired in 1997; however, livestock paths are quickly degrading the quality of the riparian areas which critical to protecting instream habitat. DWQ will work with SWCD to target this subwatershed for livestock exclusion BMPs and local agencies should continue trout buffer educational efforts.

Upper Linville River (030501010301)

Linville River [AUs: 11-29-(4.5) & (19)]:

Use Support: Supporting (22 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos 11-29-(4.5) (CB33) 11-29-(19) (CB32)	 Good-Fair (2007) Excellent (2007)
AMS (C1000000)	No Exceedances

The Linville River originates north of and flows through Grandfather Village, draining residential areas, multiple golf courses and agricultural areas before reaching Lake James. The river is a total length of 40 miles and is split into four segments [AUs: 11-29-(1), (4.5), (16) & (19)], two of which are currently monitored by DWQ [AUs: 11-29-(4.5) & (19)]. Unlike most streams in this subbasin, the headwaters are being impacted by development pressures and agricultural runoff and lower segments are somewhat protected by the Pisgah National Forest.

In the second portion of the river [AU: 11-29-(4.5)], the health of the benthic community is declining which can be attributed to land disturbing activities, failing septic systems and other nonpoint sources. Despite the drought, conductivity levels were higher in 2007 than ever recorded at the CB33 site. Even though this segment is currently supporting it designated uses, it is critical to protect the secondary classification use of Trout water (Tr).

The benthic community in the last segment of this river [AU: 11-29-(19)] has been rated Excellent since 1989 as it did in 2007. This site is just downstream of the Linville Gorge Wilderness Area which has protected aquatic life. However, this stable benthic community is indicating early signs of impacts from increased residential growth near tributaries which are outside of the protected wilderness area.

The cumulative impacts of new development, golf courses, failing septic systems, and agriculture can be devastating to the health of aquatic life. If proper planning and actions are not taken, the lower HQW portion of the stream may soon become impaired. Twenty-five foot trout buffers are required by the state for newly disturbed lands over an acre to help protect the trout population downstream. During this 5 year cycle, the local SWCD has completed 38 Agriculture Cost Share Program (ACSP) projects in this subwatershed. These projects included erosion and nutrient reductions and stream protection. These efforts are a productive start to protecting this subwatershed and DWQ will continue to work with local agencies to ensure protection of these headwaters. Information about Golf Course Water Quality Protection can be found on the *Catawba River Basin* web page. For more information about trout buffers, review the *Trout Buffer fact sheet* and for the ACSP, see the *NC Agriculture Cost Share Program* Section below.

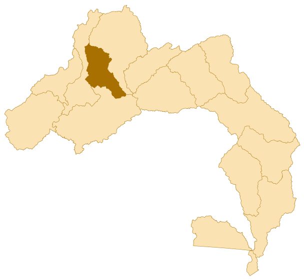
Watershed Recommendations

The entire Linville River 10-digit watershed drains to Lake James which is the first lake in the Catawba Chain of Lakes. It is critical to keep the headwaters of this chain protected. Local agencies should work with local WWTPs and residential and commercial land owners to develop local ordinances and land use plans in preparation for new development and a growing population.

Water Quality Improvements & Success Stories

A large number of SWCD best management practices have been completed in this watershed over the past five to six years. Most of these measures are focused on erosion and nutrient removal, benefits of which should be observed over the next several years. For more information on what SWCD is doing in this watershed, see *NC Agriculture Cost Share Program* Section below.

Warrior Fork - Catawba River (0305010104)



This 10-digit watershed drains to the Catawba River just before Lake Rhodhiss and was sampled twice for biological integrity during this five year cycle. A benthic sample (CB102) was taken on Warriors Fork and a fish community sample (CF22) was taken on Irish Creek; both samples resulted in Excellent ratings. The majority of this watershed drains to Warriors Creek just above the benthic station providing a excellent glance at the biological health of the entire watershed. These two sites will continue to be sampled during the next cycle.

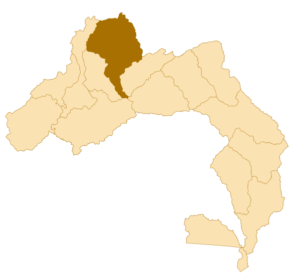
The Western Piedmont Council of Government (WPCOG) completed a *Watershed Management Plan* in 2009 for the Lake Rhodhiss watershed and surrounding watersheds. The Warrior Fork watershed is included in that management plan. The main purpose of the plan is to identify the most critical restoration areas in the watersheds draining to Lake Rhodhiss and to implement strategies to restore and protect these watersheds. The WPCOG has worked with many stakeholders to develop this plan and implementation will start in 2010 depending on funding.

Water Quality Improvements & Success Stories

Irish Creek [AU: 11-35-3-(2)b]:

This segment of Irish Creek flows from NC-181 three miles to its confluence with Warrior Fork. It received a fish community rating of Fair in 2002 and 2003 and was placed on the 2006 Impaired Waters list. Since 2003, the local SWCD has completed streambank stabilization projects on five farms through the Emergency Watershed Protection Program. These projects included the removal of flood debris, restoration of the channel profile, structural and vegetative stabilization, and in one case reconstruction of livestock exclusion fencing. The SWCD also did a regional outreach project to promote and educate the agricultural community about conservation cover on their croplands. Due to these significant efforts the same site received an Excellent rating in 2007; therefore, the creek will be removed from the list in 2010. These targeted efforts and the dedication of the local SWCD have doubled the total number and increased quality of fish species found by biologist during the 2007 sampling. For more information about the SWCDs and their programs, visit the *SWCD* website.

Johns River (0305010105)



Restoration Opportunities

Lower Johns River (030501010506)

Parks Creek [AU: 11-38-35]:

Use Support: Impaired (5 mi)	
2008 IR Cat.	--
2010 IR Cat.	5
Benthos (CB312)	Fair (2007)

Parks Creek is a five mile creek that flows into the Lower Johns River about 9 miles above where the river empties into Lake Rhodhiss. The creek was included in the 2007 HQW/ORW Reclassification Study[1] and did not qualify for either secondary classification due to the Fair benthic sample rating which will place the creek on the 2010 Impaired Waters list. This was the first biological sample taken on this creek, and the majority of benthic species collected were pollution tolerant. The most likely cause of the low rating may be land clearing activities in 2007 adjacent to the stream. The creek also drains agricultural lands that could be contributing to stream degradation. This site will be added to the regular basinwide sampling cycle.

Protection Priorities

Upper & Lower Wilson Creek (030501010502 & 030501010504)

Wilson Creek [AU: 11-38-34]:

Use Support: Supporting (23 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB318)	Excellent (2008)
AMS (C1370000)	No Exceedances

Wilson Creek is a 23 mile creek which drains into the Johns River. The first seven miles of the creek (from source to Crusher Branch) is contained within the Pisgah National Forest. Wilson Creek has been identified by multiple natural resource agencies as a waterbody of significant importance. In August of 2000, the full length of the creek was designated as a *National Wild and Scenic River* by local governments and the US Forestry Service. DWQ has also recognized these subwatersheds as the most biologically important aquatic habitats in the basin along with Waxhaw and Upper Creek. It is one of only two

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

known sites that support a population of a rare dragonfly, *Edmund's Snaketail*. *Edmund's Snaketail* is a globally rare species, which was feared to be extinct until it was rediscovered a few years ago. The creek has received Excellent benthic ratings since the mid 1980's as it did again in 2008.

Stack Rock Creek [AU: 11-38-34-5]:

Use Support: Supporting (3 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
AMS (C1370100)	Low pH

Stack Rock Creek is a 3.4 mile creek which flows into Wilson Creek's headwaters. Ambient sampling taken between November 2007 and December 2008 resulted in low pH levels within the creek. A stream walk by DWQ staff in 2009 found high concentrations of leaf packs releasing tanins. This indicates the low pH levels are due to natural causes. Even though low pH levels were measured across the basin, which signifies a larger scale issue, this creek has been previously documented as having naturally low pH levels. Additional information on the basinwide issue can be found in the *Basin Overview Chapter*.

Middle Johns River (030501010505)

Franklin Branch [AU: 11-38-31]:

Use Support: Supporting (4 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Benthos (CB311)	Good-Fair (2007)

Franklin Branch is approximately a 4 mile creek that flows into the Johns River just above the Collettsville Elementary School. The creek was included in the 2007 HQW/ORW Reclassification Study[1] and did not qualify for either secondary classification due to the Good-Fair benthic sample rating. The impacts to the aquatic community may be a result of low flow conditions created by the 2007 drought and residential development in the area that has caused some sedimentation to build up within the stream. Local agencies should work with developers to ensure sediment and erosion control measures are installed properly and maintained even during times of drought. This benthic site will be sampled during the next cycle to help determine if the stream's rating was due to drought or other influences.

Water Quality Improvements & Success Stories

Upper, Middle & Lower Johns River (030501010501, 030501010505 & 030501010506):

Johns River [AUs: 11-38-(1), (28) & (35.5)]:

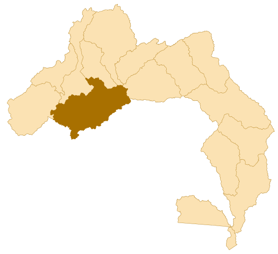
Johns River is 42.5 miles long from its source in Blowing Rock to where it flows into Lake Rhodhiss near the City of Morganton. Johns River drains this entire 10-digit watershed which is mostly forested and mostly contained within the Pisgah National Forest. The river has historically received Excellent ratings since first sampled in 1983. In 2002, the benthic site (CB269) closest to the confluence with Lake Rhodhiss dropped a rating to Good for the first time. The 2004 *Catawba River Basinwide Water Quality Plan* explains the biological sampling showed signs of significant nutrient enrichment and suggested that immediate action be taken to permanently protect the remaining intact riparian forests and to implement agricultural BMPs on the areas where intensive agricultural activities are currently underway or likely to expand. A portion of this watershed was placed under a conservation easement, discussed below, to provide such permanent protection.

Other Watershed Successes:

Since 2004, the local SWCD has implemented four agricultural BMPs that include sediment and nutrient removal and agri-chemical pollution prevention within this watershed. Also, the Conservation Easement Fund as discussed in the 2004 basin plan, administered by the UNCC Urban Institute and Clemson University and funded by Crescent Resources, Inc., was successful in preserving and protecting 1,311 acres in NC and 146 acres in SC of riparian and wetland habitats along perennial streams and rivers in the Catawba River basin. These efforts have significantly improved water quality and habitat throughout the Johns River watershed, as seen in the Excellent biological ratings it received during the 2007 sampling. For more information about this grant, please see the *Strom Thurmond Institute website*.

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Silver Creek - Catawba River (0305010106)



Restoration Opportunities

North Muddy Creek (030501010601)

Use Support: Impaired (5 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB17)	Poor (2007)
Fish Com (CF8)	Fair (2002)

<u>Youngs Fork (Corpening Creek) [AU: 11-32-1-4a & b]:</u>
Corpening Creek begins in the City of Marion and flows southeast to its confluence with Muddy Creek. Over half of the creek runs through the city which can drain highly polluted urban stormwater runoff into the creek. The stormwater, in addition to point source pollution, has led to the creeks biological impairment represented by the Fair and Poor biological ratings received continuously since it was first sampled in 1985. This degradation emphasized the need for a watershed study (*Collaborative Assessment for Watersheds and Streams Project on Corpening Creek*) funded by EPA which was completed in 2004. Results suggested the primary stressors of impairment were toxic impacts, sedimentation and nutrient enrichment from both point and nonpoint sources. The majority of non-point source impacts were originating from urban stormwater runoff and point source impacts were originating from the Corpening Creek WWTP.

Since 1985, two benthic sites have been monitored on the lower segment of Corpening Creek [AU: 11-32-1-4b] (from Marion WWTP to North Muddy Creek). The benthic site above the WWTP (CB17) was monitored during the 2007 cycle and received the first Poor rating. Biologist noted that the drought may have had a small influence on this rating but the lack of certain benthic species for the first time suggest worsening water quality. One absent species (*Heptageniid Mayfly*) in the 2007 sample has been shown to be sensitive to metal toxicity. Urban stormwater runoff is suspected to be the main cause of the absence of this species.

Downstream of the US-221 bridge is the City of Marion's Corpening Creek WWTP (NC0031879). This facility has been noted as a cause of impairment since 1990. It has had numerous compliance issues, enforcement actions and civil penalties for biochemical oxygen demand (BOD), total suspended sediment (TSS), cyanide (Cn), and total residual chlorine (TRC) limit violations prior to requesting and receiving a Special Order by Consent (SOC) on March 7, 2007. This SOC granted relaxed limits for BOD5 and TSS and allowed the facility time to evaluate and address any problems that may be contributing to the noncompliance with permitted limits. Sewer and WWTP improvements were the target areas chosen by the City to regain compliance with the NPDES Permit discharge limits. SOC Amendment #1 was granted on October 20, 2009 which extended the compliance schedule for one year and granted relaxed limits for Cn and TRC.

As a positive result of utilizing this SOC for Corpening Creek, the City of Marion will be diverting influent from the Catawba River WWTP (NC0071200) which is also owned and operated by the City of Marion, to the Corpening Creek WWTP. The City of Marion requested a Rescission of NPDES Permit NC0071200 in May 2010. The City spent 6.6 million dollars to complete upgrades to the Corpening Creek facility that will bring it back into compliance and allow for the closure of the Catawba River facility. This will assist the NPDES program in achieving the goal of eliminating point source dischargers when feasible.

Due to the magnitude of both point and non-point source pollutants, this subwatershed has been chosen as part of DWQ's Use Restoration Watershed Program. This program coordinates partnership efforts to study, plan and restore degraded waterbodies on a subwatershed scale. This watershed was also the subject of a 319 grant funded effort to develop a Stormwater Action Plan, coordinated by Equinox Environmental and Carolina Land & Lakes RC&D as well as some local governments which was completed in July of 2008. This group has identified stormwater runoff as one of the main stressors and is working with DWQ and local governments to target areas and installing stormwater BMPs. A nine element watershed restoration plan will also be completed for this project and linked to the Catawba River Basin page on the DWQ-BPU website once it is available.

Youngs Fork (Corpening Creek) is a tributary to North Muddy Creek. The entire Muddy Creek watershed has been the subject of a large watershed restoration effort through the Muddy Creek Restoration Partnership, which includes the McDowell County SWCD, Equinox Environmental, Trout Unlimited, Duke Energy, the Foothills Conservancy, and Carolina Land & Lakes RC&D, as well as some local governments. The Partnership has implemented or are implementing more than 23 miles of stream enhancement and restoration

EEP has been working with Equinox Environmental to identify high-priority stream restoration opportunities in the Muddy Creek watershed. As of January 2009, the EEP had 11 projects either in the ground or in development within the Muddy Creek watershed. Additional information about the Muddy Creek Restoration Partnership's work can be found on the EEP *Fact Sheet* or for more detailed information and definition of a nine element plan, see the *URW website* or the *DWQ Guidance for Preparing Watershed Plans*.

Canoe Creek (030501010605)

Canoe Creek [AU: 11-33-(2)]:

Use Support: Impaired (6 mi)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (CB8)	Fair (2007)

Canoe Creek is located in the 12-digit subwatershed directly northeast of Lake James. The creek has historically received Good-Fair benthic community ratings since 1992. However in 2007, it was part of an Overlap Sampling Study[1] conducted by DWQ-ESS and received a Fair benthic rating. The Fair rating is believed to be caused by drought conditions in 2007; however, further study is needed to verify drought as the source of the biological impairment. The subwatershed is a mixture of forest lands as well as agricultural land use which could be contributing to the lower ratings through nutrient and sediment enriched stormwater runoff. DWQ will conduct additional sampling during the next planning cycle to evaluate possible sources.

Hunting Creek-Catawba River (030501010608)

Hunting Creek [AU: 11-36-(0.7)]:

Use Support: Impaired (7 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF20)	Fair (2003)
FCB (5-in-30)	Above Standard (2009)

Hunting Creek was not biologically sampled during this cycle; however, fish community samples were taken in 2002 and 2003 which resulted in Fair ratings for both years. These ratings are the reflection of urban stormwater runoff impacts from the City of Morganton. The town has implemented the Phase II Stormwater requirements to assist in the protection and restoration of the creek. In February of 2006, an industrial explosion caused a fish kill of over 1,000 fish; however, this is not the reason for the impairment. DWQ will monitor this segment during the next sampling cycle to help further understand the source of impairment. For more information on the City of Morganton's Stormwater Programs, visit the City's *website*. For more information about the fish kill, *see above*.

Carolina Land & Lakes RC&D received 319 grant funding to perform a watershed assessment and develop a watershed plan for the Hunting Creek watershed. A stakeholder effort has been formed by the RC&D and includes Burke and McDowell Counties, Equinox Environmental and EEP. The group is planning to develop a Watershed Management Plan similar to the one developed for Corpening Creek. EEP has been working with Equinox Environmental to identify high-priority stream restoration and preservation opportunities in the Hunting Creek watershed.

In 2009, the Ecosystem Enhancement Program (EEP) requested that DWQ complete a 5-in-30 study (five fecal coliform bacteria samples taken in 30 days) to determine whether water quality standards are being met for FCB. Five FCB samples were collected at six locations along Hunting Creek and its tributaries between September 3, 2009 and September 29, 2009. All six sites had geometric means greater than the water quality standard of 200 cfu/100 ml. Hunting Creek at Bethel Road had the highest geometric mean (2024 cfu/100 ml) followed by Hunting Creek at Causby Quarry Road (1054 cfu/100 ml). It appears that the elevated FCB in the Hunting Creek subwatershed may have a variety of sources which could include agriculture, wildlife, failing or improper use of septic systems and failures in the city sewer system. The results of this study will be used during the restoration planning process. DWQ, EEP and local natural resource agencies are currently working on a strategy for locating the specific sources of excess FCB levels. For more information about the FCB study, see the *5-in-30 Study Memo*. For more information about this Use Restoration Targeted Watershed, see the *URW website*.

Since the study was completed outside of the current data window, the study results will be reflected on the 2012 Impaired Waters List. The six segments that will become Impaired from this study include Hunting Creek [11-36-(0.3), (0.7), & (3)], Fiddlers Run [11-36-1-1], East Prong Hunting Creek [11-36-1], and Pee Dee Branch [11-36-2].

1 *Overlap Sampling Results for Benthos in 2007 (B-20080124)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Protection Priorities

North Muddy Creek-Muddy Creek (030501010601 & 030501010603)

Use Support: Supporting (5 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB44)	Good-Fair (2007)
Fish Com (CF46)	Excellent (2007)

North Muddy Creek [AU: 11-32-(0.5)]:
North Muddy Creek originates just southwest of the City of Marion, flows southeast for about six miles then flows northeast and drains into Muddy Creek. Historically, North Muddy Creek has supported a stable but pollution tolerant benthic population. However, in 2007, benthic indicators suggested a decline in water quality. The fish community sample taken two months after the benthic sample in 2007 resulted in an Excellent rating. This difference in ratings suggests the decline in water quality was recent and may not have had time to affect the fish community.

One reason for decline in the type of benthos found is the effects of drought concentrating effluent from upstream dischargers as well as concentrated stormwater runoff from agricultural and urban land use. The North Muddy Creek also receives flow from Corpening Creek which is impaired and may be another source of this benthic decline. North Muddy Creek is also part of the Muddy Creek Restoration Partnership as described in the Youngs Fork/ Corpening Creek section.

Use Support: (2 mi)	
2008 IR Cat.	3a
2010 IR Cat.	3a
Benthos (CB26)	Not Rated (2001)

Jacktown Creek [AU: 11-32-1-4-1]:
Jacktown Creek is a 2.4 mile stream that flows into Youngs Fork (Corpening Creek) just above the City of Marion's Corpening Creek WWTP. This creek was sampled once in 2001 as a special study (*Collaborative Assessment for Watersheds and Streams Project*) conducted by ESS. The benthic sample resulted in a Fair rating; however, due to a methodology change in 2007 the rating was changed to a Not-Rated. The creek was listed on the 2004 and 2006 Impaired Waters list, but was removed in 2008 because the stream width is less than four meters and current DWQ methodologies do not accurately assess streams this small. In efforts to restore the Muddy Creek watershed, Jacktown Creek is included in the *Corpening Creek Watershed Stormwater Action Plan* and the Use Restoration Watershed Program (*details below*). For more information about this Use Restoration Targeted Watershed, see the *URW website*.

These two 12-digit subwatersheds (030501010601 & 030501010603) are also part of the Muddy Creek Restoration Partnership and Restoration Plan as described in the Youngs Fork/Corpening Creek section.

Upper Silver Creek (030501010604)

Use Support: Supporting (15 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB86)	Good (2007)
Fish Com (CF51)	Good (2007)

Silver Creek [AU: 11-34-(0.5)]:
Even though Silver Creek received a Good rating for both benthic and fish communities during this cycle, the creek is showing signs of major habitat degradation. A HQW/ORW Reclassification Study[1] completed in 2007 noted the habitat as poor to fair due to severe bank erosion and lack of sufficient vegetated riparian buffers. An active irrigation pump at this site is causing further depletion of water resources within the creek which is already distressed by severe drought conditions.

Hunting Creek-Catawba River (030501010608)

Use Support: Supporting (4 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB64)	Good-Fair (2002)
AMS (C1230000)	No Exceedances

Catawba River [AU: 11-(32.7)]:
A four mile segment of the Catawba River has had an impacted biological community since 1997. The latest benthic sample was taken in 2002 and resulted in a Good-Fair rating. Canoe Creek and Silver Creek flow into the Catawba River within a mile upstream of this benthic station. The full length of this segment of the river flows through the City of Morganton. The City has implemented Phase II Stormwater Permit requirements in efforts to reduce stormwater impacts. The *Stormwater Ordinance* for the city was recently updated to ensure further protection of water quality. DWQ will sample this station during the next sampling cycle to re-evaluate the water quality of this segment. For more information on Morganton's Stormwater Program visit the *City of Morganton's website*.

1 *Benthos HQW/ORW Reclassification Study: Catawba Subbasins 30 and 31, June-October, 2007 (B-20080205)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Watershed Recommendations & Action Plans

This entire 10-digit watershed drains directly into Lake Rhodhiss. In 2008, Lake Rhodhiss was placed on the Impaired Waters list due to high pH standard violations. A multiple partnership effort led to the completion of the Lake Rhodhiss Watershed Management Plan in 2009. It is critical to protect the water quality of the streams in this watershed to ensure the health of Lake Rhodhiss and the success of the planned restoration projects. For more information on the Lake Rhodhiss Watershed Management Plan, visit the *Western Piedmont Council of Government* website or see the *Lake Rhodhiss watershed Section* below.

Muddy Creek Watershed Restoration Partnership has been active since 1998 and includes McDowell County SWCD, City of Marion, McDowell & Burke County, NC Cooperative Extension Service, NRCS, WRC, Trout Unlimited, Duke Energy, Foothills Conservancy, Carolina Land & Lakes RC&D, EEP, DWQ & citizens of the Muddy Creek watershed. The group actively reaches out to landowners and organizations that are located in the priority areas and informs them of available conservation opportunities. For more information on this group and its activities, see the *Muddy Creek Fact Sheet*. This partnership also developed the *Corpening Creek Stormwater Action Plan Development Project* in July of 2008 as one of the first steps in the long-term process of restoration. There are three specific goals of the project which consist of 1) development of a stormwater action plan; 2) installation of stormwater BMP demonstration projects; and 3) establishment of a reliable, valid monitoring regimen that can be used over time to detect improvement in watershed condition over the long term.

Water Quality Improvements & Success Stories

South Muddy Creek (030501010602)

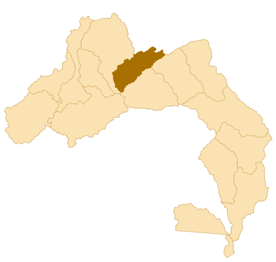
South Muddy Creek [AU: 11-32-2]:
South Muddy Creek has been rated Good-Fair for its benthic community since 1992; however, during this sampling cycle it received a Good rating. This may be due to a reduction in runoff from surrounding farms as an effect of drought; however, the local SWCD has installed a handful of agricultural BMPs along South Muddy Creek and Hoppers Creek to reduce impact from farmlands which could have resulted in this improvement. EEP has also implemented or is in the process of implementing several stream restoration projects in the watershed.

Upper Silver Creek (030501010604)

Silver Creek:
Division of Water Quality (DWQ) was forwarded a complaint from the Division of Land Resources (DLR) around Christmas 2006 for sediment impacts from a stream restoration project in Burke County. In January 2007, DWQ performed an inspection of the site and issued a Notice of Violation (NOV) to both the property owner and the Consultant. The site was found to have discharged significant amounts of “other waste” to Silver Creek. The sediment impacts exceeded 3 feet in the channel for approximately 1,500 linear feet.

The DWQ NOV required a response from the responsible party and was addressed promptly. The responsible party, being an environmental consulting firm, prepared a plan of action in-house. Immediately upon approval, stabilization, sediment removal and site remediation began. The Consultant sent a Final Report to DWQ in July 2007. DWQ performed a follow up inspection in August 2007 and determined the actions taken successful.

Lower Creek (0305010107)



Restoration Opportunities

Lower Creek [AUs: 11-39-(0.5)b, (6.5) & (9)]:
Lower Creek has a total length of 22.5 miles and runs the entire length of this 10-digit watershed. The first segment of Lower Creek [AU: 11-39-(0.5)a] is supporting its designated uses. The three segments discussed below (between US-321 and Lake Rhodhiss) have been on the Impaired Waters list for turbidity violations since 2000 and for biological integrity since 2002. A turbidity *TMDL* was developed for this watershed in 2004 and approved in 2005 by EPA to address this issue. Portions of Lower Creek will also be seen on the 2012 Impaired Waters list for fecal coliform bacteria (FCB) violations observed during a 5-in-30 study (five FCB samples taken over a 30 day period) conducted in 2009.

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%
FCB (5-in-30)	Geomean - 1129 cfu/100ml (2009)

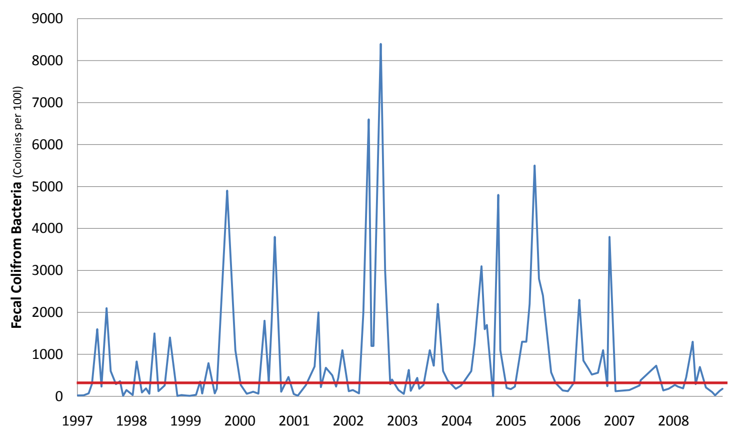
Lower Creek was last biologically sampled in 2002 as part of a watershed study conducted by EEP. A *Summary of Monitoring Results in Lower Creek Watershed and Tributaries* (September, 2005) can be found on the EEP website. Three benthic sites and one fish community site were monitored on these three segments. Samples taken in the headwaters segment [AU: 11-39-(0.5)a] indicate the majority of water quality problems found throughout the length of the creek are also found in the headwaters. These issues include poor habitat scores, bank erosion, inconsistent riparian zones, pollution tolerant taxa and organically enriched indicator taxa. Some of these stressors were found to have different sources. In the headwaters, the organically enriched waters are likely a result of stormwater runoff from pastures. The lower segments were receiving excess nutrients from the City of Lenoir's WWTP (NC0023981). The facility is currently undergoing upgrades to address this issue. The EEP study results also concluded that of the nutrients that were studied, phosphorous was the only one to exceed benchmark values. The high phosphorous concentrations may be attributed to manure or fertilizers.

Urban and commercial land uses in the headwaters could be the source of high volume stormwater which can easily erode streambanks and fill in critical aquatic habitat during large rainfall events. This is a common source of excess turbidity and sedimentation throughout the creek and the main reason for low (between 29 and 40 out of 100) habitat scores. When high velocity stormwater from urban impervious surfaces is drained into a channelized creek or river like Lower Creek, the erosion and bank failure increases significantly.

As mentioned above, excess turbidity violations have placed this creek on the Impaired Waters list since 2000. During the last monitoring cycle (1998-2004), 22% of the samples collected were in violation of the turbidity standard of 50 NTU. That number was cut in half to 11% during this monitoring cycle (2004-2008). This decrease in standard exceedances indicates a significant improvement.

Fecal coliform bacteria levels however, are increasing. The last monitoring cycle showed a geometric mean of 253 cfu/100 ml and the current cycle resulted in a geometric mean of 438 cfu/100 ml. Excessive fecal coliform bacteria was identified as a key stressor for this watershed in a *Lower Creek Watershed Management Plan*, completed by EEP in 2006. In 2005, the City of Lenoir completed construction on upgrades made to the wastewater collection system in hopes of addressing this issue. EEP requested DWQ to conduct a 5-in-30 study (five samples in 30 days) in 2009 as a follow up to the sewer line improvements performed by the City of Lenoir. Five samples were taken within a 30 day period (September 3, 2009 to September 29, 2009) at five locations within the watershed. Results of the study showed all five sites had geometric means greater than the water quality standard of 200 cfu/100 ml. Spainhour Creek and Lower Creek had the highest geometric means of 1294 cfu/100 ml and 1129 cfu/100 ml respectively. For more information about this study, see the *5-in-30 Study Memo*.

Figure 1-12: Measured FCB Levels in Lower Creek at AMS C1750000 between 1997 & 2008



* The red line on the graph indicates the 400 colonies/100 ml standard if a 5-in-30 study is conducted.

The high levels of FCB are not a new occurrence for the Lower Creek watershed. DWQ data (Figure 1-12) indicates the high levels date back to 1997. The AMS site where this data was collected is located a little over six miles downstream of the 5-in-30 study area. The red line on the graph indicates the FCB standard of 400 colonies per 100ml if exceeded in a 5-in-30 study. The graph shows the highest violations occurred between 2002 and 2003. Specific sources of the excess FCB have not yet been identified. However, efforts are being made by local watershed groups and other resource agencies to determine those sources.

The continued turbidity and FCB violations put this subwatershed among the top of the restoration priorities list for this subbasin (8-digit HUC). Restoration efforts led by EEP, DWQ, WPCOG and others have resulted in the installation of BMPs to control known sources and further studies will be conducted to identify other sources of excess turbidity and fecal coliform bacteria. Additional information on how to address these issues are discussed in the *Watershed Recommendations and Actions Plans* Section below. This 10-digit watershed is also included in the larger Lake Rhodhiss Watershed Management Plan area.

An unnamed tributary, which flows into Lower Creek [AU: 11-39-(0.5)b] upstream of the confluence with Spainhour Creek, was monitored as part of the same 2005 EEP study. Monitoring on the unnamed tributary, which drains a highly industrial area, found the creek to be suffering from toxicity, high levels of metals, nutrients and FCB as well as semi-volatile organic pollutants. A *Summary of Monitoring Results in Lower Creek Watershed and Tributaries* (September, 2005) can be found on the EEP website. For more information about this Use Restoration Targeted Watershed (0305010107), see the *URW website*.

Since the study was completed outside of the current data window, the study results will be reflected on the 2012 Impaired Waters List. The five segments that will become Impaired from this study include Blair Fork [11-39-3-1], Greasy Creek [11-39-4], Spainhour Creek [11-39-3], Zacks Fork [11-39-1], and Lower Creek [11-39-(0.5)].

Upper Lower Creek (030501010701)

Spainhour Creek [AU: 11-39-3]:
Spainhour Creek is a 4.7 mile streams that partially flows through the City of Lenoir and flows into Lower Creek. Urban stormwater runoff from the city is impacting the biological health of both Spainhour and Lower Creek. It first appeared on the Impaired Waters list in 2000 for biological integrity. The benthic community has received a Fair rating since 1997. The study completed by EEP in 2005 (as mentioned above) indicates Spainhour Creek had a similarly degraded habitat and sever bank erosion as Lower Creek. The benthic community was populated with pollution tolerant taxa. In May of 2009, the city was issued a NPDES Phase II Stormwater Permit. This permit will assist the City in its efforts to reduce stormwater impacts on waterbodies within the city limits. DWQ will work with the city to enhance their public education and outreach efforts. Biological samples will be taken during the next sampling cycle to assess effectiveness of these efforts and other permit requirements. For more information about Phase II efforts in this area, visit *Lenoir's Stormwater Management Program* page on their website.

Use Support: Impaired (5 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB89)	Fair (2002)
FCB (5-in-30)	Geomean - 1294 cfu/100ml (2009)

This creek was also included in the fecal coliform bacteria (FCB) study completed for Lower Creek (see above). Spainhour Creek had the highest levels of FCB measured in the watershed. See the *Watershed Recommendations and Action Plans* Section below for suggested solutions to this issue. The stream will be placed on the 2012 Impaired Waters List for FCB.

Blair Fork [AU: 11-39-3-1]:
Blair Fork is a tributary to Spainhour Creek, and drains an area of residential, industrial, and commercial land uses. This stream was last sampled in 2004 and 2005 as part of the Lower Creek watershed assessment conducted by EEP. Results showed the benthic community was extremely degraded, characterized by a set of organisms that indicate toxicity. The stream has failed multiple toxicity tests, and a likely source of toxicity is a closed unlined landfill on NC-90. Fecal coliform bacteria, copper, turbidity, and nutrients were also high in Blair Fork. Stormflow scour is also a cause of degradation for Blair Fork (NCEEP, 2006 - *Lower Creek Watershed Management Plan*).

Use Support: Supporting (2.6 mi)	
2008 IR Cat.	3a
2010 IR Cat.	3
Benthos (CB61)	Not Rated (2002)
FCB (5-in-30)	Geomean - 550 cfu/100ml (2009)

In February of 2010, NC Division of Waste Management (DWM) began working on assessing over 650 landfills constructed before 1983 to determine their risk to human health and the environment. A priority list of which high risk landfill sites to begin cleanup efforts is currently being developed as a result of this assessment. The Lenoir Dump is currently in the top 15% of this list (list subject to change until assessment is completed). DWQ will continue to work with DWM to provide any information/data to assist with this process.

This creek was also included in the fecal coliform bacteria (FCB) study completed for Lower Creek (see above). Blair Fork had the lowest levels of FCB measured in the watershed; however, it was still above the FCB standard. See the *Watershed Recommendations and Action Plans* Section below for suggested solutions to this issue. The stream will be placed on the 2012 Impaired Waters List for FCB.

Middle Lower Creek (030501010702)

Greasy Creek [AUs: 11-39-4b]:
Greasy Creek was split into two segments in 2004; a 2.6 mile portion from source to SR-1305 and a 2.6 mile portion from SR-1305 to Lower Creek. The upper portion [AU: 11-39-4a] is discussed in the *Protection Priorities* Section of this watershed. The lower portion [AU: 11-39-4b] of the creek has been receiving benthic ratings of Fair since 1997 and will remain on the Impaired Waters list.

Use Support: Impaired (3 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB68)	Fair (2004)
FCB (5-in-30)	Geomean - 636 cfu/100ml (2009)

The study completed by EEP in 2005 (as mentioned above) found that this creek is being impacted by channelization, lack of sufficient riparian buffers, high velocity runoff from impervious surfaces. Physical/chemical sampling taken in 2004 and 2005 resulted in high levels of FCB, phosphorus, turbidity and metals. Stream walks by EEP found the severe bank erosion was being caused by cattle with access to the stream from both sides which could also be the source of high phosphorus and FCB levels. However, other high phosphorus and turbidity sources may be stream side hayfields or ornamental nurseries. More information can be found at the *EEP* website. DWQ will re-sample the creek during the next biological sampling cycle to assist EEP in measuring effects of restoration projects implemented during the next few years.

This creek was also included in the fecal coliform bacteria (FCB) study completed for Lower Creek (see above). See the *Watershed Recommendations and Action Plans* Section below for suggested solutions to this issue. The stream will be placed on the 2012 Impaired Waters List for FCB.

Lower Lower Creek (030501010703)

Bristol Creek [AU: 11-39-8]:

Use Support: Impaired (6 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB62)	Fair (1997)

Bristol Creek is a 5.6 mile creek that drains mostly agricultural and forested lands. The stream has been on the Impaired Waters list for biological integrity/benthos since 1997. In 2002, the site was monitored again; however, it was given a Not Rated. The creek is located within the EEP (2005) study area but was not monitored during that time. Local SWCD have worked to install livestock exclusion agricultural BMPs as well as stream crossings and erosion/nutrient reduction BMPs since 2006. DWQ will re-sample this creek during the next biological sampling cycle to assess for improvements to the biological community.

Protection Priorities

Upper Lower Creek (030501010701)

Lower Creek [AU: 11-39-(0.5)a]:

Use Support: Supporting (9 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB77)	Good-Fair (2004)

This segment of Lower Creek is the most upstream portion and flows from the source to Zacks Fork. In 2002, this portion received a benthic rating of Poor. However, in 2004 the segment was re-sampled as part of the 2005 EEP study (discussed above) and received a Good-Fair rating. The EEP study found the segment to be significantly channelized which is causing unstable and eroding banks that are contributing to the sedimentation issues downstream.

Currently, this is the only portion of Lower Creek not on the Impaired Waters list; however, runoff from this 12-digit subwatershed is negatively effecting the habitat and health of aquatic life downstream. Restoration efforts and agricultural BMPs should be focused on these headwaters to support future efforts downstream. Additional information on Lower Creek and its tributaries is provided in the *Watershed Recommendations and Action Plans* Section below. EEP also has an excellent *Summary of Monitoring Results* posted on their website. This subwatershed is high priority to restoring the whole Lower Creek watershed.

Zacks Fork [AU: 11-39-1]:

Use Support: Supporting (8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB109) (CB110)	Not Rated (2002) Not Imp. (2002)
FCB (5-in-30)	Geomean - 913 cfu/100ml (2009)

Zacks Fork runs parallel with the headwaters of Lower Creek before they merge around US-321. In 2002, the creek was given a Not Impaired rating for the benthic community. The study completed by EEP in 2005 (as mentioned above) monitored two locations on Zacks Fork, one half way downstream from the source and one near the confluence with Lower Creek.

The upstream site results were significantly different from the downstream site. Both sites had poor habitat but the upstream site scored twice as high as the downstream site. Downstream, high specific conductivity, low dissolved oxygen concentrations and pollution tolerant species were found that were not seen upstream. Stream walks by EEP discovered large amounts of sand and silt dunes within the stream, an ongoing sewage leak as well as an old water retention pond/dam. The ongoing sewage leak may explain the high conductivity and low dissolved oxygen levels that were not found anywhere else within the watershed during this study. The results of this study found aquatic life in Zacks Fork to be severely impacted. DWQ will monitor site CB110 during the next sampling cycle to ensure the creek is being represented accurately on the Use Assessment/Integrated Report. For more information on the condition of Zacks Fork, see the *Summary of Monitoring Results* posted on EEP's website. The protection of this subwatershed it critical to the rebound of Lower Creek and Lake Rhodhiss.

This creek was also included in the fecal coliform bacteria (FCB) study completed for Lower Creek (see above). See the *Watershed Recommendations and Action Plans* Section below for suggested solutions to this issue. The stream will be placed on the 2012 Impaired Waters List for FCB.

Middle Lower Creek (030501010702)

Greasy Creek [AU: 11-39-4a]:

Use Support: Supporting (3 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB69)	Good-Fair (2004)

Greasy Creek was split into two segments in 2004; a 2.6 mile portion from source to SR-1305 and a 2.6 mile portion from SR-1305 to Lower Creek. The upper portion of the creek was sampled in 2004 and received a benthic rating of Good-Fair which is an improvement from the Fair rating it received in 2002. Even though it will be removed from the Impaired Waters list, the creek is still considered impacted and will be re-sampled during the next cycle to assess the health of the biological community after restoration efforts. For more information on the condition of the creek, see the *Summary of Monitoring Results* posted on EEP's website. Additional information on restoration for Lower Creek and its tributaries is given under the *Watershed Recommendations and Action Plans* Section.

Watershed Recommendations & Action Plans

The Lower Creek watershed drains directly into Lake Rhodhiss. A multiple partnership effort led to the completion of the Lake Rhodhiss Watershed Management Plan in 2009. Protection of the water quality in this watershed is critical to ensuring the health of Lake Rhodhiss and the success of the planned restoration projects. For more information on the Lake Rhodhiss Watershed Management Plan, visit the *Western Piedmont Council of Government* website or see the Lake Rhodhiss Watershed Section in the *Chain of Lakes Chapter*.

Lower Creek Turbidity TMDL & Implementation Efforts:

An approved turbidity TMDL was published in 2005 by DWQ. A thorough assessment of the watershed, completed by the DWQ Modeling Unit and ESS, found multiple sources of excess turbidity including urban stormwater runoff velocity, storm sewers, municipal point sources, and non-urban development. It was concluded that a 72% reduction from municipal separate storm sewer systems (MS4) is needed in order to meet the water quality standards for turbidity. The sources of turbidity are discussed in further detail under *Restoration Opportunities*.

The *Lower Creek Advisory Team* (LCAT)is comprised of many different agencies and stakeholders working together to find and understand the cause(s) of water quality degradation in Lower Creek and its tributaries. These agencies/groups include DWQ, the Western Piedmont Council of Governments, the NC Ecosystem Enhancement Program and other local agencies. Turbidity was noted high on the group's list as a stressor for Lower Creek. EEP has already completed approximately 4,000 feet of eroding stream channel restoration along Zacks Fork. A stormwater wetland was constructed in the Lower Creek floodplain in the City of Lenoir in 2008, with the help of a Clean Water Management Trust Fund grant. EEP is currently pursuing other stream restoration projects in the watershed. Efforts to reduce turbidity have also been implemented by Caldwell County, the City of Lenoir, and the Town of Gamewell who have adopted a comprehensive stormwater and sedimentation control ordinance in 2007. For more information, assessment reports, monitoring reports and more, visit EEP's *Lower Creek Watershed Planning* website.

The *Lower Creek Watershed Restoration Implementation Plan* (LCWRIP) is coordinated through the Caldwell and Burke County SWCDs. LCWRIP is funded through a 319 grant and works to implement residential, commercial, and agricultural BMPs throughout the watershed. These BMPs include educational efforts, sediment and nutrient reductions, erosion reductions, stream restorations, as well as many others. More information on reductions made and locations of BMPs can be found in the SWCD Section below. For additional information on LCWRIP, please contact Pamela Bowman at pamela.bowman@nc.nacdnet.net.

Lower Creek Action Plans:

Turbidity:

During the next planning cycle, DWQ will work with EEP, the City of Lenoir and other resource agencies to address the turbidity exceedances within this watershed. Caldwell and Burke Counties will be working to address the agricultural and non-agricultural concerns through ACSP, CCAP, and the LCWRIP. DWQ supports funding for these stream restoration efforts. Restoration projects should focus on bank stabilization, reducing stormwater velocity through man-made wetlands or other proven practices, reduce channelization and enforce the newly adopted sedimentation control ordinance.

FCB:
DWQ's Asheville Regional Office will be conducting a routine inspection of the City of Lenoir's wastewater collection system in coordinated efforts with the city to assist in finding leaks and pipe failures. The City has contacted an engineering firm to evaluate the WWTP and the collection system. EEP has been a strong lead in this watershed and will be conducting additional studies and stream walks to find additional sources such as failing septic systems. DWQ, along with EEP and the City of Lenoir, will also be working with Caldwell County SWCD to find additional solutions for excess FCB within this system.

Water Quality Improvements & Success Stories

Upper Lower Creek (030501010701)

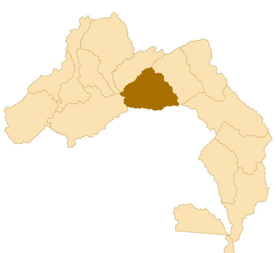
Unnamed Tributary to Zacks Fork:
A Notice of Violation (NOV) was issued by Division of Land Resources (DLR) in March of 2008 to the property owner of a development under construction in Caldwell County NC for sediment and erosion control violations. DLR notified DWQ of the violations and noted the failure to control sediment on the property was causing water quality issues. In April 2008, DWQ performed an inspection of the development to address this situation and found the site was in violation of the permit resulting in another NOV following this inspection.

The site was found to have NCG010000 Stormwater Permit condition violations due to sediment impacts to an Unnamed Tributary (UT) to Zacks Fork. The impacts averaged 8 inches of sediment buildup throughout the channel for approximately 400 linear feet.

The DWQ NOV required a response from the property owner which was received in May of 2008. The responsible party hired an Environmental Consultant to assist with compliance. The Consultant submitted to DWQ a response indicating how and when all permit condition violations were to be resolved or met. The response included a Sediment Removal Restoration Plan. This plan was approved by DWQ in May of 2008 and restoration work began on the site in June 2008. Sediment was removed from the channel by manual labor with shovels and buckets. The laborers were overseen by the Consultant, who is experienced in stream geomorphology, to make sure the sediment was removed without further damage to the stream bed and bank.

The Consultant sent a Final Sediment Removal Restoration Report to DWQ in June 2008. DWQ performed a follow up inspection in June 2008. In July 2008, DWQ sent a letter to the responsible party indicating the violation had been resolved.

Lake Rhodhiss - Catawba River (0305010108)



Restoration Opportunities

McGalliard Creek-Lake Rhodhiss (030501010801)

McGalliard Creek [AU: 11-44-(3)]:
McGalliard Creek is approximately four miles long and drains residential, agricultural and forested land cover into Lake Rhodhiss. The creek was monitored in 2007 and received an improved benthic rating of Good-Fair as compared to the Fair rating in 2003. There is no indication as to why the benthic community has improved. This rating will remove the creek from the Impaired Waters list for its benthic impairment; however, it will remain on the 2008 and 2010 Impaired Waters lists for the fish community impairment from a Poor rating in 2003. DWQ will re-sample the fish community during the next sampling cycle to evaluate if water quality improvements are seen there as well.

Use Support: Impaired (4 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB82)	Good-Fair (2007)
Fish Com (CF41)	Poor (2003)

Gunpowder Creek (030501010803)

Gunpowder Creek [AU: 11-55-(1.5)]:
This middle portion of Gunpowder Creek is a little over 13 miles long and flows through parts of the Town of Hudson and Granite Falls. The creek eventually flows into Lake Hickory. This creek will be on the Impaired Waters list for the first time in 2008 due to a Fair benthic rating. Between the 2007 sample and the 2002 sample, the benthic community decreased by 39%. This is a significant decline and indicates major impacts to the community between 2002 and 2007. The habitat had not changed much since the

Use Support: Impaired (13 mi)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (CB254)	Fair (2007)

previous sample, concluding the decline is due to waterborne pollutants. The cause of this decline is unknown. Possible sources could include urban stormwater runoff and impacts from drought. The protection of this subwatershed is critical to the health of Lake Hickory because inputs here flow downstream and impact the lake. As resources become available, DWQ will conduct further biological, and if possible, physical/chemical monitoring to narrow down the possible sources. However, DWQ supports and recommends this issue be studies on a local level.

Drowning Creek-Catawba River (030501010804)

Horseford Creek [AU: 11-54-(0.5)]:
A half mile portion of Horseford Creek flows through the City of Hickory and drains a large industrial area. It was monitored in 2002 for the first time to assess a citizen complaint. The instream habitat was stable; however, the benthic community received a Poor rating. This unusual combination of good habitat and poor biological integrity suggests that even favorable instream habitat cannot compensate for the toxic effects of poorly controlled urban runoff. The City of Hickory adopted a Phase II Stormwater Ordinance in July of 2007 to address the impacts of urban stormwater runoff. The creek has not been monitored since these efforts were made by the City. DWQ will re-sample this site during the next monitoring cycle to re-evaluate the stream's health. For more information on the *City of Hickory's Stormwater Program*, visit the City's website.

Use Support: Impaired (0.4 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB115)	Poor (2002)

Protection Priorities

McGalliard Creek-Lake Rhodhiss (030501010801)

Smoky Creek [AU: 11-41-(1)]:
The eight mile upper portion of Smoky Creek drains mostly residential and forested lands and some agricultural land. During the 2002 monitoring, excess sediment covered much of the benthic habitat causing the creek to be rated as Good-Fair. Since that time, silt within the creek has been reduced and there are signs of the benthic community returning. Sources of the sediment could be farming activities near the monitoring site. DWQ will work with SWCD to evaluate the need for agricultural BMPs that target sediment runoff.

Use Support: Supporting (8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB88)	Good (2007)
Fish Com (CF53)	Excellent (2007)

Gunpowder Creek (030501010803)

Silver Creek [AU: 11-56-(2)]:
The lower segment of Silver Creek drains mostly agricultural properties as well as residential properties into Gunpowder Creek just before it reaches Lake Hickory. In 2002, this creek was sampled for the first time and received a benthic rating of Good-Fair. The local SWCD completed the placement of 16 agricultural BMPs within the creeks drainage area between 2006 and 2008. These BMPs are focused erosion and nutrient reductions, waste management, sediment reductions and stream protection. DWQ will sample this site again during the next sampling cycle to assess for stream health improvements as a result of these efforts.

Use Support: Supporting (0.8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB129)	Good-Fair (2002)

Drowning Creek-Catawba River (030501010804)

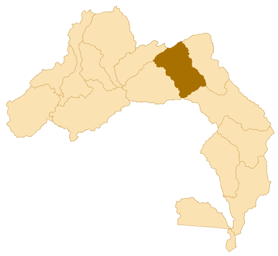
Drowning Creek [AU: 11-52-(1)]:
Drowning Creek drains mostly residential and agricultural lands before flowing into the western portion of Lake Hickory. This creek was sampled for the first time in 2007 and received a Good-Fair fish community rating. This moderate rating is likely a result urban stormwater runoff and sedimentation from non-point sources. The City of Hickory adopted a Phase II Stormwater Ordinance in July of 2007 to address the impacts of urban stormwater runoff. DWQ will continue to monitor this location during the next sampling cycle to help further understand the streams biological health.

Use Support: Supporting (9 mi)	
2008 IR Cat.	--
2010 IR Cat.	2
Fish Com (CF72)	Good-Fair (2007)

Watershed Recommendations & Action Plans

As with the Lower Creek Watershed, this entire 10-digit watershed (Lake Rhodhiss-Catawba River) drains directly into Lake Rhodhiss or Lake Hickory making protection and enhancement of its water quality critical to protecting Lake Rhodhiss and Hickory. A multi-partnership effort led to the completion of the Lake Rhodhiss Watershed Management Plan in 2009 and the Division will be supporting the implementation of this management plan during the upcoming planning cycles. For more information on the Lake Rhodhiss Watershed Management Plan, visit the *Western Piedmont Council of Government* website or see the Lake Rhodhiss Watershed Section in the *Chain of Lakes Chapter*.

Lake Hickory - Catawba River (0305010109)



Agricultural land uses have made a recent shift to small poultry farms within this and surrounding watersheds. The fish community in Lambert Fork is already showing signs of nutrient enrichment. This watershed drains into the Catawba Chain of Lakes which has already become impacted by excess nutrients in some locations. Farm owners are encouraged to install BMPs designed for nutrient removal with support from the Agricultural Cost Share Program. To learn more about this program and how the SWCD can provide financial and professional support, see the *Agricultural Chapter* or visit the *ACSP website*. Additional information about *Animal Operations* within the subbasin are discussed later in this Chapter.

Restoration Opportunities

Lake Hickory-Catawba River (030501010904)

Falling Creek [AU: 11-60]:

Use Support: Impaired (4 mi)	
2008 IR Cat.	--
2010 IR Cat.	5
Benthos (CB303)	Fair (2007)

Falling Creek is approximately four miles long and flows directly into Lake Hickory. The full length of the creek runs through the City of Hickory. This creek was sampled for the first time in 2007 to address local concerns of urban runoff impacting the creek from suburban expansion throughout this subwatershed. A benthic sample was taken at 29th Avenue North East which is 100% residential land use. At that time, biologist noted a fair amount of trash along the banks and within the stream. The benthic community was mostly pollution tolerant species and the habitat was poor. The riparian buffers had been replaced with residential yards and much of the banks were reinforced by hardened structures.

The water quality in this creek is being greatly impacted by urban runoff and inadequate habitat due to development pressures. An urban restoration effort for Falling Creek would be highly beneficial and is recommended by DWQ.

Protection Priorities

Upper Little River (030501010901)

Upper Little River [AUs: 11-58 & 11-58-(5.5)]:

Use Support: Supporting (19 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB130)	Excellent (2007)
Fish Com (CF66)	Good-Fair (2007)

Upper Little River, also know as Cedar Creek, is a 19 mile stream that drains forested areas in the headwaters and a large area of agricultural land before flows into Lake Hickory. Fish community samples were taken for the first time on this upper segment in 2007 resulting in a Good-Fair rating. Even thought the fish community is in moderate health, the habitat of this stream is overall poor due to badly eroded, exposed banks. Between 2004 and 2009 the local SWCD completed installation of ten agricultural BMPs along the Upper Little River which focus on waste management, stream protection and erosion and nutrient reductions. DWQ will continue to work with SWCD to find additional areas which would benefit from agricultural BMPs.

Upper Middle & Lower Middle Little River (030501010902 & 030501010903)

Middle Little River [AUs: 11-62a & b]:

Use Support: Supporting (22 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB317) (CB123)	Excellent (2008) Good-Fair (2007)
Fish Com (CF42)	Good (2007)

Middle Little River is split into two segments that drain forested and large areas of agricultural lands before flowing into Lake Hickory. The fish community in the upper segment of this stream experienced a decline in rating from Excellent to Good. Benthic monitoring was conducted for the first time on this upper segment in 2008. Results of this study are currently being analyzed by DWQ.

However, the benthic community in the lower reach of the river continued to be rated Good-Fair. This moderate rating is due to the lack of proper habitat which has been smothered by sediment. The site is located below the confluence of Duck Creek which maybe the contributor of this excess sediment (See Duck Creek discussion below). The local SWCD has been very active in implementing numerous agricultural BMPs in the watershed to reduce the impact of agricultural activities on streams health. For more information on what the SWCD has done in this subwatershed and this subbasin, see the *Agricultural* Section below. DWQ recommends further study to verify the source of this habitat degradation which will ensure for proper restoration planning.

Duck Creek [AUs: 11-62-2-(1) & (4)]:

Use Support: Supporting (13 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB112)	Good (2007)
Fish Com (CF13)	Good (2007)

Duck Creek has steadily been improving in biological ratings since the 1990's and has completed two full sampling cycles in which both benthic and fish communities received a Good rating. The continued increase in the biological community is likely to be contributed to the agricultural BMPs installed and maintained by property owners with much assistance from the local SWCD. Cattle have remained fenced out of the stream allowing the riparian buffers to flourish.

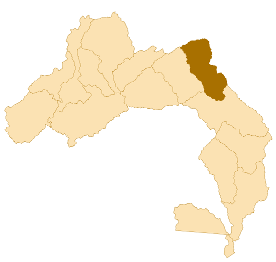
Even though the creek appears to be returning to more natural conditions, it is still considered a protection priority by DWQ. The monitoring site at NC-90 had notably more sand and gravel in the stream than in 2002. Sediment runoff from the construction of poultry buildings in the headwater are a likely source of this in-stream sedimentation. The upper reach of Duck Creek holds a secondary classification of Trout Waters (Tr) which increases the need for protection. This secondary classification requires all land-disturbing activities greater than one acre to establish a 25 foot buffer along streams bordering or running through the property. For more information on trout buffers, *see the Buffers Chapter*.

Watershed Recommendations

Lake Hickory-Catawba River (030501010904)

Falling Creek [AU: 11-60]: The water quality in this creek is being greatly impacted by urban runoff and inadequate habitat due to development pressures. An urban restoration effort for Falling Creek would be highly beneficial and is recommended by DWQ.

Lookout Shoals Lake - Catawba River (0305010110)



Agricultural land uses have made a recent shift to small poultry farms within this and surrounding watersheds. The fish community in Lambert Fork is already showing signs of nutrient enrichment. This watershed drains into the Catawba Chain of Lakes which has already become impacted by excess nutrients in some locations. Farm owners are encouraged to install BMPs designed for nutrient removal with support from the Agricultural Cost Share Program. To learn more about this program and how the SWCD can provide financial and professional support, see the *Agricultural Chapter* or visit the *ACSP website*. Additional information about *Animal Operations* within the subbasin are discussed later in this Chapter.

Restoration Opportunities

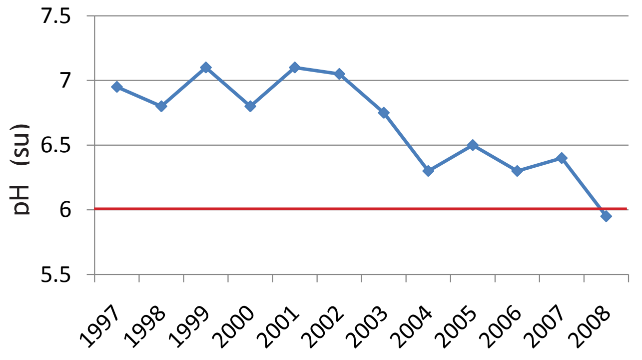
Grassy Creek-Lower Little River & Lookout Shoals (030501011002 & 030501011003)

Lower Little River [AU: 11-69-(0.5)]:

Use Support: Impaired (14 mi)	
2008 IR Cat.	3a
2010 IR Cat.	5
Fish Com (CF34)	Good-Fair (2003)
AMS (C2818000)	Low pH - 22% FCB - 48%

Lower Little River is a 14 mile stream that drains mostly a large agricultural area. The biological community in this river is fairly unstable. It was first sampled in 1993 for its fish community and received a Poor rating. Since then, samples have fluctuated between a Good rating in 1997, Fair in 2002 and Good-Fair in 2003. The benthic community has not been monitored since the 1980s due to increased monitoring in the headwaters. An ambient monitoring station (AMS), located at the confluence with Lambert Fork, shows a significant amount of fecal coliform bacteria (FCB) in the water column and signs of a long-term drop in pH.

Figure 1-13: Median pH Levels in Lower Little River at AMS C2818000 between 1997 & 2008*



* The red line indicates the low pH standard for NC

In 1997, the median pH at this site was 6.95 su; however, in 2008 the median had dropped to 5.95 su. The North Carolina standard for pH is between 6 and 9 su. Figure 1-13 shows the median pH level for each year at this station. The red line indicates the low pH standard for NC. This downward trend appears to have the most dramatic drop between 2002 and 2004, which is common throughout the basin. This basinwide issue is discussed in greater detail in the *Basin Overview Chapter*.

A little less than half of the FCB samples taken in the river were over the suggested level of 400 colonies per 100 ml and had a geometric mean of 367. This level of exceedance indicates a significant issue, and further study into the sources is suggested. This is a high priority due to the fact Lower Little River flows directly into Lookout Shoals Lake which is a primary recreational waterbody and a drinking water supply for the City of Statesville. The stream will not be listed on the Impaired Waters list for FCB until a study of five samples taken in a 30 day period (a 5-in-30 study) is conducted. However, since the river is not a primary recreational waterbody, it will be listed as a lower priority.

Muddy Fork [AU: 11-69-4]:

Muddy Fork is a 6.8 mile creek that drains agricultural properties and few forested lands. The creek is just north of the Town of Taylorsville and flows into the Lower Little River. Over the past 17 years the creek has been on and off the Impaired Waters list for biological integrity. The last benthic sample taken in 2007 will place it back on the list due to a Fair rating. The recent decrease in rating is contributed to excess silt smothering habitat from surrounding land-disturbing activities and livestock with access to both banks of the stream. The local SWCD has implemented at least six agricultural BMPs which focus on stream protection, waste management, erosion control and nutrient removal.

Use Support: Impaired (7 mi)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (CB127)	Fair (2007)
Fish Com (CF44)	Good-Fair (2004)

Protection Priorities

Lambert Fork (030501011002)

Lambert Fork [AU: 11-69-3]:

Lambert Fork is a little over eight miles long and drains agricultural lands into the Lower Little River. The stream was sampled for the first time in 2007 for fish community and received a rating of Good-Fair. Results revealed a lack of common fish species and signs of nutrient enrichment. The 2007 sample also showed deep entrenchment along the stream. Excess nutrients are likely entering the stream through stormwater runoff from small poultry farms scattered across the subwatershed. The local SWCD has implemented at least six agricultural BMPs on Muddy Fork which focus on stream protection, waste management, erosion control and nutrient removal. DWQ will continue to work with SWCD to assess further need for agricultural BMPs for this subwatershed.

Use Support: Supporting (8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB119)	Not Imp. (2005)
Fish Com (CF65)	Good-Fair (2007)

Lookout Shoals Lake (030501011005)

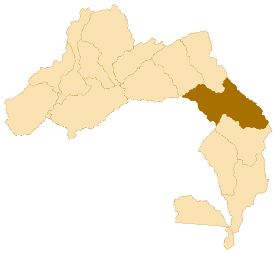
Elk Shoal Creek [AU: 11-73-(0.5)]:

Elk Shoal Creek about eight miles long and drains mainly agricultural lands into Lookout Shoals Lake. This creek has a moderate but stable benthic community. The lack of habitat is restricting the community from reestablishing itself. DWQ will continue to work with SWCD to assess further need for agricultural BMPs for this subwatershed.

Use Support: Supporting (8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB113)	Good-Fair (2007)
Fish Com (CF15)	Good (2002)

The health of the waterbodies listed above is critical to the health of the lakes they drain into. The pollutants collected in the upper portion of the Chain of Lakes often continue downstream. The accumulative impacts are already being seen in Lake Wylie. The more protection given to the headwater streams and lakes, the less time and funding will be needed on waters already impaired due to this process. For more information on the Chain of Lakes, see the *Chain of Lakes Chapter.*

Upper Lake Norman (0305010111)



Restoration Opportunities

McLin Creek (030501011101)

McLin Creek [AUs: 11-76-5-(0.7)]:

Use Support: Impaired (7 mi)	
2008 IR Cat.	2
2010 IR Cat.	5
Benthos (CB124)	Fair (2007)

McLin Creek begins in the City of Conover, flows through the City of Newton and empties into Lyle Creek. The headwaters of McLin Creek and Long Creek (which flows into McLin) receives industrial stormwater discharge from the cities of Newton and Claremont. McLin Creek receives stormwater discharge from about 22 industrial facilities with General Stormwater Discharge permits. There are additional industrialized urban properties which draining to McLin Creek that may not require a stormwater permit. Dense urban industrial areas such as this are often covered by large areas of impervious surfaces. The next several miles of the creek flow through agricultural properties.

This creek has resulted in a moderate benthic rating of Good-Fair since 1997; however, in 2007 the rating declined to Fair. Habitat degradation and waterborne sources, most likely from agricultural and industrial stormwater runoff, are the cause of this impairment. Stormwater runoff may have had more of an impact due to drought causing the runoff to be more concentrated. The biological community is expected to improve as normal rainfall levels return.

Protection Priorities

Lyle Creek (030501011102)

Lyle Creek [AUs: 11-76-(4.5)]:

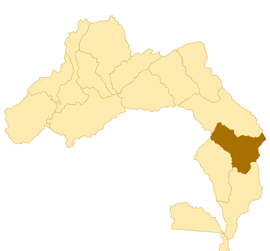
Use Support: Supporting (6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB122)	Good-Fair (2007)
Fish Com (CF35)	Excellent (2004)

Lyle Creek is a little over 20 miles in total length and is split into three segments. The creek begins in the City of Hickory, flows east through the City of Conover and into Lake Norman at the Town of Catawba. Between the municipalities the creek drains agricultural land. Since 1992, the biological community has been stable but of moderate quality. The benthic site had the highest specific conductivity level (122 μS/cm) of any other site in this and surrounding watersheds in 2007. Biologist also noted the water had a chlorine odor at the time of sampling. The City of Conover's Northeast WWTP (NC0024252) is located upstream of the benthic site and received a few permit violations during this sampling cycle; however, there were no exceedances for chlorine. Further study is needed to determine what the sources are of the chlorine odor and other in-stream pollutants.

Even though the fish community received an Excellent rating, the habitat score for the site dropped from a 73 out of 100 in 1997 to a 46 in 2004. The local SWCD has been very active in this subwatershed, implementing over 20 stream protection agricultural BMPs. These efforts are expected to increase the quality of habitat which are likely to be seen in future monitoring cycles. For more information on SWCD activities see the *Agricultural* Section below.

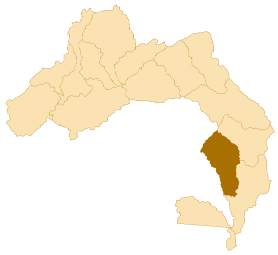
The health of the waterbodies listed above is critical to the protection of the lakes they drain into. The pollutants collected in the upper portion of the Chain of Lakes often continue downstream. The accumulative impacts are already being seen in Lake Wylie. The more protection given to the headwaters, the less time and funding will be needed to improve waters already impaired. For more information on the Chain of Lakes, see the *Chain of Lakes Chapter*.

Lower Lake Norman (0305010112)



This 10-Digit watershed contains the majority of Lake Norman as well as parts of the Towns of Mooresville, Davidson, Cornelius and Huntersville. This watershed does not contain any impaired or impacted waterbodies and displays overall good water quality and aquatic life health. This may be in large part due to the size of Lake Norman. However, the lake should be closely monitored in the future to ensure upstream activities do not start to effect this highly recreational lake. For more information on the lakes water quality status and other lakes in the basin, see the *Chain of Lakes Chapter*.

Dutchmans Creek (0305010113)



Restoration Opportunities

Upper Dutchmans Creek (030501011303)

Forney Creek [AU: 11-119-2-3]:

Use Support: Impaired (8 mi)	
2008 IR Cat.	--
2010 IR Cat.	5
Fish Com (CF63)	Fair (2007)

Forney Creek is an eight mile creek that drains mostly forested and some residential properties into Killian Creek. This creek was sampled for the first time in April of 2007 and received a Fair rating. Due to drought in 2007, the flow during sampling was mostly provided by the effluent from two NPDES dischargers.

This segment received a low habitat score due to eroded and unstable banks, in-channel sedimentation and elevated conductivity levels (164 µS/cm). The stream flows through urban subdivisions where polluted runoff could be contributing to habitat degradation. The elevated conductivity is most likely a result of the effluent discharged during drought conditions. The sediment is most likely originating from the NC-16 road construction which runs along Forney Creek and other large construction projects. Construction sites with land disturbing activities of over an acre are required to place proper BMPs on the site to reduce the amount of sediment that leaves the site during a rain event. However, if the BMPs are not properly maintained of if a large storm event hits the area sediment will continue to cause negative impacts to this biological community. The fish community is expected to recover as normal rainfall returns.

Lower Dutchmans Creek (030501011304)

Dutchmans Creek [AU: 11-119-(0.5)]:

Use Support: Impaired (7 mi)	
2008 IR Cat.	3a
2010 IR Cat.	5
Benthos (CB132)	Good-Fair (2007)
AMS (C3860000)	Turbidity - 10.2% FCB - 29%

Dutchmans Creek begins where Leepers Creek and Killians Creek join then runs seven miles southwest draining forested and residential areas before reaching Lake Wylie just above NC-27. All streams in this 10-digit watershed eventually drain into this stream which provides a holistic view of water quality in this watershed. In 1988, Dutchmans Creek was given an Excellent benthic rating which has gradually declined over the years to a low Good-Fair rating in 2007. The in-stream habitat was intact but had a silty substrate and was not significantly effected by recent drought.

An Ambient Monitoring System (AMS) station is located at the same site as the benthic sample. These physical/chemical samples taken between 2004 and 2008 resulted in a turbidity impairment. This is the first impairment for this creek. Results also showed 29% of samples were over the suggested 400 colonies per 100ml. A 5-in-30 study (five samples in a 30 day period) will need to be completed on Dutchmans Creek before DWQ can determine whether or not the creek is impaired for FCB. Low pH values, as seen across the basin, are also beginning to emerge in Dutchmans Creek. Almost 9% of samples had a pH value below 6 su which is the low standard for pH.

The cumulative impact from upstream pollutants in the watershed are beginning to harm the aquatic life within the creek. The creek's turbidity impairment; however, is most likely due to recent residential development and other land clearing activities within the Dutchmans Creek subwatershed. DWQ will work with DLR to determine if additional action needs to take place to avoid further degradation due to sedimentation. High FCB levels may be a result of failing septic tanks or collection systems. This subwatershed will be placed on the priority list for a 5-in-30 study, but since the creek is not classified as a recreational water it will be placed lower on the list than those commonly used for swimming. The City of Mount Holly and Gaston County should work together with DWQ to ensure proper planning for new and existing development to reduce further impact on water quality and stream habitat. Gaston County and the City of Mount Holly are NPDES Stormwater Phase II communities which requires implementation of certain management practices to reduce impacts from toxic urban runoff. For more information on what Gaston County has accomplished for fulfill these requirements, visit *Gaston County's Stormwater Program* website.

Protection Priorities

Upper & Lower Leepers Creek (030501011301 & 030501011302)

Use Support: Supporting (16 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB137)	Good (2008)
Fish Com (CF27)	Good-Fair (2007)

Leepers Creek [AU: 11-119-1-(1)]:
The majority of Leepers Creek's 16 miles drains residential and some agricultural lands. In 1993, the creek received an Excellent fish community rating. In 2007, it rated Good-Fair with elevated specific conductivity levels (65 µS/cm) and poor habitat with eroding banks on either side. Biologist noted the creek appeared to be experiencing dramatic extremes in its flow rate. Some areas around this stream have been subject to timbering which can cause high volumes of turbid stormwater runoff to reach the creek at high velocities. Local agencies should work with the state to ensure properly installed and maintained forestry BMPs are in place during timbering activities.

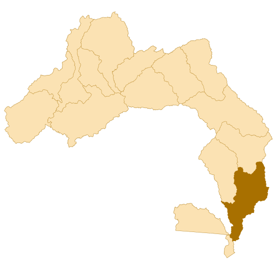
Upper Dutchmans Creek (030501011303)

Use Support: Supporting (15 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB134)	Good-Fair (2007)
Fish Com (CF25)	Good (2007)

Killian Creek [AU: 11-119-2-(0.5)a & b]:
The total length of Killian Creek is a little over 15 miles; beginning north of NC-150 flowing south to its confluence with Dutchmans Creek and is split into two segments. This creek, like others in this watershed, has a benthic community with steadily declining health since 1992 when it received an Excellent rating. In 2007, it rated Good-Fair possibly due to receiving flow from Forney Creek which receives discharge from two minor NPDES facilities. These facilities had a greater impact during this cycle due to low flows during the 2007 drought. Killian Creek had a high conductivity level of 149 µS/cm which supports this theory. Local restoration efforts should focus projects in headwaters of this subwatershed.

The health of the waterbodies listed above is critical to the health of the lakes they drain into. The pollutants collected in the upper portion of the Chain of Lakes often continue downstream. The cumulative impacts are already being seen in Lake Wylie. The more protection given to the headwater streams and lakes, the less time and funding will be needed on waters already impaired due to this process. For more information on the Chain of Lakes, see the *Chain of Lakes Chapter.*

Mountain Island Lake - Catawba River (0305010114)



Restoration Opportunities

Mountain Island Lake and portions of Lake Wylie are located in this watershed. Impairments and water quality updates are discussed in the *Chain of Lakes Chapter*.

McDowell Creek (030501011401)

Use Support: Impaired (12 mi)	
2008 IR Cat.	4
2010 IR Cat.	4
Benthos (CB139)	Fair (2007)
Fish Com (CF40)	Poor (2002)

McDowell Creek [AUs: 11-115-(1), (1.5)a, (1.5)b & (5)]:
McDowell Creek is 12 miles long beginning in the southern portion of the Town of Cornelius and flows southwest through the Town of Huntersville before it empties into Mountain Island Lake. A large majority of the creek flows through urban areas that include residential communities and golf courses as well as agricultural lands. The creek has been on the Impaired Waters list since the first list was published in 1998. Only one segment [AU: 11-115-(1)] was listed in 1998 which was due to excessive sediment. From the 2000 list to the current list, all four segments have been listed for biological integrity.

A Fair benthic rating was given in 1990, 2002 and 2007. In 1997, a fish community site was added just upstream from the benthic site and received a Fair rating as well. The site was sampled again in 2002 and dropped to a Poor rating. The 2008 list moved the creek from *Impaired standard violation in need of a TMDL for parameter of interest* category on the list to *Impaired - Other program expected to address parameter of interest* category (4b). The Charlotte/Mecklenburg Utility Department (CMUD), Mecklenburg County, and the Town of Huntersville have been designated and are working together to address this Impairment.

Mecklenburg County continues to collect ambient water quality, stormwater, benthic macroinvertebrate, fish, and stream habitat data at numerous sites throughout the McDowell watershed including McDowell Creek Cove on Mountain Island Lake. Monitoring data collected between May 1994 and June 2009 was approved by DWQ in July of 2009. It shows the quality of the benthic community has not changed appreciably over the monitoring period. In addition, physical/

chemical data showed the average FCB levels were exceeding 400 colonies per 100 ml, and turbidity levels were elevated but the average remained under the state standard.

The Towns of Huntersville, Cornelius and Mecklenburg County joined efforts with EEP in 2002 to develop a Watershed Management Plan which is discussed further below. During this process it was determined that excess sediment was not only running off construction sites and other land disturbing activities but also from erosion of stream banks. Major construction projects for residential neighborhoods has been on going in this watershed for the past several years. Recently, that construction has subsided; however, the turbidity levels have not dropped as low as expected.

Another parameter of concern is total phosphorus which is likely coming from excessive fertilizing of residential lawns and the golf course the creek runs through. CMUD has made necessary upgrades to the McDowell Creek WWTP (NC0036277) to eliminate the facility as a possible source of excess nutrient loading. In the January 2004 permit, mass-based nutrient limits for phased flow were developed based on extensive modeling. The model endpoint was to have 10% or less of model predictions exceed the water quality standard of 40ug/L for chlorophyll *a*. The phased nutrient limits represented load reductions from the previous permitted loads for Total Nitrogen (TN) and Total Phosphorus (TP) which were concentration limited. The most recent permit (issued in 2009) maintained the same 12 MGD TP and TN limitations found in the 2004 permit. The facility is regularly in compliance.

The Watershed Management Plan and other recommendations are discussed in the *Watershed Recommendations & Action Plans* Section below.

Long Creek (030501011403)

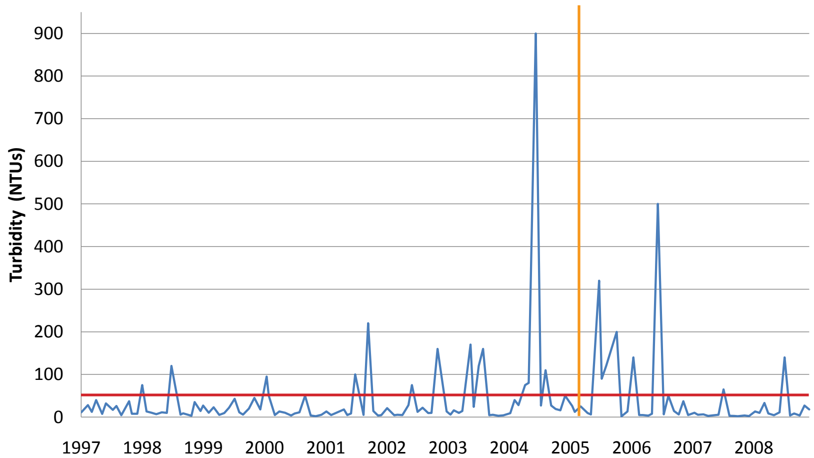
Use Support: Impaired (11 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF30)	Good (2004)
AMS (C4040000)	Copper - 23% Turbidity - 20% FCB - 25%

Long Creek [AU: 11-120-(2.5)]:
The headwaters of Long Creek drain a large industrial area in north Charlotte before crossing and running southwest along I-485. It then crosses I-485 a third time flowing through the Pine Island Golf Course & County Club and continues to drain densely populated residential neighborhoods until reaching Lake Wylie [AU: 11-(117)]. The total 18 miles of the creek are split into three segments. This creek first appeared on the 2000 Impaired Waters list for turbidity violations. In February 2005, EPA approved a turbidity *TMDL* for Long Creek.

Between 2004 and 2008, the ambient monitoring station, located just downstream of McIntyre Creek, showed standard violations for copper and turbidity. Data collected at that site also indicated elevated levels of fecal coliform bacteria. Despite the turbidity TMDL, turbidity violations were at the highest percent this site has recorded between 1997 and 2008 (Figure 1-14). Long Creek will be listed on the 2008 and 2010 Impaired Waters lists for copper and turbidity standard violations. Other stressors found at this site include slightly high levels of manganese and zinc.

The headwaters of Long Creek drain a large industrial area of Charlotte which could be a significant contributor of these parameters. Construction of I-485 (Charlotte's outer belt line) runs through the watershed and crosses Long Creek three times. DOT and Charlotte/Mecklenburg collect physical/chemical samples automatically every hour and staff are alerted if there are elevated levels of turbidity or other parameters. This intensive monitoring is beneficial to alert staff when a sediment and erosion control BMP has failed; however, until the project is completed, large storm events will continue to wash sediment off the property and into the creek. The recorded data can be found on the Charlotte-Mecklenburg *Stormwater* website. For detailed information on the I-485 construction project, visit *NC DOT's* website.

Figure 1-14: Measured Turbidity Levels in Long Creek at AMS C4040000 between 1997 & 2008*



* The red line indicates the state standard of 50 NTUs, and the orange line indicates when the TMDL was approved.

In 2004, the creek's fish community was monitored for the first time at the same location as the AMS site and received a Good rating. The conductivity was elevated (173 µS/cm) and the overall habitat was given a score of 44 out of 100. The benthic community has not been monitored by DWQ since 1989; however, Charlotte/Mecklenburg samples the creek on the downstream side of Pine Island Country Club monthly. During the next biological sampling cycle, DWQ will monitor for both the benthic and the fish community to compare biological sampling results and will continue to work with the City of Charlotte and Mecklenburg County to ensure efforts continue to reduce urban impact on aquatic life.

The turbidity TMDL and recommendations for Long Creek are discussed below in the *Watershed Recommendations & Action Plans* Section.

Protection Priorities

Mountain Island Lake (030501011402)

Gar Creek [AU: 11-116-(1)]:

Use Support: Supporting (4 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB133)	Good-Fair (2007)

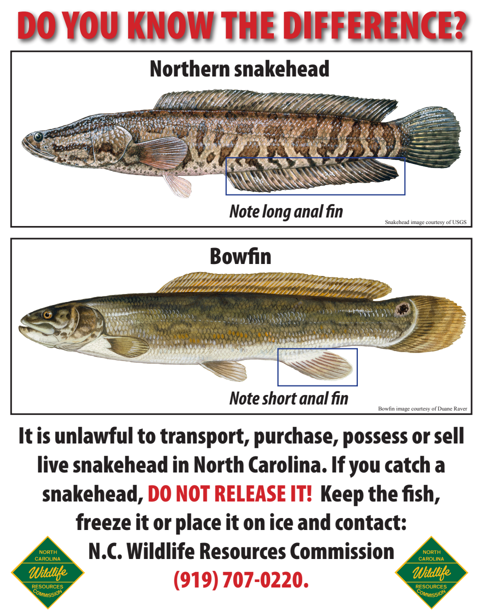
Gar Creek is a four mile creek originating in the Town of Huntersville and drains to Mountain Island Lake. The creek has been monitored for benthos four times since 1992 and received a Good rating every cycle except during this last cycle. In 2007, the rating dropped to a Good-Fair. The decline is most likely due to a combination of drought and increasing development. Biologist noted the stream being turbid. The sources of the biological decline are not definitive since the stream was not sampled during the 2002 cycle, which was also a dry year. Further study is required to better understand which sources are the cause of degradation.

Watershed Recommendations & Action Plans

Paws Creek-Lake Wylie (030501011404)

In April 2009, an angler caught a 31-inch Northern Snakehead in Paw Creek. Snakehead fish are native to China but are imported into the US as aquarium fish or to be consumed as food. This invasive species can be extremely harmful to an ecosystem if populations become established in US waters. In 2002, adults and juveniles were found in Maryland waters in large numbers indicating the species was thriving in that area. After the fish caught in Paw Creek was identified, NC Wildlife Resource Commission biologist conducted a study and were not able to find any signs of a Snakehead population and stated that Snakeheads do not pose any immediate threat to Lake Wylie. However, due to the nature of these fish, biologist are cautious. Media coverage and distribution of fliers (as seen in Figure 1-15) helped biologist educate the public on the difference between the common Bowfin (a native species) fish and the Northern Snakehead. The *News Release* about this catch can be found on the NC Wildlife Resource Commission's website.

Figure 1-15: Northern Snakehead Flier Distributed by NC Wildlife Resources Commission in 2009



McDowell Creek Watershed Management Plan & Strategy

In the 1930's, McDowell Creek was modified (dredged, straightened) to eliminate ponding to prevent malaria. Associated wetlands were also drained to prevent malaria and to provide more agricultural land for farming. This process was not only effective at preventing ponding but also allowed the flow to move swiftly down the creek. When large amounts of impervious surface increases the volume of stormflow that reaches the creek, as this watershed has, and is combined with high velocity, streambank failure is inevitable. This issue, among others, is causing the creek to remain on the Impaired Waters list.

McDowell Creek Watershed Management Plan:

A *Watershed Management Plan* was completed in 2006 and was revised in March 2008. The plan is a comprehensive road map for the management and restoration of surface waters in the entire McDowell Creek watershed. A nine element plan is included in this watershed plan. Mecklenburg County, in partnership with the Town of Huntersville and Cornelius, NC Natural Resources Conservation Service, and the NC EEP are using NC CWMTF and EPA 319 funds along with their own *Storm Water Services* fees to implement the watershed plan. Specifically, Mecklenburg County has prioritized the subbasins within the watershed and is managing several projects involving retrofitting existing development by installing bioretention basins (rain gardens) and stormwater wetlands, along with several miles of stream restoration. The total cost of this subwatershed project is $478,416 (combined from federal EPA 319(h) grant and non-federal match funds) which includes the construction of 17 bioretention cells in the parking lots of six different properties and monitoring. For more detailed information regarding the numerous projects in the McDowell Creek watershed and definition of a nine element plan, see the *URW website*. The *Watershed Management Plan* include more detailed information on total suspended solids and nutrient levels recorded within the watershed as well as detailed plans for restoration implementation.

DWQ encourages Charlotte-Mecklenburg to continue working with EPA to develop a more accurate model for estimating turbidity load reductions within the watershed. The Division also supports funding efforts to allow the City and County to continue restoration implementation and monitoring efforts. Assistance will be provided by DWQ as resources allow.

Long Creek Turbidity TMDL & Implementation Efforts:

The *Long Creek TMDL* was completed in 2005 and originally included McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek. However, during sampling studies, it was determined that Long Creek was the only creek still violating turbidity standards. Figure 1-14 above, graphs monthly turbidity data collected by DWQ. The red line indicates the state standard of 50 NTUs and the orange line indicates when the TMDL was approved. As explained in the TMDL (Section 4.7), a 58% TSS load reduction is needed to meet the state standard under all flow conditions. It was determined that the majority of turbidity violations were being caused by nonpoint sources.

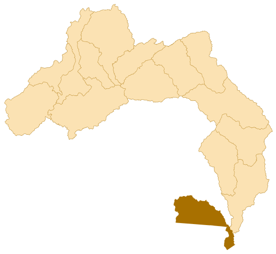
Recent intensive construction and other land disturbing activities are the primary source of suspended sediment in Long Creek and its tributaries. Erosion problems associated with land-disturbing activities are compounded by increased flows, that result from an increase in impervious area after development. Enforcement of stormwater BMP requirements for construction sites and urban stormwater controls for sediment are potential management options for improving turbidity levels. Among these measures are construction entrances, diversion ditches and berms, sediment basins, and silt fences, which, to be effective, must be installed and maintained from the initiation of land disturbing activities until the establishment of permanent soil stabilization measures. While stormwater controls are required on construction sites, significant loadings can occur due to initial periods of land disturbance before controls are in place or during high rainfall periods during which the controls are inadequate. North Carolina Phase II rules require development, implementation, and enforcement of an erosion and sediment control program for construction activities that disturb one or more acres of land. In addition, Phase II rules require the development, implementation, and enforcement of a program to address discharges of post-construction storm water runoff from new development and redevelopment areas (NCDENR-DWQ, 2005). The North Carolina Phase II rules can be found on the *DWQ Stormwater website*.

Long Creek Management Strategies:

<u>Turbidity Management Strategy:</u>
The City of Charlotte is using a variety of mechanisms to protect and enhance water quality in the Long Creek subwatershed. The two main mechanisms are the City of Charlotte Soil Erosion and Sedimentation Control Ordinance (CSESCO) and the Surface Water Improvement and Management (SWIM) Program. The city has set a goal within the CSESCO to achieve a 25% reduction in TSS loads in streams that have established in-stream stormwater monitoring sites. The SWIM approach has prioritized Mecklenburg's creek basins and focus on preventing further degradation, preserving the best waters, improve the good waters, and remediating the worst waters. The program has been successful in improving water quality conditions, enhancing efforts to enforce erosion control ordinances, reducing sediment levels in some streams by as much as 79%, establishing vegetative stream buffers county wide through the adoption of ordinances, and in the development of automated water quality monitoring techniques (NCDENR-DWQ, 2005). For more information about both programs, see Section 6.0 of the *TMDL*.

<u>Nutrient Management Strategy:</u>
Long Creek should be included in the Lake Wylie Chlorophyll *a* TMDL which places total phosphorus (TP) and total nitrogen (TN) limits on permitted dischargers in the watershed in efforts to reduce the chlorophyll *a* levels within the lake. New dischargers on Long Creek with a design flow of greater than or equal to 1 MGD (Major NPDES permit) would be required to meet monthly average limits of 1.0 mg/l TP and 6.0 mg/l TN, and facilities with a design flow between 0.05 MGD and 1 MGD (Minor NPDES permit) would need to meet a TP limit of 2.0 mg/l. Existing facilities with plans to expand would be required to meet 1.0 mg/l TP and 6.0 mg/l TN for Major permits and 2.0 mg/l TP for Minor permits after expansion. TN limits would be during summer months only. For more details about this TMDL and nutrient limits and why Long Creek should be included within the management area, see the Lake Wylie Section of Chapter 4, *The Chain of Lakes*.

Lake Wylie-Catawba River (0305010115)



Restoration Opportunities

Upper Crowders Creek (030501011501) & Lower Crowders Creek (030501011504)

McGill Creek [AU: 11-135-2]:
McGill Creek is three miles long and flows through the City of Kings Mountain, draining into Crowders Creek. It has been impaired since 1989 for biological integrity. In previous years, the Kings Mountain WWTP discharged effluent into this creek; however, after the closing of this facility, biologist were only able to find a dry ditch. DWQ will re-visit this stream during the next sampling cycle to determine if it remains a dry ditch. If the creek continues to be dry, it will be removed from the Impaired Waters list. DWQ will re-sample if the creek has sufficient flow to do so.

Use Support: Impaired (3 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB241)	Poor (1989)

Crowders Creek [AUs: 11-135a, b, c, d, e, f & g]:
The first 15 miles of Crowders Creek (from source to NC-321) is located within the Upper Crowders Creek subwatershed and runs through the City of Kings Mountain and Gastonia draining forested and residential areas. The last mile and a half of the creek [11-135e] is located in the Lower Crowders Creek subwatershed which has similar land uses. A fecal coliform bacteria (FCB) TMDL was completed in 2004 for the lower portion of the creek [AUs: 11-135e, f & g] which is discussed below in the *Watershed Recommendations & Action Plans Section*.

Crowders Creek [AU: 11-135a]: The first segment of Crowders Creek runs from the source two miles northeast to Canterbury Road (SR-1118) and was last sampled in 2002 as part of the TMDL study. At that time it was considered too small to rate; however, biologist noted the upstream segments were just as degraded as the lower segments.

Use Support: Impaired (2 mi)	
2008 IR Cat.	5
2010 IR Cat.	5

Crowders Creek [AU: 11-135b]: The second segment flows three miles from Canterbury Road to Linwood Road (SR-1122). The segment was sampled in 2002 as part of the same TMDL study and was rated Good-Fair. This is a significant increase from the Fair rating the segment received in 1989. The segment will be removed from the Impaired Waters list in 2010. The segment should be re-sampled during next cycle to ensure the improved rating was not an effect of the 2002 drought.

Use Support: Supporting (3 mi)	
2008 IR Cat.	5
2010 IR Cat.	2
Benthos (CB236)	Good-Fair (2002)

Crowders Creek [AU: 11-135c]: The third segment runs a little over three miles from Linwood Road to SR-1131 and was first sampled for fish community in 2004 when it received a Poor rating. It will remain on the Impaired Waters list for its 2002 Fair benthic rating as well as for the 2004 fish community rating. A portion of this segment runs through Crowders Mountain Golf Course. The habitat score (24 out of 100) was the lowest score of any fish community site within the entire Catawba River Basin between 2003 and 2008. Tree canopy and riparian buffers are completely absent in this area. The specific conductance was elevated to 151 µS/cm. This factor, as well as total lack of tree canopy and riparian buffers, are all contributing to this segments impairments. The City of Gastonia should work with this golf course and surrounding land owners to improve the tree cover as well as riparian buffer area.

Use Support: Impaired (3 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB237)	Fair (2002)
Fish Com (CF11)	Poor (2004)

Crowders Creek [AU: 11-135d]: For the past ten years this segment has received a Fair fish community rating for each sample taken. The specific conductance was also elevated at this station to 156 µS/cm. This stretch has slightly improved habitat from when it was sampled in 2002 due to bank stability and wider riparian zones; however, it still scored a 58 out of 100 for habitat. Almost the entire segment runs through the City of Gastonia. Toxic urban stormwater runoff may be the cause of the elevated conductivity. The City along with Gaston County have been working together to install stormwater BMPs in efforts to reduce the impact.

Use Support: Impaired (7 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF10)	Fair (2007)

Crowders Creek [AU: 11-135e]: This segment flows from SR-1108 (Crawford Rd.) to NC-321, just upstream of the Crowders Creek WWTP (NC0074268). The short one and a half mile segment was last sampled in 1989. At that time, the segment received a benthic rating of Fair. The land use for this drainage area is mostly agriculture. Satellite imagery shows the riparian buffers are mostly intact in this segment; however,

Use Support: Impaired (2 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB239)	Fair (1989)

there are a few breaks to allow for utility easements. The FCB TMDL management area begins with this segment and flows into South Carolina. The segment is on the Impaired Waters list for FCB standard violations as well as the 1989 benthic rating. This segment will be monitored during the next cycle to evaluate restoration efforts implemented as a result of the TMDL.

Crowders Creek [AU: 11-135f]: This segment flows from the Crowders Creek WWTP to about a mile above the state line. The short one and a half mile segment was last sampled in 1989. At that time, the segment received a benthic rating of Fair. The drainage area for this segment receives stormwater runoff from a grease recycling facility, other industrial facilities as well as residential and agricultural properties. Satellite imagery indicates the presents of riparian buffers, though the buffer conditions are uncertain. This segment is also included in the TMDL management area and should be sampled during the next cycle as resources are available.

Use Support: Impaired (1 mi)	
2008 IR Cat.	4a
2010 IR Cat.	5
Benthos (CB238)	Fair (1989)

Crowders Creek [AU: 11-135g]: The last segment of Crowders Creek flows for a mile and a half before entering South Carolina. In 2002, it received a Fair benthic rating which was sampled as part of the FCB TMDL study. The 2007 sample showed improving benthic community with a Good-Fair rating. Land use along this segment is mostly forest; however, input from an unnamed tributary drains a diverse land use of residential and agricultural properties as well as industrial areas. Point source discharger changes and facility upgrades have gradually reduced the impacts on this segment since 1989.

Use Support: Supporting (2 mi)	
2008 IR Cat.	5
2010 IR Cat.	4t
Benthos (CB234)	Good-Fair (2007)

As mentioned above, the last four miles of Crowders Creek [AU: 11-135e, f & g] are part of the *Fecal Coliform Bacteria TMDL* for North and South Carolina which was completed in 2004. This is a bi-state TMDL to protect the designated uses of the creek on each side of the state line. In North Carolina the designated uses are aquatic life propagation/ protection and secondary recreation (also referred to as Class C), and in South Carolina they are primary recreation (Class B) and water supply (WS). Due to the more stringent classifications (Class B) of the downstream segments in SC, the upstream NC segments must meet SC standards to protect human health. This TMDL is discussed in the *Watershed Recommendations & Action Plans* below.

Catawba Creek (030501011502)

Catawba Creek [AUs: 11-130a, b & c]:
Catawba Creek is a 13.6 mile creek originating in the City of Gastonia and flows southwest, draining directly into Lake Wylie. This creek will remain on the Impaired Waters list due to a fish community sample taken in 2007 resulting in a Poor rating. This creek has been steadily declining in biological health since 1997 when it was rated Good-Fair. The impacts from toxic urban stormwater runoff, plant nurseries, and non-stable stream banks are all contributing to this creek's impairment. Current conditions of Catawba Creek have been compared to conditions found in Long Creek (within HUC 030501011403) before the restoration efforts. Efforts made in the Long Creek watershed should be implemented here as well. The City along with Gaston County have been working together to install stormwater BMPs in efforts to reduce the impact. DWQ will assist with these efforts if needed and as resources are available.

Use Support: Impaired (14 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB233)	Fair (1990)
Fish Com (CF5)	Poor (2007)
Gaston AMS (GAS14)	FCB - 41.2%

This creek is also monitored on a local level by Gaston County. Results of those sampling efforts indicate elevated levels of FCB. DWQ does not impair waters for FCB until five samples are collected within a 30 day period (5-in-30 study). However, this creek is not a primary recreational waterbody, which receive a higher priority for 5-in-30 studies; therefore, a study will not be conducted until all other primary recreational waterbodies on the priority list have been assessed.

Lower Crowders Creek (030501011504)

South Crowders Creek [AU: 11-135-10-1]:
The South Crowders Creek originates at Shorts Lake in Crowders Mountain State Park, then flows through the City of Gastonia and southeast to the South Fork Crowders Creek [AU: 11-135-10]. Land use in this drainage area is mostly forested with scattered agricultural and residential properties. The creek was monitored on a local level by Gaston County which resulted in a 17% DO standard violation. This exceedance may be due to the six dams located in this drainage area upstream of the monitoring location and drought conditions. Local and state authorities should work with land owners to

Use Support: Impaired (6 mi)	
2008 IR Cat.	--
2010 IR Cat.	5
Gaston AMS (GAS14)	DO - 17%

reevaluate the need for all six dams and determine if any could be removed. Gaston County should continue to monitor this location during the upcoming cycle to see if results change during normal rainfall conditions. DWQ supports the need for funding of Gaston County's monitoring program due to the valuable water quality information it provides in areas DWQ does not have monitoring sites.

Protection Priorities

Lower Crowders Creek (030501011504)

Use Support: Supporting (6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB243)	Good-Fair (2002)
Fish Com (CF49)	Good-Fair (2004)

South Fork Crowders Creek [AU: 11-135-10]:
The South Fork Crowders Creek originates in North Carolina, flows into South Carolina for a few miles, then returns to NC and drains into Crowders Creek at US-321. A fish community sample taken in 2004 received a Good-Fair rating. Biologist noted cattle in the stream and along both streambanks, turbid water, and significantly impacted habitat from cattle, nonpoint source runoff and little to no riparian buffers. A few miles upstream of this biological site, a benthic site in South Carolina rated Fair during the same monitoring cycle. This creek was only one fish species collection away from being Impaired. DWQ will work with SWCD to determine the need for agricultural BMPs for this creek to avoid further habitat degradation. The creek will be monitored during the next sampling cycle at a minimum one biological site.

This subwatershed should be included in the implementation of the *Restoring and Assessing Fecal Coliform Impairment of Crowders Creek* project described above.

Watershed Recommendations & Action Plans

Crowders Creek

Fecal Coliform Bacteria TMDL:
As discussed above, the last four miles of Crowders Creek are part of the *Fecal Coliform Bacteria TMDL* for North and South Carolina which was completed in 2004. The TMDL lists potential point and nonpoint sources of FCB loading in the watershed which included faulty collection system lines and septic systems, the City of Gastonia's Crowders Creek WWTP (NC0074268), Berkley Oaks (NC0062278), CWS Saddlewood WWTP (NC0060755), Ridge Community WWTP (NC0069175) and Pines Mobile Home Park (NC007499), biosolids application and livestock. The TMDL concluded that a 79% reduction across all point and nonpoint sources must be made in order to meet North and South Carolina's FCB standards for Crowders Creek.

Crowders Creek Watershed Management Plan:
As suggested in the 2004 Catawba River Basin Plan, an implementation plan was developed under a NC 319 grant to the University of North Carolina at Charlotte. The final *Restoring and Assessing Fecal Coliform Impairment of Crowders Creek* 319 Grant Report, completed in October 2008, discusses the two year monitoring effort to further pinpoint the source as well as current and future actions of implementation. Monitoring showed that the majority (69%) of FCB loading was coming from Blackwood Creek which is a tributary to Crowders Creek. A constructed wetland BMP was built on Blackwood Creek to examine the effectiveness of removing FCB and resulted in a 20-40% reduction of inflow FCB concentrations. This methodology can be applied to basinwide BMP assessment, as well as to watersheds of similar conditions.

A watershed restoration plan is presented (within the Restoring and Assessing Fecal Coliform Impairment of Crowders Creek 319 Grant Report) *to outline appropriate actions that are necessary for improving and ultimately restoring FC impairments for the Crowders Creek. Relevant issues and corrective actions presented in this plan include uncontrolled discharges, sanitary sewer overflow, failing septic systems, illicit discharge and dry weather flow, stream buffer, exfiltration from sanitary sewers, structural BMPs, and watershed management and development. The plan calls for an immediate action to prioritize the following four restoration efforts:*

- Decommission the failing sand-filtration sewage treatment plant and provide sanitary sewer extension to three "communities of concern". This action will likely achieve at least 40% or more reduction of the observed FC loads originating from the Blackwood Creek subwatershed,
- Perform a survey of stormwater outfalls on the Blackwood Creek subwatershed to identify dry weather flows due to illicit discharges, groundwater seepage and exfiltration,
- Conduct a study to assess the magnitude and potential of FC input from stream sediments and in-line sewer deposits as a secondary FC pollution source during runoff events, and

- Develop a spatial decision support system (SDSS) that incorporates relevant field and GIS data to support a comprehensive watershed/water quality and infrastructure improvement program for the entire Crowders Creek watershed (Wu, 2008).

Further information on the TMDL and implementation report can be found at the links provided above. Progress of the TMDL implementation plan will be updated within this Section as more data becomes available. Water quality throughout the entire length of the creek has improved significantly since the late 1980's; however, as of 2002 the creek was still considered to be degraded. DWQ will sample this creek during the next biological sampling to determine if water quality has improved. A watershed restoration plan (i.e., 9 Element Plan) has been developed for the Crowders Creek watershed and is included in the implementation report linked above. For more information on the description, purpose and goals of 9 Element Plans, see the *Watershed Plan Development Guidance Document* on the URW website.

Crowders Creek Recommendations & Action Plan:
DWQ will work with local governments to organize a stakeholder group to begin implementation efforts. The Gaston County Health Department should do a full assessment of septic systems throughout this watershed to locate failing systems and assist with making necessary repairs. Stream walks have been proven to enhance the ability to identify FCB sources and are highly recommended for this watershed. DWQ will work with Gaston County to assist in evaluating the watershed for other sources of excess FCB as resources allow. The City of Gastonia will be required to develop a Water Quality Recovery Program as a result of the Gastonia's Crowders Creek WWTP (NC0074268) being listed in the TMDL as a major source contributor.

Watershed Restoration & Success Stories

Upper Crowders Creek (030501011501)

Abernethy Creek [AU: 11-135-4b]:
Abernethy Creek is five miles long originating in north Kings Mountain and drains to Crowders Creek. This creek received a Good-Fair benthic rating in 2007. The Mooresville Regional Office requested this creek be sampled to assess benefits of a large agricultural restoration project which had just been completed and upgrades made to the NPDES permitted discharger (FMC Corporation Lithium Division Plant). A special study[1] completed in 2007 showed a dramatic improvement from the last sample taken in 1989. Biologist noted that drought conditions may have kept the creek from receiving a higher benthic rating. The creek will be removed from the Impaired Waters list in 2010.

Subbasin Recommendations & Action Plans

Update of 7Q10 Flows in NPDES Permits

It is important that 7Q10 flow values be updated to include changing climatic conditions and water withdrawals that impact stream flow conditions. All NPDES permitted facilities use 7Q10's as critical flow in determining permit limits for toxicants. These critical flow values used to determine permit limits for all NPDES facilities may need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions induced by drought impacts the health of aquatic life as demonstrated in this basin for roughly seven years between 1997 and 2007 (see Figure 1-3: stream flow graph). Droughts as well as the demand on water resources are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with DWR and other agencies to discuss the need and resource availability to update 7Q10 values.

Suggested Studies for Upcoming Planning Cycle

Lake Hickory - Catawba River (0305010109) & Lookout Shoals - Catawba River (0305010110)
Agricultural land uses have made a recent shift to small poultry farms within these and surrounding watersheds. The fish community in Lambert Fork is already showing signs of nutrient enrichment. These watersheds drain into the Catawba Chain of Lakes which has become impacted by excess nutrients in some locations. DWQ suggests a long term study of nutrient levels for these watersheds. Monitoring the nutrient levels at the confluence of Lower Little River and Lambert Fork as well as Lower Little River and Glade Creek will assist in determining the amount of nutrients entering the Chain of Lakes from these watersheds. Additional monitoring of turbidity and other physical parameters throughout these watersheds would also be beneficial to the future water quality health of the area.

---

1 *Results from benthic sampling of three sites requested by Planning Section and Mooresville Regional Office in Catawba subbasins 35 through 37 for summer 2007 (B-20070727).* Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Point Source Contributors

National Pollutant Discharge Elimination System Permit Program

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, as authorized by the Clean Water Act. Non-compliance with permit limits on wastewater flow and constituents can lead to discharge of pollutants that degrade surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES Permitting and Compliance Programs of North Carolina's DWQ are responsible for administering the program for the state. These permits are reviewed and are potentially renewed every 5 years, a list and map of NPDES permits can be found in *Appendix 1-E & 1-D*, respectively.

There are a total of 127 NPDES Dischargers within this subbasin. Twenty-one of those are Major Dischargers which means the facility discharges greater than one million gallons of wastewater a day (1 MGD). One hundred seven of the facilities are Minor facilities which discharge less than 1 MGD. The Major facilities discharge mainly to the main stem Catawba River or other major rivers flowing into the Catawba. If a facility is impacting water quality or has made improvements to minimize the impact of their waste load, it is discussed in the 10-digit HUC watershed sections.

Implementation of New Water Quality Standard for Total Residual Chlorine:

On April 1, 2003, a new aquatic life surface water quality standard for total residual chlorine (TRC) became effective in North Carolina. Previously, TRC had been a freshwater Action Level standard, except in designated Trout waters where the aquatic life standard of 17 ug/l was implemented as a permit limit. The new standard removes the Action Level status and sets the new instream standard for TRC for all freshwater streams at 17 µg/L including those classified as Tr. After April 1, 2003, as existing permits were renewed and new permits issued, TRC limits were included in the permits. Facilities that do not use chlorine for disinfection did not receive TRC limits; however, the presence of a chlorine back-up system to augment Ultraviolet (UV) and other disinfection treatments resulted in a TRC permit limit. Facilities that discharge to streams with a 7Q10 flow <0.05 cfs (considered zero-flow streams) received a limit of 17 µg/L. TRC permit limits are capped at 28 µg/L in freshwater discharges to protect against acute impacts.

Facilities were given 18 months to add dechlorination or other means of disinfection to become compliant with the new standard. The 18 month period for most facilities in the Catawba River basin fell between 2004 and 2007, depending on when the permit was renewed. All facilities in the Catawba basin are beyond this 18 month period. It should be noted that meeting the new TRC limits has been difficult for some facilities; however, DWQ has been working with all facilities to assist with compliance.

Special Order by Consent (SOC):

Special Order by Consent may be an appropriate course of action if a facility is unable to consistently comply with the terms, conditions, or limitations in an NPDES Permit. However, SOCs can only be issued if the reasons causing the non compliance are not operational in nature (i.e., they must be tangible problems with plant design or infrastructure). Should a facility and the Environmental Management Commission enter into an SOC, limits set for particular parameters under the NPDES Permit may be relaxed, but only for a time determined to be reasonable for making necessary improvements to the facility.

Pretreatment

The Federal and State Pretreatment Program gives regulatory authority for EPA, States, and Municipal Governments to control the discharge of industrial wastewater into municipal Wastewater Treatment Plants (WWTPs) or Publicly Owned Treatment Works (POTWs). The objectives of the Pretreatment Program are to prevent pass-through, interference, or other adverse impacts to the POTW, its workers or the environment; to promote the beneficial reuse of biosolids; and to assure all categorical pretreatment standards are met. There are currently around 700 Significant Industrial Users (SIUs) who discharge industrial wastewater to over 120 POTWs throughout the State of North Carolina. The WWTPs covered by POTW Pretreatment Programs are indicated in *Appendix 1-E* by an asterisk (*) next to the permit number. If a facility's Pretreatment Program is impacting water quality or has made improvements to minimize the impact of their industrial user waste load, it is discussed in the 10-digit HUC watershed sections.

Non-point Source Contributors

Stormwater

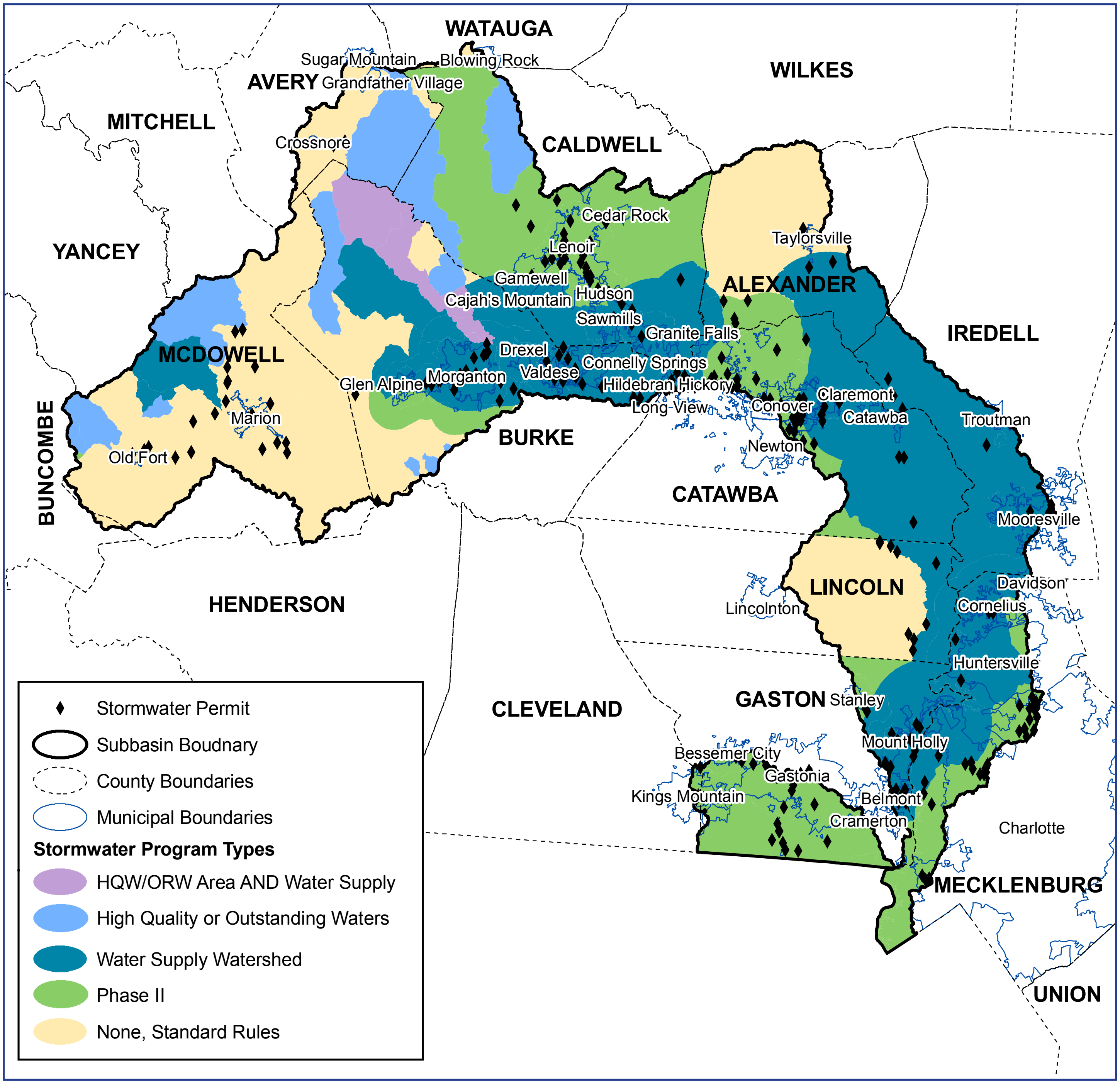
There are many different stormwater programs administered by DWQ. One or more of these affects many communities in the Catawba River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include Phase II stormwater program, HQW/ORW stormwater, and Water Supply Watershed Program. Figure 1-16 indicates the different stormwater programs that control runoff from development and municipal separate storm sewer system (MS4) discharges in this subbasin.

HQW/ORW Stormwater Program is implemented in the headwaters and Water Supply Watershed Stormwater Programs are scattered throughout this subbasin. McDowell, Burke, Caldwell, Catawba, Mecklenburg and Gaston counties are covered under the Phase II Stormwater program as well as most cities within this subbasin. The Phase II programs are delegated to the counties and some municipalities in this area. For more information on stormwater permits and the requirements of each, see *Chapter 5.3 of the Supplemental Guide to NC's Basinwide Planning* or *DWQ's Stormwater Permitting Unit's* website.

Caldwell County Stormwater Program

In early 2009, Caldwell County delegated the county's Stormwater Program to the City of Lenoir. The county's Board of Commissioners took this action as part of a cost cutting effort. This also included a reduction in force, reducing the County Planning staff to one employee. DWQ conducted a Stormwater Compliance Evaluation of Caldwell County on June 2, 2009 in which 16 violations of the State's Stormwater Program were found. The county is currently working with DWQ's Stormwater Program Staff to bring the program back into compliance.

FIGURE 1-16: STORMWATER PROGRAM AREAS IN SUBBASIN 03050101



INDUSTRIAL STORMWATER

The Division has renewed several industrial stormwater permits with a revised monitoring strategy in the past few years, including the majority of General NPDES Stormwater Permits. These permits now incorporate benchmark concentrations to provide permittees a tool with which to assess the effectiveness of best management practices (BMPs). These benchmark concentrations are not effluent limits but instead provide guidance for responses under the facility's Stormwater Pollution Prevention Plan (SPPP). The basis for each benchmark varies depending on the type of pollutant; values are based on thresholds like acute effects to aquatic life (e.g., metals), water quality standards (e.g., pH), secondary treatment standards (e.g., BOD and COD), or other reference levels.

Exceedances of stormwater benchmark values require the permittee to respond in a tiered program with increased monitoring, increased management actions, increased record keeping, and/or installation of stormwater BMPs. In previous versions of these general permits, "cut-off concentrations" were used to minimize the required analytical monitoring. The arithmetic mean of all monitoring data collected during the term of the permit was compared to the cut-off concentration. If the mean was less than the cut-off concentration, then the facility could discontinue analytical monitoring for that parameter at that outfall until the final year of the permit.

The Division revised that strategy to incorporate benchmarks with (typically) semi-annual monitoring throughout the permit term on the basis that (1) so few data points over the term of a permit were insufficient to provide confidence in an average concentration and justify discontinuance of monitoring; (2) industrial processes or activities may change during the period of the permit that the facility is not monitoring; and (3) periodic monitoring encourages maintained attention to stormwater management.

Non-Discharge

Non-discharge wastewater treatment options include spray irrigation, animal waste management systems, rapid infiltration basins, drip irrigation systems, land application of residuals programs, wastewater collection systems and beneficial reuse of wastewater systems. These systems are operated without a discharge to surface waters; however, they still require a DWQ permit. Sanitary sewer collection systems used to collect the wastewater from NPDES discharge wastewater treatment facilities and non-discharge wastewater treatment facilities are both permitted by Non-Discharge Permitting Unit (NDPU). The land application of residuals program and the distribution and marketing program are also permitted by NDPU. The permit insures that treated wastewater is applied to the land at a rate that is protective of groundwater, and does not produce ponding or runoff into a waterbody. A list of Non-Discharge Permits in this watershed are listed in *Appendix 1-E*. More information about land application and non-discharge requirements and how it impacts water quality can be found in Section 9.3.2 of the *Supplemental Guide to North Carolina's Basinwide Planning* or the DWQ Aquifer Protection Section-*Land Application Unit* website. A map of these permits can be seen in *Chapter 11.*

Wetland Or Surface Water Disturbance (401 Certification)

The "401" refers to Section 401 of the Clean Water Act. The North Carolina Division of Water Quality (DWQ) is the state agency responsible for issuing 401 water quality certifications (WQC) (Table 1-6). When the state issues a 401 certification this certifies that a given project will not degrade Waters of the State or violate State water quality standards. A 401 WQC is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Typically, if the USACE determines that a 404 Permit or Section 10 Permit is required because your proposed project involves impacts to wetlands or surface waters, then a 401 WQC is also required. Examples of activities that may require permits include:

- Any disturbance to the bed (bottom) or banks (sides) of a stream.
- Any disturbance to a wetland.
- The damming of a stream channel to create a pond or lake.
- Placement of any material within a stream, wetland or open water, including material that is necessary for construction, culvert installation, causeways, road fills, dams, dikes or artificial islands, property protection, reclamation devices and fill for pipes or utility lines.
- Temporary impacts including dewatering of dredged material prior to final disposal and temporary fill for access roads, cofferdams, storage and work areas.

In streams and wetlands (in accordance with 15A NCAC 02H .0506(h) and 15A NCAC 02H .1305(g)) the DWQ requires compensatory mitigation (Table 1-7) for losses of streams and wetlands (404 jurisdictional wetlands as well as isolated and other non-404 jurisdictional wetlands) as follows:

- For all non-linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet of perennial and intermittent streams or impacts equal to or exceeding one acre of wetlands.
- For linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet per stream or one acre of wetlands.

Buffer mitigation may be required for any project within a Riparian Buffer Protection Rule for impacts to the protected riparian buffer listed as "(potentially) allowable with mitigation" or "prohibited" within the Table of Uses require mitigation. For more information about the Riparian Buffer Protection Rules including the Table of Uses, *click here*.

Options for compensatory mitigation:

- **Mitigation banks:** Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- **In-lieu fee mitigation:** Applicant satisfies the mitigation requirement by purchasing mitigation credits through the N.C. Ecosystem Enhancement Program (NCEEP).
- **Project-specific mitigation:** Applicant satisfies the mitigation requirement him/herself, either at the project site or at an off-site location.

For impacts to federally jurisdictional waters requiring compensatory mitigation, information on mitigation options can be viewed at the U.S. Army Corps of Engineers Mitigation *website*.

Table 1-6: 401 Permits Within the Catawba River Subbasin (03050101) Issued Between 2004 & 2009

Impact Category	Project Type	Approved Area
Open Water	Shoreline Stabilization	3,952 ac
	Dredging	0.8 ac
	Residential	0.13 ac
	Commercial	1.8 ac
	Recreational	2.0
	Other	1,199 ac
Total Open Water Acres		**5,155 ac**
Buffer	Recreational	92,971 sq ft
	Shoreline Stabilization	409,406 sq ft
	Residential	11,577 sq ft
	Other	157,850 sq ft
Total Buffer Square Feet		**671,804 sq ft**
Stream	Residential	4,431 ft
	Commercial	3,758 ft
	Recreational	1,264 ft
	Roads	25,688 ft
	Sewer/Piping	3,338 ft
	Shoreline Stabilization	73,801 ft
	Stream Restoration	1,397 ft
	Other	9,554 ft
Total Stream Feet		**123,231 ft**
Wetland	Residential	1.6 ac
	Commercial	1.5 ac
	Roads	6.5 ac
	Sewer/Pipping	0.3 ac
	Shoreline Stabilization	0.1 ac
	Other	8.8 ac
Total Wetland Acres		**18.8 ac**

TABLE 1-7: 401 MITIGATION WITHIN THE CATAWBA RIVER SUBBASIN (03050101) ISSUED BETWEEN 2004 & 2005*

Impact Category	Mitigation Type	Amount
Buffer	Restoration (Zone 2)	560 sq ft
	WRP/EEP (Zone 1)	32,592 sq ft
	WRP/EEP (Zone 2)	80,936 sq ft
Total Buffer Mitigation (Square Feet)		**114,088 sq ft**
Stream	Restoration	1,000 ft
	WRP/EEP	13,664 ft
	Preservation	133,209 ft
	Mitigation Bank	535 ft
Total Stream Mitigation (Feet)		**148,408 ft**
Wetland	WRP/EEP	16.8 ac
	Preservation	40.6 ac
Total Wetland Mitigation (Acres)		**57.4 ac**

For more information about 401 certifications and 404 federal permits, see the DWQ's *401 Oversight & Express Permitting Unit* website.

AGRICULTURE

Agriculture is North Carolina's leading industry and is most abundant in this subbasin of the Catawba River basin. The approach taken in North Carolina for addressing agriculture's contribution to the nonpoint source water pollution problem is to primarily encourage voluntary participation by the agricultural community. This approach is supported by financial incentives, technical and educational assistance, research, and regulatory programs.

The conversion of agricultural lands to developed lands with large amounts impervious surfaces is another major contributing factor to nonpoint source pollution. A *report* by the American Farmland Trust organization identifies this subbasin as having high quality farmland with areas threatened by development. A *map of these areas* is available from their website. However, other farmers are protecting their land through the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pasture land. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements.

NC Agriculture Cost Share Program

The NC Agriculture Cost Share Program (ACSP) started in 1984 to help reduce the sources of agricultural nonpoint source pollution to the state's waters. The program assists owners and renters of established agricultural operations to improve their on-farm management by using Best Management Practices (BMPs). It is a voluntary program that reimburses farmers up to 75% of the cost of installing an approved BMP. The Division of Soil and Water Conservation implements the program on both a county district (SWCD) and state level. The Division has been very active in this basin as can be seen in the Table 1-8 and Table 1-9 and Figure 1-17 below.

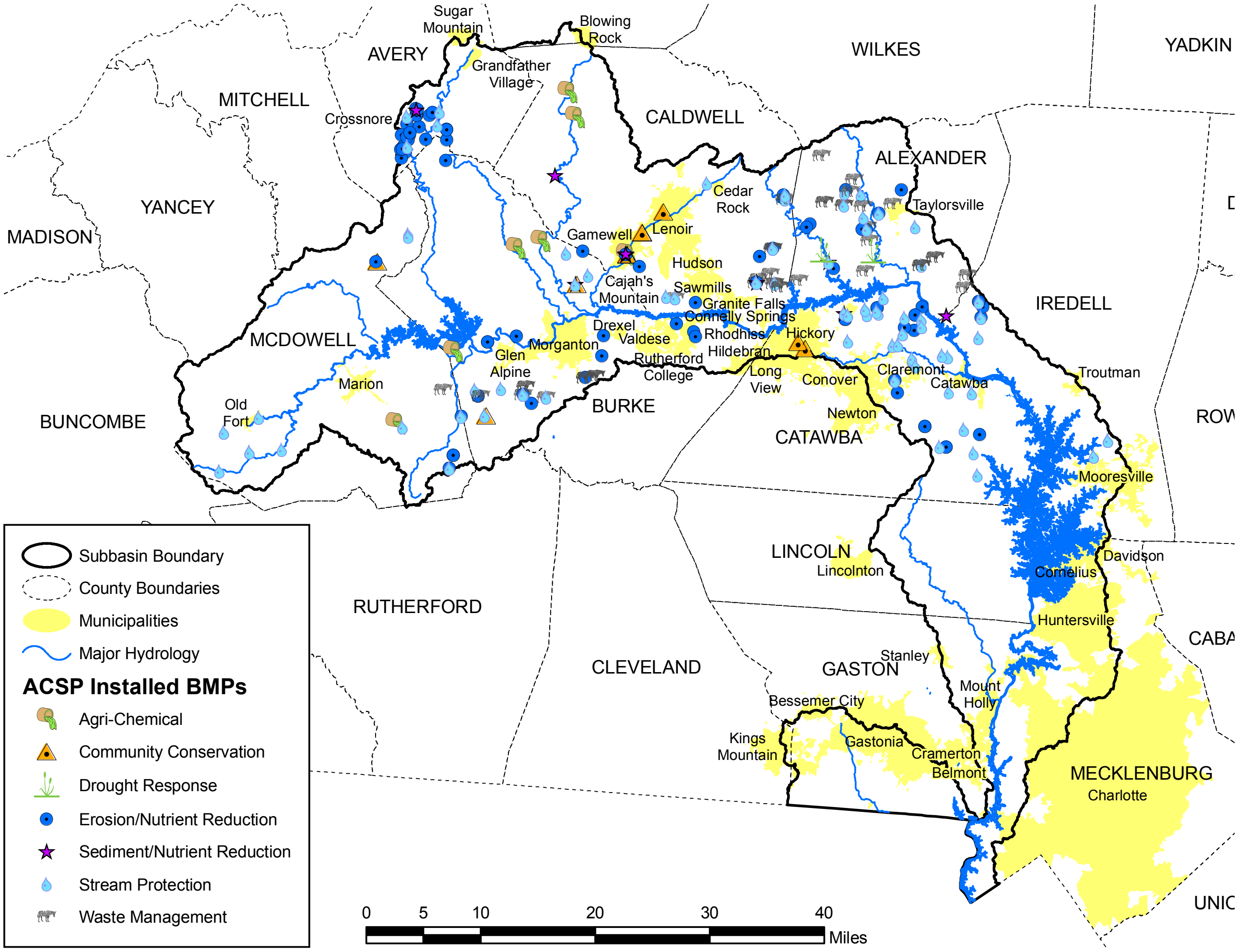
Table 1-8: List of BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050101

Purpose of BMP	Total Implemented	Cost-Shared Funds	Total Project Costs
Agri-Chemical Pollution Prevention	--	$47,106	$62,808
Number of Facilities	7	--	--
Drought Response	--	$27,449	$36,599
Well-Confined Supply	2	--	--
Irrigation Well	--	--	--
Conservation Irrigation	--	--	--
Erosion/Nutrient Loss Reduction from Fields	--	$201,451	$268,601
Acres Treated	3,848	--	--
Sediment/Nutrient Delivery Reduction from Fields	--	$24,845	$33,127
Stream Protection	--	$541,211	$721,615
Linear Feet Treated	87,009	--	--
Waste Management	--	$355,017	$473,356
Number of Units Installed	47	--	--
Grand Total	**105,049**	**$1,297,781**	**$1,730,375**

Table 1-9: BMP Benefits Gained Between January 2003 to June 2009 by 10-Digit HUC

10 Digit Hydrologic Unit	Acres Affected	Nitrogen Saved (lb.)	Phosphorus Saved (lb.)	Soil Saved (tons)	Waste-N Managed (lb.)	Waste-P Managed (lb.)
0305010101	175.0	1,875.0	310.3	1,401.8	--	--
0305010102	69.0	1,663.0	135.5	834.3	48,105	37,920
0305010103	832.9	6,583.0	3,256.5	3,144.3	--	--
0305010104	1,004.4	4,918.0	2,458.8	402.9	--	--
0305010105	1,076.6	4,116.0	6,656.0	584.5	25,271	32,779
0305010106	363.3	--	--	49.6	5,032	7,292
0305010107	109.9	3.0	1.0	2,721.0	--	--
0305010108	1,319.1	--	--	24,662.0	--	--
0305010109	786.7	6,328.0	263.4	3,847.6	--	--
0305010110	1,855.0	16.0	4.0	1,149.8	78,513	80,950
0305010111	1,722.4	--	--	1,659.4	53,726	58,467
0305010112	2,161.3	--	35.8	295.8	265,455	395,040
0305010113	1,491.0	--	--	162.9	204,742	169,796
0305010114	1,461.5	803.1	51.3	4,376.9	--	--
0305010115	2,205.3	718.0	124.6	722.0	--	--

Figure 1-17: BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050101



Animal Operations

DWQ's Animal Feeding Operations Unit is responsible for the permitting and compliance activities of animal feeding operations across the state. Table 1-10 summarizes the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight (SSLW) in this subbasin. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in the subbasin. For more details about animal operation permits in North Carolina, see Section 6.3.3 of the *Supplemental Guide to NC's Basinwide Planning*.

Table 1-10: Animal Operations in 03050101

Type	# of Facilities	# of Animals	SSLW
Cattle	12	4,713	5,714,950
Swine	1	260	368,420

*Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service (NRCS) guidelines. Since the amount of waste produced varies by hog size, this is the best way to compare the sizes of the farms.

For additional information about agriculture and water quality impacts, see *Chapter 6* of the *Supplemental Guide to NC's Basinwide Planning.*

On-Site Wastewater Treatment Systems (Septic Systems)

Wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits. Instead, it is treated on-site through the use of permitted septic systems. Poorly planned and/or maintained systems can fail and contribute to nonpoint source pollution. Wastewater from failing septic systems makes its way to streams or contaminates groundwater. Failing septic systems are health hazards and are considered illegal discharges of wastewater into waters of the State. Information about the proper installation and maintenance of septic tanks can be obtained by calling the environmental health sections of the local county health departments. Precautions should be taken by local health departments to ensure that new systems are sited and constructed properly and an adequate repair area is available. County, town and city planners need to understand the economic and human health ramifications caused by failing septic systems and plan for long-term septic system sustainability.

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin. In 1990, the Catawba River basin had the highest septic system density (53 systems/mi^2) on a river basin scale of all other basins. And, currently is most likely exceeding the EPA threshold of 40 systems/mi^2. The results for this subbasin based on 1990 census data indicate a population of 245,636 people using septic systems resulting in a nitrogen loading of 2,456,349 lbs/yr and nitrogen loading rate of 7,033 lbs/mi^2/yr. These numbers reflect the total N discharged to the soil from the septic system and does not account for N used because of soil processes and plant uptake (Pradhan et al. 2007). For more information about this study on a basin scale, see the Executive Summary. The full study (*Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*) can be viewed on the North Carolina State University website or the link above.

Population & Land Cover

Population

The 2000 census estimated population for this subbasin is 555,543 and this number is expected to increase with the results of the 2010 census. As population increases so does our demand for clean water from aquifer and surface water sources and for the land and water to assimilate wastes. Table 1-11 list the populations for the 10-Digit HUCs in this subbasin and the estimates for future population values.

Table 1-11: Population and Estimated Populations for 2000 to 2030 for Subbasin 03050101

10-Digit HUC	2000 Population	2000 Population Density (per sq mi)	2010 Estimated Population	2020 Estimated Population	2030 Estimated Population
0305010101	16,539	91	17,625	18,600	19,499
0305010102	2,698	32	2,875	3,032	3,175
0305010103	7,093	64	7,486	7,708	7,848
0305010104	4,728	54	4,689	4,656	4,618
0305010105	3,756	18	3,895	3,982	4,033
0305010106	58,846	252	59,670	60,427	61,059
0305010107	29,917	304	30,762	31,312	31,649
0305010108	76,354	511	78,777	80,823	82,584
0305010109	40,470	296	44,767	48,701	52,587
0305010110	17,862	130	20,038	21,761	23,397
0305010111	51,553	263	60,955	70,575	80,553
0305010112	47,722	489	60,985	74,707	89,072
0305010113	34,061	241	39,159	44,029	48,737
0305010114	88,439	571	114,834	142,121	170,956
0305010115	110,833	750	120,876	129,485	137,211
Totals	**590,871**	**4,067**	**667,393**	**741,919**	**816,980**

* Source: 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.

Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. For more information on how population impacts water quality, see *Chapter 12 of the Supplemental Guide to NC's Basinwide Planning*. A full page subbasin population map can be viewed in *Appendix 1-D*.

Land Cover

Table 1-12 to the right displays the percentage of each land cover type within this subbasin according to 2001 land cover data. The data shows the majority of the Catawba River Headwaters subbasin is just over 60% forested land. Total agricultural and developed land were about even at 16% in 2001; however, the percent of present developed land is estimated to be slightly greater (Homer, 2004).

Developed land accounts for a relatively small portion of this subbasin; however, the way the land is developed may have some of the largest impacts to water quality. In municipal areas, impervious surfaces (those which water can not penetrate, like asphalt) can prevent rainfall from filtering into the ground. Instead, the stormwater is sent at high velocities into storm drains which empty into the nearest waterbody without treatment. This can cause multiple negative water quality issues due to heating up runoff, eroding streambanks from high velocity runoff, toxic urban runoff in the streams, etc. For more information on how to better understand these issues and find solutions see *Chapter 5 of the Supplemental Guide to NC's Basinwide Planning*. A full page subbasin land cover map is included in *Appendix 1-D*.

Table 1-12: Land Cover Percentages

Land Cover Type	Percentage
Developed Open Space	10.5
Developed Low Intensity	4.4
Developed Medium Intensity	1.0
Developed, High Intensity	0.4
Total Developed	**16.3**
Bare Earth or Transitional	0.1
Deciduous Forest	49.2
Evergreen Forest	9.9
Mixed Forest	2.5
Total Non-Wetland Forest	**61.6**
Scrub/Shrub	1.9
Grasslands	3.1
Pasture/Hay	16.2
Cultivated Crops	0.4
Total Agriculture	**16.6**
Wooded Wetlands	0.4
Emergent Wetlands	0.0
Total Wetlands	**0.4**
Bare Earth or Transitional	0.1
Scrub/Shrub	1.9
Grasslands	3.1
Other	**5.1**

Restoration, Protection & Conservation Planning

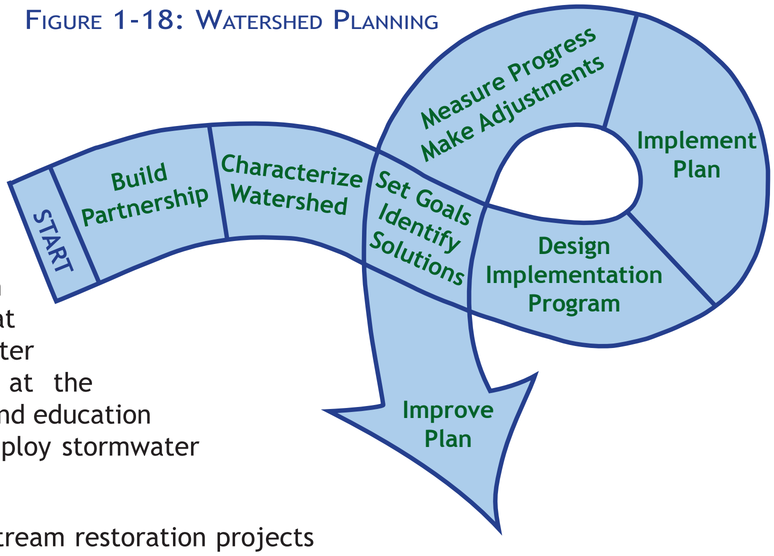
One NC Naturally Conservation Planning Tool

NCDENR's One North Carolina Naturally initiative promotes and coordinates the long-term conservation of North Carolina's threatened land and water resources. Each DENR division specializes in management of a specific natural resource, while the collaborative coordination and planning process results in cost effective implementation and management of multiple resources. Natural resource planning and conservation provides the science and incentives to inform and support conservation actions of North Carolina's conservation agencies and organizations. The Conservation Planning Tool was developed to assist in building partnerships through the exchange of conservation information and opportunities, support stewardship of working farms and forests, inform conservation actions of agencies and organizations, and guide compatible land use planning. A link to the interactive map view is found the *Conservation Planning Tool's* website.

Watershed Planning

Figure 1-18 illustrates a general process for developing watershed restoration plans. This process can and should be applied to streams suffering from habitat degradation and pollution. Interested parties should contact the Basinwide Planning Program to discuss opportunities to begin the planning and restoration process in their chosen watershed. Many tools are available to address habitat degradation and pollution including; urban stormwater BMPs, agricultural BMPs, ordinance/rule changes at the local, state, and federal levels, volunteer activism, and education programs. New and existing development should employ stormwater BMPs wherever practical.

Figure 1-18: Watershed Planning



DWQ believes land conservation accompanied with stream restoration projects can be very successful. Prevention and protection activities are known to be more cost effective than retrofits and restoration. DWQ strongly encourages conservation in this watershed. Many programs and organizations can assist with these projects. Additionally, there are significant tax incentives landowners can take advantage of. Many of these programs allow and encourage owners to maintain control and exclusive use or their land. Some provide opportunities to ensure farmland remains productive and is not converted into commercial development and subdivisions. Local land trusts can help landowners explore conservation options and identify potential funding sources. For more information about land trusts in North Carolina, see the *Conservation Trust for North Carolina's* website.

Local Initiatives

Sediment & Erosion Control Local Programs

The North Carolina Sedimentation Control Commission may delegate authority to implement the Sedimentation Pollution Control Act to cities and counties that adopt a qualifying local erosion and sediment control ordinance in compliance with State requirements. Local program staff perform plan reviews and enforce compliance with plans within their jurisdictions. S&EC Local Programs already established in this subbasin include Avery, Catawba, Gaston, Iredell, Lincoln and Mecklenburg counties as well as the Cities of Charlotte, Monroe and Newton. Programs such as the one in Gaston County, can make a significant impact in reducing site runoff. The County has reviewed 1,835 soil and erosion control plans since 2003 and collected $267,720 in violation fines. Within the past year (April 2009 - April 2010) nearly 90% of all plans submitted had no recorded violations proving the Program to be successful in its continued efforts. More information about this program and its activities can be found in the *Local Initiative Chapter*.

Municipalities experiencing any level of development and population growth should evaluate the need for a S&EC Local Program. For more information about the Division of Land Resources and Local Programs visit the *Local Programs* page of their website.

Local initiatives covering more than one subbasin are discussed in the *Local Initiative Chapter*.

Construction Grants & Loans

The NC Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades and expansion of wastewater collection and treatment systems. As a financial resource, the section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriations for a specific "special needs" project within NC. The High Unit Cost Grant (SRG) Program, the State Emergency Loan (SEL) Program and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of $70,729,100. These funds are administered according to existing SRF procedures. All projects (Table 1-13) must be eligible under title VI of the Clean Water Act. For more information, please see the *CG&L* website.

Table 1-13: Construction Grants & Loan Projects Between 2004 - 2009

Location	Project Description	Date	~ Amount
WSACC	Construction of Back Creek Parallel Interceptor	2/18/2004	$4,609,600
Burke County	Indian Hills (Drowning Creek) Sewer project	11/18/2004	$466,400
Cramerton	Eagle Road WWTP upgrade to meet new effluent limits and other infrastructure and process upgrades	10/27/2005	$5,049,000
Granite Falls	Water Treatment plant Improvements	11/15/2005	$173,500
Drexel	Sanitary Sewer System Improvements	11/22/2005	$86,700
Catawba County	Bunker Hill High School Area Sewer Project	6/19/2006	$3,000,000
Valdese	Phase II Infiltration/Inflow Reduction	6/26/2006	$216,800
Morganton	FMG Industrial Sewer Trunk Line Project	7/18/2006	$173,500
Maiden	Wastewater Treatment Plant Improvements (no expansion)	5/14/2007	$1,492,000
McDowell County	Nebo Community Water System Improvements.	6/5/2007	$962,200
Lincoln County	Killian Creek WWTP, Pump Station, Force Mains and Gravity Sewer for East Lincoln County Water and Sewer District.	7/24/2008	$17,500,000
Marion	3,429 l.f. of 8-inch sewer and 22 manholes.	9/30/2008	$385,700

Location	Project Description	Date	~ Amount
City of Hickory	City of Hickory's Northeast Wasewater Treatment Improvements	3/20/2009	$17,500,000
Conover, City of	North East Outfall and Associated Sewer System Rehabilitation	5/8/2009	$1,727,025
Town of Rhodhiss	Rehabilitation of sewer	5/8/2009	$188,764
Town of Troutman	Sewer rehabilitation	5/8/2009	$237,595
City of Gastonia	Sewer Pipe Lining at Catawba River Pump Station.	5/8/2009	$308,532
City of Hickory	Cripple Creek Sewer Replacement	5/8/2009	$1,938,000
City of Marion	Corpening Creek WWTP Improvements	5/8/2009	$2,601,364
Charlotte Mecklenburg Storm Water Services	Muddy Creek/Campbell Creek Watershed Restoration	5/8/2009	$1,570,740
Mecklenberg County	Torrence Creek Stream Restoration	8/12/2009	$2,576,000
Town of Taylorsville	Sewer Collection System Rehabilitation	11/10/2009	$1,017,923
Mooresville	Rocky River WWTP Interim Plant Expansion and Lake Norman Effluent Force Main	4/14/2010	13,275,000
Total Funded:			**$74,572,216**

Clean Water Management Trust Fund

Created in 1996, the Clean Water Management Trust Fund (CWMTF) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the Catawba River Headwaters. Table 1-14 includes a list of recent (2004-2008) projects and their cost. These projects include several land acquisitions and WWTP upgrades.

Table 1-14: Clean Water Management Trust Fund Projects Between 2004 - 2008

ID	Project Name	Project Description	County	Amount Funded
2004A-410	Mountain Valleys RC&D - Rest./ Muddy Creek	Partially fund a Muddy Creek Coordinator position and provide funds for a natural channel stream restoration project on 4,000 linear feet, buffer plantings on 8,000 linear feet, and livestock exclusion systems on 12,000 linear feet. Monitor results.	McDowell	$183,000
2004B-009	Catawba Lands Conservancy - Acq/ Cloninger Tract, Stanley Creek (Cancelled)	Protect through permanent conservation easements 171 acres along Stanley Creek. CWMTF funds to purchase easement on 38 riparian acres and applicant to donate a permanent agricultural easement on the upland 133 acres.	Gaston	$154,000
2004B-013	Foothills Conservancy of NC - Acq/ Adams Tract, Left Prong, Catawba River	Protect through fee simple purchase 130 acres along headwaters of the Left Prong Catawba River. CWMTF funds would purchase the 45 riparian acres.	McDowell	$208,000
2004B-014	Foothills Conservancy of NC - Acq/ Creston Reserve, Left Prong Catawba River	Protect through purchase of a conservation easement 330 acres along the Left Prong Catawba River. CWMTF funds would purchase riparian 165 acres and applicant would hold easement on uplands. Tract is on Hicks Mountain, adjacent to Pisgah National Forest.	McDowell	$578,000
2004B-017	Hickory, City of-Acq/ Lake Hickory Greenway	Protect through fee simple purchase 11.5 acres, including 9.9 riparian acres, along Horseford Creek and Lake Hickory. The tract would become part of Hickory's existing greenway system.	Catawba	$160,000
2004B-022	Mount Holly, City of-Acq/ Mountain Island Lake and Upper Lake Wylie	Protect 223 acres through fee simple purchase on Lake Wylie and Mountain Island Lake. The tracts are within the critical areas for the water supply intakes and complement existing protection efforts.	Gaston	$2,666,000

ID	Project Name	Project Description	County	Amount Funded
2004B-038	NC Div Parks & Recreation - Acq/ Lake James State Park Expansion	Protect through fee simple purchase 3,915 acres on Lake James and its tributaries. Project would expand Lake James State Park.	Burke	$6,600,000
2004B-510	Lenoir, City of - WW/ Collection System Rehabilitation, Lower Creek	Design, permit and construct 10,500 LF of a new sewer collection line and 40 manholes to replace a failing terra cotta line along Lower Creek, a tributary of Lake Rhodhiss.	Caldwell	$1,787,000
2005A-003	Conservation Trust for North Carolina - Acq/ CSX Tract, Catawba River	Protect through a permanent conservation easement 2,012 ac along Honeycutt and Pepper Cks. CWMTF funds to purchase the 503 riparian ac. Tract borders the Blue Ridge Parkway and protects headwater tributaries to a Regionally Significant Aquatic Habitat.	McDowell	$936,000
2005A-023	NC Wildlife Resources Commission - Acq/ Marion Carter Tract, Silver Creek	Protect through fee simple purchase 1,800 ac, including 898 riparian ac, along the headwaters of Silver, Hall and Brindle Creeks. Tract ties in with the gamelands and CWMTF efforts in the South Mountains and would become part of the Game Land program.	Burke	$2,188,000
2005A-702	Mecklenburg County - Storm/ Mt. Island Lake Initiative, Caldwell Station Creek	Address stormwater contamination delivered to Caldwell Station Creek through construction of 12 bioretention BMPs and 2 off-line stormwater wetlands. An additional 34 BMPs will be funded by the project partners. Project drains 196 acres.	Mecklenburg	$639,000
2005B-012	Wildlife Resources Commission- Acq/ Johns River Confluence Tract II South, Johns River	Protect through fee simple purchase 523 acres along Johns River. CWMTF funds to purchase the 212 riparian acres. Tract is part of an intensive effort to protect Johns River and Lower Creek and will become part of the Game Lands program.	Burke	$1,358,000
2005B-033	NC Wildlife Resources Commission - Acq/ Johns River Loop Road Tract, Johns River	Protect through fee simple purchase 1,000 acres of the John River Loop Road tract along the Johns River, a State Significant Aquatic Habitat. The tract will be managed as part of the Game Lands Program.	Burke	$2,238,000
2006A-006	Catawba Lands Conservancy - Acq/ Duncan-Rankin Preserve, Stanley Creek	Protect a total of 220 acres along the Stanley Creek through purchase of 85 acres in fee (CWMTF funds) and donated conservation easements on 135 acres. Tracts are part of a significant riparian corridor protection effort along Stanley Creek.	Gaston	$596,000
2006A-013	Wildlife Resources Commission - Acq/ Johns River Tract I North, Lower Creek	Protect through fee simple purchase 2248 acres along the Johns River. The tract is a critical piece of the WRC Gamelands Program along the Johns River corridor. CWMTF funds to purchase the 920 riparian acres.	Burke	$4,266,000
2006A-526	Rutherford College, Town of- WW/ Pump Station & Outfall Rehabilitation, Island Creek	Conduct infiltration/inflow study for sewer system along Island Creek, a 303(d)-listed stream. Rehabilitate Island Creek pump station and 13 manholes.	Burke	$385,000
2006A-705	Mecklenburg County- Storm/ Recycling Center Retrofit, Mountain Island Lake	Design, permit and construct two swales and one bioretention cells at the County Recycle Center. These BMPs will drain to a wetland and riparian buffer along Torrence Creek, a tributary of McDowell Creek (a 303(d)-listed stream).	Mecklenburg	$145,000
2006A-802	Blowing Rock - Town of- Stormwater Minigrant/ Stormwater Master Plan	Fund a stormwater minigrant to develop a stormwater master plan, including preparation of an inventory and map of the stormwater system, model of system needs, master plan, capital improvement plan, and review of ordinances and policy.	Watauga	$40,000

ID	Project Name	Project Description	County	Amount Funded
2006A-804	Carolina Land & Lakes RC&D - Plan/Rest/ Lake Rhodhiss Watershed Restoration Plan	Fund development of a watershed restoration plan, including assessing land cover and modeling watershed nutrients and 19 subbasins. Complements EPA Section 319 grant.	Burke	$40,000
2006B-004	Catawba Lands Conservancy - Acq/ Rhyne Creek Preserve, Stanley Creek	Protect through fee simple purchase & donation of a permanent conservation easement 87.6 acres, including 80.9 riparian acres, along Stanley Creek. CWMTF to fund purchase of buffer. Tract is part of comprehensive conservation effort along the creek.	Gaston	$470,000
2006B-512	Marion, City of - WW/ Regionalization, Discharge Elimination and I&I, Corpening Creek	Design, permit & construct upgrades to the City's Corpening Creek WWTP to correct deficiencies noted in SOC and decommission Catawba River WWTP (upstream of Lake James) and transport waste to Corpening Ck WWTP.	McDowell	$2,500,000
2006B-514	Mooresville, Town of - WW/ WWTP Upgrade, Rocky River	Upgrade treatment to reuse standards & transfer 1.6 MGD reuse wastewater to a golf course, school grounds and soccer/sports complex and remove majority of discharge to 303(d) Dye Creek. Additional waste used for cooling at Marshall Steam Station.	Iredell	$2,000,000
2006M-008	Foothills Conservancy of NC - Mini/ Dysartsville Gameland Tract, Muddy Creek	Minigrant to pay for pre-acquisition costs for the 3,300 acre Dysartsville Gamelands tract on Muddy Creek.	McDowell	$25,000
2006B-801	American Forests - Plan/Storm/ Watershed Mapping, McDowell Creek	Produce a high resolution, geo-referenced land cover map & interactive GIS model for the Mountain Island Lake watershed. Charlotte-Mecklenburg Storm Water Services would use outputs to estimate water & air quality benefits of proposed mgmt strategies.	Mecklenburg	$43,000
2007-020	Mecklenburg County - Acq/ Cedar Grove Greenway, McDowell Creek	Protect through fee simple purchase 38 acres, including 16 riparian acres along McDowell Cr.. The tract will become part of a greenway system.	Mecklenburg	$563,000
2006S-006	Carolina Land & Lakes RC&D - Storm Mini/ Corpening and Jacktown Creeks	Stormwater minigrant to fund a small drainage basin study of two impaired streams (Corpening and Jacktown Creeks). Study will identify pollutant sources and stormwater BMP retrofit opportunities. Study is in conjunction with a DWQ 319 grant.	McDowell	$50,000
2007-013	Foothills Conservancy of NC - Acq/ Edgemont Limited Tract, Wilson Creek	Protect through conservation easement 150 acres, including 69 riparian acres along Wilson Cr.. Wilson Cr. is B, Tr, ORW, Wild Tr and a Nationally Significant Aquatic Habitat. Tract is adjacent to Pisgah National Forest and TNC Wilson Creek Slopes Preserve	Caldwell	$620,000
2007-031	NC Parks and Recreation - Acq/ Crescent Resources Tract, Lake Norman	Protect through fee simple purchase 249 acres, including 69 riparian acres along Lake Norman. Tract will be added to Lake Norman State Park.	Iredell	$1,270,000
2007-033	NC Parks and Recreation - Acq/ Earwood Tract, Chestnut Flat Branch	Protect through fee simple 216 acres, including 73 riparian acres along Chestnut Flat Br, a headwater stream and High Quality Waters. The tract will be added to South Mountains State Park.	Burke	$256,000
2007-516	Hickory, City of - WW/ Interceptor Replacement, Cripple Creek	Replace portion of existing sewer line to reduce overflows and improve water quality in Cripple Cr.	Caldwell	$1,162,000

ID	Project Name	Project Description	County	Amount Funded
2007-524	Marion, City of - WW/ WWTP Upgrades, Corpening Creek	Project would add $500,000 to 2006B-512 to design, permit and construct upgrades to City's WWTP to upgrade the plant beyond SOC requirements; decommission Catawba R. WWTP; reduce pollutant loadings to Catawba R. and Corpening Cr.	McDowell	$500,000
2007-532	Ranlo, Town of - WW/ Pump Station Construction, Houser's Branch	Rehabilitate or replace existing pump station and portion of sewer system	Gaston	$296,000
2007-608	Gaston County - WW/ Ridge Mill, Blackwood Creek	Design, permit and install sewer system to eliminate failing septic systems, straight pipes, etc and a failing sand filter treatment system and treat the wastewater at Gastonia WWTP. The project would improve water quality in Blackwood Cr. and Crowders Cr.	Gaston	$1,169,000
2007-705	Gastonia, City of - Storm/ Open Sand Filter, McGill Creek	Design, permit and construct detention open sand filter for runoff of new residential development on tributary to McGill Cr.. Development is not required to treat stormwater.	Gaston	$59,000
2007-708	Lenoir, City of - Storm/ Constructed Wetland, Lower Creek	Design, permit and construct a 3/4 acre stormwater wetland to treat runoff from an established residential area, daylighting 200+ LT of UT to Lower Cr..	Caldwell	$311,000
2007-813	Cramerton, Town of - Plan/WW/ Regional Wastewater Plan, Lake Wylie	Complete conceptual plan, preliminary engineering report and Preliminary Site Investigation for a regional wastewater treatment facility	Gaston	$120,000
2007-814	Gaston County - Plan/ WW/ Consolidated Wastewater Plan, Dutchmans Creek	Regionalization study to potentially decommission outdated and poorly performing WWTPs	Gaston	$120,000
2008-006	Catawba County - Acq/ Crescent Resource Tracts, Mountain Creek	Protect through fee simple purchase 720 acres, including 324 riparian acres along Mountain Cr., Terrapin Cr., and Lake Norman. The property is a priority in the Catawba County Parks Master Plan.	Catawba	$2,629,000
2008-018	Foothills Conservancy - Acq/ Hull Tract, Wilson Creek	Protect through conservation easement 170 acres, including 90 riparian acres along Wilson Cr.. Wilson Cr. is an ORW, National Wild and Scenic River, and a Nationally Significant Aquatic Habitat.	Caldwell	$693,000
2008-020	Foothills Conservancy - Acq/ Lutz Tract, Wilson Creek	Protect through fee simple purchase 649 acres, including 396 riparian acre along Wilson Cr.. Wilson Cr. is an ORW, National Wild and Scenic River, and a Nationally Significant Aquatic Habitat.	Caldwell	$4,858,000
2008-044	NC Div. Parks and Recreation - Acq/ Barron Tract, Hall Creek	Protect through fee simple purchase 683 acres, including 223 riparian acres along Hall Cr., Sutterwhite Cr., and unnamed tributaries. Property will be added to South Mountains State Park.	Burke	$719,000
2008-415	Pilot View RC&D - Rest/ Linville River Watershed Restoration, Phase III	Design, permit and construct 4,800 lf of Priority 1, 2, and 3 on Linville R. and tributary to enhance hydrological, geomophological, and biological functions, stop diversion of flow to 2 lakes and restore wetland/bog habitat.	Avery	$224,000
2008-815	Charlotte, City of - Plan/Storm/ Beaverdam Creek Watershed Plan	Evaluate the extent to which existing federal, state and local watershed-management measures protect surface-water resources in developing and developed watersheds.	Mecklenburg	$162,000
2008D-006	Foothills Conservancy of NC - Donated Mini/ Melton Tr/S Fork Hoppers Cr.	Minigrant to pay for transactional costs for a donated easement on 105 acres of the Melton Farm tract along S Fk Hoppers Cr. and unnamed tributaries	McDowell	$25,000

ID	Project Name	Project Description	County	Amount Funded
2008D-010	Southern Appalachian Highlands Conservancy- Donated Mini/ Wells Tr/ Anthony Cr.	Minigrant to pay for transactional costs for a donated easement on 93 acres of the Wells tract along unnamed tributaries to Anthony Cr.	Avery	$25,000
2008-406	Mecklenburg County - Rest/ McDowell & Torrence Creek Restoration Phase I	Design, permit and construct 7,776 lf of Priority 1 restoration on McDowell and Torrence Crs to re-introduce a natural channel and educated the public about surface water resources.	Mecklenburg	$740,000
2008S-005	Carolina Land & Lakes RC & D - Mini/Storm/ Planning		Burke	$50,000
Total Cost Amount				**$46,826,000**

Section 319-Grant Program

The Section 319 Grant Program was established per the Federal Clean Water Act to provide funding for efforts to reduce nonpoint source (NPS) pollution, including that which occurs though stormwater runoff. The U.S. Environmental Protection Agency provides funds to state and tribal agencies, which are then allocated via a competitive grant process to organizations to address current or potential NPS concerns. Each fiscal year North Carolina is awarded nearly 3 million dollars to address nonpoint source pollution through its 319 Grant Program. Thirty percent of the funding supports ongoing state nonpoint source programs. The remaining 70% is made available through a competitive grants process. Table 1-15 list the most current 319 contracts in this subbasin. More information can be found about these contracts and the *319 Grant Program* on their website.

Table 1-15: 319 Grant Contracts Between 2004 & 2008

Fiscal Year	Contract Number	Name	Description	Agency	Funding
2005	EW06038	Clean Water Neighbors - Protecting our Common Resources	Construction, Education	Burke County SWCD	$35,000
2006	EW07040	Develop Lake Rhodhiss Watershed Restoration Plan	Watershed Protection	Carolina Land & Lakes RC & D	$279,859
2006	EW07035	Mountain Island Lake Initiative, McDowell Creek Watershed Restoration, Caldwell Station Creek	Stream Restoration	Mecklenburg County	$287,050
2007	EW08007	Corpening-Jacktown Creek NPS Control	BMP Implementation	Carolina Land & Lakes RC & D	$368,165
2007	EW08021	McDowell Creek Watershed Restoration- Focus Area 2, Phase I	Watershed Restoration, BMP Implementation	Mecklenburg County	$381,661
2008	1571	Lower Creek Watershed Restoration Implementation Plan	Watershed Restoration, BMP Implementation	Caldwell County SWCD	$225,010
2008	1404	Hunting Creek Watershed Assessment	Watershed Planning	Carolina Land & Lakes RC&D	$75,000
Total Funded:					**$2,003,385**

Ecosystem Enhancement Program (EEP)

EEP uses watershed planning at two scales (basinwide and local) to identify the best locations to implement stream, wetland and riparian buffer restoration/enhancement and preservation projects. The planning process considers where mitigation is needed and how mitigation efforts might contribute to the improvement of water quality, habitat and other vital watershed functions in the state. Watershed planning requires GIS data analysis, stakeholder involvement, water quality monitoring, habitat assessment and consideration of local land uses and ordinances. It is a multi-dimensional process which considers science, policy and partnership.

River Basin Restoration Priorities

EEP River Basin Restoration Priorities (RBRPs) are focused on the identification of Targeted Local Watersheds (TLWs) within the 8-digit Cataloging Units (subbasins) that comprise individual river basins. TLWs represent priority areas (14-digit HUCs) for the implementation of stream and wetland mitigation projects. GIS screening factors considered in the selection of TLWs include: documented water quality impairment and habitat degradation, the presence of critical habitat or significant natural heritage areas, the presence of water supply watersheds or other high-quality waters, the condition of riparian buffers, estimates of impervious cover, existing or planned transportation projects, and the opportunity for local partnerships. Recommendations from local resource agency professionals and the presence of existing watershed projects are given significant weight in the selection of TLWs. RBRP documents (and TLW selections) for each of the 17 river basins in North Carolina are updated periodically to account for changing watershed conditions, increasing development pressures and local stakeholder priorities.

The most recent updates to the Catawba River Basin TLWs occurred in 2007 for the lower Catawba and in 2009 for the upper Catawba. In total, 41 14-digit HUCs have been designated TLWs by EEP in the Catawba Catalog Units (Table 1-16). These updated RBRPs, including a summary table of Targeted Local Watersheds, can be found at EEP's website for the *2007* and *2009* reports.

Table 1-16: Catawba River TLWs & LWPs by Subbasin (as of February 2010).

HUC	TLWs (#)	LWPs (# - Names)
03050101	26	3 - Muddy Creek, Lower Creek, & Charlotte (partial)
03050102	9	1 - Indian/Howard Creeks
03050103	6	1 - Charlotte (partial)
Total:	**41**	**4**

Local Watershed Planning

EEP Local Watershed Planning (LWP) initiatives are conducted in specific priority areas (typically a cluster of two or three Targeted Local Watersheds) where EEP and the local community have identified a need to address critical watershed issues. The LWP process typically takes place over a two-year period, covers a planning area around 50 to 150 square miles, and includes three distinct phases: I - existing data review and preliminary watershed characterization (largely GIS-based); II – detailed watershed assessment (including water quality & biological monitoring and field assessment of potential mitigation sites); and III – development of a final Project Atlas and Watershed Management Plan. EEP collaborates with local stakeholders and resource professionals throughout the process to identify projects and management strategies to restore, enhance and protect local watershed resources. EEP is currently conducting LWP Phase IV activities (project site evaluation and landowner outreach) in the Lower Creek, Hunting Creek and Muddy Creek watersheds within the Catawba 03050101 subbasin.

More information about the River Basin Restoration Priorities and LWP project areas within the *Catawba River Basin* can be found on the EEP website.

EEP Projects in the Catawba Basin

As of February 2010, EEP had a total of 40 mitigation projects in some stage of being completed in the Catawba Basin. These stages include identification/acquisition; design; construction; monitoring (construction complete); and long-term stewardship. Table 1-17 provides details on these project that include stream and wetland restoration/enhancement and preservation projects. In total, EEP is in some stage of restoration or enhancement on over 191,000 feet of stream and 127 acres of wetlands in the Catawba. In addition, the program is in some stage of preservation on over 97,000 feet of stream and 43 acres of wetlands. For additional information about EEP's Project Implementation efforts, go to the *EEP Project Implementation* webpage. To view the locations of these project sites, go to *EEP's Web Map site*.

Table 1-17: EEP Projects in Some Stage of Completion in the Catawba River Basin by Subbasin

HUC	Projects (#)	Stream Restoration/ Enhancement (ft)	Stream Preservation (ft)	Wetland Restoration/ Enhancement (ac)	Wetland Preservation (ac)
03050101	30	151,829	97,597	71.1	38.7
03050102	6	27,848	0	52.0	4.5
03050103	4	11,500	0	4.7	0
Total:	**40**	**191,177**	**97,597**	**127.7**	**43.2**

For more information on EEP mitigation projects in the Catawba 03050101 and 03050101 subbasins, contact Paul Wiesner or Julie Cahill in EEP's western field office (Asheville) at, respectively, 828-273-1673 or 828-230-5172. For 03050103 subbasin, contact Robin Dolin at 919-715-5836.

Natural Heritage Program

The North Carolina Natural Heritage Program has Significant Natural Areas in six of the ten counties in this subbasin. A list of these areas can be found on *pages 10 - 14* of the *Basinwide Assessment Report: Catawba River Basin*. A full page subbasin map of these Significant Natural Areas can be found in *Appendix 1-D*.

References

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. www.mrlc.gov

North Carolina Department of Environment and Natural Resources (DENR). N.C. Ecosystem Enhancement Program (EEP) September, 2005. *Summary of Monitoring Results in Lower Creek Watershed and Tributaries; Catawba River Basin: February 2004 - April 2005*. http://www.nceep.net/services/lwps/Lower_Creek/Lower_Division_of_Water_Quality_Monitoring_Report.pdf

North Carolina Department of Environment and Natural Resources (DENR). Division of Water Quality (DWQ). Planning Section. January, 2008. *Total Daily Maximum Loads (TMDLs) for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek in North Carolina*. Raleigh, NC. http://portal.ncdenr.org/c/document_library/get_file?uuid=21705c54-29c9-4065-a14a-66a475de2e1d&groupId=38364

_____. DWQ. Planning Section. September 2004. *Catawba River Basinwide Water Quality Plan*. Raleigh, NC. http://portal.ncdenr.org/web/wq/ps/bpu/basin/catawba.

_____. DWQ. Environmental Science Section. Biological Assessment Unit. April 2008. *Basinwide Assessment Report: Catawba River Basin*. Raleigh, NC.

_____. DWQ. Environmental Science Section. Biological Assessment Unit. December 2008. *Catawba River Basin Ambient Monitoring Systems Report*. 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.

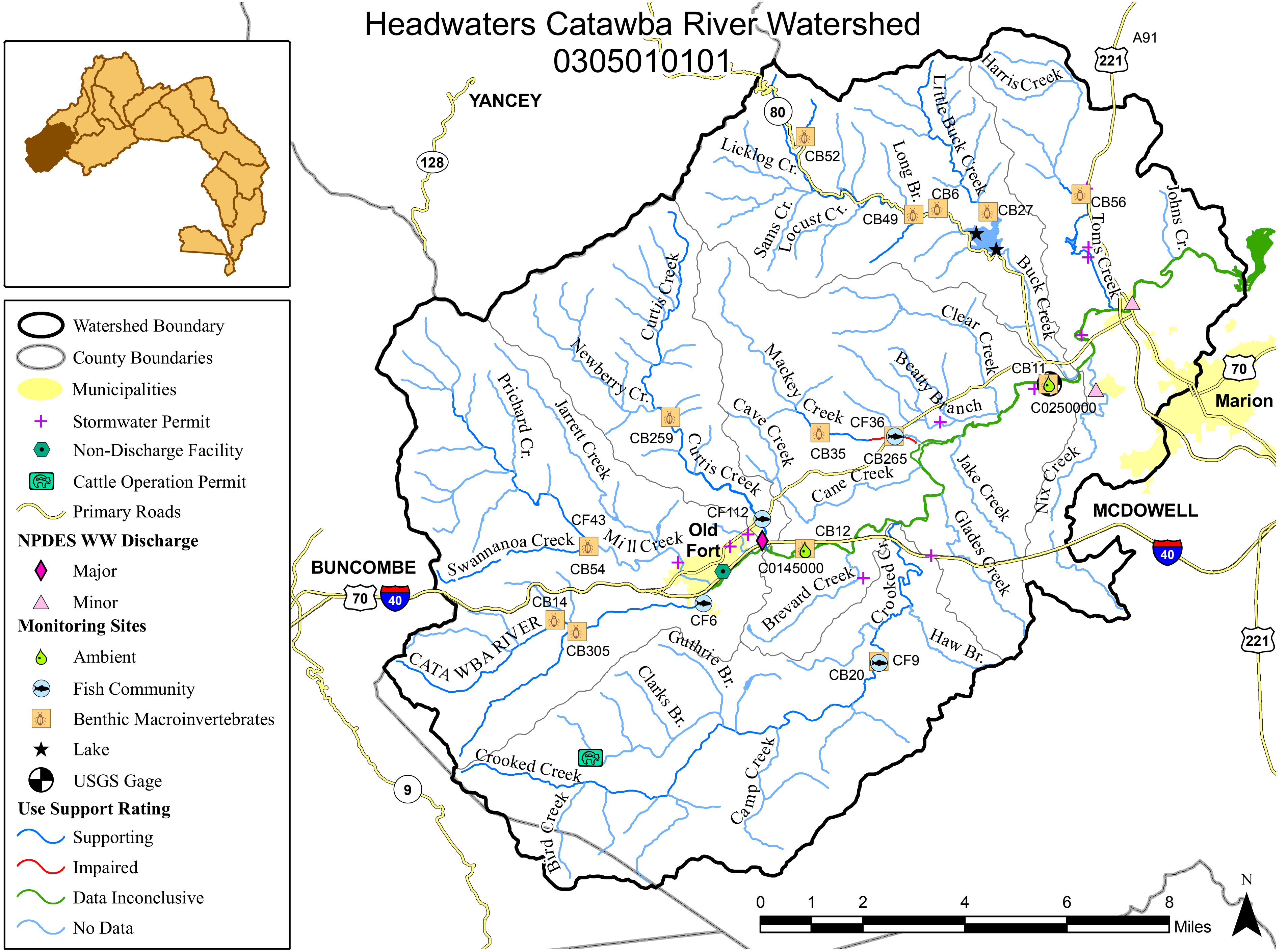
Pradhan, S. S., M. T. Hoover, R. E. Austin, and H. A. Devine. May 2007. *Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*. North Carolina State University, Raleigh, North Carolina. North Carolina Agricultural Research Service. Technical Bulletin 324.

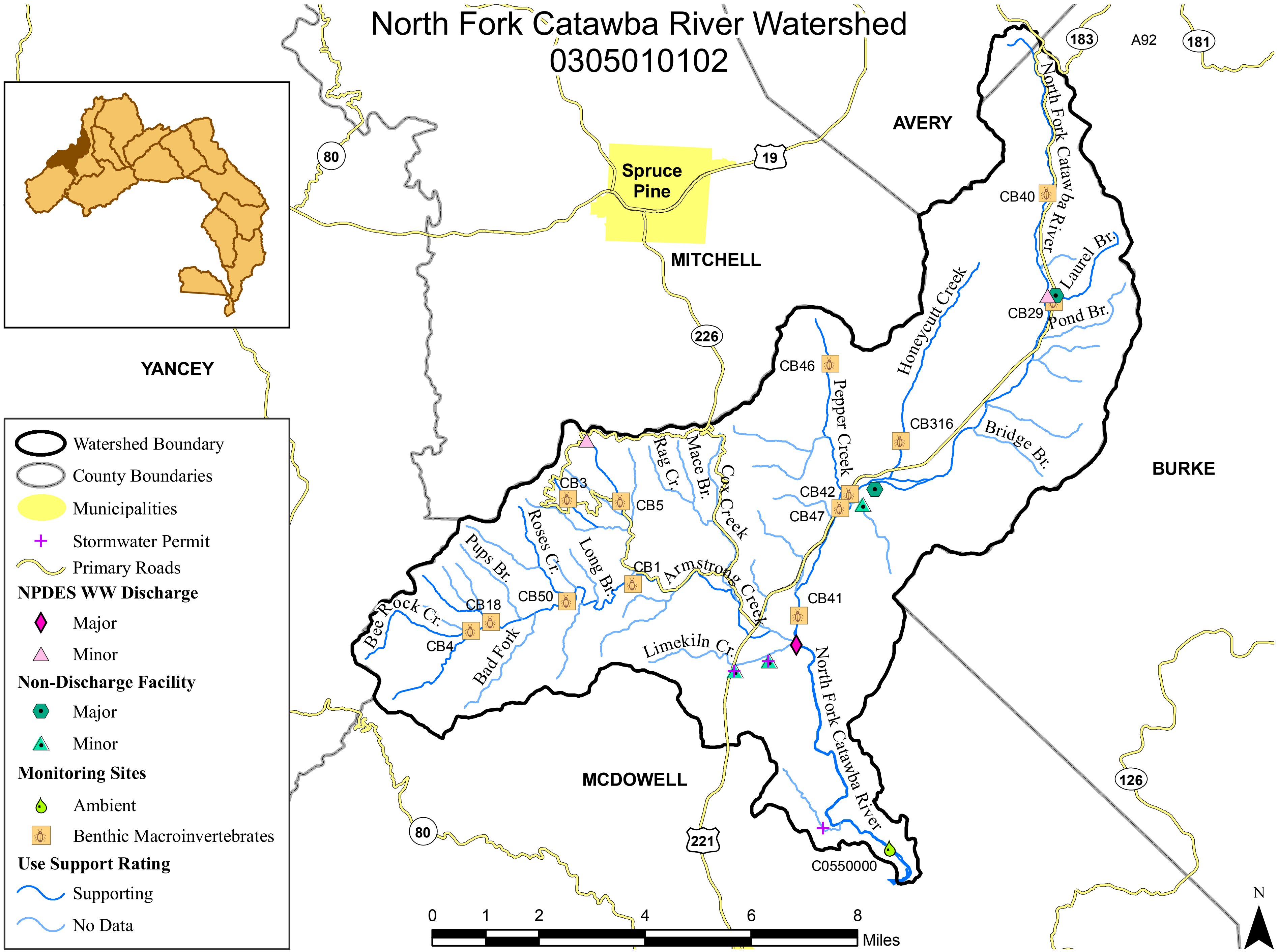
U.S. Environmental Protection Agency (USEPA) 1999. *Protocol for Developing Sediment TMDLs*. First Edition. EPA 841-B-99-044. U.S. EPA, Office of Water, Washington D.C.

Waters, T.F. 1995. *Sediment in streams—Sources, biological effects, and control*. American Fisheries Society Monograph7. American Fisheries Society, Bethesda, MD.

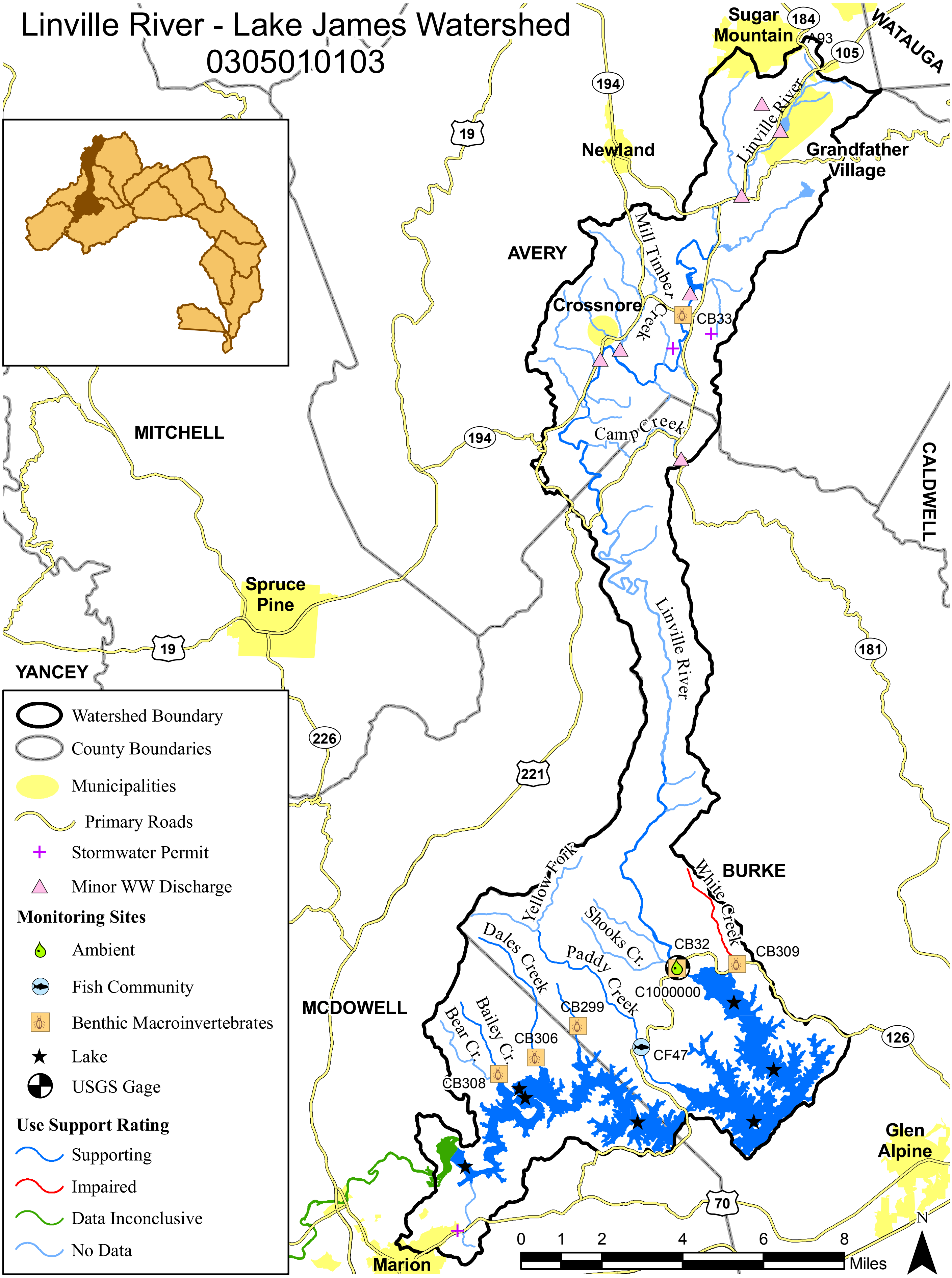
Wu, Jy S. and Allan, Craig. October 2008. *Restoring and Assessing Fecal Coliform Impairment of Crowders Creek - Final Report*. Sponsored by EPA 319 Grant Contract Number NC-DENR EW05020. University of North Carolina at Charlotte, Department of Civil and Environmental Engineering. Charlotte, NC.

Headwaters Catawba River Watershed 0305010101

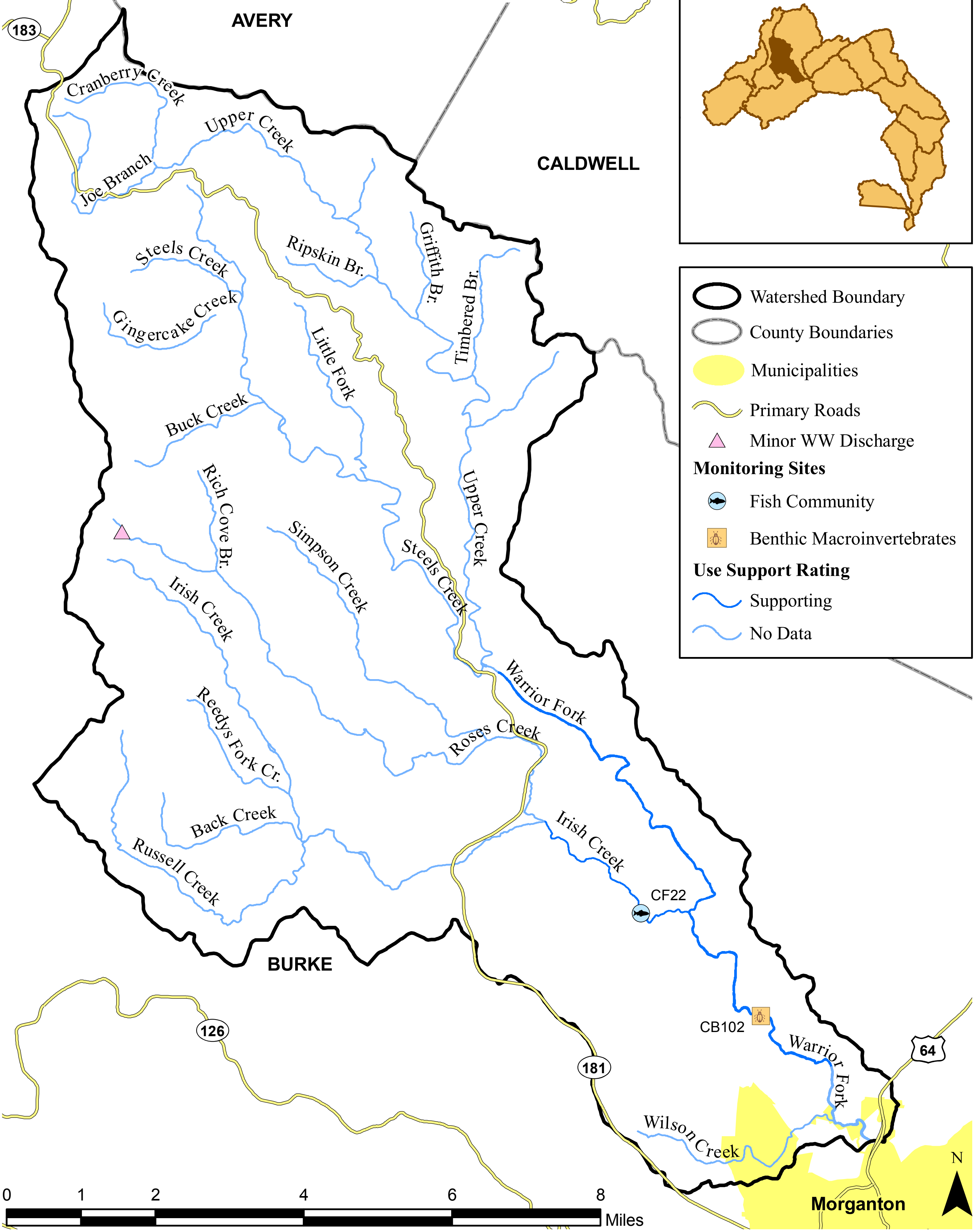


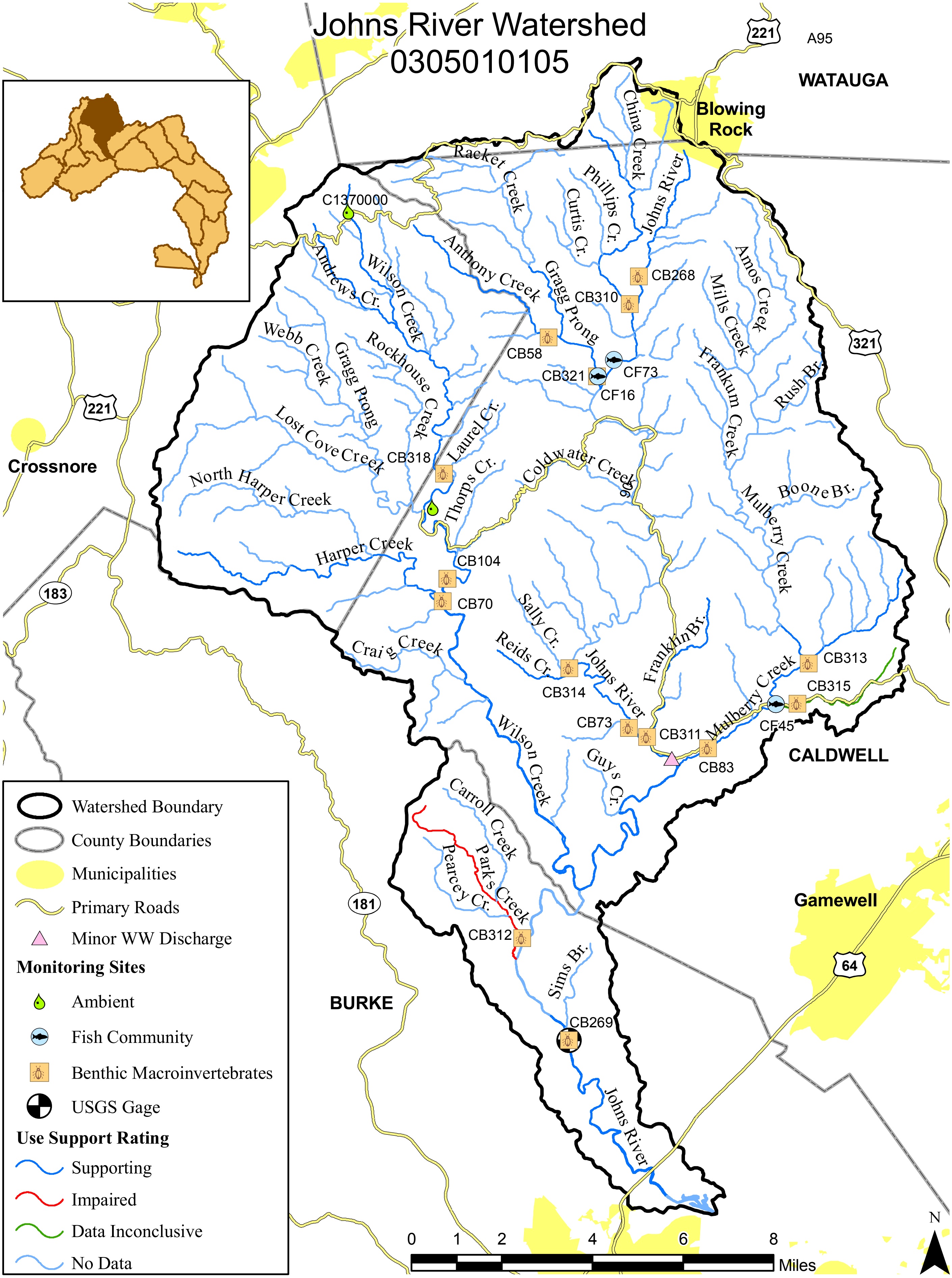

North Fork Catawba River Watershed
0305010102
AVERY
MITCHELL
YANCEY
BURKE
MCDOWELL
Spruce Pine
80
19
226
183
181
A92
126
221
North Fork Catawba River
Laurel Br.
Pond Br.
Honeycutt Creek
Pepper Creek
Bridge Br.
Rag Cr.
Mace Br.
Cox Creek
Armstrong Creek
Roses Cr.
Long Br.
Pups Br.
Bee Rock Cr.
Bad Fork
Limekiln Cr.
CB40
CB29
CB46
CB316
CB42
CB47
CB3
CB5
CB1
CB50
CB18
CB4
CB41
C0550000
Watershed Boundary
County Boundaries
Municipalities
Stormwater Permit
Primary Roads
NPDES WW Discharge
Major
Minor
Non-Discharge Facility
Major
Minor
Monitoring Sites
Ambient
Benthic Macroinvertebrates
Use Support Rating
Supporting
No Data
0
1
2
4
6
8
Miles
N

Linville River - Lake James Watershed 0305010103

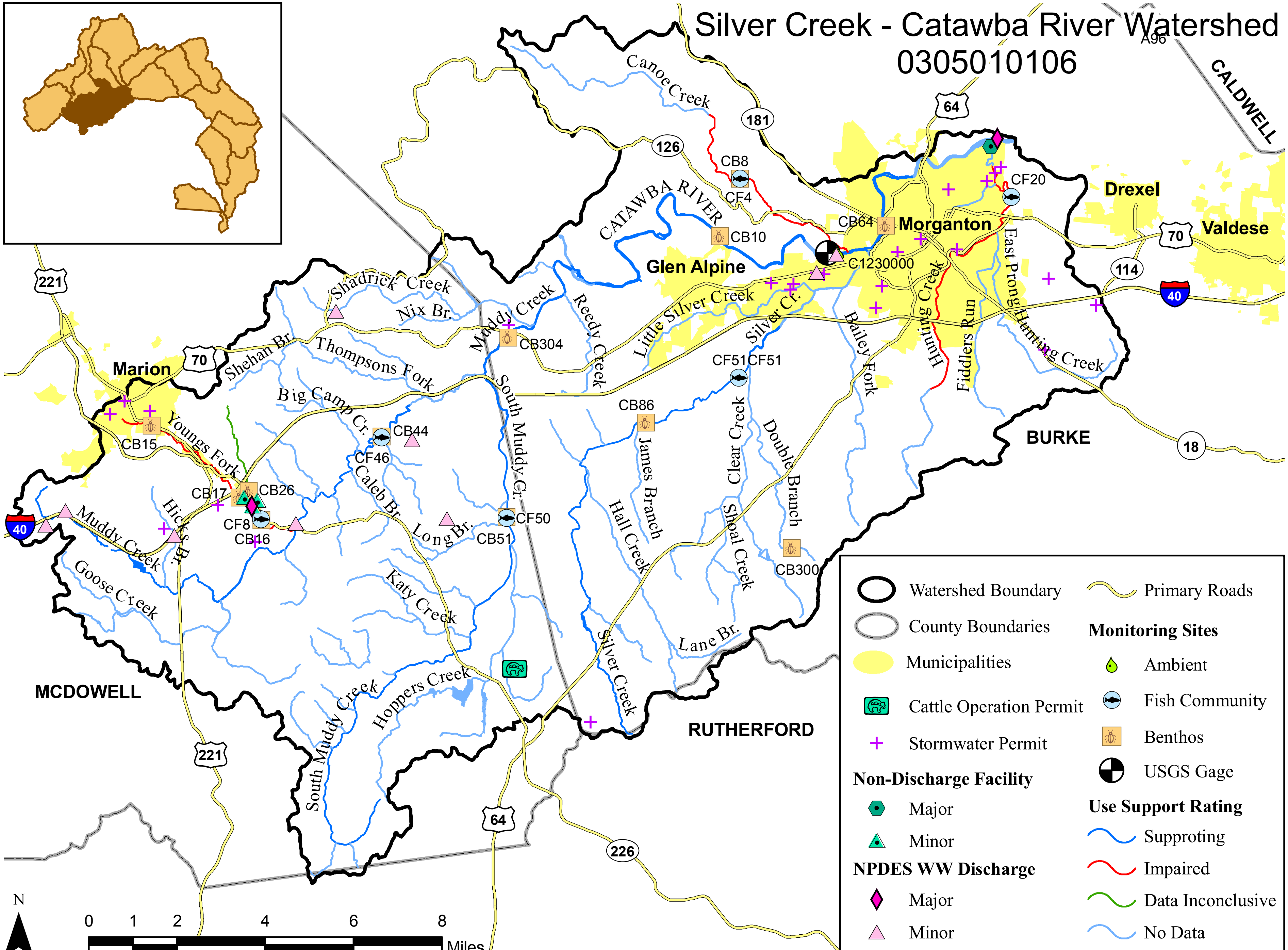


Warrior Fork - Catawba River Watershed
0305010104



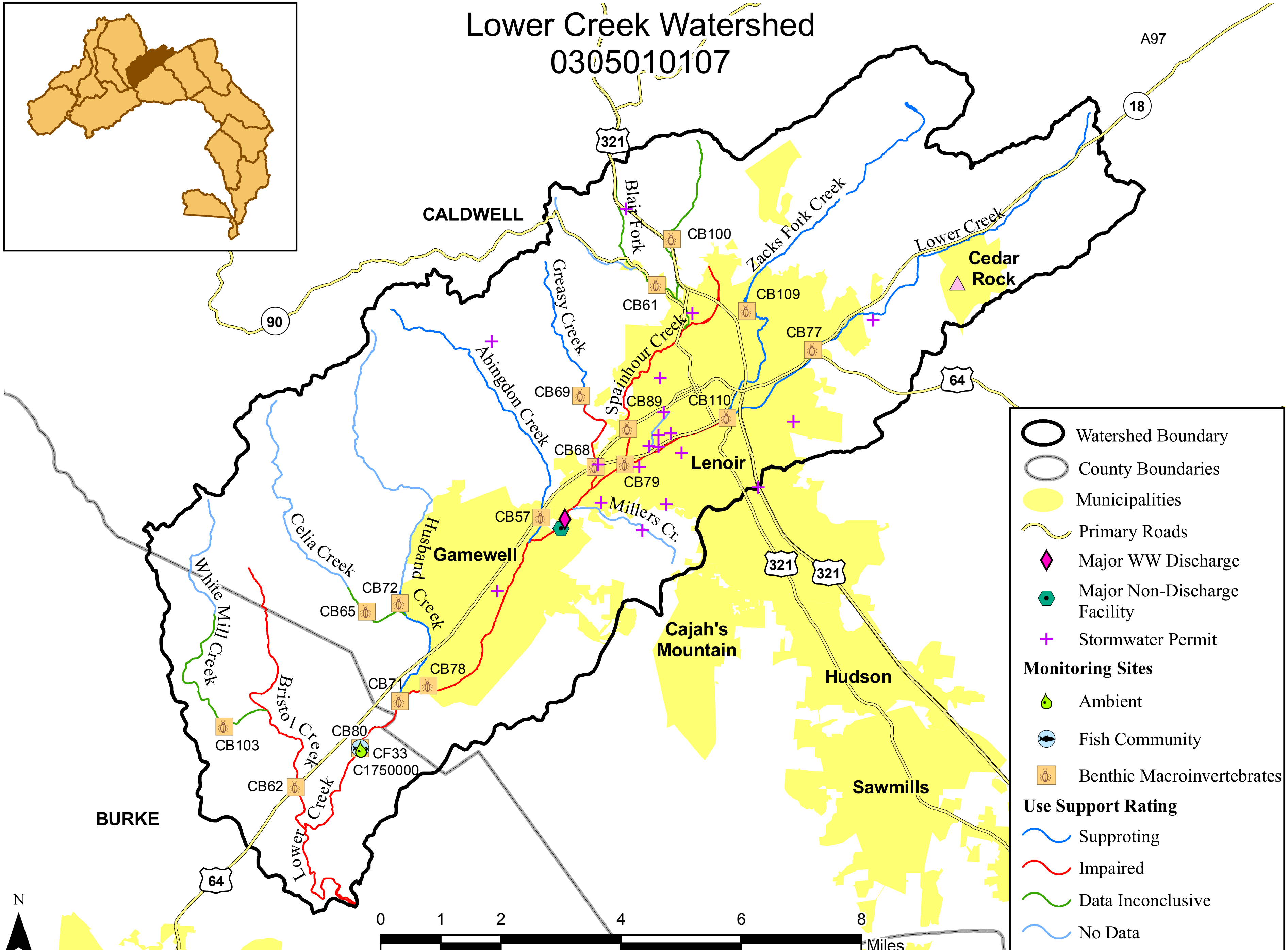


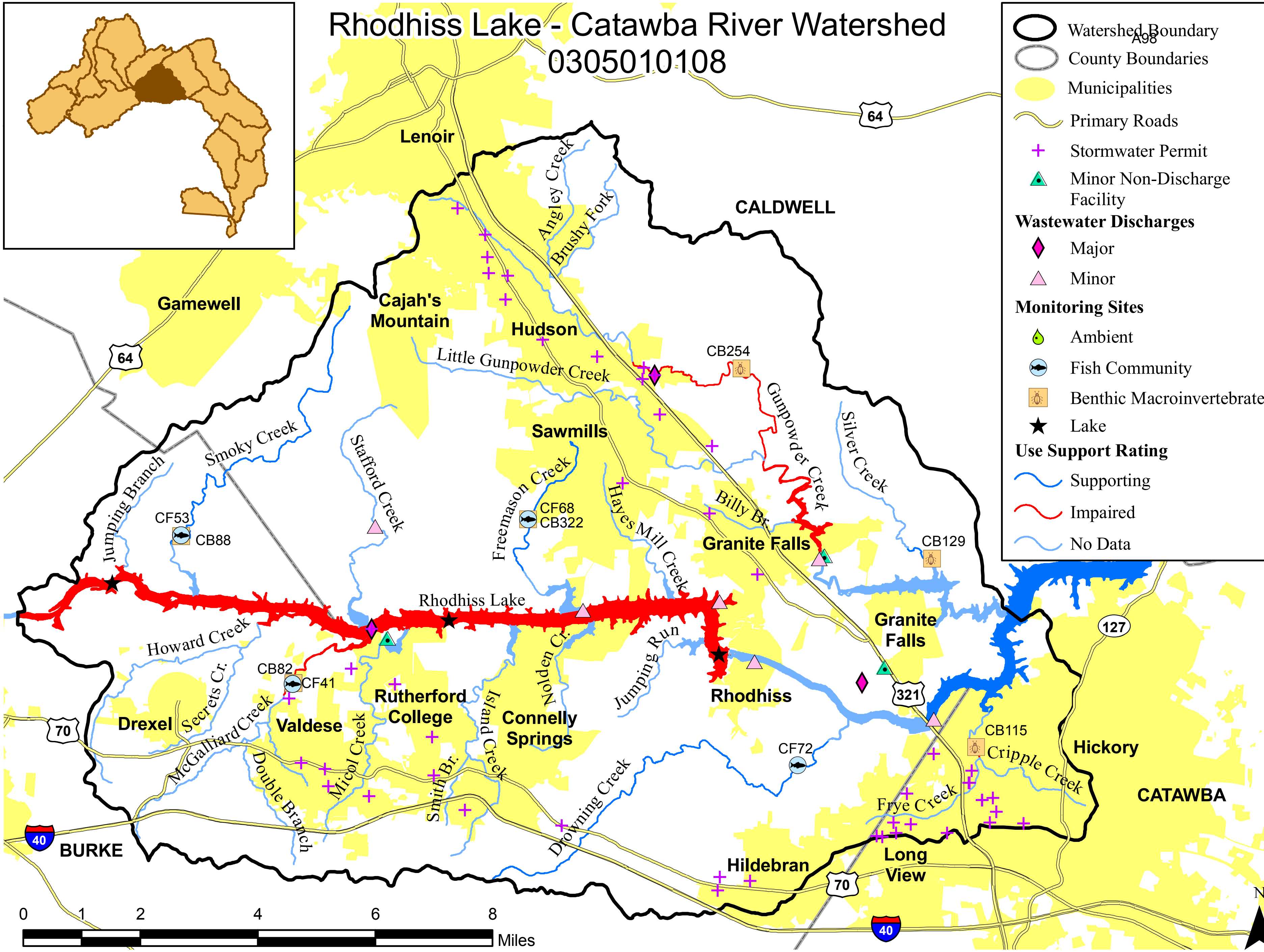
Johns River Watershed
0305010105
A95
WATAUGA
Blowing Rock
CALDWELL
BURKE
Crossnore
Gamewell
221
321
183
181
64
China Creek
Racket Creek
Phillips Cr.
Curtis Cr.
Johns River
Anthony Creek
Gragg Prong
Amos Creek
Mills Creek
Andrews Cr.
Wilson Creek
Webb Creek
Rockhouse Creek
Frankum Creek
Rush Br.
Laurel Cr.
Lost Cove Creek
Coldwater Creek
North Harper Creek
Thorps Cr.
Boone Br.
Mulberry Creek
Harper Creek
Craig Creek
Sally Cr.
Reids Cr.
Franklin Br.
Guys Cr.
Carroll Creek
Parks Creek
Pearcey Cr.
Sims Br.
C1370000
CB268
CB310
CB58
CF73
CB321
CF16
CB318
CB104
CB70
CB313
CB315
CB314
CF45
CB73
CB311
CB83
CB312
CB269
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Minor WW Discharge
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
Use Support Rating
Supporting
Impaired
Data Inconclusive
No Data
0 1 2 4 6 8
Miles
N



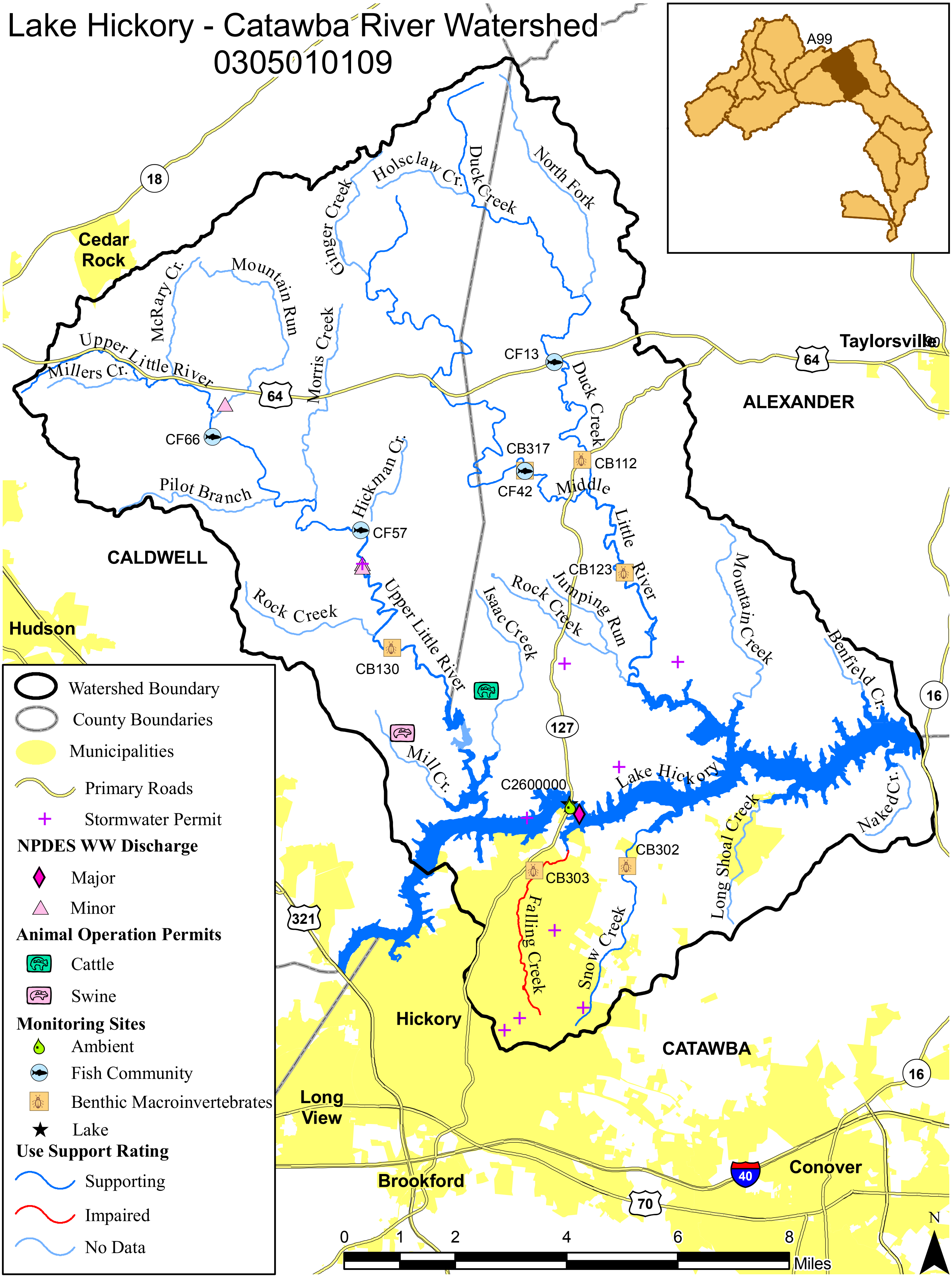
Silver Creek - Catawba River Watershed
03050101106
Marion
Glen Alpine
Morganton
Drexel
Valdese
MCDOWELL
BURKE
RUTHERFORD
CALDWELL
CATAWBA RIVER
Canoe Creek
Shadrick Creek
Nix Br.
Muddy Creek
Reedy Creek
Little Silver Creek
Silver Cr.
Bailey Fork
Hunting Creek
Fiddlers Run
East Prong Hunting Creek
Shehan Br.
Thompsons Fork
Big Camp Cr.
Youngs Fork
South Muddy Cr.
Caleb Br.
Long Br.
Hicks Br.
Muddy Creek
Goose Creek
Katy Creek
Hoppers Creek
South Muddy Creek
James Branch
Hall Creek
Clear Creek
Double Branch
Shoal Creek
Lane Br.
Silver Creek
CB8
CF4
CB10
CB64
C1230000
CF20
CB304
CF51
CB86
CB15
CB44
CF46
CB17
CB26
CF8
CB16
CF50
CB51
CB300
A96
Watershed Boundary
County Boundaries
Municipalities
Cattle Operation Permit
Stormwater Permit
Non-Discharge Facility
Major
Minor
NPDES WW Discharge
Major
Minor
Primary Roads
Monitoring Sites
Ambient
Fish Community
Benthos
USGS Gage
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data
N
0 1 2 4 6 8
Miles

Lower Creek Watershed
0305010107



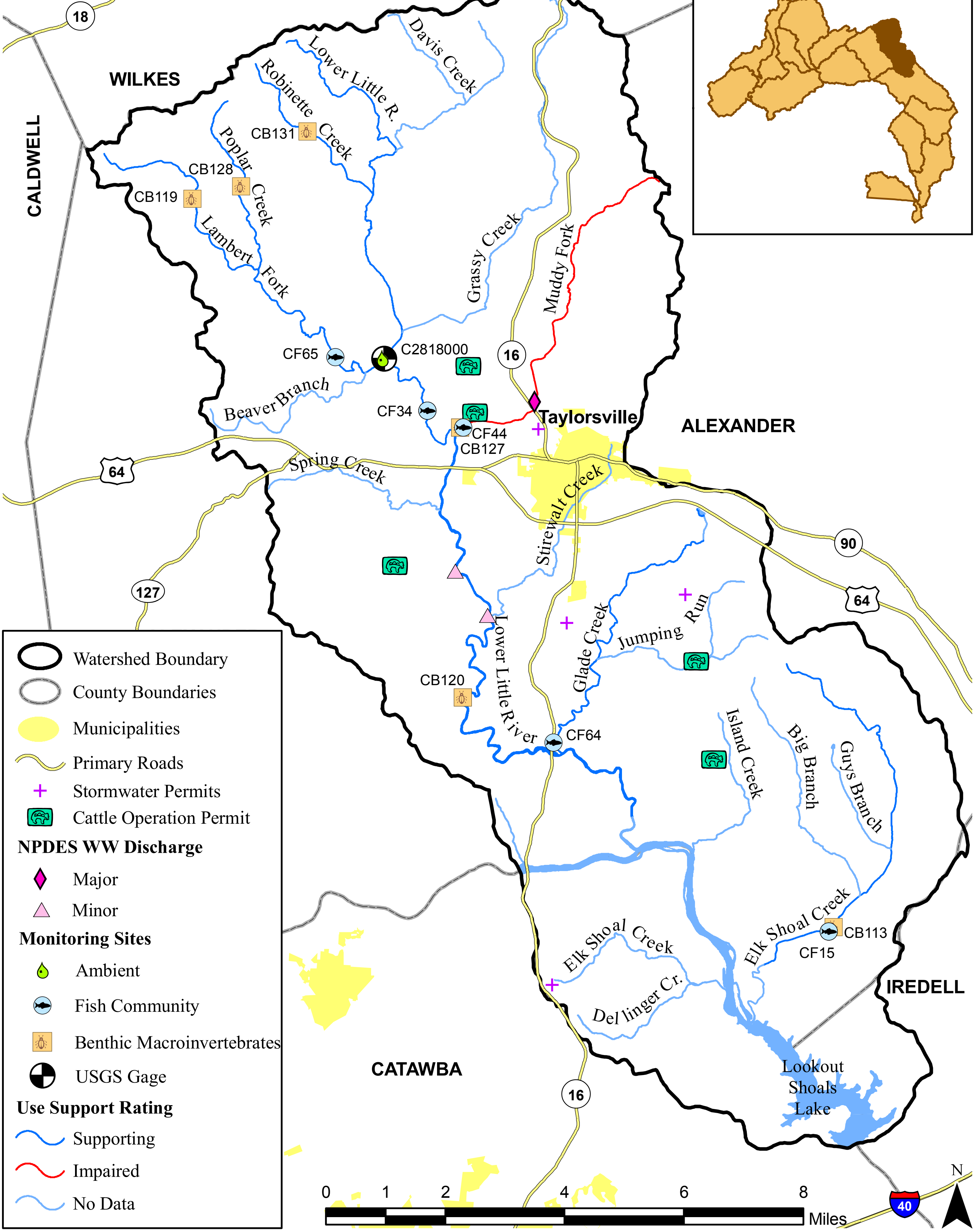


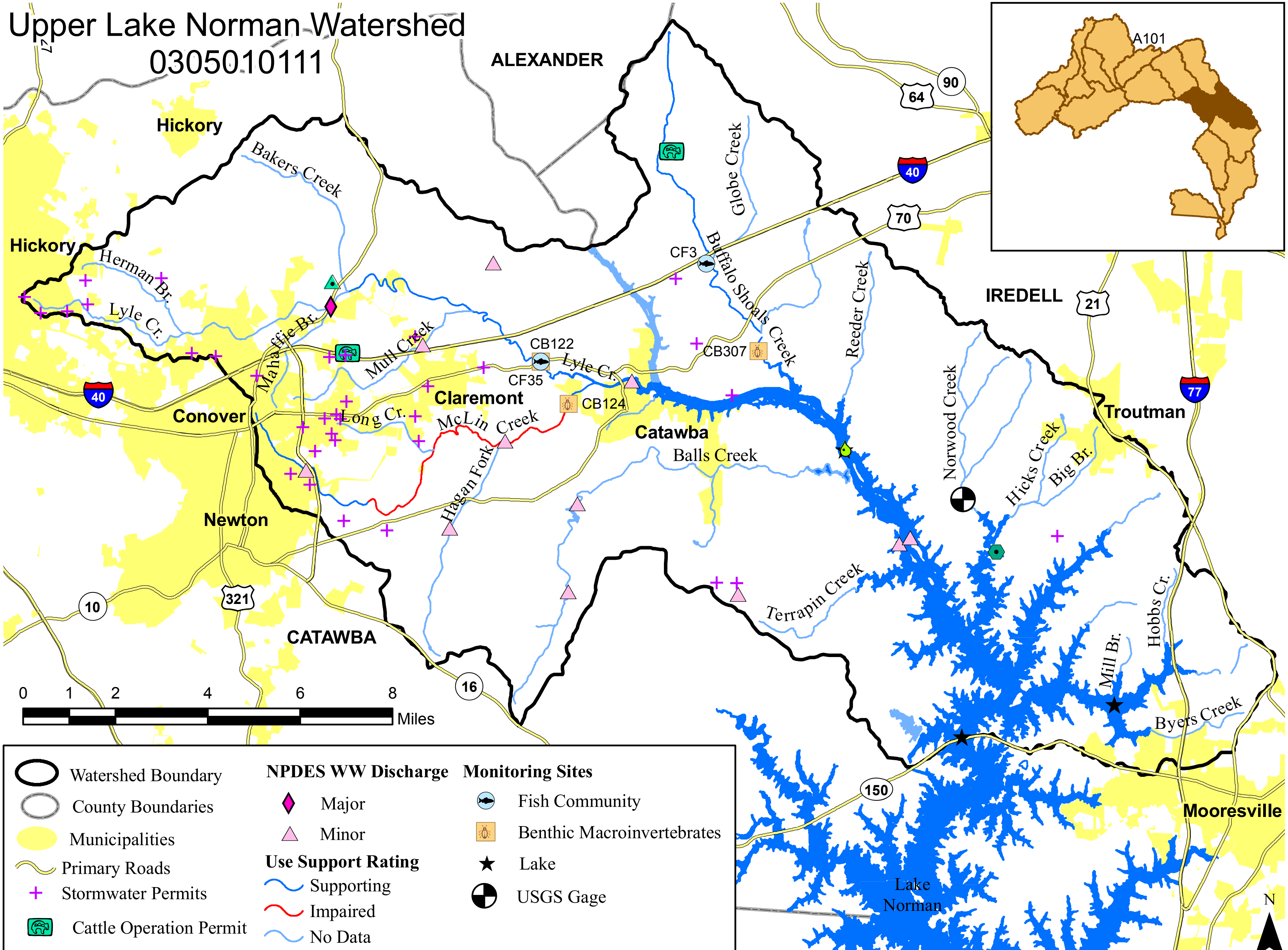
Rhodhiss Lake - Catawba River Watershed
0305010108
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Minor Non-Discharge Facility
Wastewater Discharges
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Lake
Use Support Rating
Supporting
Impaired
No Data
Lenoir
Gamewell
Cajah's Mountain
Hudson
Sawmills
Granite Falls
Rhodhiss
Drexel
Valdese
Rutherford College
Connelly Springs
Hildebran
Long View
Hickory
CALDWELL
CATAWBA
BURKE
Angley Creek
Brushy Fork
Little Gunpowder Creek
Gunpowder Creek
Silver Creek
Smoky Creek
Jumping Branch
Stafford Creek
Freemason Creek
Hayes Mill Creek
Billy Br.
Rhodhiss Lake
Howard Creek
Secrets Cr.
McGalliard Creek
Double Branch
Micol Creek
Smith Br.
Island Creek
Nolden Cr.
Jumping Run
Drowning Creek
Cripple Creek
Frye Creek
CB254
CF68
CB322
CF53
CB88
CB129
CB82
CF41
CF72
CB115
64
70
40
321
127
0
1
2
4
6
8
Miles
N



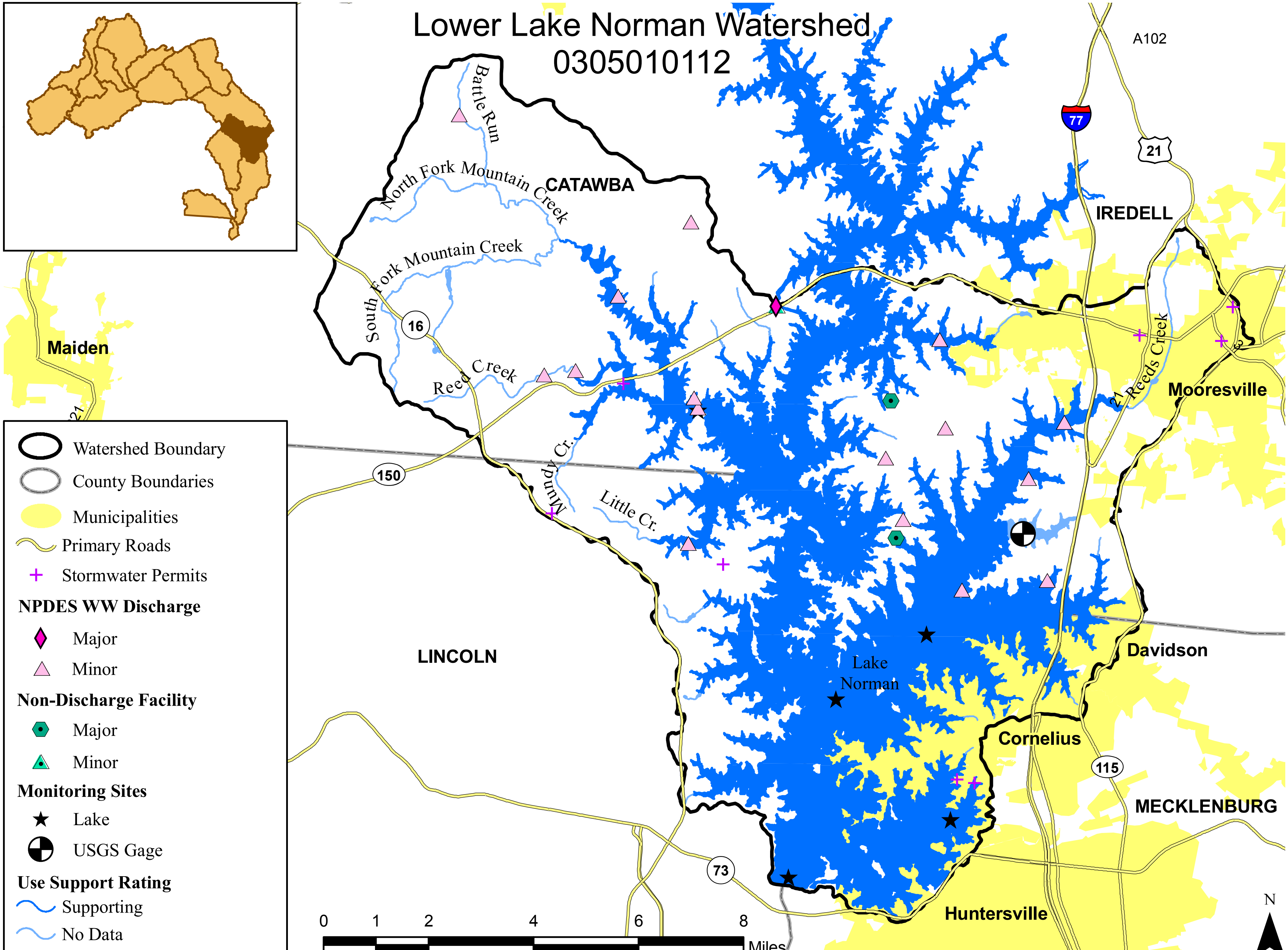
Lake Hickory - Catawba River Watershed
0305010109
A99
Cedar Rock
Taylorsville
ALEXANDER
CALDWELL
Hudson
Hickory
CATAWBA
Long View
Brookford
Conover
18
64
127
16
321
40
70
Holsclaw Cr.
Duck Creek
North Fork
Ginger Creek
Mountain Run
McRary Cr.
Morris Creek
Upper Little River
Millers Cr.
CF13
CF66
Pilot Branch
Hickman Cr.
CF57
CB317
CB112
CF42
Middle
Little River
CB123
Rock Creek
Jumping Run
Isaac Creek
Mountain Creek
Benfield Cr.
CB130
Mill Cr.
C2600000
Lake Hickory
Long Shoal Creek
Naked Cr.
CB302
CB303
Falling Creek
Snow Creek
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
NPDES WW Discharge
Major
Minor
Animal Operation Permits
Cattle
Swine
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Lake
Use Support Rating
Supporting
Impaired
No Data
0 1 2 4 6 8
Miles
N

Lookout Shoals Lake - Catawba River Watershed 0305010110

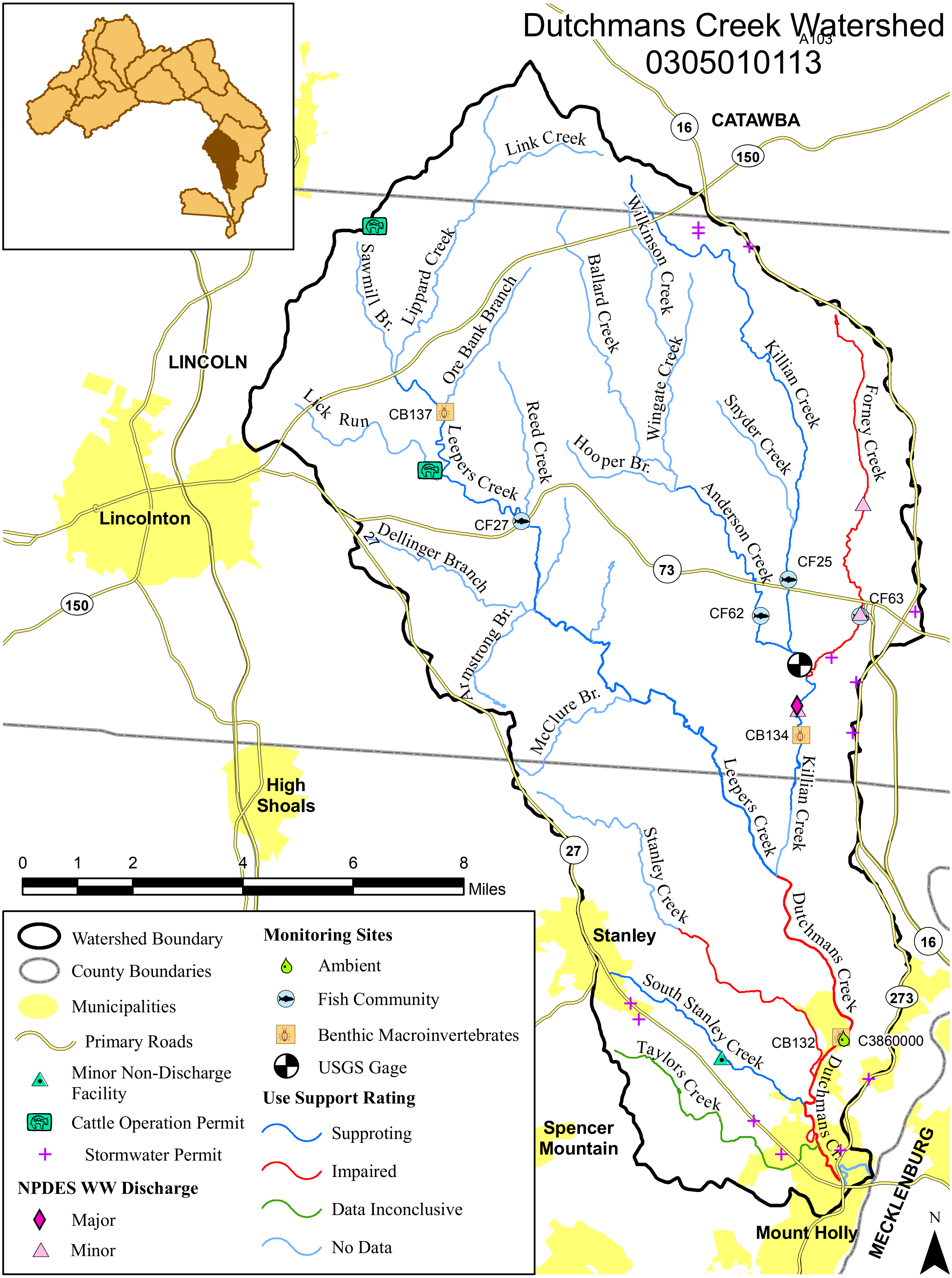


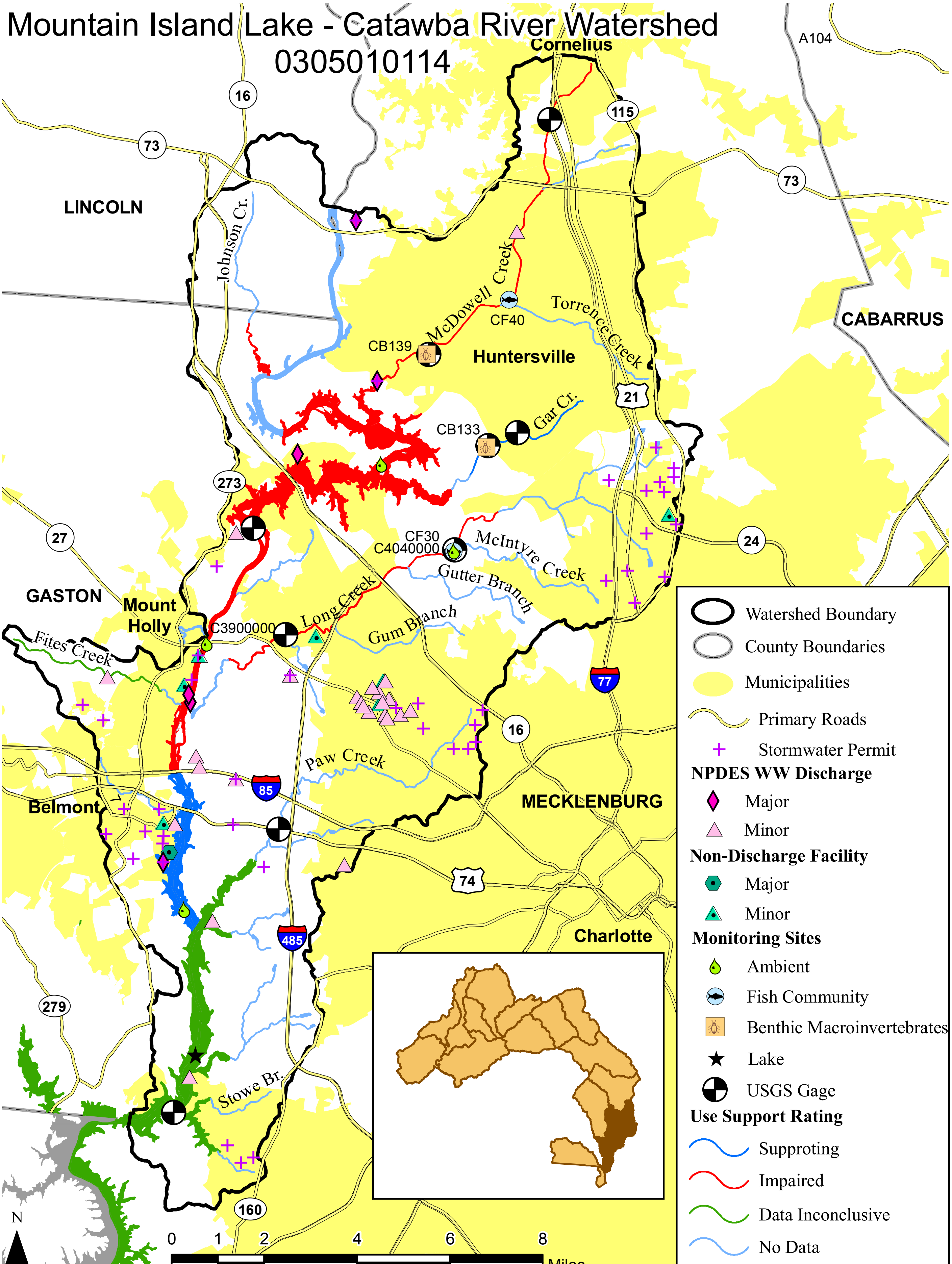


Upper Lake Norman Watershed
0305010111
ALEXANDER
IREDELL
CATAWBA
Hickory
Conover
Newton
Claremont
Catawba
Troutman
Mooresville
Bakers Creek
Herman Br.
Lyle Cr.
Mahaffie Br.
Mull Creek
Long Cr.
McLin Creek
Hagan Fork
Globe Creek
Buffalo Shoals Creek
Reeder Creek
Balls Creek
Norwood Creek
Hicks Creek
Big Br.
Terrapin Creek
Hobbs Cr.
Mill Br.
Byers Creek
Lake Norman
CF3
CB122
CF35
CB307
CB124
A101
0 1 2 4 6 8 Miles
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permits
Cattle Operation Permit
NPDES WW Discharge
Major
Minor
Use Support Rating
Supporting
Impaired
No Data
Monitoring Sites
Fish Community
Benthic Macroinvertebrates
Lake
USGS Gage
N

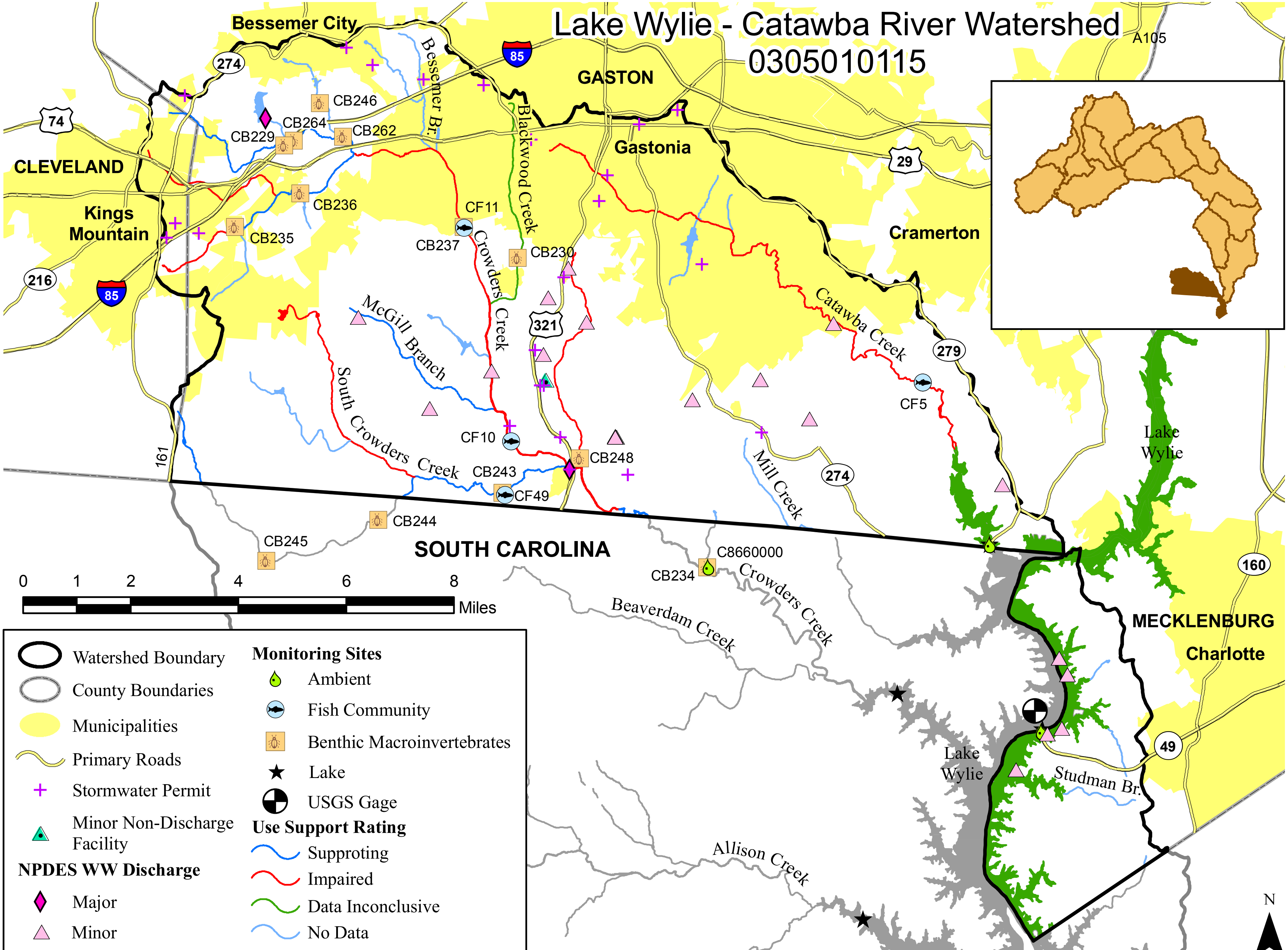


Lower Lake Norman Watershed
0305010112
A102
77
21
IREDELL
CATAWBA
Battle Run
North Fork Mountain Creek
South Fork Mountain Creek
16
Reed Creek
Maiden
Mooresville
Reeds Creek
150
Mundy Cr.
Little Cr.
LINCOLN
Lake Norman
Davidson
Cornelius
115
MECKLENBURG
73
Huntersville
0 1 2 4 6 8
Miles
N
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permits
NPDES WW Discharge
Major
Minor
Non-Discharge Facility
Major
Minor
Monitoring Sites
Lake
USGS Gage
Use Support Rating
Supporting
No Data


Dutchmans Creek Watershed
A103
0305010113
CATAWBA
LINCOLN
MECKLENBURG
Lincolnton
High Shoals
Stanley
Spencer Mountain
Mount Holly
16
150
73
27
273
Link Creek
Sawmill Br.
Lippard Creek
Ore Bank Branch
Wilkinson Creek
Ballard Creek
Wingate Creek
Killian Creek
Snyder Creek
Forney Creek
Lick Run
Leepers Creek
Reed Creek
Hooper Br.
Anderson Creek
Dellinger Branch
Armstrong Br.
McClure Br.
Stanley Creek
South Stanley Creek
Taylors Creek
Dutchmans Creek
Dutchmans Cr.
CB137
CF27
CF25
CF62
CF63
CB134
CB132
C3860000
0
1
2
4
6
8
Miles
N
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Minor Non-Discharge Facility
Cattle Operation Permit
Stormwater Permit
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data



Mountain Island Lake - Catawba River Watershed
0305010114
Cornelius
A104
16
73
115
LINCOLN
Johnson Cr.
McDowell Creek
CF40
Torrence Creek
CABARRUS
CB139
Huntersville
21
CB133
Gar Cr.
273
27
CF30
C4040000
McIntyre Creek
Gutter Branch
24
GASTON
Mount Holly
C3900000
Long Creek
Gum Branch
Fites Creek
77
16
Paw Creek
85
MECKLENBURG
Belmont
74
Charlotte
485
279
Stowe Br.
160
N
0
1
2
4
6
8
Miles
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
NPDES WW Discharge
Major
Minor
Non-Discharge Facility
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Lake
USGS Gage
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data



Lake Wylie - Catawba River Watershed
0305010115
Bessemer City
GASTON
Gastonia
CLEVELAND
Kings Mountain
Cramerton
SOUTH CAROLINA
MECKLENBURG
Charlotte
Bessemer Br.
Blackwood Creek
Crowders Creek
McGill Branch
South Crowders Creek
Catawba Creek
Mill Creek
Lake Wylie
Beaverdam Creek
Allison Creek
Studman Br.
CB246
CB264
CB229
CB262
CB236
CB235
CF11
CB237
CB230
CF10
CB248
CB243
CF49
CF5
CB244
CB245
C8660000
CB234
A105
274
74
85
29
216
321
279
161
160
49
0 1 2 4 6 8 Miles
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Minor Non-Discharge Facility
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Lake
USGS Gage
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data
N

Appendix 1-A

Use Support Ratings for All Monitored Waterbodies

2010 DRAFT

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 metfirst 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

Catawba River Basin 2010 NC 305(b) Report

All 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
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year

Catawba River Basin — Catawba River Headwaters Subbasin — 03050101

Catawba River Basin — Headwaters Catawba River Watershed — 0305010101

11-19-(1)a	**Buck Creek**	From source to Chestnut Branch	**6.9**	**FW Miles**	WS-II,B;Tr,H
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-(1)	**CATAWBA RIVER**	From source to Old Fort Finishing Plant Water Supply Intake	**7.6**	**FW Miles**	C;Tr
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Good-Fair Bioclassification	Aquatic Life	2002	
11-(8)	**CATAWBA RIVER (including backwaters of Lake James below elevation 1200)**	From Dam at Old Fort Finishing Plant Water Supply Intake to North Fork Catawba River	**23.5**	**FW Miles**	C
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
11-12	**Crooked Creek**	From source to Catawba River	**16.0**	**FW Miles**	C
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	
11-10	**Curtis Creek**	From source to Catawba River	**9.7**	**FW Miles**	C;Tr
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	2007	
11-6	**Left Prong Catawba River**	From source to Catawba River	**3.8**	**FW Miles**	C;Tr
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-19-11	**Little Buck Creek**	From source to Lake Tahoma, Buck Creek	**4.4**	**FW Miles**	WS-II,B;Tr,H
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-15-(3.5)a	**Mackey Creek**	From Laurel Fork Creek to US 70	**1.8**	**FW Miles**	C
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2002	
11-15-(3.5)b	**Mackey Creek**	From US 70 to Catawba River	**0.8**	**FW Miles**	C
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
4b	Toxic Impacts	Data Inconclusive	Aquatic Life	2000	2000

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-7-(0.5)	Mill Creek	From source to Swannanoa Creek	5.0	FW Miles	C;Tr,HQW
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	1999	
11-19-8	Reedy Branch	From source to Buck Creek	1.5	FW Miles	WS-II,B;HQW
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2005	
11-19-2	Singecat Branch	From source to Buck Creek	1.4	FW Miles	WS-II,B;HQW
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	
11-7-9	Swannanoa Creek	From source to Mill Creek	3.2	FW Miles	C;Tr
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2002	
11-21-(6)	Toms Creek (Morgan Lake)	From McDowell County SR 1434 to Catawba River	3.5	FW Miles	C
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2002	

Catawba River Basin — **North Fork Catawba River Watershed 0305010102**

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-24-14-(1)	Armstrong Creek	From source to Hickory Botton Creek	10.8	FW Miles	C;Tr,HQW
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-24-14-10-3-1	Bartlett Creek	From source to O'Dear Creek	1.3	FW Miles	C;HQW
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2005	
11-24-14-2	Bee Rock Creek	From source to Armstrong Creek	2.9	FW Miles	C;Tr,HQW
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	
11-24-14-10-1	Buchanan Creek	From source to Three Mile Creek	1.7	FW Miles	C;HQW
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	
11-24-14-3	Cow Creek	From source to Armstrong Creek	1.8	FW Miles	C;Tr,HQW
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	
11-24-8	Honeycutt Creek	From source to North Fork Catawba River	4.8	FW Miles	C;Tr
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-24-3	Laurel Branch	From source to North Fork Catawba River	2.3	FW Miles	C;Tr
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2005	
11-24-(1)	North Fork Catawba River	From source to mouth of Laurel Branch	5.9	FW Miles	C;Tr
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-24-(2.5)a	North Fork Catawba River	From mouth of Laurel Branch to Stillhouse Branch	7.1	FW Miles	B;Tr
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
11-24-(2.5)b	North Fork Catawba River	From Stillhouse Branch to Armstrong Creek	3.5	FW Miles	B;Tr
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-24-10	Pepper Creek	From source to North Fork Catawba River	4.0	FW Miles	C;Tr
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-24-14-6	Roses Creek	From source to Armstrong Creek	2.3	FW Miles	C;Tr,HQW
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	

Catawba River Basin — **Linville River-Lake James Watershed 0305010103**

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-26	Bailey Creek	From source to Lake James, Catawba River	2.2	FW Miles	C
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-(23)	CATAWBA RIVER (Lake James below elevation 1200)	From North Fork Catawba River to Bridgewater Dam	5,810.5	FW Acres	WS-V,B
3a	High Water Temperature	Data Inconclusive	Aquatic Life	2007	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply	2008	
11-27	Dales Creek	From source to Lake James, Catawba River	4.1	FW Miles	C
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-29-(19)	Linville River	From southern Boundary of Daniel Boone Wildlife Management Area to Lake James, Catawba River	7.1	FW Miles	B;HQW
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
11-29-(4.5)	Linville River	From Grandmother Creek to Linville Falls	15.3	FW Miles	B;Tr
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-24-(13)	North Fork Catawba River	From Armstrong Creek to Lake James, Catawba River	7.0	FW Miles	C
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-28	**Paddy Creek**	From source to 1.5mi upstream of Lake James	**4.6**	**FW Miles**	C;Tr
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2007	
11-(23)ut8	**UT LAKE JAMES**	Source to LAKE JAMES	**1.8**	**FW Miles**	
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007	
11-30	**White Creek**	From source to Lake James, Catawba River	**3.1**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2010
Catawba River Basin		**Warrior Fork-Catawba River Watershed**		**0305010104**	
11-35-3-(2)b	**Irish Creek**	From Roses Creek to Warrior Fork	**3.0**	**FW Miles**	WS-III
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
11-35-(1)	**Warrior Fork**	From source to a point 0.6 mile upstream of City of Morganton water supply intake	**4.9**	**FW Miles**	WS-III
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	
Catawba River Basin		**Johns River Watershed**		**0305010105**	
11-38-10-3	**Anthony Creek**	From source to Gragg Prong	**4.8**	**FW Miles**	C;Tr
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007	
11-38-31	**Franklin Branch**	From source to Johns River	**4.2**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-38-10	**Gragg Prong**	From source to Johns River	**4.0**	**FW Miles**	C;Tr
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
11-38-34-14	**Harper Creek**	From source to Wilson Creek	**9.1**	**FW Miles**	C;Tr,ORW
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2002	
11-38-(1)	**Johns River**	From source to Gragg Prong (previously called Anthony Creek)	**6.7**	**FW Miles**	C;Tr
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
11-38-(28)	**Johns River**	From Reids Creek to Wilson Creek	**10.3**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	
11-38-(35.5)	**Johns River**	From a point 0.5 mile upstream of Sims Branch to a point 0.7 mile downstream of N.C. Hwy. 18	**6.9**	**FW Miles**	WS-IV;HQW
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-38-32-17	Little Mulberry Creek	From source to Mulberry Creek	3.6	FW Miles	C
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
11-38-32-18	Little Mulberry Creek	From source to Mulberry Creek	3.8	FW Miles	C
3a	Ecological/biological Integrity Benthos	Not Rated Bioclassification	Aquatic Life	2007	
11-38-32-(15)	Mulberry Creek	From Dam at Mulberry Beach to Johns River	5.4	FW Miles	C
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	2007	
11-38-35	Parks Creek	From source to Johns River	5.3	FW Miles	C
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2007	2010
11-38-29	Reids Creek	From source to Johns River	2.3	FW Miles	C
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2007	
11-38-34-5	Stack Rock Creek (Gabes Mountain Branch)	From source to Wilson Creek	3.4	FW Miles	C;Tr,ORW
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1n	Low pH	No Criteria Exceeded	Aquatic Life	2008	
11-38-5	Thunderhole Branch	From source to Johns River	5.7	FW Miles	C
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
11-38-34	Wilson Creek	From source to Johns River	23.3	FW Miles	B;Tr,ORW
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2008	
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1n	Low pH	No Criteria Exceeded	Aquatic Life	2006	

Catawba River Basin — **Silver Creek-Catawba River Watershed 0305010106**

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-33-(2)	Canoe Creek	From Burke County SR 1248 to Catawba River	5.6	FW Miles	WS-IV
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2007	2010
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	2002	
11-(31.5)	CATAWBA RIVER (including backwaters of Rhodhiss Lake below elevation 995)	From a point 0.6 mile upstream of Muddy Creek to a point 1.2 mile upstream of Canoe Creek	9.8	FW Miles	WS-IV
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	

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

11-(32.7) — **CATAWBA RIVER (including backwaters of Rhodhiss Lake below elevation 995)** — From a point 0.7 mile upstream of Canoe Creek to a point 0.6 mile upstream of Warrior Fork — **3.9 FW Miles** — WS-IV

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2002	
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		

11-36-(0.7) — **Hunting Creek** — From a point 1.0 mile upstream of Burke County SR 1940 to a point 0.4 mile downstream of Pee Dee Branch — **7.4 FW Miles** — WS-IV

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2003	2006

11-32-1-4-1 — **Jacktown Creek** — From source to Youngs Fork — **2.4 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
3a	Ecological/biological Integrity Benthos	Not Rated Bioclassification	Aquatic Life	2001	

11-32-(0.5) — **Muddy Creek** — From source to a point 0.5 mile upstream of mouth — **4.6 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	2007	

11-34-(0.5) — **Silver Creek** — From source to a point 1.3 miles downstream of Clear Creek — **15.4 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	

11-32-2 — **South Muddy Creek** — From source to Muddy Creek — **16.1 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	

11-32-1-4a — **Youngs Fork (Coperning Creek)** — From source to Marion WWTP — **3.6 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Ecological/biological Integrity Benthos	Poor Bioclassification	Aquatic Life	2001	1998

11-32-1-4b — **Youngs Fork (Coperning Creek)** — From Marion WWTP to North Muddy Creek — **1.9 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Ecological/biological Integrity Benthos	Poor Bioclassification	Aquatic Life	2007	1998
5	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2002	1998

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-39-6	**Abingdon Creek**	From source to Lower Creek	**5.6**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2002	
11-39-3-1	**Blair Fork**	From source to Spainhour Creek	**2.6**	**FW Miles**	C
3a	**Ecological/biological Integrity Benthos**	Not Rated Bioclassification	Aquatic Life	2002	
11-39-8	**Bristol Creek**	From source to Lower Creek	**5.6**	**FW Miles**	WS-IV
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1997	2000
11-39-7-1-(2)	**Celia Creek**	From a point 0.5 mile upstream of Caldwell County SR 1325 to Husband Cr.	**1.3**	**FW Miles**	WS-IV
3a	**Ecological/biological Integrity Benthos**	Not Rated Bioclassification	Aquatic Life	2002	
11-39-4a	**Greasy Creek**	From source to SR 1305	**2.6**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2004	
11-39-4b	**Greasy Creek**	From SR 1305 to Lower Creek	**2.6**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2004	2000
11-39-7-(2)	**Husband Creek**	From a point 0.5 mile upstream of Celia Creek to Lower Creek	**2.1**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2002	
11-39-(0.5)a	**Lower Creek**	From source to Zack's Fork	**8.8**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2004	
11-39-(0.5)b	**Lower Creek**	FromZack's Fork to Caldwell County SR 1143	**5.1**	**FW Miles**	C
4s	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1997	2000
4t	**Turbidity**	Standard Violation	Aquatic Life	2008	1998
11-39-(6.5)	**Lower Creek**	From Caldwell County SR 1143 to a point 0.7 mile downstream of Bristol Creek	**6.8**	**FW Miles**	WS-IV
4s	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2002	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
4t	**Turbidity**	Standard Violation	Aquatic Life	2008	1998
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-39-(9)	**Lower Creek**	From a point 0.7 mile downstream of Bristol Creek to Rhodhiss Lake, Catawba River	**1.8**	**FW Miles**	WS-IV;CA
4s	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1997	2000
4t	**Turbidity**	Standard Violation	Aquatic Life	2008	1998

AU_Number / IR Cat	AU_Name / Parameter	AU_Description / Reason for Rating	Use Category	LengthArea	AU_Units	Classification / Collection Year	303(d)year
11-39-3	**Spainhour Creek**	From source to Lower Creek		**4.7**	**FW Miles**	C	
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life			2002	2000
11-39-3-1ut2	**UT to Blair Fork**	From source to Blair Fork		**2.1**	**FW Miles**	C	
3a	Ecological/biological Integrity Benthos	Not Rated Bioclassification	Aquatic Life			2002	
11-39-8-1-(2)	**White Mill Creek**	From a point 0.6 mile downstream of Burke County -Caldwell County Line to Bristol Creek		**3.4**	**FW Miles**	WS-IV	
3a	Ecological/biological Integrity Benthos	Not Rated Bioclassification	Aquatic Life			2002	
11-39-1	**Zacks Fork Creek**	From source to Lower Creek		**8.0**	**FW Miles**	C	
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life			2002	

Catawba River Basin — **Rhodhiss Lake-Catawba River Watershed 0305010108**

AU_Number / IR Cat	AU_Name / Parameter	AU_Description / Reason for Rating	Use Category	LengthArea	AU_Units	Classification / Collection Year	303(d)year
11-(53)	**CATAWBA RIVER (Lake Hickory below elevation 935)**	From U.S. Highway 321 Bridge to N.C. Hwy. 127		**1,232.8**	**FW Acres**	WS-IV,B;CA	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life				
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply				
11-(37)	**CATAWBA RIVER (Rhodhiss Lake below elevation 995)**	From Johns River to Rhodhiss Dam		**1,848.5**	**FW Acres**	WS-IV,B;CA	
3n	Chlorophyll a	Potential Standards Violation	Aquatic Life				
5	High pH	Potential Standards Violation	Aquatic Life				2006
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply				
11-52-(1)	**Drowning Creek**	From source to a point 0.6 mile upstream of mouth		**9.1**	**FW Miles**	WS-IV	
1	Ecological/biological Integrity FishCom	Good-Fair Bioclassification	Aquatic Life			2007	
11-47-(1)	**Freemason Creek**	From source to a point 0.6 mile upstream of mouth		**3.2**	**FW Miles**	WS-IV	
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life			2008	
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life			2007	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life			2008	
11-55-(1.5)	**Gunpowder Creek (Old Mill Pond)**	From a point 0.5 mile downstream of Caldwell County SR 1127 to a point 0.8 mile downstream of Billy Branch		**13.4**	**FW Miles**	WS-IV	
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life			2007	2010

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-54-(0.5)	**Horseford Creek**	From Frye Creek to a point 0.7 mile upstream of mouth	**0.4**	**FW Miles**	WS-IV
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2002	2006
11-54-(3)	**Horseford Creek**	From a point 0.7 mile upstream of mouth to Lake Hickory, Catawba River	**0.7**	**FW Miles**	WS-IV;CA
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2002	2006
11-44-(3)	**McGalliard Creek**	From a point 0.6 mile upstream of mouth to Rhodhiss Lake, Catawba River	**3.9**	**FW Miles**	WS-IV;CA
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
5	**Ecological/biological Integrity FishCom**	Poor Bioclassification	Aquatic Life	2003	2006
11-56-(2)	**Silver Creek**	From a point 0.7 mile upstream of mouth to Lake Hickory, Catawba River	**0.8**	**FW Miles**	WS-IV;CA
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2002	
11-41-(1)	**Smoky Creek**	From source to a point 0.6 mile upstream of mouth	**7.5**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
Catawba River Basin		**Lake Hickory-Catawba River Watershed**			**0305010109**
11-(59.5)	**CATAWBA RIVER (Lake Hickory below elevation 935)**	From N.C. Hwy. 127 to Oxford Dam	**2,093.6**	**FW Acres**	WS-V,B
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
3a	**Low pH**	Potential Standards Violation	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-62-2-(1)	**Duck Creek**	From source to N.C. Highway 90	**8.5**	**FW Miles**	C;Tr
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	
11-62-2-(4)	**Duck Creek**	From N.C. Highway 90 to Middle Little River	**4.4**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007	
11-60	**Falling Creek**	From source to Lake Hickory, Catawba River	**4.0**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2010
11-62a	**Middle Little River**	From source to Duck Creek	**14.6**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-62b	**Middle Little River**	From Duck Creek Lake Hickory	**6.9**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-61	**Snow Creek**	From source to Lake Hickory, Catawba River	**4.4**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-58	**Upper Little River (Cedar Creek)**	From source to Morris Creek	**9.1**	**FW Miles**	C
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2007	
11-58-(5.5)	**Upper Little River (Cedar Creek)**	From Morris Creek to a point 0.5 mile upstream of mouth	**9.8**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2002	
Catawba River Basin		**Lookout Shoals Lake-Catawba River Watershed**			**0305010110**
11-73-(0.5)	**Elk Shoal Creek (East Side)**	From source to a point 1.4 miles upstream of mouth	**7.8**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2002	
11-69-7-(0.7)	**Glade Creek**	From Alexander County SR 1604 to Lower Little River	**5.9**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
11-69-3	**Lambert Fork**	From source to Lower Little River	**8.2**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2005	
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2007	
11-69-(0.5)	**Lower Little River**	From source to a point 0.5 mile upstream of mouth of Stirewalt Creek	**14.0**	**FW Miles**	C
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2003	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
11-69-(5.5)	**Lower Little River**	From a point 0.5 mile upstream of of mouth Stirewalt Creek to a point 0.8 mile upstream of mouth	**8.6**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-69-4	**Muddy Fork**	From source to SR 1409	**6.8**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2010
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2004	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-69-3-1	Poplar Creek	From source to Lambert Fork	3.4	FW Miles	C
1	Ecological/biological Integrity Benthos	Excellent Bioclassification	Aquatic Life	2005	
11-69-1.5	Robinette Creek	From source to Lower Little River	3.4	FW Miles	B
1	Ecological/biological Integrity Benthos	Not Impaired Bioclassification	Aquatic Life	2005	
Catawba River Basin			Upper Lake Norman Watershed		0305010111
11-78-(0.5)	Buffalo Shoals Creek	From source to a point 0.2 mile downstream of Broad Meadow Creek	8.1	FW Miles	WS-IV
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	
11-78-(3)	Buffalo Shoals Creek	From a point 0.2 mile downstream of Broad Meadow Creek to Lake Norman, Catawba River	3.5	FW Miles	WS-IV;CA
1	Ecological/biological Integrity Benthos	Good Bioclassification	Aquatic Life	2007	
11-(75)	CATAWBA RIVER (Lake Norman below elevation 760)	From Lyle Creek to Cowan's Ford Dam	31,331.6	FW Acres	WS-IV,B;CA
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
3a	Low pH	Data Inconclusive	Aquatic Life	2008	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		
11-76-(3.5)	Lyle Creek	From Bakers Creek to U.S. Hwys. 64 & 70	6.3	FW Miles	WS-IV
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2002	
11-76-(4.5)	Lyle Creek	From U.S. Hwys. 64 & 70 to Lake Norman, Catawba River	5.9	FW Miles	WS-IV;CA
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
1	Ecological/biological Integrity FishCom	Excellent Bioclassification	Aquatic Life	2004	
11-76-5-(0.3)	McLin Creek	From source to Catawba County SR 1734	3.7	FW Miles	C
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2002	
11-76-5-(0.7)	McLin Creek	From Catawba County SR 1734 to a point 0.2 mile upstream of Catawba County SR 1722	6.8	FW Miles	WS-IV
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2007	2010
11-76-5-(3)	McLin Creek	From a point 0.2 mile upstream of Catawba County SR 1722 to Lyle Creek	0.7	FW Miles	WS-IV;CA
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2007	2010
Catawba River Basin			Dutchmans Creek Watershed		0305010113

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-119-2-2	**Anderson Creek**	From source to Killian Creek	**5.0**	**FW Miles**	C
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	
11-119-(0.5)	**Dutchmans Creek**	From source to a point 0.8 mile downstream of Taylors Creek	**7.4**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-119-2-3	**Forney Creek**	From source to Killian Creek	**8.4**	**FW Miles**	C
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2007	2010
11-119-2-(0.5)a	**Killian Creek**	From source to Anderson Creek	**11.6**	**FW Miles**	C
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	
11-119-2-(0.5)b	**Killian Creek**	From Anderson Creek to a point 1.2 miles upstream of mouth	**3.2**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-119-1-(1)	**Leepers Creek**	From source to a point a point 0.8 mile upstream of mouth	**15.9**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2007	
11-119-1-(12)	**Leepers Creek**	From a point 0.8 mile upstream of mouth to Dutchmans Creek	**0.9**	**FW Miles**	WS-IV
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-119-4	**South Stanley Creek**	From source to Dutchmans Creek	**4.8**	**FW Miles**	WS-IV
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-119-3-(2)	**Stanley Creek**	From a point 1.0 mile upstream of Gaston County SR 1918 to Dutchmans Creek	**4.7**	**FW Miles**	WS-IV
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Low Dissolved Oxygen**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-119-5	Taylors Creek	From source to Dutchmans Creek	6.0	FW Miles	WS-IV
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply	2008	

Catawba River Basin — **Mountain Island Lake-Catawba River Watershed 0305010114**

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-(117)	CATAWBA RIVER (Lake Wylie below elevation 570)	From Mountain Island Dam to Interstate Highway 85 Bridge at Belmont	375.3	FW Acres	WS-IV;CA
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
5	Low pH	Standard Violation	Aquatic Life	2008	2008
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		
11-(122)	CATAWBA RIVER (Lake Wylie below elevation 570)	From I-85 bridge to the upstream side of Paw Creek Arm of Lake Wylie, Catawba River	601.1	FW Acres	WS-IV,B;CA
1t	Chlorophyll a	No Criteria Exceeded	Aquatic Life	2008	1994
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		
11-(123.5)a	CATAWBA RIVER (Lake Wylie below elevation 570) North Carolina portion	From the upstream side of Paw Creek Arm of Lake Wylie to North Carolina-South Carolina State Line	4,294.0	FW Acres	WS-V,B
3t	Chlorophyll a	Potential Standards Violation	Aquatic Life	2008	1994
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
3a	High pH	Potential Standards Violation	Aquatic Life		
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		
11-(114)	CATAWBA RIVER (Mountain Island Lake below elevation 648)	From Water Intake at River Bend Steam Station to Mountain Island Dam (Town of Mount Holly water supply intake)	1,937.1	FW Acres	WS-IV,B;CA
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
5	Low pH	Standard Violation	Aquatic Life	2008	2010
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-121-(1)	Fites Creek	From source to a point 0.3 mile downstream of N.C. Hwy. 273	3.9	FW Miles	WS-IV
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply	2008	
11-116-(1)	Gar Creek	From source to a point 0.6 mile upstream of mouth	3.4	FW Miles	WS-IV
1	Ecological/biological Integrity Benthos	Good-Fair Bioclassification	Aquatic Life	2007	
11-113-(2)	Johnson Creek	From a point 0.6 mile upstream of mouth to Mountain Island Lake, Catawba River	3.0	FW Miles	WS-IV;CA
1	Fecal Coliform (recreation)	No Criteria Exceeded	Recreation	2008	
5	Turbidity	Standard Violation	Aquatic Life	2008	2010
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply	2008	
11-120-(0.5)	Long Creek	From source to a point 0.6 mile downstream of Mecklenburg County SR 2074	4.7	FW Miles	C
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2004	
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
4t	Turbidity	Standard Violation	Aquatic Life	2008	2008
11-120-(2.5)	Long Creek	From a point 0.6 mile downstream of Mecklenburg County SR 2074 to a point 0.4 mile upstream of Mecklenburg County SR 1606	11.3	FW Miles	WS-IV
5	Copper	Standard Violation	Aquatic Life	2006	2008
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2004	
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
4t	Turbidity	Standard Violation	Aquatic Life	2008	2008
1	Water Quality Standards Water Supply	No Criteria Exceeded	Water Supply		
11-115-(1)	McDowell Creek	From source to U.S. Hwy. 21	1.6	FW Miles	C
4b	Ecological/biological Integrity FishCom	Poor Bioclassification	Aquatic Life	2002	1998
11-115-(1.5)a	McDowell Creek	From U.S. Hwy. 21 to SR 2136 Mecklenburg Co	4.4	FW Miles	WS-IV
4b	Ecological/biological Integrity FishCom	Poor Bioclassification	Aquatic Life	2002	1998

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-115-(1.5)b	**McDowell Creek**	FromSR2136 Mecklengurg Co to a point 0.7 mile upstream of mouth	**2.9**	**FW Miles**	WS-IV
4b	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2000
11-115-(5)	**McDowell Creek**	From a point 0.7 mile upstream of mouth to Mountain Island Lake, Catawba River	**2.7**	**FW Miles**	WS-IV;CA
4b	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2002	2000
Catawba River Basin		**Lake Wylie-Catawba River Watershed**	**0305010115**		
11-135-4a	**Abernethy Creek**	From source to First Creek	**3.2**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2002	
11-135-4b	**Abernethy Creek**	From First Creek to Crowders Creek	**1.8**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
11-135-7	**Blackwood Creek**	From source to Crowders Creek	**4.4**	**FW Miles**	C
3a	**Ecological/biological Integrity Benthos**	Not Rated Bioclassification	Aquatic Life	2002	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
11-130a	**Catawba Creek**	From source toSR2446, Gaston	**5.6**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1990	1998
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
11-130b	**Catawba Creek**	From SR2446, Gaston to SR2439, Gaston	**3.1**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1990	1998
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
11-130c	**Catawba Creek**	FromSR2439 to Lake Wylie	**4.9**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity FishCom**	Poor Bioclassification	Aquatic Life	2007	1998

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

11-(123.5)b	**CATAWBA RIVER (Lake Wylie South FK Catawba Arm) North Carolina portion**	South Fork Catawba River Arm of Lake Wyly	**1,291.0**	**FW Acres**	WS-V,B
1t	**Chlorophyll a**	No Criteria Exceeded	Aquatic Life	2008	1994
5	**Copper**	Standard Violation	Aquatic Life	2006	2008
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**High Water Temperature**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-135a	**Crowders Creek**	From source to SR 1118	**1.9**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	1998
5	**Ecological/biological Integrity FishCom**	Poor Bioclassification	Aquatic Life	2004	1998
11-135b	**Crowders Creek**	From State Route 1118 to State Route 1122	**3.1**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2002	
11-135c	**Crowders Creek**	From State Route 1122 to State Route 1131	**3.3**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	1998
5	**Ecological/biological Integrity FishCom**	Poor Bioclassification	Aquatic Life	2004	1998
11-135d	**Crowders Creek**	From State Route 1131 to State Route 1108	**7.3**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2007	1998
11-135e	**Crowders Creek**	From State Route 1108 To NC 321	**1.5**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1989	2000
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2000
11-135f	**Crowders Creek**	From State Route 321 to State Route 2424	**1.4**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1989	2000
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2000

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-135g	**Crowders Creek**	From State Route 2424 to North Carolina-South Carolina State Line	**1.5**	**FW Miles**	C
3t	**Chlorophyll a**	Data Inconclusive	Aquatic Life	1996	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
11-135-9	**McGill Branch**	From source to Crowders Creek	**3.8**	**FW Miles**	C
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
11-135-2	**McGill Creek**	From source to Crowders Creek	**3.3**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	1989	1998
11-135-10-1	**South Crowders Creek**	From source to South Fork Crowders Creek	**5.7**	**FW Miles**	C
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Low Dissolved Oxygen**	Standard Violation	Aquatic Life	2008	2010
11-135-10	**South Fork Crowders Creek**	North Carolina Portion	**5.7**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2002	
1	**Ecological/biological Integrity FishCom**	Good-Fair Bioclassification	Aquatic Life	2004	
11-135fut1	**UT to Crowders Creek**	From source to Crowders Creek	**4.6**	**FW Miles**	
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2002	
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	

Appendix 1-B

Biological (Benthic & Fish) Sample Site Sheets

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Catawba R	SR 1274	CB14	07/12/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	353652	821348	11-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	4.5	1600	6	0.4

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

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

Water Quality Parameters

Temperature (°C)	23.4
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	62
pH (s.u.)	6.8
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	14
Pool Variety (10)	8
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	81

Site Photograph

Substrate cobble, boulder, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/12/07	10255	---	42	---	2.64	Excellent
08/08/02	8934	---	26	---	2.75	Good-Fair
08/07/97	7404	---	24	---	2.88	Good-Fair

Taxonomic Analysis

The 2007 sample produced a record high EPT taxa richness, EPT abundance (195 in 2007, 139 and 122 in 2002 and 1997 respectively) , and record low EPTBI. EPT taxa collected in 2007 but not present at any other sampling include the mayflies *Diphetor hageni* , *Epeorus dispar* , *Rhithrogena exilis* , *Maccaffertium ithaca* , and the caddisflies *Apatania* , *Neophylax consimilis* , *N. mitchelli* , *Psychomyia flavida* , *Pycnopsyche gentilis* , *Rhyacophila acutiloba* , and *R. carolina* .

Data Analysis

Although large portions of the catchment upstream of this location are forested, there are some rural residences and runoff from both SR 1274 and I-40 are potential stressors. As is typical in a watershed where there are no point discharges, and where nonpoint pollution is the greatest potential source for pollution, the 2007 drought and corresponding reduced runoff may be a reason why the invertebrate community has improved greatly in 2007. Other factors may also be involved since 2002 was also a drought year.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Catawba R	SR 1234	CB12	07/10/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	353813	820838	0	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	55	1380	12	0.4

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	60	10	20	10 (intersate highway)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Old Fort WWTP	NC0021229001	0.8

Water Quality Parameters

Temperature (°C)	26.8
Dissolved Oxygen (mg/L)	6.3
Specific Conductance (µS/cm)	75
pH (s.u.)	7.5
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	10
Pool Variety (10)	4
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	76

Site Photograph

Substrate boulder, cobble, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10250	104	38	4.73	3.58	Good
08/08/02	8933	89	36	4.73	3.56	Good
08/07/97	7406	70	31	5.32	4.19	Good-Fair
07/09/92	5897	102	41	4.14	3.20	Good
07/26/90	5404	84	38	4.43	3.72	Good

Taxonomic Analysis

Excluding the spring (April 18, 1985; Fair) and the post-soybean oil 1997 (Good-Fair) sample, this location has had a stable macroinvertebrate community. Some taxa that have been consistently common or abundant at this location since sampling first started here include the mayflies *Baetis flavistriga* , *B. pluto* , *Isonychia* , as well as three species of *Maccaffertium* , the stoneflies *Acroneuria abnormis, Paragnetina immarginata,* and *Perlesta* and the caddisflies *Ceratopsyche bronta* , *C. sparna* , and *Psychomyia flavida* .

Data Analysis

With the exception of the April 1985 (Fair) and August 1997 (Good-Fair) samples, this site has always maintained a bioclassification of Good. The decline in rating measured in 1997 was related to a large soybean-oil spill upstream on nearby tributary (Swannanoa Creek). Since that sample, the community continues to maintain a stable ecological invertebrate community despite the proximity to the Old Fort WWTP discharge which is upstream on the tributary Curtis Creek. It was also noted that there are numerous active cow pastures located near this site as the odor of cow manure was obvious and persistent throughout the sample collection.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Catawba R	SR 1221	CB11	07/12/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354109	820340	0	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	126	1270	26	0.5

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

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

Water Quality Parameters

Temperature (°C)	24.6
Dissolved Oxygen (mg/L)	6.0
Specific Conductance (µS/cm)	55
pH (s.u.)	6.8
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	13
Bottom Substrate (15)	8
Pool Variety (10)	3
Riffle Habitat (16)	7
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	59

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/12/07	10251	93	35	5.17	3.88	Good
08/07/02	8931	73	27	5.38	4.11	Good-Fair
08/06/97	7399	75	35	4.46	3.90	Good
07/08/92	5894	90	42	4.42	3.61	Good
07/26/90	5405	77	43	4.28	3.77	Good

Taxonomic Analysis

EPT taxa collected in 2007 that had been previously abundant or common from the 1990, 1992, and 1997 collections but were absent in 2002 included the mayflies *Baetis intercalaris* , *Baetis pluto* , *Serratella serratoides* , the stoneflies *Acroneuria abnormis* , *Paragnetina immarginata* , and *Perlesta* , and the caddisfly *Hydropsyche venularis* . While *B. intercalaris* and *B. pluto* are somewhat pollution tolerant, the stoneflies *A. abnormis* and *P. immarginata* are both pollution intolerant and long-lived. Their absence for the first time at this location in 2002 suggests a temporary decline in water quality that year. Their reappearance in 2007 may indicate that conditions have since recovered.

Data Analysis

Including the 2007 collection, this segment of the Catawba River has been sampled on 11 occasions with four samples producing Good bioclassifications and the remaining seven producing Good-Fair ratings. Starting with the initial collection in 1983, five subsequent annual samples (1984-1988) produced Good-Fair bioclassifications. In 1990, the bioclassification improved to Good and remained so with subsequent samples in 1992, and 1997. However, the 2002 sample reverted back to the Good-Fair rating seen in the early and mid 1980's and this decrease in bioclassification was thought at that time to be the result of low flows and lower dissolved oxygen levels. However, the 2007 sample was collected during a drought so the decline in 2002 was likely not a result of poor flows. Since 1983 and through 11 samples, it appears that water quality in this large catchment has mostly been stable. Why this site suddenly reverted in 2002 to bioclassifications seen through the 1980's is unknown but conditions in the invertebrate community in 2007 have recovered to levels measured from the early and mid 1990's.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Catawba R	SR 1147	CB10	07/10/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	30	03050101	354440	814620	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;Tr	506	1100	50	0.5

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

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

Water Quality Parameters

Temperature (°C)	13.4
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	49
pH (s.u.)	6.5
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	16
Bottom Substrate (15)	13
Pool Variety (10)	4
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	3
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	71

Site Photograph

Substrate cobble, boulder, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10094	88	33	4.61	3.35	Good
08/08/02	8913	60	21	4.04	2.98	Good
08/08/97	7409	66	30	4.17	3.13	Good
08/12/88	4697	79	34	4.83	3.37	Good

Taxonomic Analysis

Although there is some variation among the major community metrics, the overall invertebrate community here has been largely stable through time with several of the same mayflies (*Baetis pluto* , *Maccaffertium modestum, Serratella serratoides*), stoneflies (*Acroneuria abnormis* , *Perlesta* , *Pteronarcys*), and caddisflies (*Brachycentrus numerosus* , *Ceratopsyche sparna* , *Glossosoma* , *Lepidostoma* , *Micrasema wataga* , *Neophylax oligius*) present from each sample.

Data Analysis

This site is located approximately 10 miles downstream of the powerhouse at Lake James. As a result, this river segment is subjected to large diurnal swings in discharge. Nevertheless, this site continues to exhibit a very stable macoinvertebrate community with all samples producing Good bioclassifications with very small ranges in the BI and EPT BI.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Curtis Cr	SR 1227	CB22	07/12/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354023	821132	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	13	1700	6	0.4

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

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

Water Quality Parameters

Temperature (°C)	23.1
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	19
pH (s.u.)	7.1
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	14
Pool Variety (10)	9
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	90

Site Photograph

Substrate boulder, cobble, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/12/07	10253	---	40	---	2.70	Excellent
08/08/02	8936	---	30	---	3.35	Good
08/07/97	7405	---	34	---	2.47	Good
02/10/92	5776	---	42	---	2.10	Good

Taxonomic Analysis

The 2007 EPT sample produced the highest EPT species richness for a summer sample at this location. Pollution intolerant taxa collected in 2007 but absent from all previous collections included the stonefly *Isoperla holochlora* and the caddisflies *Nyctiophylax celta*, *Polycentropus*, and *Psychomyia flavida*.

Data Analysis

Although nearly all of the Curtis Creek catchment is forested, there are some small breaks in the riparian zone that may cause impacts from SR 1227 especially during wet years. The high 2007 EPT taxa richness is not entirely explained by less nonpoint runoff in a drought because 2002 was also a drought year.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CURTIS CR	US 70	05/24/07	CF112	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MCDOWELL	30	03050101	35.645	-82.15916667	11-10	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	16.6	1442	12	0.4	Yes

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	65	0	25	10 (rural commercial)

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	21
pH (s.u.)	6.1

Water Clarity: Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	9
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**88**

Site Photograph

Substrate: cobble, boulder, gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/24/07	2007-68	20	60	Excellent
04/30/02	2002-34	19	60	Excellent

Most Abundant Species: Central Stoneroller

Exotic Species: Green Sunfish, Smallmouth Bass, Rainbow Trout, and Brown Trout

Species Change Since Last Cycle: **Gains** -- Green Sunfish, Piedmont Darter, and Western Blacknose Dace. **Losses** -- Notchlip Redhorse and Yellow Perch.

Data Analysis

Watershed -- a headwater tributary to the Catawba River located about 7/10 of a mile above its confluence; drainage area is almost entirely within the Southern Crystalline Ridges and Mountains ecoregion and the Pisgah National Forest. **Habitat** -- long runs, good riffles, chutes, side snags, and a few undercuts; nice forested riparian zone widths; very low conductivity. **2007** -- an abundant (n = 746) and diverse fish community including 4 intolerant species (Smallmouth Bass, Fieryblack Shiner, Piedmont Darter, and Rainbow Trout) was collected with a maximum NCIBI score and rating. **2002 - 2007** -- a total of 22 fish species are known from this watershed including 8 minnow species, 4 sucker species, and 3 darter species; based on two consecutive Excellent ratings, this regional reference site qualifies for HQW or ORW status if petitioned.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Crooked Cr	SR 1135	CB20	07/12/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	3050101	353620	820701	11-12	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	29	1520	9	0.4

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	50	10	10	30

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

Water Quality Parameters

Temperature (°C)	25.4
Dissolved Oxygen (mg/L)	6.3
Specific Conductance (µS/cm)	42
pH (s.u.)	7.3
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	13
Pool Variety (10)	3
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	5
Total Habitat Score (100)	78

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/12/07	10254	---	27	---	3.29	Good-Fair
08/07/02	8932	74	32	4.41	3.66	Good
08/06/97	7401	69	38	4.25	3.74	Good
07/08/92	5895	---	32	---	3.03	Good

Taxonomic Analysis

EPT taxa present from all previous samples but absent in 2007 were restricted to just mayflies and included *Baetis flavistriga* , *Baetis pluto* , and *Caenis* . As these are fairly tolerant EPT taxa their absence in 2007 does not support a conclusion of deteriorating water chemistry.

Data Analysis

Although the 2007 sample had fewer EPT than any other collection, the 2007 collection was just one EPT taxon short of receiving a bioclassification of Good. In addition, the EPT BI was the second lowest ever measured at this location. These data suggest that the overall water quality remains essentially unchanged from earlier collections. This is supported by the 2007 conductivity value (43 µS/cm) which was down from 50 µS/cm in 2002 and 70 µS/cm in 1997. These data are consistent with a watershed where nonpoint pollution is the largest potential source of stress and in a drought year reduced runoff would be expected to result in lower stream conductivity. Why the reduced runoff did not translate into additional EPT taxa is unknown and is not likely the result of drought-induced habitat limitations as several edge taxa were present in 2007. However, despite the lower EPT richness, the EPT BI was the second lowest measured.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CROOKED CR	**SR 1135**	**05/24/07**	**CF9**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MCDOWELL	30	03050101	35.60527778	-82.11694444	11-12	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	28.6	1438	12	0.3	Yes

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	90	5 (rural residential)	0	5 (construction site)

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

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	40
pH (s.u.)	5.5

Water Clarity: Slightly turbid

Site Photograph

Habitat Assessment Scores (max)

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

Substrate: sand, gravel, cobble, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/24/07	2007-67	19	52	Good
04/30/02	2002-35	22	56	Excellent

Most Abundant Species: Fantail Darter

Exotic Species: Brown Trout

Species Change Since Last Cycle: **Gains** -- Flat Bullhead, Western Blacknose Dace, and Brown Trout. **Losses** -- Fieryblack Shiner, Eastern Silvery Minnow, Bluegill, Smallmouth Bass, Notchlip Redhorse, and Yellow Perch.

Data Analysis

Watershed -- a tributary to the Catawba River, located about 4.5 miles above its confluence; drains the extreme southwest corner of McDowell County, just below the town of Old Fort; the headwaters of this watershed lie within the Southern Crystalline Ridges and Mountains ecoregion. **Habitat** -- shallow sandy runs, good riffles, and stick snags; good canopy and forested riparian zone widths; the low morning pH tracks the overnight highs in stream respiration. **2007** -- a diverse and abundant (n = 466) fish community collected including the intolerant Piedmont Darter. **2002 - 2007** -- overall, the NCIBI metrics have remained stable in this stream; the loss of two intolerant species (Fieryblack Shiner and Smallmouth Bass) are driving the slight decline in NCIBI score and rating; this regional reference watershed is supporting a diverse fish community including 25 known fish species; there are no apparent water quality issues in this watershed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Mackey Cr	US 70	CB34	07/12/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354011	820651	0	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-I;Tr;HQW	7.5	1360	7	0.4

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

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

Water Quality Parameters

Temperature (°C)	26.2
Dissolved Oxygen (mg/L)	5.9
Specific Conductance (µS/cm)	35
pH (s.u.)	7.1
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	82

Site Photograph

Substrate boulder, cobble, gravel, sand, and bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/12/07	10252	---	33	---	3.14	Good
08/06/02	8911	67	30	4.25	3.68	Good
03/25/98	7541	29	15	4.44	3.93	Fair
10/21/96	7218	43	25	4.90	4.47	Good-Fair

Taxonomic Analysis

The 2007 EPT sample resulted in the highest EPT taxa richness ever at this site. This is particularly significant as all but the 1998 sample were collected using the more intensive Full-Scale methodology. EPT taxa collected in 2007 not previously observed here included the mayfly *Eurylophella verisimilis* , *Hexagenia* , the stonefly *Paragnetina fumosa* , and the caddisflies *Goera* , *Heteroplectron americanum* , *Oecetis persimilis* , and *Triaenodes perna* .

Data Analysis

Historically, a metal plating facility (Metal Industries, Inc.) had maintained a small (0.01 MGD) NPDES discharge upstream of this location. However, this facility ceased its discharge just prior to July, 2002 and an immediate and dramatic improvement in the invertebrate community was noted just one month later as the August 6, 2002 sample produced a doubling of the EPT taxa richness over the previous sample in 1998. In addition to the improving EPT taxa richness measured here, the BI and EPT BI continue to decrease demonstrating that the invertebrate community continues recovery following the removal of the discharge.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Buck Cr	**NC 80**	**CB6**	**07/11/07**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354405	820605	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III;Tr;HQW	14	1600	17	0.4

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

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

Water Quality Parameters

Temperature (°C)	22.4
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	28
pH (s.u.)	6.9
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	14
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	94

Site Photograph

Substrate cobble, boulder, bedrock, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10248	---	45	---	2.88	Excellent
08/05/02	8905	---	31	---	3.04	Good
08/06/97	7397	---	38	---	2.59	Excellent
06/14/94	6558	75	41	3.28	2.47	Excellent
02/10/94	5773	---	42	---	2.20	Excellent

Taxonomic Analysis

The 2007 EPT collection produced the highest EPT taxa richness ever measured at this site. Even the more intensive Full-Scale collection from June 1994 did not produce as many EPT taxa as seen in 2007. EPT collected in 2007 and not previously observed here included the intolerant mayflies *Ephemerella dorothea* , *Serratella carolina* , and the caddisflies *Lepidostoma* and *Psychomyia flavida* .

Data Analysis

Almost all of the Buck Creek catchment is forested with only a few residences observed upstream. However, large portions of the NC 80 corridor are contained in this watershed. Despite the presence of NC 80, this site has been quite stable through time in terms of EPT species richness and EPT BI. The 2007 high EPT species diversity was most similar to that found in 1994.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Little Buck Cr	SR 1436	CB27	07/11/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354403	820502	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-II;B;Tr;HQW	5.7	1430	7	0.4

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

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

Water Quality Parameters

Temperature (°C)	21.7
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	23
pH (s.u.)	6.9
Water Clarity	clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	14
Pool Variety (10)	8
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	89

Substrate boulder, cobble, gravel, and bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10100	---	49	---	2.51	Excellent
08/06/02	8910	---	35	---	2.75	Good
08/06/97	7398	---	37	---	2.44	Excellent
02/10/92	5774	---	43	---	2.01	Excellent
07/09/91	5652	60	37	2.75	2.32	Good

Taxonomic Analysis

The 2007 Little Buck Creek sample produced the highest EPT species richness ever measured at this location. Numerous EPT taxa not previously collected here but present in 2007 included: the mayflies *Diphetor hageni* , *Habrophlebioides* , and *Serratella serratoides;* the stoneflies *Acroneuria arenosa* and *A. carolinensis;* and the caddisflies *Neophylax consimilis* , and *N. ornatus* .

Data Analysis

This site has oscillated between Good and Excellent since sampling first started here in 1991. Nearly all of the Little Buck Creek watershed is forested with only a few rural residences observed. Predictably, the invertebrate community here is not only temporally stable, but it is also pollution intolerant and diverse. In addition to the few residences, there are small breaks in the riparian zone associated with SR 1436.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N Fk Catawba R	SR 1573	CB42	07/11/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	355005	820010	0	Southern Metasedimentary Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr	32	1420	8	0.4

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	60	20	0	20 (commercial, industrial)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Baxter Healthcare	NC0006564001	1.2

Water Quality Parameters

Temperature (°C)	22.2
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	107
pH (s.u.)	7.5
Water Clarity	slightly turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	13
Bottom Substrate (15)	12
Pool Variety (10)	3
Riffle Habitat (16)	13
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	2
Total Habitat Score (100)	69

Substrate boulder, gravel, cobble, sand, and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10097	---	31	---	4.20	Good
08/06/02	8907	---	29	---	3.80	Good
08/08/97	7408	---	37	---	2.97	Excellent
01/09/91	5510	---	37	---	2.83	Good

Taxonomic Analysis

Considering the last three summer samples, EPT taxa richness has never reached the highest level seen in 1997. Several intolerant EPT taxa present in 1997 but absent in 2002 and 2007 included the mayfly *Paraleptophlebia* , the stoneflies *Acroneuria abnormis* , *Leuctra* , *Malirekus hastatus* , and *Perlesta* , and the caddisflies *Dolophilodes* , *Glossosoma* , *Goera* , *Neophylax consimilis* , and *Helicopsyche borealis* . Moreover, at least two taxa of pollution tolerant caddisflies (*Hydropsyche betteni* and *H. venularis*) were collected for the first time at this location in 2002 and 2007. These data suggest slightly worsening conditions in this catchment.

Data Analysis

In addition to lower trending EPT taxa richness at this site since 1997, this location has also been experiencing an increasing trend in EPT BI over the same timeframe. Moreover, there has been a decreasing trend in EPT abundance with the 2007 and 2002 samples producing the lowest abundance totals (121 and 97 respectively) whereas samples in 1997 and 1991 resulted in 167 and 185 individuals respectively. Collectively, these trends suggest deteriorating conditions in this catchment.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N Fk Catawba R	SR 1560	CB41	07/11/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354804	820107	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;Tr	44	1380	20	0.4

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	60	10	10	20

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Coats American-Sevier Plant	NC0004243001	2.0
Baxter Healthcare	NC0006564001	1.2

Water Quality Parameters

Temperature (°C)	24.4
Dissolved Oxygen (mg/L)	6.4
Specific Conductance (µS/cm)	206
pH (s.u.)	7.0
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	4
Riffle Habitat (16)	13
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	1
Total Habitat Score (100)	69

Site Photograph

Substrate: cobble, boulder, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10098	---	21	---	4.16	Good-Fair
08/27/03	9295	78	33	4.24	3.71	Good
08/06/02	8909	74	23	5.90	4.92	Fair
08/05/97	7394	81	39	3.90	3.09	Good
07/07/92	5889	95	41	4.20	3.31	Good

Taxonomic Analysis

The 2007 (EPT) sample produced the fewest EPT taxa ever noted at this location although the 2002 (Full-Scale) sample had the second lowest EPT taxa richness. In both 2007 and 2002 there were numerous EPT taxa that were absent but which had been present at all other summer sampling events and included the mayflies *Epeorus rubidus* and *Leucrocuta*, the stoneflies *Acroneuria abnormis*, *Leuctra*, *Paragnetina immarginata*, and *Tallaperla*, and the caddisflies *Glossosoma*, and *Micrasema wataga*. The 2007 and 2002 samples were taken during severe droughts. The absence of these taxa, along with the lowered bioclassifications in 2007 and 2002, were likely the result of concentrated effluent from the upstream dischargers (Coats American and Baxter Healthcare).

Data Analysis

The 2002 and 2007 drought year samples had by far the highest conductivity (400 µS/cm and 206 µS/cm respectively) with the next highest (133 µS/cm) being measured in 2003. Increased stream conductivity would be expected under drought conditions where there are significant upstream NPDES inputs as is the case here. Although these two samples were taken in drought years, it appears that lowered flows did not adversely effect available habitat (and therefore EPT diversity) as the edge-dwelling caddisflies *Oecetis persimilis* and *Triaenodes ignitus* were plentiful from both sampling events. Moreover, although the 2007 sample was collected using the less intense EPT collection method (where all other samples had been obtained using the more intense Full-Scale collection method) this sampling discrepancy did not account for the lower EPT richness as all taxa absent in 2007 are readily collected using EPT methods and are not specific to Full-Scale collection methods.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Armstrong Cr	Armstrong Creek Rd	CB1	07/11/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354830	820428	0	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr;HQW	14	1800	7	0.5

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

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

Water Quality Parameters

Temperature (°C)	20.8
Dissolved Oxygen (mg/L)	7.0
Specific Conductance (µS/cm)	28
pH (s.u.)	6.1
Water Clarity	clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	88

Substrate boulder, cobble, gravel, and bedrock

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10049	---	44	---	2.55	Excellent
08/06/02	8908	---	38	---	2.80	Excellent
08/05/97	7390	---	36	---	2.15	Excellent
07/07/92	5890	---	38	---	2.11	Excellent

Taxonomic Analysis

The 2007 sample resulted in the highest EPT taxa richness recorded for this location. EPT collected in 2007 not previously observed here included the intolerant mayflies *Drunella cornutella* , *Epeorus dispar* , *Serratella carolina* , and the caddisflies *Ceratopsyche morosa* , and *Neophylax mitchelli* .

Data Analysis

Nearly all of the Armstrong Creek watershed is forested with only a few rural residences observed. Predictably, the invertebrate community here is not only temporally stable, but it is also pollution intolerant and diverse. The 2007 sample had the highest EPT taxa richness noted at this location and the EPT abundance was also the highest every measured (261) with a previous high of 176 seen in 1997. There is very little disturbance in this catchment, though there are some small breaks in the riparian zone associated with Armstrong Creek Road.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
PADDY CR	**NC 126**	**05/23/07**	**CF47**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	30	03050101	35.7661111	-81.905	11-28	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	6.7	1315	7	0.3	No

	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)	17.1
Dissolved Oxygen (mg/L)	8.4
Specific Conductance (µS/cm)	16
pH (s.u.)	6.3

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	15
Pool Variety (10)	9
Riffle Habitat (16)	16
Left Bank Stability (7)	5
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	0
Right Riparian Score (5)	3
Total Habitat Score (100)	**86**

Site Photograph

Substrate: Large cobble and bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/23/07	2007-64	12	46	Good-Fair
05/01/02	2002-38	13	46	Good-Fair
05/05/97	97-31	9	40	Fair

Most Abundant Species: Central Stoneroller

Exotic Species: Brown Trout and Smallmouth Bass

Species Change Since Last Cycle: **Gains** -- Bluehead Chub X Rosyside Dace hybrids (2), Flat Bullhead, and Brown Trout. **Losses** -- White Sucker, Striped Jumprock, and Snail Bullhead.

Data Analysis

Watershed -- tributary to Lake James (the Catawba River); borders the Northern Inner Piedmont and the Eastern Blue Ridge Foothills; rural; forested watershed with pasture in the lower reaches; livestock with direct access to the stream from both banks. **Habitat** -- shallow riffles and runs; high gradient plunge pools with bedrock shelves and chutes; *Podostemum*; barren riparian areas due to cattle grazing and trampling. **2007** -- very low flow; conductivity consistently low (the lowest of any fish community site in the Catawba River basin in 2007) even though cattle have access to the stream. **1997 - 2007** -- no real change in fish community; the dominant species continued to be the Central Stoneroller, a species that successfully exploits mountain streams that have been altered by livestock; 15 species known from the site, but only 1 species of darter; percentage of omnivores and insectivores ~ 50%; community is isolated by Lake James which continues to serve as a barrier to recolonization by some species; community also affected by hydrologic extremes in flows (i.e., prolonged droughts followed by hurricane-induced flooding); habitat scores have ranged from 75 to 87.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Linville R	US 221	CB33	07/10/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Avery	30	03050101	360144	815345	11-29-(4.5)	Southern Metasedimentary Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C;Tr	20	2650	11	0.3

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

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

Water Quality Parameters

Temperature (°C)	22.4
Dissolved Oxygen (mg/L)	6.6
Specific Conductance (µS/cm)	70
pH (s.u.)	7.3
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	3
Riffle Habitat (16)	11
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	1
Right Riparian Score (5)	3
Total Habitat Score (100)	67

Site Photograph

Substrate: bedrock, cobble, boulder, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10096	101	29	5.81	4.21	Good-Fair
08/06/02	8906	---	28	---	3.90	Good
08/05/97	7396	---	27	---	3.25	Good-Fair
06/10/97	7280	---	24	---	3.24	Good-Fair
07/06/92	5887	---	30	---	3.27	Good

Taxonomic Analysis

A Full-Scale sample was taken here for the first time in order to better assess potential impacts due to the rapidly expanding upstream areas of Newland, Linville, and Grandfather Mountain. Despite the more intensive collection methodology, the 2007 sample still produced EPT taxa richness and EPT abundance levels comparable to earlier, less intensive EPT samples. In addition, the 2007 sample resulted in the highest EPT BI ever measured here and may suggest a slightly more tolerant invertebrate community relative to earlier samples. Facultative EPT taxa collected for the first time in 2007 include the mayflies *Plauditus dubius* , and *Procloeon* , and the caddisfly *Hydropsyche venularis* . In addition, the gastropod *Physella* , which can thrive in low dissolved oxygen conditions, was abundant and suggests that low dissolved oxygen may be a stress to this system.

Data Analysis

Conductivity was the highest ever measured at this location in 2007 (70µS/cm) and has been steadily increasing since 1997 with two measurements in 1997 at 20 µS/cm and 34 µS/cm respectively and one in 2002 measured at 59 µS/cm. Landuse activities stream of this location is a mix of forest, residential areas, and several golf courses. The high conductivity level despite the 2007 drought in this nonpoint driven system suggests increased levels of land disturbance or possibly increased point sources such as straight piping, or effects from upstream lakes. However, water temperature (22 degrees in 2007, 2002 and 1997) and pH (7.3 in 2007, 7.1 in 2002, 7.3 in 1997) and dissolved oxygen (6.6 mg/L in 2007, 6.3 mg/L in 2002, and 7.5 mg/L in 1997) have all been very stable and therefore do not suggest any changes due to the lakes.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Linville R	NC 126	CB32	07/10/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	30	03050101	354741	815325	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
B;HQW	67	1220	35	0.4

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

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

Water Quality Parameters

Temperature (°C)	25.6
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	53
pH (s.u.)	7.1
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	10
Pool Variety (10)	5
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	5
Left Riparian Score (5)	2
Right Riparian Score (5)	4
Total Habitat Score (100)	74

Site Photograph

Substrate boulder, cobble, gravel, sand, and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10095	95	45	4.01	3.41	Excellent
08/23/02	8978	91	48	4.22	3.48	Excellent
08/04/97	7386	107	53	4.05	3.12	Excellent
07/07/92	5886	108	48	4.15	3.15	Excellent
07/09/91	5650	84	43	4.03	3.03	Excellent

Taxonomic Analysis

The benthic macroinvertebrate community at this location is remarkably stable and is indicative of the largely protected nature of this catchment. Several intolerant taxa have been collected here at every sampling attempt and include: the mayflies *Epeorus rubidus* , *Leucrocuta* , *Heptagenia marginalis;* the stoneflies *Acroneuria abnormis* , *Leuctra* , and *Paragnetina ichusa;* and the caddisflies *Ceratopsyche morosa* , *C. sparna* , *Chimarra* , *Lepidostoma* , *Micrasema wataga* , *Polycentropus* , and *Nyctiophylax* .

Data Analysis

This location has been sampled 23 times since 1983. Twenty of these samples produced bioclassifications of Excellent with only three samples (8/10/1983, 8/16/1985, and 3/29/1989) producing bioclassifications of Good. This location is immediately downstream of the Linville Gorge Wilderness Area and nearly all of the immediate catchment is protected. The stable, protected nature of most of the watershed upstream of this location helps explain the remarkable consistency of Excellent bioclassifications here through time. However, the last two samples have produced two of the highest EPT BIs (3.41 and 3.40 respectively) since sampling started here and may reflect increased residential growth adjacent to nearby river segments which are outside of the protected Wilderness Area.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
N MUDDY CR	**SR 1760**	**05/23/07**	**CF46**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MCDOWELL	30	03050101	35.675	-81.90638889	11-32-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	42.8	1100	11	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Marion - Corpening Creek WWTP (approximately 6 miles upstream)	NC0031879	3.0

Water Quality Parameters

Temperature (°C)	19.2
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	71
pH (s.u.)	7.9

Water Clarity: Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	5
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**79**

Site Photograph

Substrate: bedrock, sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/23/07	2007-65	23	54	Excellent
04/30/02	2002-36	19	48	Good
05/07/97	97-36	20	52	Good

Most Abundant Species: Bluehead Chub

Exotic Species: Green Sunfish

Species Change Since Last Cycle: **Gains** -- Flat Bullhead, Green Sunfish, Pumpkinseed, Bluegill, and Creek Chub. **Losses** -- Warmouth.

Data Analysis

Watershed -- a tributary to Muddy Creek located about 3 miles upstream of its confluence; drains part of southeastern McDowell County including most of the City of Marion. **Habitat** -- runs, fast plunge chutes, and bedrock ledge pools; nicely forested riparian zones with tall bluffs and bedrock outcrops. **2007** -- the highest number of species collected in the Catawba River basin for the year, including 4 species of suckers, 4 species of sunfish, 9 species of minnows, 3 species of catfish, and 3 species of darters. **1997 - 2007** -- a more balanced trophic structure of the fish community is the main reason for the improvements seen in the 2007 NCIBI score and rating. This watershed continues to support a highly diverse fish community with no apparent detrimental water quality issues.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
N Muddy Cr	SR 1760	CB44	07/09/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	354031	815423	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	43	1100	12	0.5

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Marion, Corpening Creek WWTP	NC0031879	3

Water Quality Parameters

Temperature (°C)	23.9
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	76
pH (s.u.)	7.8
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	12
Pool Variety (10)	5
Riffle Habitat (16)	14
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	81

Site Photograph

Substrate boulder, cobble, gravel, and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/09/07	10092	78	25	5.36	4.39	Good-Fair
08/05/02	8902	79	32	5.51	4.59	Good-Fair
08/04/97	7388	63	33	4.76	4.26	Good
07/08/92	5892	80	32	4.95	4.47	Good-Fair
04/17/85	1426	85	35	5.48	4.16	Good-Fair

Taxonomic Analysis

The 2007 sample produced by far the fewest EPT taxa ever collected although total species richness remained consistent with previous samples. This fact, combined with the collection of many edge-dwelling caddisflies in 2007, suggests that there were no drought-related habitat effects. Among the most notably intolerant and long-lived taxa absent in 2007 but collected previously included two species of stonefly (*Paragnetina fumosa* and *Paragnetina immarginata*) as well as the intolerant caddisflies *Goera* and *Glossosoma*.

Data Analysis

The sharp decline in EPT taxa richness in 2007 is likely the result of drought effects concentrating effluent from upstream dischargers. This may explain the disappearance of the long-lived *Paragnetina* species as well as the intolerant caddisflies *Goera* and *Glossosoma*. While the overall BI and EPT BI have been relatively stable since 1985, the drastic decline in numerous EPT taxa suggests a decline in water quality at this location for 2007.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Corpening Cr	SR 1819	CB17	07/09/07	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	353914	815747	0	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	6.5	1210	6	0.3

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

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

Water Quality Parameters

Temperature (°C)	21.8
Dissolved Oxygen (mg/L)	7.6
Specific Conductance (µS/cm)	52
pH (s.u.)	7.0
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	12
Pool Variety (10)	6
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	78

Site Photograph

Substrate cobble, sand, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/09/07	10091	---	7	---	5.99	Poor
08/07/02	8930	65	21	5.79	4.62	Fair
04/09/01	8404	52	15	5.36	4.73	Fair
08/08/97	7407	---	16	---	5.02	Fair
09/12/90	5443	55	17	6.11	5.36	Fair

Taxonomic Analysis

The 2007 EPT sample produced the fewest EPT, highest EPT BI, and lowest EPT abundance ever measured at this location. Although several tolerant mayflies (*Baetis flavistriga* and *B. pluto*) and caddisflies (*Cheumatopsyche* and *Hydropsyche betteni)* remained either common or abundant in 2007 (as they were in previous samples) no stoneflies were collected here for the first time since sampling started in 1985. In addition, no heptageniid mayflies were collected in 2007 for the first time. All previous samples had at least two of these taxa (always common or abundant) present. Heptageniid mayflies have been shown to be sensitive to metal toxicity. Their absence in 2007 may suggest metal toxicity.

Data Analysis

All previous samples had at least one habitat-edge taxa present (either *Triaenodes* or *Pycnopyche* or both). The 2007 sample lacked all such taxa. This suggests that the drought had lowered water levels enough to preclude their collection. Nonetheless, the absence of just one or two of these taxa would not improve the bioclassification from Poor and therefore their absence does not explain the decrease in bioclassification in 2007. Moreover, the absence of heptageniids and stoneflies for the first time suggest worsening water quality in this catchment. This is surprising since the catchment is dominated by non-point pollution and would likely improve with lessened runoff due to drought. Indeed, the 2007 conductivity (51.6µS/cm) was significantly less than the three previous measurements from 1997, 2001, and 2002 (120 µS/cm, 91 µS/cm, and 130 µS/cm respectively). The 2007 and 1997 sample were both sampled by EPT collection methods. Every other sample was taken usuing more intensive Full-Scale methods. That the 1997 EPT sample had better EPT metrics versus the 2007 EPT sample supports worsening conditions rather than sample method bias.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S MUDDY CR	SR 1764	05/23/07	CF50	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MCDOWELL	30	03050101	35.64972222	-81.855	11-32-2	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	33.2	1100	8	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	18.7
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	45
pH (s.u.)	6.2

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	4
Pool Variety (10)	4
Riffle Habitat (16)	12
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	**66**

Site Photograph

Substrate: sand, cobble, boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/23/07	2007-66	16	52	Good
05/01/02	2002-37	14	48	Good
07/02/97	97-70	15	50	Good
06/28/93	93-27	11	50	Good

Most Abundant Species: Greenhead Shiner

Exotic Species: None

Species Change Since Last Cycle: **Gains** -- Flat Bullhead, Northern Hogsucker, and Warmouth. **Losses** -- Notchlip Redhorse.

Data Analysis

Watershed -- a tributary to Muddy Creek located about 3.5 miles above its confluence; drains the extreme southeast corner of McDowell County including parts of the Northern Inner Piedmont and the Eastern Blue Ridge Foothills ecoregions. **Habitat** -- primarily one long sandy run with side snags and a few riffles; both the left and right 6-12 meter riparian zones are bordered by active crops; chicken manure had just been applied to the adjacent fields, yet relatively low stream conductivity. **2007** -- good abundance and diversity of the fish community with the highest number of species collected at this site; improvement of NCIBI comes from a very slight shift in the fish community trophic structure. **1993 - 2007** -- stable NCIBI metrics and scores over a 14 year period; the Muddy Creek Watershed Restoration Initiative is likely a contributing factor to the Good water quality in this watershed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Canoe Cr	SR 1250	CB8	07/10/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	30	03050101	354549	814553	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	12	1100	6	0.4

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

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

Water Quality Parameters

Temperature (°C)	21.4
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	49
pH (s.u.)	6.5
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	12
Pool Variety (10)	3
Riffle Habitat (16)	9
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	71

Site Photograph

Substrate sand, silt, gravel, cobble, and boulder

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10249	---	27	---	4.11	Good-Fair
08/21/02	8971	---	28	---	3.51	Good
08/04/97	7411	---	19	---	4.05	Good-Fair
08/03/92	5958	---	25	---	3.14	Good-Fair

Taxonomic Analysis

The mayfly *Paraleptophlebia* , and the caddisfly *Brachycentrus nigrosoma* were all collected from each previous sample but were absent in 2007. Conversely, there were several mayflies (e.g., *Plauditus punctiventris* and *Leucrocuta*) and caddisflies (e.g., *Diplectrona modesta* , *Lype diversa* , and *Polycentropus*) that were present in 2007 but were absent from all other previous samples. These data suggest overall stable conditions in this watershed.

Data Analysis

Although this site technically decreased in bioclassification from Good in 2002 to Good-Fair in 2007, the 2007 sample was only one EPT taxon short of receiving a Good bioclassification. In addition, the 27 EPT taxa collected in 2007 was still higher than levels measured in 1997 and 1992. Overall, the EPT community apepars to be relatively stable in this catchment.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Silver Cr	SR 1127	CB86	08/03/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	31	03050101	354057	814800	11-34-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	21	1080	8	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)	20.2
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	50
pH (s.u.)	7.0
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	15
Bottom Substrate (15)	8
Pool Variety (10)	6
Riffle Habitat (16)	7
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	60

Site Photograph

Substrate mostly sand; remainder a mix of cobble, boulder, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/03/07	10291	---	31	---	4.11	Good
08/21/02	8970	---	25	---	3.74	Good-Fair

Taxonomic Analysis

Abundant EPT taxa collected from the site in 2007 were: *Baetis intercalaris, B. pluto, Serratella deficiens, Maccaffertium modestum, Maccaffertium pudicum, Stenacron pallidum, Isonychia, Leuctra, Pteronarcys proteus, Brachycentrus nigrosoma, Cheumatopsyche, Hydropsyche betteni,* and *Triaenodes ignitus.* Most of the difference between EPT taxa present in the 2002 and 2007 samples involved rare taxa in one or the other. Exceptions are: *Maccaffertium pudicum*--absent in 2002 and abundant in 2007; *Eccoptura xanthenes*--common in 2002 and absent in 2007; *Ceratopsyche sparna*--absent in 2002 and common in 2007; and *Polycentropus*--absent in 2002 and common in 2007.

Data Analysis

The site is eight miles southwest of Morganton. Six additional EPT taxa collected in 2007 over 2002 pushes the site into the classification of Good. The bottom substrate was dominated by sand; cobbles and boulders were about half embedded in the sand. Such habitat characteristics can limit the benthic community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SILVER CR	SR 1149	05/22/07	CF51	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	31	03050101	35.69805556	-81.76305556	11-34-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	26.1	1095	11	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	18.6
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	50
pH (s.u.)	6.3

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	2
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**51**

Site Photograph

Substrate	sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/07	2007-62	13	50	Good
05/01/02	2002-39	19	60	Excellent

Most Abundant Species	Greenhead Shiner	Exotic Species	None

Species Change Since Last Cycle

Gains -- None. **Losses** -- Redfin Pickerel, Highback Chub, Green Sunfish, Bluegill, Largemouth Bass, and Yellow Perch.

Data Analysis

Watershed -- a tributary to the Catawba River located almost 5 miles above its confluence; drains the extreme southwest corner of Burke County below Glen Alpine. **Habitat** -- sandy runs with side snags and a few small pools; low flow; good riparian zone widths. **2007** -- the decline in NCIBI score and rating at this site reflects the reduction in total abundance (n= 152 vs. 384 in 2002) and diversity, including the loss of all three piscivorous species collected in 2002 (Redfin Pickerel, Largemouth Bass, and Yellow Perch); low flows and possibly non-point sources of sediment are likely responsible, evidenced by the marginal pool habitats and exposed substrates present. **2002 - 2007** -- there are 19 known species from this stream including 2 species of suckers, 7 species of minnows, and 3 species of darters. Overall, water quality continues to be good.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Warrior Fk	SR 1440	CB102	08/02/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	31	03050101	354749	814307	11-35-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III	82	1000	17	0.4

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

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

Water Quality Parameters

Temperature (°C)	25.4
Dissolved Oxygen (mg/L)	7.9
Specific Conductance (µS/cm)	37
pH (s.u.)	6.8
Water Clarity	clear

Habitat Assessment Scores (max)

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

Site Photograph

Substrate mix of gravel, cobble, sand, and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/02/07	10288	---	39	---	4.14	Excellent
08/21/02	8972	---	34	---	3.31	Good
08/04/97	7413	---	41	---	3.26	Excellent

Taxonomic Analysis

Along with *Oectis persimilis*, two species of *Oecetis* rarely identified from BAU samples were collected from the site for the first time in 2007: *O. avara* and *O. sphyra*. Though abundant in the 1997 collection, both *Epeorus rubidus* and *Psychomyia nomada* have not been collected from the site during the most recent two sampling events. Similarly, *Lepidostoma*, which was common in the 1997 collection, was not collected in the two latest samples. Abundant EPT taxa collected in 2007 were: *Caenis, Hexagenia, Maccaffertium modestum, Stenacron pallidum, Isonychia, Cheumatopsyche, Triaenodes ignitus,* and *Polycentropus.*

Data Analysis

The site is four miles NNW of Morganton and three stream-miles upstream of Catawba River. Five more EPT taxa were collected in 2007 than in 2002, putting the site back into the Excellent classification in 2007.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
S Muddy Cr	SR 1764	CB51	07/09/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
McDowell	30	03050101	353900	815118	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	31	1100	10	0.5

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

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

Water Quality Parameters

Temperature (°C)	23.6
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	47
pH (s.u.)	6.8
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	14
Bottom Substrate (15)	11
Pool Variety (10)	3
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	65

Site Photograph

Substrate boulder, cobble, gravel, sand, and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/09/07	10093	---	32	---	3.94	Good
08/05/02	8903	---	23	---	4.22	Good-Fair
08/04/97	7387	---	24	---	3.68	Good-Fair
07/08/92	5893	---	27	---	3.64	Good-Fair

Taxonomic Analysis

The 2007 sample resulted in the highest EPT taxa richness ever recorded at this location. EPT taxa not previously collected from this site but observed in 2007 include the mayflies *Procloeon* , *Serratella serratoides* , the stonefly *Paragnetina fumosa* , and the caddisflies *Lype diversa* , *Neophylax oligius* , and *Pycnopsyche lepida* . Like most streams in this subbasin, the drought does not seem to be adversely affecting the instream habitat of South Muddy Creek as numerous edge caddisflies were collected in 2007 and included *Oecetis persimilis* and *Triaenodes ignitus* .

Data Analysis

The South Muddy Creek watershed is dominated by agricultural uses. The large increase in EPT taxa measured in 2007 is likely related to reduced non-point pollution runoff due to the severe drought.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
IRISH CR	**SR 1439**	**05/22/07**	**CF22**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	31	03050101	35.81638889	-81.74805556	11-35-3-(2)b	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-III	31.7	1100	11	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	18.6
Dissolved Oxygen (mg/L)	9.4
Specific Conductance (µS/cm)	37
pH (s.u.)	6.0

Water Clarity	Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	1
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	**50**

Site Photograph

Substrate sand, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/07	2007-61	21	54	Excellent
07/30/03	2003-48	13	40	Fair
05/02/02	2002-42	17	38	Fair

Most Abundant Species	Tessellated Darter	**Exotic Species**	Smallmouth Bass

Species Change Since Last Cycle

Gains -- Central Stoneroller, Rosyside Dace, Greenfin Shiner, Seagreen Darter, Warmouth, Warpaint Shiner, Greenhead Shiner, Margined Madtom, Piedmont Darter, and Striped Jumprock. **Losses** -- Rock Bass and Yellow Perch.

Data Analysis

Watershed -- a tributary to Warrior Fork, located less than 1 mile above its confluence; drains a portion of northwestern Burke County; the upper reaches of this watershed lie within the Pisgah National Forest and the lower reaches flow through land used extensively for tree farming. **Habitat** -- sandy runs with side snags, root mats, and a few stick riffles; tree farms flank the site outside of its 6-12 meter riparian zones. **2007** -- a diverse and trophically balanced fish community was collected; a major improvement from the 2003 sample with 8 more species collected, including two intolerant species (Seagreen Darter, and Piedmont Darter), and greater than triple the total abundance (n = 194 vs. 52 in 2003). **2002 - 2007** -- there are 26 known species fish from this site, including 4 species of suckers, 9 species of minnows, and 4 species of darters. The reason for the dramatic change in the NCIBI rating is unknown since land use, riparian coverage, and instream habitats appear the same as in previous samples.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
JOHNS R	**off SR 1367**	**05/22/07**	**CF73**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	31	03050101	36.0517131	-81.70123	11-38-(1)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	18.4	1400	11	0.3	Yes

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

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

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	10.0
Specific Conductance (µS/cm)	42
pH (s.u.)	7.4

Water Clarity: Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	5
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	**90**

Substrate: cobble, bedrock, boulder, gravel, sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/07	2007-60	17	56	Excellent

Most Abundant Species: Central Stoneroller

Exotic Species: Smallmouth Bass, Rainbow Trout, and Brown Trout

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a headwater tributary to the Catawba River located in the northwest corner of Caldwell County; this catchment is situated directly between the Gragg Prong and Mulberry Creek watersheds within the Pisgah National Forest lands. **Habitat** -- riffles, plunge pools and runs; good riparian zones, and fairly open canopy; similar to the Gragg Prong site, substrates were minimally embedded. **2007** -- good diversity and high abundance (n = 793) including 3 intolerant species collected (Smallmouth Bass, Fieryblack Shiner, and Rainbow Trout); within the 17 species collected, there were 3 species of suckers, 6 species of minnows, and 2 species of darters. There are no indications of any water quality issues in this watershed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Johns R	SR 1356	CB73	07/13/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Caldwell	31	03050101	355603	814129	11-38-(28)	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	64	1080	17	0.4

	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)	23.3
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	40
pH (s.u.)	6.9
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	17
Bottom Substrate (15)	14
Pool Variety (10)	5
Riffle Habitat (16)	12
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	1
Total Habitat Score (100)	79

Site Photograph

Substrate mix of cobble, gravel, and sand; some boulder, silt also present

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/13/07	10256	---	45	---	2.84	Excellent
08/22/02	8975	---	43	---	3.38	Excellent
08/05/97	7415	---	49	---	2.56	Excellent
08/03/92	5957	---	43	---	3.15	Excellent

Taxonomic Analysis

No significant changes in the biota were noted between the four basinwide sampling events at the site. Abundant taxa in 2007 were *Epeorus rubidus, Heptagenia marginalis, Maccaffertium modestum, Stenacron pallidum, Isonychia, Tallaperla, Acroneuria abnormis, Apatania, Ceratopsyche morosa, Cheumatopsyche, Triaenodes ignitus, Chimarra, Neophylax fuscus* , and *Neophylax oligius* . *Brachycentrus lateralis* , rarely identified from BAU samples, has been collected from the site during three of the four basinwide sampling events.

Data Analysis

The site is about 8 miles west of Lenoir and 1.5 stream-miles upstream of the mouth of Mulberry Creek. The catchment is contained within Pisgah National Forest. The benthic community continues to indicate a high-quality site in terms of water quality.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Johns R	SR 1438	CB269	08/01/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	31	03050101	355002	814242	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV;HQW	201	1000	35	0.4

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

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

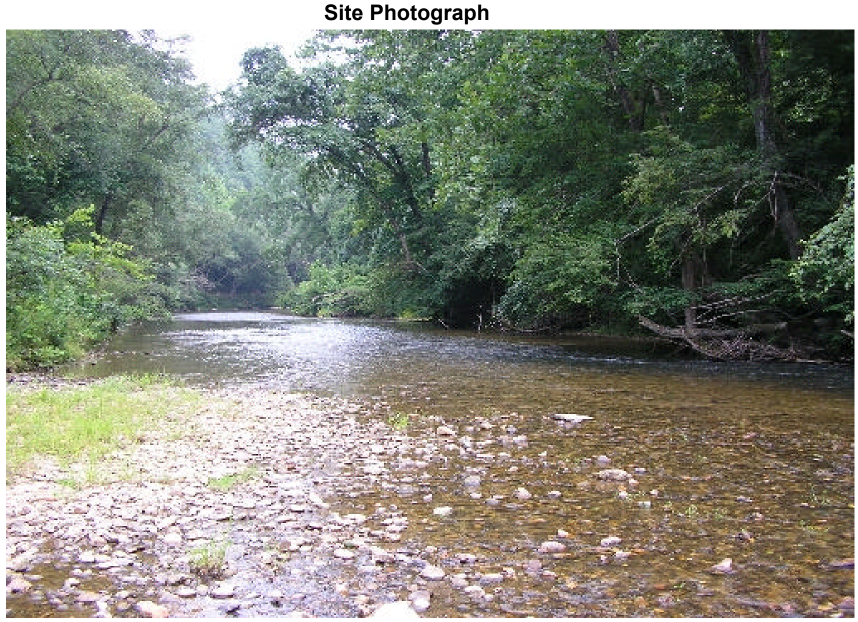
Water Quality Parameters

Temperature (°C)	25.3
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	31
pH (s.u.)	6.7
Water Clarity	clear

Habitat Assessment Scores (max)

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

Site Photograph



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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/01/07	10285	---	39	---	2.98	Excellent
08/22/02	8974	---	35	---	3.45	Good
03/28/89	4872	116	63	3.85	2.69	Excellent
08/10/83	3113	89	43	4.04	3.32	Excellent

Taxonomic Analysis

A few Trichoptera rarely identified from BAU samples were collected for the first time from the site in 2007: *Micrasema rickeri* prefers clean mountain streams; *Ceraclea slossonae* had only seven prior BAU records, all from the New River basin; and *Oecetis avara* has a wide distribution across state and a strong preference for clean streams. Abundant EPT taxa at the site were: *Heterocloeon anoka, Maccaffertium modestum, Pteronarcys dorsata, Brachycentrus lateralis* (another Trichoptera rarely identified from BAU samples though collected in 2002 from the site), *Hydropsyche venularis, Lepidostoma,* and *Neophylax fuscus.*

Data Analysis

The site is six miles NNW of Lenoir. The site slipped into the Good classification in 2002 (missing Excellent by the collection of a single additional EPT taxon for that sampling event). The four additional EPT taxa and lower EPT BI is suggestive of better water quality in 2007 over 2002.

Note that EPT richness values are not comparable between the Full-Scale samples collected in the earlier two sampling events and the latter two that were collected using EPT methods. The Full-Scale collection method is more extensive than the EPT method; it is therefore expected that collections using the Full-Scale method would result in higher richness values over EPT collections.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
GRAGG PRONG	SR 1367	05/22/07	CF16	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	31	03050101	36.0463252	-81.7074049	11-38-10	Southern Crystalline Ridges and Mountains

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	15	1385	10	0.4	Yes

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

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

Water Quality Parameters

Temperature (°C)	14.7
Dissolved Oxygen (mg/L)	9.3
Specific Conductance (µS/cm)	33
pH (s.u.)	5.9
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	19
Bottom Substrate (15)	15
Pool Variety (10)	10
Riffle Habitat (16)	16
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	6
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**95**

Site Photograph

Substrate: cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/22/07	2007-59	17	60	Excellent
05/25/99	99-37	18	56	Excellent
10/01/98	98-79	17	56	Excellent

Most Abundant Species: Fantail Darter

Exotic Species: Smallmouth Bass, Rainbow Trout, and Brown Trout

Species Change Since Last Cycle: **Gains** -- Seagreen Darter and Creek Chub. **Losses** -- Rock Bass, Flat Bullhead, and Sandbar Shiner.

Data Analysis

Watershed -- a tributary to the Johns River located about one quarter mile above its confluence; drains the extreme northwest corner of Caldwell County; this watershed is largely encompassed by the Pisgah National Forest. **Habitat** -- highest habitat score for all 2007 Catawba basin fish sites; riffles, boulder pools, plunge pools and side snags; very little embeddedness of substrates; great riparian zone widths. **2007** -- diverse and highly abundant (n = 1,080, highest for all 2007 sites in the Catawba River basin) fish community collected, including 4 intolerant species; several large adult specimens and young of year wild Brown Trout collected. **1998 - 2007** -- 22 species of fish are known from this site including 9 species of minnows, 3 species of suckers, and 3 species of darters; this regional reference site has rated Excellent on 3 occasions, and would qualify for HQW or ORW status if petitioned.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MULBERRY CR	NC 90	05/21/07	CF45	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	31	03050101	35.9430555	-81.6338888	11-38-32-(15)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	33	1150	14	0.3	Yes

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

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

Water Quality Parameters

Temperature (°C)	19.1
Dissolved Oxygen (mg/L)	9.6
Specific Conductance (µS/cm)	40
pH (s.u.)	6.1
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	7
Pool Variety (10)	6
Riffle Habitat (16)	10
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	8
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	**69**

Site Photograph

Substrate cobble, gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/07	2007-58	22	60	Excellent
09/22/99	99-61	27	60	Excellent
06/21/99	99-51	23	58	Excellent
04/16/99	99-19	26	56	Excellent
05/08/97	97-39	23	60	Excellent

Most Abundant Species: Tessellated Darter

Exotic Species: Smallmouth Bass and Mountain Redbelly Dace

Species Change Since Last Cycle: **Gains** -- Mountain Redbelly Dace. **Losses** -- Rock Bass, Thicklip Chub, Eastern Silvery Minnow, Pumkinseed, and Largemouth Bass

Data Analysis

Watershed -- a fairly large tributary to the Johns River, located about 2.7 miles above its confluence; drains part of the Pisgah National Forest in central Caldwell County; although this site is located in the Northern Inner Piedmont ecoregion, the vast majority of the catchment is located within the Southern Crystalline Ridges and Mountains ecoregion. **Habitat** -- shallow runs, one long pool, riffles, and a few small side pools; although adequate, the riparian zones include mowed lawns and tree crops. **2007** -- very diverse and abundant (n = 421) fish community; maximum scores for all NCIBI metrics. **1997 -2007** -- based on its fish community, this regional reference site has rated Excellent on 5 occasions and would qualify for HQW or ORW status if petitioned. Many of the headwater tributaries to Mullberry Creek are currently classified as HQW, and a current benthic study supports the reclassification of this reach.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
DROWNING CR	**SR 1647**	**05/21/07**	**CF72**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	32	03050101	35.7464062	-81.4161312	11-52-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	15	1000	6	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	14.4
Dissolved Oxygen (mg/L)	10.1
Specific Conductance (µS/cm)	43
pH (s.u.)	5.8

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: sand, gravel, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/07	2007-56	12	44	Good-Fair

Most Abundant Species: Bluehead Chub

Exotic Species: None

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- a tributary to Lake Hickory located to its southwest; the site is about 1.5 miles upstream of the lake and drains the eastern corner of Burke County between the towns of Hickory and Connelly Springs. **Habitat** -- primarily runs and pools with some coarse woody snags and a few bedrock outcrop chutes. **2007** - a moderate to low diversity fish community including 2 species of suckers, 4 species of minnows, and 1 darter species. Abundance of the collected population was good (n = 392), but the Bluehead Chub represented 48% of the total, and no intolerant species were collected. The urban nature of this watershed is likely having an impact on the fish community here. Although the specific conductance was not elevated, the stream did become very turbid during sampling, an indication of non-point source sedimentation.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
SMOKY CR	SR 1515	05/21/07	CF53	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	31	03050101	35.79944444	-81.605	11-41-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	7.6	1100	6	0.3	Yes

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

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

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	10.0
Specific Conductance (µS/cm)	38
pH (s.u.)	6.4

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	7
Riffle Habitat (16)	9
Left Bank Stability (7)	7
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**77**

Substrate sand, cobble, boulder, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/21/07	2007-57	17	54	Excellent
05/03/02	2002-44	16	58	Excellent

Most Abundant Species Central Stoneroller

Exotic Species None

Species Change Since Last Cycle

Gains -- Notchlip Redhorse, Spottail Shiner, and Brassy Jumprock. **Losses** -- Flat Bullhead and Warmouth.

Data Analysis

Watershed -- a small tributary to Lake Rhodhiss located less than a mile to the north of the lake; drains small portions of Caldwell and Burke Counties, just south of the Towns of Gamewell and Lenoir. **Habitat** -- cobble riffles, shallow sandy runs, shallow bedrock plunge pools, and side snags; good canopy and forested riparian zone widths. **2007** -- a diverse and abundant fish community was collected including 4 species of suckers, 7 species of minnows, and 2 species of darters. **1993 - 2007** -- very stable metrics since the 2002 sample; the stream was clear, but became extremely turbid during sampling; this watershed is subject to sedimentation, maybe from non-point sources. However, if petitioned this regional reference site would qualify for reclassification to either HQW or ORW status.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Smoky Cr	SR 1515	CB88	08/02/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	31	03050101	354757	813618	11-41-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	8.0	1010	5	0.3

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

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

Water Quality Parameters

Temperature (°C)	21.6
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	41
pH (s.u.)	6.8
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	13
Pool Variety (10)	9
Riffle Habitat (16)	15
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	87

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/02/07	10287	---	28	---	3.59	Good
08/21/02	8969	---	26	---	3.56	Good-Fair
08/05/97	7416	---	32	---	3.60	Good
08/04/92	5960	---	30	---	3.24	Good

Taxonomic Analysis

Abundant EPT taxa collected from the site in 2007 were: *Baetis pluto, Serratella deficiens, Hexagenia, Maccaffertium modestum, Stenacron pallidum, Isonychia, Leuctra, Acroneuria abnormis, Pteronarcys,* and *Cheumatopsyche*. Other than a significant loss of six Ephemeroptera taxa between the sampling events in 1997 and 2002, the EPT taxa present at the site are relatively similar between sampling efforts.

Data Analysis

The site is about 6 miles northeast of downtown Morganton and 1.5 miles upstream of the confluence with Catawba River. The collection of two additional EPT taxa in 2007 over the previous sampling effort in 2002 pushed the resulting classification back into Good from Good-Fair. Silt, which can stifle macroinvertebrate habitat, was implicated as a causative factor in the decline of EPT richness between 1997 and 2002 in the prior basinwide report. Visual estimates of the amount of silt present was less in 2007 than 2002.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
McGalliard Cr	SR 1538	CB82	08/02/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Burke	31	03050101	354549	813411	11-44-(3)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	8.0	1000	5	0.4

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

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

Water Quality Parameters

Temperature (°C)	21.8
Dissolved Oxygen (mg/L)	6.8
Specific Conductance (µS/cm)	109
pH (s.u.)	6.0
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	2
Pool Variety (10)	10
Riffle Habitat (16)	5
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	60

Site Photograph

Substrate: mostly silt and sand; small amounts of boulder, cobble, gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/02/07	10286	---	22	---	5.06	Good-Fair
08/27/03	9294	---	18	---	4.30	Fair
08/21/02	8968	---	16	---	5.09	Fair
08/05/97	7417	---	21	---	4.81	Good-Fair

Taxonomic Analysis

Abundant taxa at the site were: *Baetis pluto, Maccaffertium modestum, Eccoptura xanthenes, Cheumatopsyche,* and *Hydropsyche betteni*. Three of the five abundant taxa are tolerant to the presence of pollutants: *M. modestum, Cheumatopsyche,* and *H. betteni* have tolerance values of 5.5, 6.2, and 7.8 respectively.

Data Analysis

The site--along with nearly the entire catchment--is in the city of Valdese and about 2 stream-miles above the confluence with Catawba River. The highest number of EPT taxa for the four basinwide sampling events at the site were collected in 2007, returning the resulting classification to the Good-Fair it received in 1997.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Gunpowder Cr	SR 1718	CB114	08/01/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Caldwell	32	03050101	355039	812610	11-55-(1.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	19	1070	10	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Lenoir, Gunpowder Creek WWTP	NC0023736	2

Water Quality Parameters

Temperature (°C)	20.6
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	103
pH (s.u.)	6.7
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	8
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	7
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	4
Total Habitat Score (100)	57

Site Photograph

Substrate mostly sand with small amounts of cobble and gravel near bridge

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
08/01/07	10283	---	14	---	4.80	Fair
08/21/02	8967	---	23	---	4.73	Good-Fair

Taxonomic Analysis

There was a loss of nine EPT taxa from the sampling event in 2002 compared to the effort in 2007. Most of the loss occurred within the Ephemeroptera as eight of those taxa collected in 2002 were not collected in 2007: *Heterocloeon, Plauditus, Pseudocloeon propinquum, Baetisca, Caenis, Hexagenia, Heptagenia marginalis,* and *Stenacron pallidum*. *Maccaffertium pudicum* was uncollected in 2002 and rare in 2007. Plecoptera were entirely different between the two sampling events: *Leuctra, Acroneuria abnormis,* and *Pteronarcys* were collected in 2002; *Tallaperla* and *Perlesta* in 2007. All stonefly taxa were rare in the sample from each year except for *Pteronarcys*, which was common in 2002. Conversely, Trichoptera were very similar in both years with only the loss of *Leucotrichia pitciptes* in 2007 (it was abundant in 2002). Abundant taxa in 2007 were *Baetis pluto, Maccaffertium modestum, Isonychia, Cheumatopsyche, Hydropsyche betteni,* and *Neophylax oligius*.

Data Analysis

The site is 7.5 miles southeast of Lenoir and about 2.5 miles stream-miles downstream of the City of Lenoir Gunpowder Creek WWTP. Macroinvertebrate habitat is quite limited at the site. The only rocky sustrate is an artifact of the bridge; otherwise bottom sustrate is almost entirely sand. The large loss of EPT taxa between 2002 and 2007 is not reflected by the EPT BI, i.e. it was not just sensitive taxa that were eliminated from the latter sample. However, the loss of 39% of the number of EPT taxa between the sampling events from 2002 to 2007 is significant. No particular stressor is indicated by the taxa lost. Macroinvertebrate habitat was limited for both sampling events and specific conductance is elevated, so differences in the benthic community are very likely due to additional water-borne stressors.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
UPPER LITTLE R	**SR 1712**	**04/27/07**	**CF66**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CALDWELL	32	03050101	35.896149	-81.421808	11-58	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	11.3	1200	6	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	35	0	40	25 (tree nursery farm)

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Caldwell County Board of Education's Oak Hill Elementary School WWTP	NC0041220	0.003

Water Quality Parameters

Temperature (°C)	16.7
Dissolved Oxygen (mg/L)	9.7
Specific Conductance (µS/cm)	40
pH (s.u.)	6.3

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	4
Pool Variety (10)	4
Riffle Habitat (16)	11
Left Bank Stability (7)	3
Right Bank Stability (7)	5
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**67**

Substrate Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/07	2007-38	10	46	Good-Fair

Most Abundant Species Rosyside Dace and Greenhead Shiner **Exotic Species** None

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains east central Caldwell County and the southeastern facing slopes of the Brushy Mountains; borders the Eastern Blue Ridge Foothills ecoregion; no municipalities in the watershed; site is ~ 6 miles upstream from and about one-half the drainage area of the basinwide site sampled in 2002; WWTP is ~ 0.8 miles above the site. **Habitat** -- shallow, sandy flats and chutes; logs across the stream creating riffles; channel filled with sand; good riparian; deeply entrenched (natural?) with some badly eroded and bare banks; except for the entrenchment, site would have qualified as a reference site. **2007** -- very low flow (becomes intermittent during low flow?); low conductivity; a very abundant community, but species diversity was lower than expected, only one species of sunfish was collected and intolerant species were absent.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Upper Little R	SR 1740	CB130	07/31/07	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Caldwell	32	03050101	355032	812145	11-58-(5.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	34	980	16	0.3

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

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

Water Quality Parameters

Temperature (°C)	24.2
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	38
pH (s.u.)	7.4
Water Clarity	milky

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	20
Bottom Substrate (15)	13
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	2
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	79

Site Photograph

Substrate about half of area boulder; remainder sand, cobble, and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/07	10282	111	50	4.65	3.73	Excellent
08/20/02	8965	83	33	4.91	3.94	Good
08/06/97	7419	90	39	4.35	3.47	Good
08/04/92	5961	74	38	4.18	3.56	Good

Taxonomic Analysis

The greatest number of both Ephmeroptera and Trichoptera taxa were collected in 2007 over all sampling events at the site; the number of Plecoptera taxa collected in 2007 was equal to the number collected in 1992. *Acroneuria evoluta* and *Ochrotrichia* , taxa rarely identified from BAU samples, were collected for the first time from this site in 2007. Abundant taxa collected from the site in 2007 were: *Baetis flavistriga, Caenis, Serratella deficiens, Hexagenia, Heptagenia marginalis, Leucrocuta, Maccaffertium modestum, Stenacron pallidum, Isonychia, Leuctra, Acroneuria abnormis, Ceratopsyche sparna, Cheumatopsyche, Triaenodes ignitus, Paranyctiophylax, Boyeria vinosa, Gomphus, Helichus basalis, Macronychus glabratus, Simulium, Microtendipes pedellus* sp. group, *Polypedilum flavum, Tribelos jucundum,* Branchiobdellida, Lumbriculidae, *Elimia,* and *Corbicula fluminea* .

Data Analysis

The site is about 8 miles north of downtown Hickory and 5 stream-miles upstream of the confluence with Catawba River. The high number of EPT taxa collected resulted in a classification of Excellent for the first time for the site; the NCBI remained somewhat high though. Very good in-stream habitat helps to support macroinvertebrate diversity.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MIDDLE LITTLE R	SR 1002	04/27/07	CF42	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALEXANDER	32	03050101	35.88916667	-81.32138889	11-62	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	16.3	1200	7	0.4	Yes

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

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

Water Quality Parameters

Temperature (°C)	16.8
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	31
pH (s.u.)	5.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	8
Pool Variety (10)	8
Riffle Habitat (16)	12
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**83**

Site Photograph

Substrate	Sand, gravel, cobble, and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/27/07	2007-37	12	48	Good
05/23/02	2002-59	13	56	Excellent
05/08/97	97-41	12	52	Good
05/11/93	93-19	9	46	Good-Fair

Most Abundant Species	Bluehead Chub	**Exotic Species**	None

Species Change Since Last Cycle: **Gains** -- Highback Chub and Flat Bullhead. **Losses** -- White Sucker, Bluegill, and Largemouth Bass.

Data Analysis

Watershed -- tributary to Lake Hickory; downstream are Moretz Lake and Rink dams; drains western Alexander and eastern Caldwell counties, including the southeast facing slopes of the Brushy Mountains; no municipalities in the watershed. **Habitat** -- old mill site at the end of the reach; runs; pools with sand bottoms; snags; great riparian habitats. **2007** -- low specific conductance and very low pH; diversity metrics lower than expected and accounted for the decline in the rating from Excellent to Good; the intolerant Highback Chub was collected for the first time; declines noted in the relative abundance of Rosyside dace and Greenhead Shiner. **1993 - 2007** -- consistently low conductivity, ranging from 24 to 31 µS/cm; a relatively low species diversity, only 15 species known from the site; no exotic species have ever been collected at the site; dominant species are Bluehead Chub, Rosyside Dace, and Greenhead Shiner; no changes in the percentage of tolerant fish or in the trophic metrics; number of fish collected in 2007 (n = 295) was two-thirds of the number collected in 2002 (a low flow year), but similar to the number in 1997 (n = 230); habitat scores have ranged from 72 in 1997 to 83 in 2007.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Middle Little R	SR 1153	CB123	07/31/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Alexander	32	03050101	355148	811719	11-62	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	43	1000	8	0.5

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

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

Water Quality Parameters

Temperature (°C)	21.2
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	38
pH (s.u.)	6.6

Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate almost entirely sand; some silt present

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/07	10280	---	24	---	3.84	Good-Fair
08/27/03	9293	---	26	---	3.18	Good-Fair
08/20/02	8964	---	18	---	3.75	Fair
08/06/97	7420	---	26	---	3.96	Good-Fair
08/04/92	5963	---	32	---	4.15	Good

Taxonomic Analysis

Abundant EPT taxa collected from the site in 2007 were: *Serratella deficiens, Hexagenia, Maccaffertium modestum, Isonychia, Acroneuria abnormis, Brachycentrus nigrosoma,* and *Cheumatopsyche*. The EPT community was fairly similar between 2003 and 2007, though there are a few notable exceptions. *Heptagenia marginalis* and *Pycnopsyche lepida* were both common in 2003 though uncollected in 2007. *Neoperla* and *Triaenodes ignitus* were both uncollected in 2003 and were common in 2007.

Data Analysis

The site is 1.7 miles southwest of Bald Mountain of Barrett Mountain Range, about nine miles NNE of downtown Hickory, and about six stream-miles upstream of the confluence with Catawba River. Specific conductance is relatively low at the site. However, macroinvertebrate habitat is quite limited; reduced EPT richness generally at the site is more likely due to habitat limitations rather than water-borne pollutants.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
DUCK CR	NC 90	04/26/07	CF13	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALEXANDER	32	03050101	35.91777778	-81.31277778	11-62-2-(1)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;Tr	14.6	1200	7	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	55	20 (rural residential)	25	0

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

Water Quality Parameters

Temperature (°C)	18.3
Dissolved Oxygen (mg/L)	9.1
Specific Conductance (µS/cm)	38
pH (s.u.)	6.3

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	9
Pool Variety (10)	8
Riffle Habitat (16)	12
Left Bank Stability (7)	6
Right Bank Stability (7)	4
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	2
Total Habitat Score (100)	**77**

Substrate: Sand, gravel, and cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/26/07	2007-35	11	48	Good
05/23/02	2002-60	10	48	Good
05/08/97	97-40	10	48	Good
05/11/93	93-20	10	40	Fair

Most Abundant Species: Bluehead Chub

Exotic Species: Fathead Minnow

Species Change Since Last Cycle: **Gains** -- Fathead Minnow and White Sucker. **Losses** -- Seagreen Darter.

Data Analysis

Watershed -- tributary to the Middle Little River; drains the northeast portion of the Brushy Mountains in western Alexander and eastern Caldwell counties; no municipalities in the watershed. **Habitat** -- cattle continued to be fenced out of the stream; more sand and gravel in the stream than in 2002, bar development. **2007** -- lower species diversity and diversities of sunfish and darters than expected; percentage of tolerant fish increased from 6 to 21% between 2002 and 2007; first exotic species ever collected from the site. **1993 - 2007** -- conductivity ranged from 35 to 42 µS/cm; only 13 species known from the site, but only one species of sunfish; 10 or 11 of these species have been collected each time; the intolerant Highback Chub was not collected until 2002; no Tessellated Darter or trout have ever been collected from this site; dominant species have been Bluehead Chub, Greenhead Shiner, and Rosyside Dace; number of fish in 2002 (a low flow year) was an anomaly compared to 1997 and 2007 (n = 1,665, 421, and 387, respectively); a gradually improving trophic structure -- omnivores decreasing from 42 to 22% and the insectivores increasing from 58 to 78%.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Duck Cr	NC 127	CB112	07/31/07	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Alexander	32	03050101	355333	811811	11-62-2-(4)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	18	1040	17	0.4

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

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

Water Quality Parameters

Temperature (°C)	22.0
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	41
pH (s.u.)	6.7
Water Clarity	clear

Site Photograph

Habitat Assessment Scores (max)

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

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/07	10281	---	33	---	3.35	Good
08/20/02	8963	---	33	---	3.76	Good
08/06/97	7421	---	26	---	4.00	Good-Fair
08/04/92	5962	---	26	---	3.42	Good-Fair

Taxonomic Analysis

The difference in EPT richness between the first two sampling efforts at the site and the two most recent is driven primarily by an increase in the number of Trichoptera taxa collected during the latter two events: nine and seven Trichoptera taxa were collected in 1992 and 1997; 13 and 14 in 2002 and 2007 respectively. Abundant taxa at the site in 2007 were *Baetis pluto* , *Heterocloeon curiosum* , *Serratella deficiens* , *Maccaffertium modestum* , *Isonychia* , *Leuctra* , *Acroneuria abnormis* , *Pteronarcys proteus* , *Micrasema wataga* , *Ceratopsyche sparna* , and *Cheumatopsyche* . *Tallaperla* and *Micrasema bennetti* were among the taxa collected for the first time from the site in 2007; both taxa were common in the sample. *Epeorus rubidus* , which was abundant in 1992, has not been collected from the site during the latter sampling events.

Data Analysis

The site is 13 miles east of Lenoir and about 0.7 stream-miles above the confluence with Middle Little River. Except for the loss of a coldwater taxon (*Epeorus rubidus*) between 1992 and the more recent sampling events, no specific water-quality problems are indicated by the taxa present at the site.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Lower Little R	SR 1131	CB120	07/31/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Alexander	32	03050101	355150	811239	11-69-(5.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	77	940	14	0.3

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

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

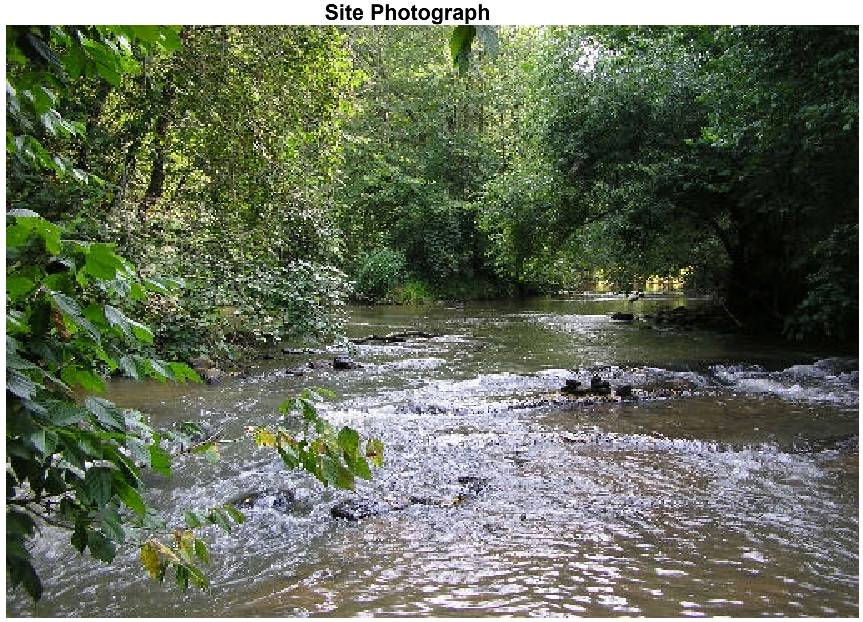
Water Quality Parameters

Temperature (°C)	22.0
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	54
pH (s.u.)	6.4
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	79

Site Photograph



Substrate: half of area sand; remainder a mix of the remaining classes

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/31/07	10279	89	32	5.08	4.11	Good-Fair
08/20/02	8962	61	28	4.85	3.92	Good-Fair
08/06/97	7423	74	34	4.95	4.19	Good
08/04/92	5964	70	29	4.60	3.86	Good

Taxonomic Analysis

Abundant taxa at the site in 2007 were: *Baetis flavistriga, B. intercalaris, Heptagenia marginalis, Maccaffertium modestum, Stenacron pallidum, Isonychia, Ceratopsyche sparna, Cheumatopsyche, Psychomyia nomada, Neophylax oligius, Gomphus, Helichus basalis, Dineutus, Simulium, Antocha, Rheotanytarsus, Corbicula fluminea,* and *Pisidium.*

Data Analysis

The site is 1.7 miles east of Barrett Mountain peak, about 12 miles northeast of downtown Hickory and about 6 stream-miles from the confluence with Catawba River. In spite of the difference in bioclassification between the first two sampling events and the latter two, the macroinvertebrate community at the site has been relatively stable. The Good classifications resulting from collections in 1992 and 1997 were bordering on Good-Fair; small shifts in either EPT richness or NCBI value resulted in Good-Fair classifications for 2002 and 2007.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LAMBERT FK	SR 1317	04/26/07	CF65	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALEXANDER	32	03050101	35.945923	-81.251191	11-69-3	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	10.3	1200	8	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	18.3
Dissolved Oxygen (mg/L)	8.8
Specific Conductance (µS/cm)	27
pH (s.u.)	6.7

Water Clarity: Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	2
Riffle Habitat (16)	12
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**69**

Substrate: Sand, cobble, gravel, and bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/26/07	2007-36	9	46	Good-Fair

Most Abundant Species: Bluehead Chub

Exotic Species: None

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Lower Little River; drains rural northwest Alexander County, including the southeast facing slopes of the Brushy Mountains; borders the Eastern Blue Ridge Foothills ecoregion; no municipalities in the watershed. **Habitat** -- good riparian zones; gravel and cobble riffles and runs; very shallow pools; bar development; deeply entrenched (natural?); except for the entrenchment, site would have qualified as a reference site. **2007** -- very low flow (becomes intermittent during low flow?); very low conductivity; an abundant community, but species diversity was lower than expected, only one species of darter and sucker were collected; only site in the Catawba River basin in 2007 where no sunfish, bass, or trout were collected; Tessellated Darter were also absent; Highback Chub, an intolerant species, was abundant.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Muddy Fk	SR 1313	CB127	07/30/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Alexander	32	03050101	355546	811248	11-69-4	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	12	1060	5	0.3

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

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

Water Quality Parameters

Temperature (°C)	22.3
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	79
pH (s.u.)	6.6
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	8
Bottom Substrate (15)	2
Pool Variety (10)	4
Riffle Habitat (16)	3
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	49

Site Photograph

Substrate almostly entirely silt and sand; small amount of cobble present

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/07	10278	---	8	---	5.39	Fair
08/27/03	9292	---	18	---	5.38	Good-Fair
08/19/02	8961	---	12	---	6.05	Fair
08/06/97	7422	76	22	6.27	5.42	Good-Fair

Taxonomic Analysis

All eight taxa collected in 2007 were also collected in 2003; the difference in EPT richness between the two sampling events is due strictly to the 2003 taxa uncollected in 2007. Richness in all three orders declined: Ephemeroptera from nine to six taxa; Plecoptera from three to zero; Trichoptera from six to two. Of the eight EPT taxa collected from the site in 2007, five were abundant in the sample: *Hexagenia, Maccaffertium modestum, Isonychia, Cheumatopsyche,* and *Hydropsyche betteni.*

Data Analysis

The site is two miles WNW of Taylorsville and about 250 meters upstream of the confluence with Lower Little River. EPT richness took a sharp decline between sampling events in 2003 and 2007. There was more silt noted at the site in 2007 than in any previous sampling event; macroinvertebrate habitat smothered by silt may be part of the reason for the decline in the benthic community. Also, as reported previously, cattle had access to the stream above the site and are therefore contributing to overall depressed EPT richness values.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MUDDY FK	SR 1313	06/21/04	CF44	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALEXANDER	32	03050101	35.92944444	-81.2125	11-69-4	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	12.6	1095	4	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	19.0
Dissolved Oxygen (mg/L)	8.1
Specific Conductance (µS/cm)	65
pH (s.u.)	6.2

Water Clarity: Turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	1
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	5
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	**33**

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/21/04	2004-96	11	42	Good-Fair

Most Abundant Species Bluehead Chub and Greenfin Shiner

Exotic Species None

Species Change Since Last Cycle N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Lower Little River; drains central Alexander County and the northern part of the Town of Taylorsville; one small (0.78 MGD) discharger located ~1.5 miles upstream. **Habitat** -- very shallow runs; no riffles; cattle with access to stream from both banks; confined animal operations proximal to the stream. **2004** -- almost 75% of all the fish were the two dominant species; total diversity lower than expected; darters were absent; omnivores (Bluehead Chub and White Sucker) abundant; Largemouth Bass represented only by young-of-year; data were also used as part of a NCSU Urban Fish Study.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
GLADE CR	SR 1610	04/26/07	CF64	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
ALEXANDER	32	03050101	35.853337	-81.183432	"11-69-7-(0.7)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	12.7	1070	8	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	55	35 (rural businesses)	0	10 (church)

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

Water Quality Parameters

Temperature (°C)	16.7
Dissolved Oxygen (mg/L)	9.5
Specific Conductance (µS/cm)	49
pH (s.u.)	6.5

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	6
Pool Variety (10)	10
Riffle Habitat (16)	11
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**79**

Site Photograph

Substrate: Bedrock and sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/26/07	2007-34	14	54	Excellent

Most Abundant Species: Redlip Shiner

Exotic Species: Redlip Shiner

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Lower Little River; site is ~ 0.4 miles above the creek's confluence; confluence is flanked by Millersville Dam upstream and North State Dam downstream; drains the southeastern portion of the Town of Taylorsville and south central Alexander County. **Habitat** -- *Podostemum* on shelf bedrock; plunge pools and runs; nice bluff on the right; pools filled in with sediment. **2007** -- a diverse and abundant community for a stream of its size; only metrics not to score a "5" were the number of Sunfish, Bass, and Trout and the Percentage of Piscivores; one-third of all the fish were Redlip Shiner; two intolerant species (Highback Chub and Fieryblack Shiner) and two species of darters (Tessellated Darter and Fantail Darter) were present.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Elk Shoal Cr	SR 1605	CB113	07/30/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Alexander	32	03050101	354836	810555	11-73-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	13	880	4	0.2

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

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

Water Quality Parameters

Temperature (°C)	21.1
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (μS/cm)	62
pH (s.u.)	6.6
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	11
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	3
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	47

Site Photograph

Substrate: nearly entirely sand with some silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/07	10275	---	18	---	4.62	Good-Fair
08/20/02	8960	---	16	---	5.04	Good-Fair
08/07/97	7426	---	18	---	4.49	Good-Fair
08/05/92	5966	---	15	---	4.93	Good-Fair

Taxonomic Analysis

Abundant taxa at the site in 2007 were *Serratella deficiens* , *Maccaffertium modestum* , *Isonychia* , and *Cheumatopsyche* . The same taxa were abundant in most cases (otherwise common) for all prior sampling events at the site. *Pseudocloeon propinquum* , which was abundant from the earliest three sampling events, was rare in 2007.

Data Analysis

The site is 12 miles west of Statesville and three stream-miles upstream of the confluence with Catawba River. The benthic community has been relatively stable over the four sampling events beginning in 1992. Macroinvertebrate habitat is deficient as the substrate is sand with little else other than a small amount of silt, and is certainly depressing EPT richness at the site. Other water-quality problems may also exist though no specific stressors are indicated.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Lyle Cr	**US 64/70**	**CB122**	**07/30/07**	**Good-Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Catawba	32	03050101	354315	810632	11-76-(3.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	44	780	9	0.3

	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)
City of Conover Northeast WWTP	NC0024252	1.5

Water Quality Parameters

Temperature (°C)	22.7
Dissolved Oxygen (mg/L)	8.6
Specific Conductance (µS/cm)	122
pH (s.u.)	7.0
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate mostly sand; some gravel, cobble; small amount boulder, silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/07	10276	---	22	---	4.42	Good-Fair
08/19/02	8958	---	22	---	4.70	Good-Fair
09/07/97	7424	51	23	4.95	4.22	Good-Fair
08/05/92	5965	62	22	5.66	4.89	Good-Fair

Taxonomic Analysis

Abundant EPT taxa in the sample collected in 2007 were: *Baetis intercalaris, Serratella deficiens, Heptagenia marginalis, Maccaffertium modestum, Isonychia, Ceratopsyche sparna, Cheumatopsyche, Hydropsyche betteni, Leucotrichia pictipes, Triaenodes ignitus,* and *Neophylax oligius*. The taxa present at the site during each sampling event have been fairly consistent over time with the exception that no Plecoptera were collected in 1992; three, three, and two stonefly taxa were collected in 1997, 2002, and 2007 respectively.

Data Analysis

The site is six miles east of Conover, three stream-miles above the confluence with Catawba River, and about seven stream-miles downstream of the City of Conover Northeast WWTP. The site had the highest specific conductance of all benthos basinwide sites sampled in 2007 in subbasin 32. The macroinvertebrate community is likely limited by both poor in-stream habitat and water quality. There has been no notable change in the benthic community over the course of the four sampling events at the site.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LYLE CR	US 70	07/14/04	CF35	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CATAWBA	32	03050101	35.72083333	-81.10888889	11-76-(4.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	43.2	810	8	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Conover's Northeast WWTP	NC0024252	1.5

Water Quality Parameters

Temperature (°C)	23.4
Dissolved Oxygen (mg/L)	6.5
Specific Conductance (µS/cm)	95
pH (s.u.)	6.2

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	4
Pool Variety (10)	6
Riffle Habitat (16)	4
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	5
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**46**

Site Photograph

Substrate: Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/14/04	2004-118	19	58	Excellent
07/01/97	97-68	22	48	Good
05/11/93	93-23	18	50	Good

Most Abundant Species: Bluehead Chub

Exotic Species: Green Sunfish

Species Change Since Last Cycle: **Gains** -- Flat Bullhead; Green Sunfish, Largemouth Bass, and Fantail Darter. **Losses** -- Whitefin Shiner, Common Carp, Greenhead Shiner, Creek Chub (young-of-year only), V-lip Redhorse, and Brassy Jumprock.

Data Analysis

Watershed -- tributary to the Catawba River; drains northeast Catawba County including the north and northeast portions of the cities of Conover and Hickory and the Interstate 40 corridor; site is ~ 3.3 miles above mouth. **Habitat** -- sandy runs, snags, a couple of decent gravel riffles; old sand-dipping operation in the middle of the reach along right shoreline. **2004** -- conductivity only slightly elevated; faint odor of chlorine; except for a slightly elevated percentage of omnivores+herbivores (White Sucker, Eastern Silvery Minnow, Bluehead Chub, and Spottail Shiner) all other metrics were indicative of an Excellent site; data were also used as part of a NCSU Urban Fish Study. **1993 - 2004** -- was a basinwide site in 1993 and 1997; high diversity, 30 species known from the site, including 10 species of cyprinids, 6 species of suckers, and 3 species of darters; except for Fantail Darter, gains or losses of species between 1997 and 2004 were represented by 1-5 fish/species; total habitat score declined from 73 in 1997 to 46 in 2004 due to loss of riffles, canopy, and instream habitats.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
McLin Cr	SR 1722	CB124	07/30/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Catawba	32	03050101	354228	810552	11-76-5-(3)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	26	780	8	0.3

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

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

Water Quality Parameters

Temperature (°C)	22.5
Dissolved Oxygen (mg/L)	9.0
Specific Conductance (µS/cm)	92
pH (s.u.)	7.3
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	7
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	3
Left Bank Stability (7)	2
Right Bank Stability (7)	3
Light Penetration (10)	3
Left Riparian Score (5)	1
Right Riparian Score (5)	2
Total Habitat Score (100)	37

Site Photograph

Substrate about half sand; remainder gravel, silt, and cobble

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/30/07	10277	---	18	---	5.28	Fair
08/19/02	8959	---	23	---	5.14	Good-Fair
08/07/97	7425	57	27	5.18	4.33	Good-Fair

Taxonomic Analysis

Abundant taxa collected from the site in 2007 were: *Baetis intercalaris, Serratella deficiens, Maccaffertium modestum, Isonychia, Tricorythodes, Eccoptura xanthenes, Cheumatopsyche, Hydropsyche betteni,* and *Hydroptila.* The difference in EPT richness between the latest two sampling events is due to several Ephemeroptera and Plecoptera that were rare in 2002 and uncollected in 2007: *Acentrella alachua, Baetis pluto, Hexagenia, Leucrocuta,* and *Leuctra.* Though the number of Trichoptera taxa were the same (at six) for the two most recent sampling events, only three taxa were in common between 2002 and 2007: *Cheumatopsyche, Hydropsyche betteni,* and *Triaenodes ignitus.*

Data Analysis

The site is about 6 miles east of Conover and about 0.8 stream-miles above the confluence with Catawba River. The resultant classification fell to Fair in 2007, though the addition of a single EPT taxon would have resulted in a Good-Fair. Poor habitat and elevated specific conductance implicate both physical and water-borne sources for impact to the biota.

Note that EPT richness values are not comparable between the Full-Scale samples collected in the earliest sampling event and the latter two that were collected using EPT methods. The Full-Scale collection method is more extensive than the EPT method; it is therefore expected that collections using the Full-Scale method would result in higher richness values over EPT collections.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BUFFALO SHOALS CR	SR 1503	04/26/07	CF3	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
IREDELL	32	03050101	35.75277778	-81.04583333	11-78-(0.5)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	13.8	830	9	0.5	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	70	5 (rural residential)	25	0

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

Water Quality Parameters

Temperature (°C)	15.9
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	80
pH (s.u.)	6.3

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	10
Pool Variety (10)	10
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**90**

Substrate Sand, gravel, cobble, bedrock, and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/26/07	2007-33	13	52	Good
06/04/97	97-54	20	58	Excellent

Most Abundant Species	Exotic Species
Bluehead Chub	None

Species Change Since Last Cycle

Gains -- Sunfish hybrid. **Losses** -- Common Carp (migrant from lake), Eastern Silvery Minnow, Shorthead Redhorse (migrant from lake), Brassy Jumprock, Brown Bullhead, Flat Bullhead, and Piedmont Darter.

Data Analysis

Watershed -- small tributary to the Lake Norman (Catawba River); drains western Iredell County, west of the City of Statesville, including the Interstate 40 corridor; no municipalities in the watershed; site is ~ 3.5 miles above the creek's mouth. **Habitat** -- an old mill site; boulder and bedrock shelves; gravel and sand bottomed pools; good riffles and instream and riparian habitats. **2007** -- intolerant species were absent which caused the rating to decline from Excellent to Good. **1997 & 2007** -- for a stream of its size, the community was abundant and diverse with 20 species known from the site, including 5 species of suckers; however 7 fewer species were present in 2007 than in 1997 including the intolerant Piedmont Darter; a noticeable decline in the relative abundance of the Greenhead Shiner between 1997 and 2007; downstream reservoir may prevent the community from recovering/recolonizing after low flow events; total habitat score was 71 in 1997 and 90 in 2007 due to higher quality riffles and greater bank stability in the reach below the bridge (sampled in 2007) than above the bridge (sampled in part in 1997).

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
McDowell Cr	SR 2128	CB139	07/17/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mecklenburg	33	3050101	352323	805517	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	24	700	6	0.2

	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)	25.3
Dissolved Oxygen (mg/L)	6.6
Specific Conductance (µS/cm)	125
pH (s.u.)	7.2
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	11
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	3
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	49

Site Photograph

Substrate nearly all sand with a small amount of silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/17/07	10241	59	8	6.61	6.08	Fair
08/20/02	8939	48	8	6.65	5.74	Fair

Taxonomic Analysis

Abundant taxa included *Baetis pluto* , *Pseudocloeon propinquum* , *Maccaffertium modestum* , *Cheumatopsyche* , *Ancyronyx variegatus* , *Boyeria vinosa* , *Calopteryx* , *Gomphus* , *Polypedilum illinoense* , *Tribelos jucundum* , *Simulium* and *Corbicula fluminea* .

Data Analysis

This stream drains the northwestern portion of Mecklenburg County between Huntersville and Charlotte. This site was added as a basinwide site in 2002 to monitor this rapidly developing portion of Mecklenburg County. Based on the benthic data no major change in water quality was observed, and it continues to be a degraded stream.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Gar Cr	SR 2074	CB133	07/11/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Mecklenburg	33	3050101	352140	805353	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	3.3	700	4	0.2

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

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

Water Quality Parameters

Temperature (°C)	24.0
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	168
pH (s.u.)	7.4
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	17
Bottom Substrate (15)	15
Pool Variety (10)	8
Riffle Habitat (16)	16
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	93

Site Photograph

Substrate mostly cobble and boulder with small amounts of gravel and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10240	---	16	---	5.60	Good-Fair
08/20/97	7439	---	21	---	4.93	Good
06/08/94	6543	64	20	5.64	4.97	Good
08/20/92	5988	87	24	5.55	4.69	Good

Taxonomic Analysis

With the exception of presence/absence of Rare taxa, there were no major changes in the community structure. Abundant taxa included *Baetis flavistriga* , *Maccaffertium modestum* , *Cheumatopsyche* , *Chimarra* and *Hydropsyche betteni* . The caddisfly *Triaenodes marginatus* was collected for the first time from the site in 2007.

Data Analysis

Gar Creek is a tributary to the lower reaches of Mountain Island Lake. This stream tends to have very low flows during the summer and was not sampled in 2002 for that reason. This stream had rated Good in 1992, 1994 and 1997 but decreased to Good-Fair in 2007. This decline in water quality may be due to the 2007 drought effects, or to impacts from increasing development that is occurring in Mecklenburg County. However, no definitive conclusions can be drawn because this site was not sampled in 2002, which was also a dry year.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Dutchmans Cr	SR 1918	CB132	07/10/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Gaston	33	3050101	352012	810051	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	117	600	12	0.4

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

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

Water Quality Parameters

Temperature (°C)	26.7
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	114
pH (s.u.)	7.0
Water Clarity	turbid

Habitat Assessment Scores (max)

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

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10237	---	18	---	5.28	Good-Fair
08/21/02	8942	---	19	---	5.08	Good-Fair
08/19/97	7435	73	33	5.26	4.54	Good
08/06/92	5970	77	33	5.68	4.76	Good

Taxonomic Analysis

Dutchmans Creek, like its tributary Killian Creek, experienced a sharp decline in the number of mayfly taxa between 1997 and 2002. Seventeen mayfly taxa were collected in 1997 compared with nine taxa in 2002 and ten taxa in 2007.

Data Analysis

Dutchmans Creek drains southeast Lincoln County and northeast Gason County and enters the Catawba River below Mountain Island Lake. This site rated Good in 1992 and 1997 but declined to Good-Fair in 2002 and 2007. The lower bioclassification ratings could be due to drought effects as evidenced by the decrease in wetted stream width from 15 meters in 1997 to seven meters in 2002. Flows could have been low enough to reduce habitat, increase temperature and reduce dissolved oxygen, producing a cumulative stress on the benthic community.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LEEPERS CR	NC 73	04/25/07	CF27	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	33	03050101	35.47055556	-81.12027778	11-119-1-(1)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	28.2	740	12	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	16.0
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	65
pH (s.u.)	6.1

Water Clarity	Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	4
Pool Variety (10)	8
Riffle Habitat (16)	4
Left Bank Stability (7)	3
Right Bank Stability (7)	5
Light Penetration (10)	2
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**57**

Site Photograph

Substrate Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/25/07	2007-29	17	46	Good-Fair
05/20/97	97-48	18	52	Good
06/29/93	93-31	19	56	Excellent

Most Abundant Species Bluehead Chub

Exotic Species Redlip Shiner

Species Change Since Last Cycle

Gains -- Swallowtail Shiner, Notchlip Redhorse, and Bluegill. **Losses** -- Fieryblack Shiner, Flat Bullhead, Seagreen Darter, and Piedmont Darter.

Data Analysis

Watershed -- tributary to Dutchmans Creek; drains east central Lincoln County, north and east of the City of Lincolnton, and southern Catawba County; no true municipalities in the watershed. **Habitat** -- very large coarse woody debris (snags and deadfalls) in the channel; deeply entrenched; severe bank erosion. **2007** -- relatively low specific conductance and pH for a Piedmont stream; abundance low for a stream of its size (n = 147); intolerant species absent. **1993 - 2007** -- conductivity has ranged from 49 to 63 µS/cm; a fairly diverse community, 24 species known from the site, including 10 species of cyprinids, 4 species of darters, and 3 species of suckers; dominant species has been the Bluehead Chub; ratings have declined, primarily due to loss of intolerant species of darters; three intolerant species lost between 1997 and 2007 (Fieryblack Shiner, Seagreen Darter, and Piedmont Darter); no change in the trophic metrics; total habitat scores have ranged from 57 in 2007 to 62 in 2002; stream appears to experience dramatic extremes in flows.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
KILLIAN CR	NC 73	04/25/07	CF25	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	33	03050101	35.45666667	-81.03416667	11-119-2-(0.5)a	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	12.1	690	9	0.2	No

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

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	117
pH (s.u.)	7.2

Water Clarity	Very slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	3
Pool Variety (10)	5
Riffle Habitat (16)	2
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	9
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	**57**

Site Photograph

Substrate: Sand and silt

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/25/07	2007-31	14	52	Good
05/21/02	2002-49	10	46	Good-Fair
05/20/97	97-47	16	52	Good

Most Abundant Species: Tessellated Darter

Exotic Species: Redlip Shiner and Green Sunfish

Species Change Since Last Cycle: **Gains** --Golden Shiner, White Sucker, Flat Bullhead, and Green Sunfish. **Losses** -- none.

Data Analysis

Watershed -- small tributary to upper Dutchmans Creek in east-southeast Lincoln County; watershed is between Forney and Anderson creeks; no municipalities in the watershed. **Habitat** -- very silty and sandy; shallow flats; a few runs; roots and undercut snags; periphyton thick on the sand; stick riffles; low flow. **2007** -- a diverse and abundant community; species gained in 2007 improved the overall rating from Good-Fair to Good; intolerant species absent. **1997 - 2007** -- conductivity has ranged from 86 to 131 µS/cm; 19 species are known from the site, but intolerant species are absent; dominant species are Bluehead Chub and Speckled Killifish; a gradually changing trophic structure -- omnivores decreasing from 34 to 24 to 17% and the insectivores increasing from 65 to 76 to 83%; the fauna was typical of that of a piedmont Catawba River basin stream; total habitat scores have ranged from 40 to 57 and increased from 40 in 2002 (a very low flow year) to 57 in 2007 due to deeper pools, better bank stability, and slightly wide riparian zones; due to its size, stream is probably low flow affected.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Killian Cr	SR 1511	CB134	07/17/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
Lincoln	33	3050101	352457	810144	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	47	690	7	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)	25.0
Dissolved Oxygen (mg/L)	7.5
Specific Conductance (µS/cm)	149
pH (s.u.)	7.6

Water Clarity: slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	10
Riffle Habitat (16)	12
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	7
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	82

Site Photograph

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

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/17/07	10242	---	19	---	5.38	Good-Fair
08/20/02	8941	---	12	---	5.04	Not Rated
08/19/97	7434	---	24	---	3.91	Good
08/05/92	5969	---	28	---	4.94	Excellent

Taxonomic Analysis

A sharp decline in the number of mayfly taxa, specifically baetids, occurred between 1997 and 2002. No baetid species were collected in 2002; whereas in 1997 six species of baetids were collected. In 2002 the wetted width was only four meters indicative of a very dry, low flow year. In 2007, the wetted width was seven meters and three species of baetids were collected. Even though 2007 was a dry year as well, the stream may have been just beginning to recover from the drought of 2002.

Data Analysis

Killian Creek is a tributary to upper Dutchmans Creek in southeastern Lincoln County. The water quality appears to have declined since 1992 but it is unclear as to the cause. The lower bioclassification may be due to drought effects alone or a combination of drought effects and other factors. Because of the 2002 drought and a followup drought study, BAU staff decided not to rate this site in 2002. A Good-Fair rating was assigned in 2007, even though there was again a drought. However 2007 was not preceded by low flow years as was 2002.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
ANDERSON CR	SR 1383	04/25/07	CF62	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	33	03050101	35.446963	-81.042733	11-119-2-2	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	21.5	695	9	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	16.4
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	74
pH (s.u.)	6.8
Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	5
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	1
Right Riparian Score (5)	5
Total Habitat Score (100)	**59**

Substrate Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/25/07	2007-30	15	48	Good

Most Abundant Species Speckled Killifish

Exotic Species Redlip Shiner and Green Sunfish

Species Change Since Last Cycle N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Killian Creek in east-southeast Lincoln County; watershed is between Killian Creek and Leepers Creek; no municipalities in the watershed. **Habitat** -- shallow sandy runs; snags and deadfalls, but not as many as in Leepers Creek; quality pools and chutes were rare; no true riffles, riffles formed by logs in the current; American beech bluff on the east side; entrenched; low flow. **2007** -- a diverse and abundant community, but intolerant species were absent and only one species of sucker was present; except for the Redlip Shiner, the fauna was typical of that of a piedmont Catawba River basin stream.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
FORNEY CR	SR 1386	04/25/07	CF63	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	33	03050101	35.447382	-81.010887	11-119-2-3	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	7.8	695	7	0.3	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
East Lincoln Water & Sewer District's Forney Creek WWTP	NC0074012	0.975

Water Quality Parameters

Temperature (°C)	21.1
Dissolved Oxygen (mg/L)	8.2
Specific Conductance (µS/cm)	164
pH (s.u.)	7.1

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	2
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**50**

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/25/07	2007-32	11	40	Fair

Most Abundant Species Bluegill and Speckled Killifish

Exotic Species Redlip Shiner and Redear Sunfish

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- drains eastern Lincoln County, west of NC 16; no municipalities in the watershed, suburbs; site is immediately downstream from the WWTP; WWTP provides all of the summer flow to the creek (7Q10 = 0.6 MGD). **Habitat** -- sandy runs with side snags; stick riffles; some deadfalls; eroded and unstable banks; open canopy in places; channel filled with sediment; low flow. **2007** -- elevated conductivity; for its size, a diverse and abundant community, but suckers and intolerant species were absent; trophic structure skewed, 97% of all the fish were insectivores.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LONG CR	SR 2042	07/15/04	CF30	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	03050101	35.32833333	-80.90972222	11-120-(2.5)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	16.4	695	6	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	25	25 (industrial)	25	25 (pre-development)

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

Water Quality Parameters

Temperature (°C)	23.9
Dissolved Oxygen (mg/L)	6.3
Specific Conductance (µS/cm)	173
pH (s.u.)	6.5
Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Pool Variety (10)	4
Riffle Habitat (16)	1
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**44**

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/15/04	2004-123	17	48	Good

Most Abundant Species Bluehead Chub and Redbreast Sunfish

Exotic Species None

Species Change Since Last Cycle N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Catawba River; drains the northwest portion of the City of Charlotte metropolitan area, west of the Interstate 77 corridor. **Habitat** -- shallow sandy runs; severe bank erosion; coarse woody debris and snags; stick riffles; deeply entrenched; densely shaded. **2004** -- conductivity elevated, diverse community but with only one species of sucker and darter; intolerant species absent; percentage of tolerant fish (Golden Shiner, Creek Chub, White Sucker, White Catfish, Flat Bullhead, Eastern Mosquitofish, and Redbreast Sunfish) slightly elevated; Striped Jumprock represented by only young-of-year; data were also used as part of a NCSU Urban Fish Study.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CATAWBA CR	SR 2435	04/24/07	CF5	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	37	03050101	35.19472222	-81.08138889	11-130c	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	23.4	600	9	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	75	0	20	5 (tree farm nursery)

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

Water Quality Parameters

Temperature (°C)	16.4
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	155
pH (s.u.)	7.0
Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	9
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	1
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	0
Total Habitat Score (100)	**41**

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/24/07	2007-26	10	34	Poor
05/22/02	2002-55	11	40	Fair
05/19/97	97-44	11	42	Good-Fair

Most Abundant Species: Bluehead Chub

Exotic Species: None

Species Change Since Last Cycle: **Gains** -- Greenfin Shiner. **Losses** -- White Catfish and Pumpkinseed.

Data Analysis

Watershed -- tributary to Lake Wylie (Catawba River); drains southeastern Gaston County, including the southeast portion of the City of Gastonia metropolitan area; three small water treatment plants within the watershed (combined flow = unlimited); plant nursery and active cattle pasture along the right shoreline. **Habitat** -- very large woody debris, blow downs and deadfalls (tree trunks); very soft, shifting sand; infrequent stick riffles; severe erosion with sloughing banks; cattle fenced out of the stream, not so in 2002. **2007** -- specific conductance elevated, but similar to 2002 measurement; low diversity and abundance (n = 10 and 117, respectively); elevated percentage of omnivores. **1997 - 2007** -- low total diversity for a stream of its size, only 14 species known from the site, including one species of darter and sucker; no intolerant species known from the site; number of fish collected in 2007 (n = 117) was only one-third of the number collected in 2002 (a low flow year), but similar to the number in 1997 (n = 138); total habitat scores declined from 59 in 1997 to 45 in 2002 to 41 in 2007 due to loss of gravel riffles and poorer bank stability.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CROWDERS CR	SR 1131	06/22/04	CF11	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	37	03050101	35.23361111	-81.23305556	11-135c	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	23.5	695	8	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	25.2
Dissolved Oxygen (mg/L)	9.4
Specific Conductance (µS/cm)	151
pH (s.u.)	---

Water Clarity: Clear

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	6
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	0
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	0
Left Riparian Score (5)	1
Right Riparian Score (5)	1
Total Habitat Score (100)	**24**

Site Photograph

Substrate: Gravel and sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/04	2004-101	9	30	Poor

Most Abundant Species: Redbreast Sunfish

Exotic Species: None

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Lake Wylie (Catawba River); drains central Gaston County, including portions of the municipal areas of Kings Mountain, Bessemer City, and Gastonia, and the Interstate 85 corridor. **Habitat** -- the lowest total habitat score of any fish community site in the Catawba River basin 2004 - 2007; a golf course stream - no canopy or forested riparian zones ; sandy runs; uniform width; one deep pool on the left. **2004** -- conductivity elevated; low diversity and abundance for a stream of its size; darters and intolerant species were absent; percentage of tolerant fish (Golden Shiner, White Sucker, Flat Bullhead, and Redbreast Sunfish) was high; skewed trophic structure, ~ 95% of all the fish were insectivores; 80% of all the fish were Redbreast Sunfish; very low percentage of species, only 2 of the 9 species, with multiple age groups ; two-thirds of the species represented by only 1 or 2 fish per species; data were also used as part of a NCSU Urban Fish Study.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CROWDERS CR	SR 1108	04/24/07	CF10	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	37	03050101	35.17638889	-81.21611111	11-135d	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	40.7	650	7	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	16.8
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	156
pH (s.u.)	6.8

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	3
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**58**

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/24/07	2007-27	12	40	Fair
05/22/02	2002-56	12	38	Fair
05/19/97	97-45	9	36	Fair

Most Abundant Species Bluehead Chub

Exotic Species None

Species Change Since Last Cycle

Gains -- Striped Jumprock, Warmouth, and Fantail Darter. **Losses** -- Rosyside Dace, Greenhead Shiner, and Flat Bullhead.

Data Analysis

Watershed -- tributary to Lake Wylie (Catawba River); drains central Gaston County, including portions of the municipal areas of Kings Mountain, Bessemer City, Gastonia, and the Interstate 85 corridor; six small permitted dischargers within the watershed (combined flow = 1.00 MGD). **Habitat** -- very shallow, sandy runs; woody debris and woody debris riffles. **2007** -- low diversity and abundance (n = 12 and 96, respectively); elevated percentage of omnivores; Striped Jumprock and Fantail Darter collected for the first time. **1997 - 2007** -- conductivity elevated, has ranged from 155 to 178 µS/cm; 18 species known from the site, but only one specimen of White Sucker and Striped Jumprock have ever been collected from the site; number of fish collected in 2007 (n = 96) was only one-third of the number collected in 2002 (a low flow year), but similar to the number in 1997 (n = 90); a gradually improving trophic structure -- omnivores decreasing from 68 to 52 to 42% and the insectivores increasing from 30 to 48 to 58%; total habitat scores have ranged from 45 to 58 and increased from 45 in 2002 to 58 in 2007 due to better quality riffles, bank stability, and wider riparian zones.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
Crowders Cr	SC 564	CB234	07/10/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
York, SC	37	3050101	350837	810903	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	---	600	12	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Crowders Creek WWTP	NC0074268	6.0

Water Quality Parameters

Temperature (°C)	26.0
Dissolved Oxygen (mg/L)	---
Specific Conductance (µS/cm)	213
pH (s.u.)	7.4
Water Clarity	slightly turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	7
Left Bank Stability (7)	5
Right Bank Stability (7)	5
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	64

Substrate: mostly sand with small amounts of boulder, gravel and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10236	51	19	5.81	5.34	Good-Fair
05/20/02	8714	57	14	6.31	5.94	Fair
08/20/97	7438	67	11	6.64	5.94	Fair
08/18/92	5979	66	18	6.28	5.53	Good-Fair

Taxonomic Analysis

EPT taxa collected in 2007 that had not been previously collected include *Procloeon*, *Oecetis persimilis*, *Polycentropus* and *Triaenodes perna*. The number of midge taxa collected in 2007 (10) had decreased by about 50% from the number of midge taxa collected in previous years. No midge taxa collected in 2007 were abundant and only two taxa were common (*Polypedilum flavum* and *Tribelos jucundum*).

Data Analysis

Crowders Creek, a tributary to Lake Wylie, drains the south and western region of the city of Gastonia, the Interstate 85 corridor, and the eastern area of the town of Kings Mountain. This site rated Good-Fair in 1992 and dropped to Fair in 1997 and 2002. In 2007, the bioclassification increased to Good-Fair and had the highest EPT taxa richness and lowest Biotic Index ever recorded for this site. Between 1997 and 2002 Bessemer City ceased its discharges to Abernethy Creek, which is a tributary to Crowders Creek, and Carolina and Southern Processing (a chicken processing plant) tied its facility into Crowders Creek WWTP. Before Carolina and Southern Processing tied its facility into Crowders Creek WWTP, this site had rated Poor. Due to these discharge changes and facility upgrades, the water quality here seems to be improving.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
S FK CROWDERS CR	SR 1109	06/22/04	CF49	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	37	03050101	35.16194444	-81.21777778	11-135-10	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	27.6	695	7	0.6	No

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

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

Water Quality Parameters

Temperature (°C)	22.1
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	95
pH (s.u.)	---

Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	1
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	10
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**48**

Site Photograph

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/22/04	2004-100	13	42	Good-Fair

Most Abundant Species Bluehead Chub

Exotic Species None

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Crowders Creek; drains southwestern Gaston County; no municipalities in the watershed. **Habitat** -- deadfalls, snags; stick riffles; good pools and canopy cover; deeply entrenched; active cattle pastures along both banks. **2004** -- diversity and total abundance slightly lower than expected; only one species of darter (Tessellated Darter) and sucker (White Sucker) were present; intolerant species were absent; highest percentage of tolerant fish (83%) of any fish community site in the Catawba River basin, 2004 - 2007; data were also used as part of a NCSU Urban Fish Study.

Appendix 1-C

Ambient Station Summary Sheets

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

Location: CATAWBA RIV AT SR 1234 NR GREENLEE
Station #: C0145000 **Hydrologic Unit Code:** 03050101
Latitude: 35.63669 **Longitude:** -82.14385 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-(8)

Time period: 01/22/2004 to 12/14/2006

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	33	0	<4	0	0		7.2	8.3	9.4	10.6	12.4	13.9	16.4
	33	0	<5	0	0		7.2	8.3	9.4	10.6	12.4	13.9	16.4
pH (SU)	33	0	<6	1	3		5.9	6.4	6.6	6.7	6.9	7	7.2
	33	0	>9	0	0		5.9	6.4	6.6	6.7	6.9	7	7.2
Spec. conductance (umhos/cm at 25°C)	32	0	N/A				31	35	44	52	58	70	87
Water Temperature (°C)	33	0	>29	0	0		2	3.7	7	13.7	18.1	19.5	21.6
Other													
TSS (mg/L)	12	3	N/A				2.5	2.5	2.5	3	6.7	52.5	63
Turbidity (NTU)	34	3	>50	2	5.9		0.7	1	1.6	2	4.7	38	450
Metals (ug/L)													
Aluminum, total (Al)	12	3	N/A				50	50	57	88	218	1198	1300
Arsenic, total (As)	12	12	>10	0	0		5	5	5	5	9	10	10
Cadmium, total (Cd)	12	12	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	12	12	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	12	11	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	12	0	>1000	2	16.7	88.9	96	100	118	190	325	1470	1500
Lead, total (Pb)	12	12	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	12	12	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	12	10	>50	0	0		10	10	10	10	10	15	17

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
34	219	10	29	93.8

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

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

Location: CATAWBA RIV AT SR 1221 NR PLEASANT GARDENS
Station #: C0250000 **Hydrologic Unit Code:** 03050101
Latitude: 35.68597 **Longitude:** -82.06075 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-(8)

Time period: 01/22/2004 to 12/09/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	48	0	<4	0	0		6	7.5	8.6	10.4	11.9	13.6	15.5
	48	0	<5	0	0		6	7.5	8.6	10.4	11.9	13.6	15.5
pH (SU)	49	0	<6	1	2		5.2	6.4	6.7	6.9	7	7.3	7.8
	49	0	>9	0	0		5.2	6.4	6.7	6.9	7	7.3	7.8
Spec. conductance (umhos/cm at 25°C)	46	0	N/A				33	39	45	50	58	70	78
Water Temperature (°C)	49	0	>29	0	0		3	4.3	7.3	13.9	19	21.4	24.7
Other													
TSS (mg/L)	20	8	N/A				2.4	2.5	3.2	6.1	9.8	36.9	74
Turbidity (NTU)	54	0	>50	3	5.6		1.5	1.8	2.4	3.4	8.3	29	500
Nutrients (mg/L)													
NH3 as N	54	44	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.08
NO2 + NO3 as N	54	1	N/A				0.02	0.08	0.13	0.18	0.2	0.23	0.48
TKN as N	54	30	N/A				0.2	0.2	0.2	0.2	0.24	0.4	2.9
Total Phosphorus	54	2	N/A				0.02	0.02	0.02	0.04	0.05	0.11	1
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				56	66	84	190	660	4720	7000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	12	>7	0	0		2	2	2	2	2	3	4
Iron, total (Fe)	13	0	>1000	2	15.4	86.6	180	180	215	330	830	3320	4400
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	12	>50	0	0		10	10	10	10	10	14	16

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
54	159	9	17	

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

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

Location: N FORK CATAWBA RIV AT SR 1552 NR HANKINS
Station #: C0550000 **Hydrologic Unit Code:** 03050101
Latitude: 35.73832 **Longitude:** -81.98572 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-24-(13)

Time period: 01/22/2004 to 12/09/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	49	0	<4	0	0		6.4	7.6	8.6	10.3	12	13.1	15.5
	49	0	<5	0	0		6.4	7.6	8.6	10.3	12	13.1	15.5
pH (SU)	50	0	<6	1	2		5.4	6.8	7.2	7.4	7.6	8	8.5
	50	0	>9	0	0		5.4	6.8	7.2	7.4	7.6	8	8.5
Spec. conductance (umhos/cm at 25°C)	47	0	N/A				11	63	83	93	120	139	171
Water Temperature (°C)	50	0	>29	0	0		4	5	8.1	14.4	19.5	22	25.9
Other													
TSS (mg/L)	20	9	N/A				2.5	2.5	2.6	5.8	10.6	24.1	51
Turbidity (NTU)	54	3	>50	4	7.4		1	1.2	1.9	3	7.4	35	400
Nutrients (mg/L)													
NH3 as N	54	42	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.07
NO2 + NO3 as N	54	0	N/A				0.04	0.15	0.24	0.3	0.42	0.55	0.69
TKN as N	54	35	N/A				0.2	0.2	0.2	0.2	0.25	0.39	1.5
Total Phosphorus	54	0	N/A				0.02	0.03	0.04	0.06	0.07	0.11	0.56
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				57	61	70	110	300	3660	5300
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	12	>7	0	0		2	2	2	2	2	4	5
Iron, total (Fe)	13	0	>1000	2	15.4	86.6	160	168	205	240	530	3220	4300
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	10	>50	0	0		10	10	10	10	12	16	17

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
54	43	9	17	

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

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

Location: LINVILLE RIV AT NC 126 NR NEBO

Station #: C1000000 **Hydrologic Unit Code:** 03050101
Latitude: 35.79539 **Longitude:** -81.89013 **Stream class:** B HQW
Agency: NCAMBNT **NC stream index:** 11-29-(19)

Time period: 01/22/2004 to 12/09/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	49	0	<4	0	0		7.2	8.1	8.9	9.9	12.1	13.3	14.5
	49	0	<5	0	0		7.2	8.1	8.9	9.9	12.1	13.3	14.5
pH (SU)	50	0	<6	1	2		5.2	6.3	6.6	6.8	7	7.2	7.4
	50	0	>9	0	0		5.2	6.3	6.6	6.8	7	7.2	7.4
Spec. conductance (umhos/cm at 25°C)	47	0	N/A				29	35	40	46	49	53	57
Water Temperature (°C)	50	0	>29	0	0		2	4.1	7.4	14.2	19.5	23	26.5
Other													
TSS (mg/L)	21	18	N/A				2.5	2.5	2.5	2.5	6.2	9.2	12
Turbidity (NTU)	54	17	>50	1	1.9		1	1	1	1.4	2.9	7.1	140
Nutrients (mg/L)													
NH3 as N	53	51	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.13
NO2 + NO3 as N	53	0	N/A				0.02	0.13	0.21	0.28	0.36	0.41	0.51
TKN as N	53	39	N/A				0.2	0.2	0.2	0.2	0.2	0.24	0.68
Total Phosphorus	53	24	N/A				0.01	0.02	0.02	0.02	0.03	0.04	0.2
Metals (ug/L)													
Aluminum, total (Al)	13	6	N/A				50	50	50	52	90	188	220
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	13	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	13	0	>1000	0	0		88	88	115	130	225	356	400
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	12	>50	0	0		10	10	10	10	10	12	14

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
54	17	2	4	

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

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

Location: CATAWBA RIV AT SR 1304 NR CALVIN
Station #: C1230000 **Hydrologic Unit Code:** 03050101
Latitude: 35.73983 **Longitude:** -81.72436 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-(32.7)

Time period: 01/07/2004 to 12/09/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	48	0	<4	0	0		5.6	7.7	8.8	9.6	11.1	12.8	13.3
	48	0	<5	0	0		5.6	7.7	8.8	9.6	11.1	12.8	13.3
pH (SU)	50	0	<6	0	0		6.1	6.4	6.5	6.7	6.9	6.9	7.1
	50	0	>9	0	0		6.1	6.4	6.5	6.7	6.9	6.9	7.1
Spec. conductance (umhos/cm at 25°C)	49	0	N/A				28	42	48	54	58	60	62
Water Temperature (°C)	52	0	>29	0	0		3.9	5.6	10.1	13.6	17.4	20.4	22.6
Other													
TSS (mg/L)	20	8	N/A				2.5	2.6	3.4	6.2	8.4	22.7	62
Turbidity (NTU)	54	0	>50	2	3.7		1.1	1.4	1.9	3.2	7.1	25	130
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				65	65	145	210	390	1780	1900
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	11	>7	0	0		2	2	2	2	2	3	4
Iron, total (Fe)	13	0	>1000	2	15.4	86.6	120	136	240	390	640	1860	1900
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	0	0		17	17	23	42	64	90	95
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	10	>50	0	0		10	10	10	10	10	14	15

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
54	34	2	4	

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

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

Location: WILSON CRK AT US 221 NR GRAGG
Station #: C1370000 **Hydrologic Unit Code:** 03050101
Latitude: 36.09695 **Longitude:** -81.80743 **Stream class:** B Tr ORW
Agency: NCAMBNT **NC stream index:** 11-38-34

Time period: 01/07/2004 to 12/04/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	45	0	<6	0	0		7.8	8.9	9.2	10.5	11.3	12.6	14.6
pH (SU)	47	0	<6	20	42.6	100	3.7	4.3	4.7	6.1	6.4	6.6	6.8
	47	0	>9	0	0		3.7	4.3	4.7	6.1	6.4	6.6	6.8
Spec. conductance (umhos/cm at 25°C)	45	0	N/A				14	17	18	20	22	26	28
Water Temperature (°C)	48	0	>29	0	0		1	3	5.7	10.5	14	15.7	18.1
Other													
Chloride (mg/L)	16	4	>230	0	0		1	1	1	1	1	2	2
Fluoride (mg/L)	16	16	>1.8	0	0		0	0	0	0	0	0	0
TSS (mg/L)	20	17	N/A				2.5	2.5	2.5	2.5	6.2	11.8	12
Turbidity (NTU)	49	25	>10	1	2		0.2	1	1	1	1.6	3.7	11
Nutrients (mg/L)													
NH3 as N	48	47	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.08
NO2 + NO3 as N	48	6	N/A				0.02	0.02	0.06	0.24	0.38	0.53	0.67
TKN as N	48	35	N/A				0.2	0.2	0.2	0.2	0.21	0.26	0.36
Total Phosphorus	48	27	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.08
Metals (ug/L)													
Aluminum, total (Al)	13	1	N/A				50	52	68	100	120	280	360
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>0.4	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	13	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	13	9	>1000	0	0		50	50	50	50	63	125	150
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	8	>50	0	0		10	10	10	10	16	28	29

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
49	3	0	0	

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

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

Location: WILSON CRK AT SR 1358 AT EDGEMONT
Station #: C1385000 **Hydrologic Unit Code:** 03050101
Latitude: 36.00300 **Longitude:** -81.77100 **Stream class:** B Tr ORW
Agency: NCAMBNT **NC stream index:** 11-38-34

Time period: 07/21/2005 to 07/21/2005

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Percentiles Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	1	0	<6	0	0		9.6	9.6	9.6	9.6	9.6	9.6	9.6
pH (SU)	1	0	<6	0	0		6.8	6.8	6.8	6.8	6.8	6.8	6.8
	1	0	>9	0	0		6.8	6.8	6.8	6.8	6.8	6.8	6.8
Spec. conductance (umhos/cm at 25°C)	1	0	N/A				21	21	21	21	21	21	21
Water Temperature (°C)	1	0	>29	0	0		19.2	19.2	19.2	19.2	19.2	19.2	19.2
Other													
Turbidity (NTU)	1	1	>10	0	0		1	1	1	1	1	1	1
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	N/A				0.05	0.05	0.05	0.05	0.05	0.05	0.05
TKN as N	1	1	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Phosphorus	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
1	19	0	0	

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

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

Location: LOWER CRK AT SR 1501 NR MORGANTON MARION
Station #: C1750000 **Hydrologic Unit Code:** 03050101
Latitude: 35.82512 **Longitude:** -81.63587 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-39-(6.5)

Time period: 01/07/2004 to 12/09/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	47	0	<4	0	0		5.7	7	7.9	9.1	10.5	12	13.4
	47	0	<5	0	0		5.7	7	7.9	9.1	10.5	12	13.4
pH (SU)	49	0	<6	0	0		6.3	6.5	6.7	6.9	7	7.1	7.2
	49	0	>9	0	0		6.3	6.5	6.7	6.9	7	7.1	7.2
Spec. conductance (umhos/cm at 25°C)	48	0	N/A				62	80	85	94	112	122	135
Water Temperature (°C)	51	0	>29	0	0		3	5.1	9.4	13.6	19	22.2	23.4
Other													
TSS (mg/L)	20	2	N/A				5.4	6.2	9	16	33.5	122	143
Turbidity (NTU)	52	0	>50	6	11.5	73.9	1.2	4.9	9.9	14.5	30.5	65.5	230
Nutrients (mg/L)													
NH3 as N	51	5	N/A				0.02	0.02	0.03	0.04	0.06	0.18	0.68
NO2 + NO3 as N	51	0	>10	0	0		0.32	0.44	0.52	0.61	0.72	0.82	1.2
TKN as N	51	7	N/A				0.2	0.2	0.24	0.3	0.4	0.62	1.2
Total Phosphorus	51	0	N/A				0.03	0.04	0.05	0.1	0.17	0.26	0.64
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				210	262	680	780	1750	5120	6000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	7	>7	0	0		2	2	2	2	3	6	7
Iron, total (Fe)	13	0	>1000	10	76.9	100	730	754	1035	1400	2100	5600	7200
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	1	7.7		65	74	92	110	130	210	250
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	2	>50	0	0		10	10	11	12	16	31	31

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
52	438	25	48	100

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

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

Location: LAKE HICKORY AT NC 127 NR HICKORY
Station #: C2600000 **Hydrologic Unit Code:** 03050101
Latitude: 35.80201 **Longitude:** -81.30426 **Stream class:** WS-V&B
Agency: NCAMBNT **NC stream index:** 11-(59.5)

Time period: 01/20/2004 to 01/02/2007

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	35	0	<4	0	0		6.5	7.3	8	8.7	10.2	10.9	12.5
	35	0	<5	0	0		6.5	7.3	8	8.7	10.2	10.9	12.5
pH (SU)	35	0	<6	4	11.4	73.1	5.7	5.9	6.3	6.6	7.4	7.9	8.4
	35	0	>9	0	0		5.7	5.9	6.3	6.6	7.4	7.9	8.4
Spec. conductance (umhos/cm at 25°C)	35	0	N/A				41	46	48	52	56	57	61
Water Temperature (°C)	35	0	>29	4	11.4	73.1	6	7.9	11	18	27.2	29.7	30.5
Other													
Chlorophyll a (ug/L)	31	0	>40	0	0		1	2	3	10	15	19	23
TSS (mg/L)	14	3	N/A				2.5	2.5	2.5	3.8	4.8	8	10
Turbidity (NTU)	36	0	>25	1	2.8		1.7	2	2.7	3.2	4.6	11.2	30
Nutrients (mg/L)													
NH3 as N	36	20	N/A				0.02	0.02	0.02	0.02	0.03	0.04	0.08
NO2 + NO3 as N	36	9	>10	0	0		0.02	0.02	0.02	0.22	0.3	0.35	0.49
TKN as N	36	8	N/A				0.2	0.2	0.2	0.24	0.3	0.36	0.55
Total Phosphorus	36	1	N/A				0.02	0.02	0.03	0.03	0.04	0.04	0.06
Metals (ug/L)													
Aluminum, total (Al)	14	0	N/A				58	60	75	125	222	850	1300
Arsenic, total (As)	14	14	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	14	14	>2	0	0		1	1.5	2	2	2	2	2
Chromium, total (Cr)	14	14	>50	0	0		10	18	25	25	25	25	25
Copper, total (Cu)	14	13	>7	0	0		2	2	2	2	2	2	3
Iron, total (Fe)	14	0	>1000	0	0		57	67	82	175	305	755	1000
Lead, total (Pb)	14	14	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	14	1	>200	0	0		10	10	11	15	34	40	41
Mercury, total (Hg)	14	14	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	14	14	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	14	12	>50	0	0		10	10	10	10	10	16	19

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
36	3	0	0	

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

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

Location: LOWER LITTLE RIV AT SR 1313 NR ALL HEALING SPRINGS
Station #: C2818000 **Hydrologic Unit Code:** 03050101
Latitude: 35.94585 **Longitude:** -81.23698 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-69-(0.5)

Time period: 01/07/2004 to 12/01/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Percentiles Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		7	7.6	8.1	9.6	11.2	12.4	15
	58	0	<5	0	0		7	7.6	8.1	9.6	11.2	12.4	15
pH (SU)	58	0	<6	13	22.4	99.9	4.9	5.7	6	6.4	6.5	6.7	7.8
	58	0	>9	0	0		4.9	5.7	6	6.4	6.5	6.7	7.8
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				41	44	46	48	51	53	56
Water Temperature (°C)	58	0	>29	0	0		2	5.6	8.4	14	19.4	21.1	24.4
Other													
TSS (mg/L)	20	4	N/A				2.5	3	3.2	4.9	6.2	21	66
Turbidity (NTU)	59	0	>50	3	5.1		2.2	3.1	3.8	6.4	9.4	27	450
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				130	138	175	210	275	438	490
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	11	>7	0	0		2	2	2	2	2	3	4
Iron, total (Fe)	13	0	>1000	0	0		270	282	315	400	560	764	880
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	27	32

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	367	28	47	100

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

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

Location: LAKE NORMAN AT SR 1004 NR MOORESVILLE
Station #: C3420000 **Hydrologic Unit Code:** 03050101
Latitude: 35.69560 **Longitude:** -80.99076 **Stream class:** WS-IV&B CA
Agency: NCAMBNT **NC stream index:** 11-(75)

Time period: 02/24/2004 to 01/02/2007

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	35	0	<4	0	0		5.3	6.2	7.5	8.1	10.3	11.6	12.5
	35	0	<5	0	0		5.3	6.2	7.5	8.1	10.3	11.6	12.5
pH (SU)	35	0	<6	4	11.4	73.1	5.7	5.9	6.2	6.4	7.2	7.9	8.6
	35	0	>9	0	0		5.7	5.9	6.2	6.4	7.2	7.9	8.6
Spec. conductance (umhos/cm at 25°C)	35	0	N/A				41	46	50	54	57	60	61
Water Temperature (°C)	35	0	>32	0	0		6	8	11.8	17.4	26.7	29.2	31.1
Other													
Chlorophyll a (ug/L)	31	0	>40	1	3.2		1	2	3	6	9	19	41
TSS (mg/L)	13	1	N/A				4.2	4.5	6.9	7.8	18	30	30
Turbidity (NTU)	35	0	>25	2	5.7		2.7	4.2	5.2	6	9.1	16.4	60
Nutrients (mg/L)													
NH3 as N	35	16	N/A				0.02	0.02	0.02	0.02	0.04	0.06	0.07
NO2 + NO3 as N	35	2	>10	0	0		0.02	0.04	0.2	0.27	0.36	0.41	0.45
TKN as N	35	8	N/A				0.2	0.2	0.22	0.24	0.31	0.4	0.5
Total Phosphorus	35	0	N/A				0.02	0.02	0.03	0.03	0.04	0.05	0.1
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				140	152	235	350	735	1808	2400
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	10	>7	0	0		2	2	2	2	2	3	4
Iron, total (Fe)	13	0	>1000	1	7.7		130	174	315	440	690	1720	2300
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	0	0		18	22	32	35	52	61	63
Mercury, total (Hg)	13	13	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	12	>50	0	0		10	10	10	10	10	20	27

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
35	16	3	9	

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

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

Location: MOUNTAIN ISLAND LAKE ABOVE GAR CRK NR CROFT
Station #: C3699000 **Hydrologic Unit Code:** 03050101
Latitude: 35.35514 **Longitude:** -80.93793 **Stream class:** WS-IV&B CA
Agency: NCAMBNT **NC stream index:** 11-(114)

Time period: 02/23/2004 to 01/02/2007

	#	#		Results not meeting EL			Percentiles						
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	34	0	<4	0	0		4.6	6	6.6	7.6	9.6	10.2	10.9
	34	0	<5	1	2.9		4.6	6	6.6	7.6	9.6	10.2	10.9
pH (SU)	34	0	<6	4	11.8	75	5.7	5.9	6.2	6.4	6.7	7.4	7.6
	34	0	>9	0	0		5.7	5.9	6.2	6.4	6.7	7.4	7.6
Spec. conductance (umhos/cm at 25°C)	34	0	N/A				51	54	55	58	60	62	64
Water Temperature (°C)	34	0	>32	0	0		9.6	10.5	12.9	19	29.2	31.4	31.5
Other													
Chlorophyll a (ug/L)	30	0	>40	0	0		2	2	3	4	5	8	10
TSS (mg/L)	13	2	N/A				2.5	2.5	2.6	3.5	4.9	17.4	25
Turbidity (NTU)	35	0	>25	0	0		1.8	2.2	2.8	3.3	4.1	6.7	22
Nutrients (mg/L)													
NH3 as N	34	19	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.09
NO2 + NO3 as N	34	1	>10	0	0		0.02	0.04	0.08	0.18	0.21	0.24	0.27
TKN as N	34	16	N/A				0.2	0.2	0.2	0.2	0.24	0.28	0.33
Total Phosphorus	34	13	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.05
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				60	62	82	140	220	610	830
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	6	>7	0	0		2	2	2	3	4	4	4
Iron, total (Fe)	13	0	>1000	0	0		70	71	93	140	280	650	870
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	0	0		15	15	18	24	38	51	58
Mercury, total (Hg)	13	13	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	13	>50	0	0		10	10	10	10	10	10	10

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
35	7	1	3	

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

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

Location: DUTCHMANS CRK AT SR 1918 AT MOUNTAIN ISLAND
Station #: C3860000 **Hydrologic Unit Code:** 03050101
Latitude: 35.33646 **Longitude:** -81.01328 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-119-(0.5)

Time period: 01/14/2004 to 12/03/2008

	#	#		Results not meeting EL			Percentiles						
	results	ND	EL	#	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5	6.7	7.4	9	11.6	12.6	14
	58	0	<5	0	0		5	6.7	7.4	9	11.6	12.6	14
pH (SU)	59	0	<6	5	8.5		5.5	6	6.4	6.6	6.9	7.1	7.5
	59	0	>9	0	0		5.5	6	6.4	6.6	6.9	7.1	7.5
Spec. conductance (umhos/cm at 25°C)	55	0	N/A				71	77	85	91	102	116	156
Water Temperature (°C)	59	0	>32	0	0		3	4.4	9.2	15.2	22	25	28.5
Other													
TSS (mg/L)	20	6	N/A				3	4.6	6	10.5	19.8	66.4	72
Turbidity (NTU)	59	0	>50	6	10.2	62.3	3.3	4.4	7.4	13	28	80	250
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	>10	0	0		0.18	0.18	0.18	0.18	0.18	0.18	0.18
TKN as N	1	0	N/A				0.83	0.83	0.83	0.83	0.83	0.83	0.83
Total Phosphorus	1	0	N/A				0.35	0.35	0.35	0.35	0.35	0.35	0.35
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				160	160	205	520	1600	3600	4800
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	8	>7	0	0		2	2	2	2	2	5	6
Iron, total (Fe)	13	0	>1000	8	61.5	100	660	744	880	1400	2050	4340	5500
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	1	7.7		86	87	92	100	115	246	330
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	13	14

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	208	17	29	96.3

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

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

Location: CATAWBA RIV AT NC 27 NR THRIFT
Station #: C3900000 **Hydrologic Unit Code:** 03050101
Latitude: 35.29818 **Longitude:** -81.00323 **Stream class:** WS-IV CA
Agency: NCAMBNT **NC stream index:** 11-(117)

Time period: 02/23/2004 to 12/08/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Percentiles Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		4	5.1	5.9	7.6	9.2	10.1	11.1
	59	0	<5	4	6.8		4	5.1	5.9	7.6	9.2	10.1	11.1
pH (SU)	59	0	<6	10	16.9	96.9	5.5	5.8	6	6.3	6.7	7	7.6
	59	0	>9	0	0		5.5	5.8	6	6.3	6.7	7	7.6
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				52	55	57	62	70	77	80
Water Temperature (°C)	59	0	>32	2	3.4		9	10.4	13.3	20.1	27	31	33
Other													
Chlorophyll a (ug/L)	53	7	>40	0	0		1	1	1	2	3	4	9
TSS (mg/L)	19	8	N/A				2.5	2.5	3.5	6	6.2	11	12
Turbidity (NTU)	59	0	>25	0	0		1.3	2	2.5	3.5	4.7	6.2	19
Nutrients (mg/L)													
NH3 as N	58	18	N/A				0.02	0.02	0.02	0.02	0.04	0.05	0.12
NO2 + NO3 as N	58	0	>10	0	0		0.03	0.06	0.09	0.16	0.21	0.23	0.49
TKN as N	58	34	N/A				0.2	0.2	0.2	0.2	0.23	0.26	0.31
Total Phosphorus	58	29	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.04
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				100	104	120	210	300	388	400
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	13	4	>7	0	0		2	2	2	2	3	5	5
Iron, total (Fe)	13	0	>1000	0	0		120	124	160	230	310	482	490
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	0	0		14	14	24	29	44	53	56
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	13	>50	0	0		10	10	10	10	10	10	10

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	9	0	0	

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

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

Location: LONG CRK AT SR 2042 NR PAW CREEK
Station #: C4040000 **Hydrologic Unit Code:** 03050101
Latitude: 35.32846 **Longitude:** -80.90962 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-120-(2.5)

Time period: 01/14/2004 to 12/03/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	1	1.7		3.7	5.5	6.8	8.1	10.3	11.6	14.4
	58	0	<5	3	5.2		3.7	5.5	6.8	8.1	10.3	11.6	14.4
pH (SU)	59	0	<6	2	3.4		5.8	6.2	6.5	6.7	7	7.4	7.7
	59	0	>9	0	0		5.8	6.2	6.5	6.7	7	7.4	7.7
Spec. conductance (umhos/cm at 25°C)	55	0	N/A				56	106	147	167	183	198	207
Water Temperature (°C)	59	0	>32	0	0		3	5.5	11.9	15.7	22.3	24.7	25.9
Other													
TSS (mg/L)	20	9	N/A				2.5	2.6	4.4	6.2	14.1	62.4	92
Turbidity (NTU)	59	0	>50	12	20.3	99.5	1.7	3.1	4.7	12	40	140	900
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				60	84	185	750	4200	5520	5800
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	6	>7	3	23.1	96.6	2	2	2	3	6	10	10
Iron, total (Fe)	13	1	>1000	6	46.2	100	50	134	630	970	3000	5220	5500
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	1	7.7		56	56	93	120	175	214	230
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	6	>50	1	7.7		10	10	10	12	20	47	61

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	270	15	25	88.4

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

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

Location: CATAWBA RIV AT POWERLINE CROSSING AT S BELMONT X REF C4210000
Station #: C4220000 **Hydrologic Unit Code:** 03050101
Latitude: 35.21480 **Longitude:** -81.00971 **Stream class:** WS-IV&B CA
Agency: NCAMBNT **NC stream index:** 11-(122)

Time period: 02/23/2004 to 01/03/2007

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	35	0	<4	0	0		4.7	5.9	7	8.4	9.1	9.9	10.8
	35	0	<5	1	2.9		4.7	5.9	7	8.4	9.1	9.9	10.8
pH (SU)	35	0	<6	1	2.9		5.9	6	6.1	6.4	7	7.4	8.6
	35	0	>9	0	0		5.9	6	6.1	6.4	7	7.4	8.6
Spec. conductance (umhos/cm at 25°C)	35	0	N/A				55	57	60	64	73	82	86
Water Temperature (°C)	35	0	>32	2	5.7		10	10.3	12.8	19.7	29	31.9	32.8
Other													
Chlorophyll a (ug/L)	30	3	>40	0	0		1	1	2	3	11	17	23
TSS (mg/L)	12	0	N/A				2.8	3.2	4.7	7.4	17.2	57.3	72
Turbidity (NTU)	35	0	>25	3	8.6		2.7	3.7	4.8	7.3	9.3	21	200
Nutrients (mg/L)													
NH3 as N	34	13	N/A				0.02	0.02	0.02	0.03	0.04	0.07	0.15
NO2 + NO3 as N	34	4	>10	0	0		0.02	0.02	0.12	0.18	0.22	0.26	0.3
TKN as N	34	9	N/A				0.2	0.2	0.2	0.26	0.34	0.4	0.82
Total Phosphorus	34	0	N/A				0.02	0.03	0.03	0.04	0.06	0.08	0.22
Metals (ug/L)													
Aluminum, total (Al)	12	0	N/A				190	193	222	430	700	1259	1400
Arsenic, total (As)	12	12	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	12	12	>2	0	0		1	1.3	2	2	2	2	2
Chromium, total (Cr)	12	12	>50	0	0		10	14	25	25	25	25	25
Copper, total (Cu)	12	2	>7	1	8.3		2	2	2	3	4	8	10
Iron, total (Fe)	12	0	>1000	2	16.7	88.9	250	253	302	420	758	1370	1400
Lead, total (Pb)	12	12	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	12	0	>200	0	0		25	26	30	44	54	152	190
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	12	12	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	12	11	>50	0	0		10	10	10	10	10	35	46

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
35	17	2	6	

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

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

Location: CATAWBA CRK AT SR 2302 AT SC STATE LINE
Station #: C7400000 **Hydrologic Unit Code:** 03050101
Latitude: 35.15135 **Longitude:** -81.05824 **Stream class:** WS-V B
Agency: NCAMBNT **NC stream index:** 11-(123.5)

Time period: 02/18/2004 to 12/08/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<4	0	0		6	6.5	7.4	8.6	9.6	10.2	11.4
	60	0	<5	0	0		6	6.5	7.4	8.6	9.6	10.2	11.4
pH (SU)	60	0	<6	5	8.3		5.5	6	6.4	6.9	8	8.4	8.9
	60	0	>9	0	0		5.5	6	6.4	6.9	8	8.4	8.9
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				58	69	74	85	102	113	125
Water Temperature (°C)	60	0	>32	3	5		8	10.4	14	21.6	30.1	31.7	33.6
Other													
Chlorophyll a (ug/L)	1	0	>40	0	0		17	17	17	17	17	17	17
TSS (mg/L)	20	6	N/A				4	4.8	5.6	6.5	8	11.7	18
Turbidity (NTU)	59	0	>25	1	1.7		2.9	3.6	4	5.6	7.7	14	30
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	>10	0	0		0.3	0.3	0.3	0.3	0.3	0.3	0.3
TKN as N	1	0	N/A				0.28	0.28	0.28	0.28	0.28	0.28	0.28
Total Phosphorus	1	0	N/A				0.03	0.03	0.03	0.03	0.03	0.03	0.03
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				140	156	205	250	480	794	830
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	13	1	>7	0	0		2	2	3	4	5	5	5
Iron, total (Fe)	13	0	>1000	0	0		170	194	280	360	475	704	720
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	6	0	>200	0	0		18	18	26	30	40	46	46
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	10	>50	0	0		10	10	10	10	10	14	15

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	5	0	0	

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

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

Location: LAKE WYLIE AT NC 49 NR OAK GROVE
Station #: C7500000 **Hydrologic Unit Code:** 03050101
Latitude: 35.10128 **Longitude:** -81.04000 **Stream class:** WS-V&B
Agency: NCAMBNT **NC stream index:** 11-(123.5)

Time period: 02/23/2004 to 01/03/2007

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	35	0	<4	0	0		4.3	6.5	7.1	8.8	9.5	10.8	11.1
	35	0	<5	1	2.9		4.3	6.5	7.1	8.8	9.5	10.8	11.1
pH (SU)	35	0	<6	1	2.9		5.4	6.1	6.2	6.6	7.9	8.3	8.7
	35	0	>9	0	0		5.4	6.1	6.2	6.6	7.9	8.3	8.7
Spec. conductance (umhos/cm at 25°C)	35	0	N/A				59	65	68	74	83	90	102
Water Temperature (°C)	35	0	>32	2	5.7		9	10.3	13.7	20	29.4	30.9	33.7
Other													
Chlorophyll a (ug/L)	30	0	>40	0	0		1	2	4	6	14	18	22
TSS (mg/L)	12	2	N/A				2.5	2.5	3	4.4	6	22.3	25
Turbidity (NTU)	35	0	>25	3	8.6		1.8	2.3	2.4	4.7	7.3	20.6	50
Nutrients (mg/L)													
NH3 as N	36	20	N/A				0.02	0.02	0.02	0.02	0.05	0.06	0.07
NO2 + NO3 as N	36	5	>10	0	0		0.02	0.02	0.07	0.2	0.29	0.35	0.43
TKN as N	36	2	N/A				0.2	0.21	0.22	0.29	0.36	0.42	0.51
Total Phosphorus	36	0	N/A				0.02	0.02	0.03	0.03	0.05	0.06	0.09
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				61	71	117	230	305	1628	2500
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	0	>7	0	0		3	3	3	3	4	5	5
Iron, total (Fe)	13	0	>1000	1	7.7		60	76	210	290	420	1480	2000
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	1	7.7		15	15	20	34	48	162	230
Mercury, total (Hg)	13	13	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	15	18

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
35	3	2	6	

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

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

Location: CROWDERS CRK AT SC 564 RIDGE RD NR BOWLING GREEN SC
Station #: C8660000 **Hydrologic Unit Code:** 03050101
Latitude: 35.14374 **Longitude:** -81.15046 **Stream class:** FW
Agency: NCAMBNT **NC stream index:**

Time period: 01/14/2004 to 12/10/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	N/A				5.6	6.5	7.5	9	10.5	12	14.2
pH (SU)	59	0	N/A				6	6.2	6.5	6.8	7	7.2	7.5
Spec. conductance (umhos/cm at 25°C)	54	0	N/A				114	128	146	173	231	324	519
Water Temperature (°C)	59	0	N/A				3.8	6	10.5	16.5	21	24.4	26.4
Other													
TSS (mg/L)	20	5	N/A				2.5	3	4	6.2	7.8	14.6	52
Turbidity (NTU)	59	0	N/A				2	2.8	5.2	8.6	14	32	260
Nutrients (mg/L)													
NH3 as N	59	10	N/A				0.02	0.02	0.02	0.03	0.04	0.07	0.33
NO2 + NO3 as N	59	0	N/A				0.16	0.3	0.43	0.59	0.85	1.5	2.5
TKN as N	59	5	N/A				0.2	0.24	0.28	0.35	0.45	0.77	1.2
Total Phosphorus	59	0	N/A				0.04	0.05	0.06	0.07	0.1	0.14	0.31
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				97	102	135	350	445	1272	1800
Arsenic, total (As)	13	13	N/A				5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	N/A				1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	N/A				10	16	25	25	25	25	25
Copper, total (Cu)	13	11	N/A				2	2	2	2	2	3	3
Iron, total (Fe)	13	0	N/A				410	450	535	790	980	2100	2700
Lead, total (Pb)	13	13	N/A				10	10	10	10	10	10	10
Manganese, total (Mn)	4	0	N/A				160	160	168	195	200	200	200
Mercury, total (Hg)	12	12	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	N/A				10	10	10	10	10	10	10
Zinc, total (Zn)	13	7	N/A				10	10	10	10	12	19	20

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	277	16	27	93.3

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

WATERSHED MAPS

Appendix 1-E

Permits

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0004243	Coats American Inc	Sevier Plant	Non-Government	Industrial Process & Commercial Wastewater	Major	McDowell	Asheville	200,0000
NC0004260	SKF USA Inc	SKF Gastonia Facility	Non-Government	Industrial Process & Commercial Wastewater	Minor	Gaston	Mooresville	14,400
NC0004375	Clariant Corporation	Mount Holly East (MHE) Facility	Non-Government	Industrial Process & Commercial Wastewater	Major	Mecklenburg	Mooresville	3,900,000
NC0004723	Kinder Morgan Southeast Terminals	Charlotte Terminal 3	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0004839	Kinder Morgan Southeast Terminals	Charlotte Terminal 2	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	57,000
NC0004961	Duke Energy Carolinas LLC	Riverbend Steam Station	Non-Government	Industrial Process & Commercial Wastewater	Major	Gaston	Mooresville	Not Limited
NC0004987	Duke Energy Carolinas LLC	Marshall Steam Station	Non-Government	Industrial Process & Commercial Wastewater	Major	Catawba	Mooresville	Not Limited
NC0005177	FMC Corporation	Lithium Division Plant	Non-Government	Industrial Process & Commercial Wastewater	Major	Gaston	Mooresville	615,000
NC0005185	Magellan Terminals Holdings L P	Charlotte II Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	259,000
NC0005258	Sgl Carbon LLC	SGL Carbon Corporation	Non-Government	Industrial Process & Commercial Wastewater	Minor	Burke	Asheville	Not Limited
NC0005771	Transmontaigne Operating Company L	Charlotte/Paw Creek Terminal #1	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0020401*	City of Hickory	Northeast WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Catawba	Mooresville	6,000,000
NC0021156*	City of Mount Holly	Mount Holly WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Gaston	Mooresville	4,000,000
NC0021181*	City of Belmont	Belmont WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Gaston	Mooresville	5,000,000
NC0021229*	Town of Old Fort	Old Fort WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	McDowell	Asheville	1,200,000
NC0021890	Town of Granite Falls	Granite Falls WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Caldwell	Asheville	900,000
NC0021962	CITGO Petroleum Corporation	Charlotte Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0021971	BP Products North America Inc	Charlotte BP Terminal/Paw Creek	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0022187	Motiva Enterprises LLC	Paw Creek Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0022497	Cross Country Campground	Cross Country Campground	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	65,000
NC0022756	Linville Land Harbor Prop Owners A	Linville Land Harbor WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Avery	Asheville	225,000
NC0023124	GGCC Utility Inc	GGCC Utility WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Avery	Asheville	70,000
NC0023540	Belmont Textile Machinery Company	Belmont Textile Machinery WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Gaston	Mooresville	5,000
NC0023736*	City of Lenoir	Gunpowder Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Caldwell	Asheville	2,000,000
NC0023981*	City of Lenoir	Lower Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Caldwell	Asheville	6,000,000
NC0024252*	City of Conover	Northeast WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Catawba	Mooresville	1,500,000
NC0024279	City of Conover	Southeast WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Catawba	Mooresville	300,000
NC0024392	Duke Energy Carolinas LLC	McGuire Nuclear Power Plant	Non-Government	Industrial Process & Commercial Wastewater	Major	Mecklenburg	Mooresville	Not Limited
NC0025135	Huffman Finishing Inc	Huffman Finishing	Non-Government	Industrial Process & Commercial Wastewater	Major	Caldwell	Asheville	250,000
NC0025542*	City of Hickory	Catawba WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Catawba	Mooresville	225,000
NC0025917	Town of Rhodhiss	Rhodhiss WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Burke	Asheville	96,000
NC0026271	Town of Taylorsville	Taylorsville WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Alexander	Mooresville	830,000
NC0026573*	City of Morganton	Catawba River Pollution Control Faci	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Burke	Asheville	13,000,000
NC0026654	Town of Crossnore	Crossnore WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Avery	Asheville	70,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0028711	Mecklenburg County Schools	Berryhill Elementary School WWTP	Government - County	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	6,000
NC0029831	Carolina Energies Inc	Sugar Hill Truck Stop	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	5,000
NC0030783	Caldwell County Schools	Baton Elementary School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	15,000
NC0030996	The Switzerland Inn	The Switzerland Inn	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	10,000
NC0031038	Colonial Pipeline Company	Paw Creek Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0031879	City of Marion	Corpening Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	McDowell	Asheville	3,000,000
NC0032662	City of Claremont	North WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Catawba	Mooresville	100,000
NC0032891	Kinder Morgan Southeast Terminals	Charlotte Terminal 1	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0034754	Commscope Inc	Commscope WWTP	Non-Government	Industrial Process & Commercial Wastewater	Minor	Catawba	Mooresville	20,000
NC0034860	Schneider Mills Inc	Schneider Mills WWTP	Non-Government	Industrial Process & Commercial Wastewater	Major	Alexander	Mooresville	780,000
NC0034967	Carolina Glove Company	Carolina Glove Company	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Alexander	Mooresville	15,000
NC0035157	McDowell County Adult Care LLC	Cedarbrook Residential Center	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	3,000
NC0035211	Shuford Yarns LLC	Shuford Yarns, LLC-Dudley Shoals Pla	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	5,400
NC0036277	Charlotte-Mecklenburg Utilities	McDowell Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	12,000,000
NC0039446	Linville Resorts Inc	Linville Resorts WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Avery	Asheville	150,000
NC0040291	Mansukh Patel	Days Inn - Marion	Individual	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	20,000
NC0040339	NC DENR/Division of Forest Resourc	B.H. Corpening Forestry Training Cen	Government - State	Discharging 100% Domestic < 1MGD	Minor	Avery	Asheville	18,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0040754	NC Outward Bound School	NC Outward Bound School	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Burke	Asheville	7,500
NC0041157	Caldwell County Schools	Gateway Alternate School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	4,000
NC0041220	Caldwell County Schools	Oak Hill Elementary School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	3,000
NC0041696*	Town of Valdese	Lake Rhodiss WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Burke	Asheville	10,500,000
NC0043231	Cedar Rock Country Club	Cedar Rock Country Club	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	9,000
NC0044059	Catawba County Schools	Bunker Hill High School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	15,000
NC0044121*	City of Hickory	Hickory WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Catawba	Mooresville	Not Limited
NC0044164	City of Lenoir	Lake Rhodhiss WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Caldwell	Asheville	Not Limited
NC0044253	North Carolina Lions Foundation In	NC Lions/ Camp Dogwood	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	10,000
NC0045438	Catawba County Schools	Sherrills Ford Elementary School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	7,000
NC0046213	Marathon Petroleum Company LLC	Charlotte Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0046531	Refuel America Inc	Refuel Terminal Operations - Charlot	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	43,200
NC0046892	Motiva Enterprises LLC	Charlotte South Terminal	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0050075	Caldwell County Schools	Collettsville Elementary School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Caldwell	Asheville	10,000
NC0051608	Catawba County Schools	Bandys High School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	15,000
NC0055221	City of Marion	Marion WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	McDowell	Asheville	Not Limited
NC0056154	Aqua North Carolina Inc	Bridgeport WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	100,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0057401	Go Go Properties LLC	The Hideaways WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	200,000
NC0058084	Gough Econ Inc	Gough Econ WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	1,200
NC0058742	Heater Utilities Inc	Country Valley WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	100,000
NC0059579	Carolina Water Service Inc Of NC	Emerald Point WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	60,000
NC0060194	City of Morganton	Catawba River WTP	Government - Municipal	Water Plants and Water Conditioning Discha	Minor	Burke	Asheville	Not Limited
NC0060224	High Country Home Care Inc	Jonas Ridge Adult Care Facility	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Burke	Asheville	7,500
NC0060593	Heater Utilities Inc	Spinnaker Bay WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	12,500
NC0060755	Carolina Water Service Inc Of NC	Saddlewood WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Gaston	Mooresville	9,000
NC0062278	Berkley Oaks LLC	Berkley Oaks WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Gaston	Mooresville	36,000
NC0062383	Carolina Water Service Inc Of NC	Queens Harbor WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	100,000
NC0062413	Linville Ridge Country Club	Linville Ridge Country Club WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Avery	Asheville	15,000
NC0062481	Heater Utilities Inc	Mallard Head WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	20,000
NC0063355	Heater Utilities Inc	Killian Crossroads WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	75,000
NC0063860	Heater Utilities Inc	Harbor Estates WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	75,000
NC0064599	Halina R Genaro	Lake Norman Motel WWTP	Individual	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	7,500
NC0067148	McDowell County Schools	Nebo Elementary School WWTP	Government - County	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	7,500
NC0068705	Mariners Watch Homeowners Associat	Mariners Watch WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	2,500

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0069035	Heater Utilities Inc	Southgate WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	Not Limited
NC0069175	Ridge Community Sewer Association	Ridge Community WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Gaston	Mooresville	10,000
NC0069345	Catawba County Historical Associat	Murray's Mill Historical Site	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	12,500
NC0071200	City of Marion	Catawba River WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	McDowell	Asheville	250,000
NC0071242	Carolina Water Service Inc Of NC	Riverpointe WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	100,000
NC0071528	Lake Norman Woods Homeowners Assoc	Lake Norman Woods WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	25,000
NC0072061	Heater Utilities Inc	Fox Run WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	Not Limited
NC0072621	Fa Be Enterprises Inc	Fa-Be Enterprises	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Lincoln	Mooresville	12,000
NC0074012	Lincoln County	Forney Creek WWTP	Government - County	Municipal Wastewater Discharge, < 1MGD	Minor	Lincoln	Mooresville	975,000
NC0074268*	City of Gastonia	Crowders Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, Large	Major	Gaston	Mooresville	6,000,000
NC0074705	Magellan Terminals Holdings L P	Charlotte/Southern Facilities Termin	Non-Government	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0074772	Heater Utilities Inc	Diamond Head WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	100,000
NC0074799	Pines Mobile Home Park	Pines Mobile Home Park	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Gaston	Mooresville	11,000
NC0074900	Hydraulics Ltd	Highway 150 WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	100,000
NC0075205	Aqua North Carolina Inc	Alexander Island WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	15,000
NC0075353	McDowell Assisted Living LLC	McDowell Assisted Living WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	10,000
NC0077763	City of Belmont	Belmont WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	Not Limited

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0079481	Dennis J Whitson	Harmony Estates WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	40,000
NC0080098	Coastal Ventures Group II LLC	Blue Ridge Country Club WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	202,000
NC0080691	Heater Utilities Inc	Windemere WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	Iredell	Mooresville	90,000
NC0080781	Duke Energy Carolinas LLC	Lincoln Combustion Turbine Plant	Non-Government	Industrial Process & Commercial Wastewater	Minor	Lincoln	Mooresville	400,000
NC0081370	City of Claremont	McLin Creek WWTP	Government - Municipal	Municipal Wastewater Discharge, < 1MGD	Minor	Catawba	Mooresville	300,000
NC0082546	Town of Granite Falls	Granite Falls WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Caldwell	Asheville	Not Limited
NC0083887	City of Charlotte	Charlotte Douglas International Airp	Government - Municipal	Industrial Process & Commercial Wastewater	Minor	Mecklenburg	Mooresville	Not Limited
NC0084387	Charlotte Mecklenburg Utility Depa	Lee S. Dukes WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Mecklenburg	Mooresville	Not Limited
NC0084468	Heater Utilities Inc	Keltic Meadows WTP #2	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	Not Limited
NC0084549	Charlotte Mecklenburg Utility Depa	Franklin WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Mecklenburg	Mooresville	Not Limited
NC0084565	Carolina Water Service Inc Of NC	The Harbour - Wells 1 & 2 WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Iredell	Mooresville	Not Limited
NC0084573	Lincoln County	Lincoln County WTP	Government - County	Water Plants and Water Conditioning Discharge	Minor	Lincoln	Mooresville	Not Limited
NC0084689	City of Mount Holly	Mount Holly WTP	Government - Municipal	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	100,000
NC0086142	Heater Utilities Inc	Oakley Park WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	1,000
NC0086193	Heater Utilities Inc	Maplecrest WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	Not Limited
NC0086304	Catawba County Schools	Mill Creek Middle School	Government - County	Discharging 100% Domestic < 1MGD	Minor	Catawba	Mooresville	6,500
NC0086428	Sugar Hill Enterprises Inc	Marion Travel Plaza WWTP	Non-Government	Discharging 100% Domestic < 1MGD	Minor	McDowell	Asheville	10,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-1: Wastewater Discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0086592	Carolina Water Service Inc Of NC	The Point / Well 1 WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Iredell	Mooresville	Not Limited
NC0086606	Carolina Water Service Inc Of NC	The Harbour - Well #4 WTP	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Iredell	Mooresville	Not Limited
NC0088684	Daniel Jonathan Stowe Conservancy	Daniel Stowe Botanical Garden	Non-Government	Water Plants and Water Conditioning Discharge	Minor	Gaston	Mooresville	3,800
NC0088722	Lincoln County	Killian Creek WWTP	Government - County	Municipal Wastewater Discharge, Large	Major	Lincoln	Mooresville	3,350,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 1E-2: Non-discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
WQ0001512	Baxter Healthcare Corporation	North Cove Steam Generation Plant	Non-Government	Wastewater Recycling	Minor	McDowell	Asheville
WQ0001618	Town of Granite Falls	Town of Granite Falls Residuals Land Application Program	Government - Municipal	Land Application of Residual Solids (503)	Minor	Caldwell	Asheville
WQ0001990	Town of Valdese	Town of Valdese Distribution of Composted Residuals Program	Government - Municipal	Distribution of Residual Solids (503)	Minor	Burke	Asheville
WQ0002127	City of Morganton	City of Morganton Morganite Composting Facility and Distribution Program	Government - Municipal	Distribution of Residual Solids (503)	Major	Burke	Asheville
WQ0002431	Huffman Finishing Inc	Huffman Finishing Co-WWTP/A S	Non-Government	Land Application of Residual Solids (503)	Minor	Caldwell	Asheville
WQ0002544	Clariant Corporation	Mount Holly West (MHW) Facility	Non-Government	Land Application of Residual Solids (503)	Minor	Gaston	Mooresville
WQ0003281	City of Belmont	City of Belmont Residuals Land Application Program	Government - Municipal	Land Application of Residual Solids (503)	Major	Gaston	Mooresville
WQ0003698	City of Marion	Corpening Creek WWTP	Government - Municipal	Surface Disposal of Residual Solids (503)	Minor	McDowell	Asheville
WQ0004270	AB Carter Inc	AB Carter Incorporated-A B Carter	Non-Government	Surface Irrigation	Minor	Gaston	Mooresville
WQ0004381	City of Conover	City of Conover Residuals Land Application Program	Government - Municipal	Land Application of Residual Solids (503)	Minor	Catawba	Mooresville
WQ0004624	Explosives Supply Co	Explosives Supply Co-Woodlawn	Non-Government	Wastewater Recycling	Minor	McDowell	Asheville
WQ0004751	Colonial Pipeline Company	Colonial Pipeline Co-Char Del	Non-Government	Surface Irrigation	Minor	Mecklenburg	Mooresville
WQ0005603	Coats American Inc	Coats American-Sevier Plant	Non-Government	Wastewater Recycling	Minor	McDowell	Asheville
WQ0006060	Gerdau Ameristeel Corporation	Gerdau Ameristeel US, Inc., Charlotte Steel Mill	Non-Government	Wastewater Recycling	Minor	Mecklenburg	Mooresville
WQ0009368	ITL Corp.	Industrial Timber and Land Company Marion Kiln Drying Facility	Non-Government	Wastewater Recycling	Minor	McDowell	Asheville
WQ0010059	City of Lenoir	City of Lenoir Lenoir Blends Processing Facility and Distribution Program	Government - Municipal	Distribution of Residual Solids (503)	Major	Caldwell	Asheville
WQ0010197	American & Efird Inc	American & Efird Incorporated-WWTP	Non-Government	Wastewater Recycling	Minor	Gaston	Mooresville
WQ0010689	Baxter Healthcare Corporation	North Cove Steam Generation Plant Ash Distribution Program	Non-Government	Distribution of Residual Solids (503 exempt)	Major	McDowell	Asheville
WQ0011260	Town of Old Fort	Old Fort Town-A Sludge/Resid	Government - Municipal	Distribution of Residual Solids (503)	Major	McDowell	Asheville
WQ0012073	Coastal Ventures Group II LLC	Linville Falls Club	Non-Government	Reuse	Major	McDowell	Asheville

Table 1E-2: Non-discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
WQ0015931	The Point Lake and Golf Club Inc	The Village at the Point	Non-Government	Reuse	Major	Iredell	Mooresville
WQ0016686	Metal Industries Inc	Metal Industries Incorporated	Non-Government	Wastewater Recycling	Minor	McDowell	Asheville
WQ0016922	Lincoln County	Lincoln County Residuals Land Application Program	Government - County	Land Application of Residual Solids (503)	Minor	Lincoln	Mooresville
WQ0019504	City of Belmont	Belmont City-A Sludge/Dors	Government - Municipal	Distribution of Residual Solids (503 exempt)	Minor	Gaston	Mooresville
WQ0019911	CITGO Petroleum Corporation	Charlotte Terminal	Non-Government	Surface Irrigation	Minor	Mecklenburg	Mooresville
WQ0019960	City of Marion	City of Marion Residuals Land Application Program	Government - Municipal	Land Application of Residual Solids (503)	Minor	McDowell	Asheville
WQ0020881	NC DENR Division of Parks and Recreation	Lake Norman State Park Swim Beach	Government - State	Surface Irrigation	Major	Iredell	Mooresville
WQ0021734	Charlotte Mecklenburg Utility Department	Franklin WTP	Government - Municipal	Reuse	Minor	Mecklenburg	Mooresville
WQ0023511	Iredell-Statesville Schools	Woodland Heights Elementary School	Government - County	Surface Irrigation	Major	Iredell	Mooresville
WQ0023580	Cove Key Association Inc	Cove Key Townhomes on Lake Norman	Non-Government	Reuse	Minor	Iredell	Mooresville
WQ0023680	Cove Key Association Inc	Cove Key Townhomes on Lake Norman	Non-Government	Gravity Sewer Extension, Pump Stations, & Pressure Sewer Extensions	Minor	Iredell	Mooresville
WQ0029447	Marcus M Goodson	Marcus Goodson SFR	Individual	Surface Irrigation - SFR (Single Family Residence)	Minor	Gaston	Mooresville
WQ0030106	Camp Lake James LLC	Camp Lake James	Non-Government	Gravity Sewer Extension, Pump Stations, & Pressure Sewer Extensions	Minor	Burke	Asheville
WQ0030259	Shannon M Wright	Shannon Wright & Michael Elmore SFR	Individual	Surface Irrigation - SFR (Single Family Residence)	Minor	Cabarrus	Mooresville
WQ0031131	Larry Kreider	Larry and Carol Kreider SFR	Individual	Surface Irrigation - SFR (Single Family Residence)	Minor	McDowell	Asheville
WQ0031133	James E Roberts	James Ernest Roberts SFR	Individual	Surface Irrigation - SFR (Single Family Residence)	Minor	McDowell	Asheville
WQ0033677	Case Farms LLC	Morgan Hatchery	Non-Government	Surface Irrigation	Minor	Burke	Asheville
WQCSD0117	Duke Energy Carolinas LLC	Marshall Steam Station	Non-Government	Deemed permitted collection system management and operation	Minor	Catawba	Mooresville

Table 1E-2: Non-discharge Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
WQCSD0356	Carolina Energies Inc	Sugar Hill Truck Stop	Non-Government	Deemed permitted collection system management and operation	Minor	McDowell	Asheville
WQCSD0357	Larry G Scott	Scotty's Mobile Village	Non-Government	Deemed permitted collection system management and operation	Minor	McDowell	Asheville
WQCSD0358	McDowell Assisted Living LLC	McDowell Assisted Living WWTP	Non-Government	Deemed permitted collection system management and operation	Minor	McDowell	Asheville
WQCSD0359	Coastal Ventures Group II LLC	Blue Ridge Country Club WWTP	Non-Government	Deemed permitted collection system management and operation	Minor	McDowell	Asheville
WQCSD0360	McDowell County Adult Care LLC	Cedarbrook Residential Center	Non-Government	Deemed permitted collection system management and operation	Minor	McDowell	Asheville
WQCSD0396	Carolina Water Service Inc Of NC	Emerald Point WWTP	Non-Government	Deemed permitted collection system management and operation	Minor	Mecklenburg	Mooresville
WQCSD0398	Carolina Water Service Inc Of NC	Riverpointe WWTP	Non-Government	Deemed permitted collection system management and operation	Minor	Mecklenburg	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG020026	Vulcan Construction Materials LP	Vulcan Construction Materials - Lenoir Quarry	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG020039	Martin Marietta Materials Inc	Caldwell Quarry	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG020097	B V Hedrick Gravel & Sand Company	B V Hedrick-Lowesville Quarry	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG020169	Martin Marietta Materials Inc	Martin Marietta-Denver Quarry	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG020177	Vulcan Construction Materials LP	Vulcan Construction Materials-Morganton	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Burke	Asheville
NCG020231	Bv Hedrick Gravel & Sand Co	Hedrick Industries-Greenlee P	Unknown	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020236	Appalachian Stone Co Inc	Applachian Stone Co.-Edge Mine	Non-Government	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020267	Statesville Brick Co	Statesville Brick Co-Iredell2	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Iredell	Mooresville
NCG020275	Johnson Paving Co Inc	Johnson Paving Co Incorporated	Non-Government	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020309	Johnson Paving Co Inc	Johnson Paving Co Incorporated 1	Non-Government	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020333	B V Hedrick Gravel & Sand Company	B V Hedrick-Gravel & Sand	Non-Government	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020467	Cumberland Gravel & Sand Co	Cumberland Gravel & Sand Co	Non-Government	Mining Activities Stormwater Discharge COC	Minor	McDowell	Asheville
NCG020506	JEJ Borrow Pit	JEJ Borrow Pit	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG020761	Statesville Brick Co	Statesville Brick Co-Iredell	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Iredell	Mooresville
NCG030078	Commscope Inc	Commscope Incorporated	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG030085	Freightliner LLC	Mt Holly Truck Plant	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG030148	Neptco Inc	Neptco Incorporated	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG030179	Acme/Romac Inc	Acme/Romac Inc	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Iredell	Mooresville
NCG030212	Claremont NA Cable Systems LLC	Claremont NA Cable Systems LLC	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG030259	Blum Inc	Blum Incorporated	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG030285	AB Carter Inc	A B Carter Incorporated	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG030314	Huntington Alloys	Special Metals Welding Products Company	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Catawba	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG030325	Structural Steel of Carolina	Hickory Steel	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG030375	SteelFab Inc & C M Steel Inc	SteelFab Inc & C M Steel Inc	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030412	Wix Corporation	Wix Corporation- Allen Plant	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG030414	Wix Corporation	Wix Filtration Products Division -Dixon Plant	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG030422	Masonite Entry Door Corporation	Masonite Entry Doors	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030452	United Technologies Carrier	United Technologies Carrier	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030467	Wireway/Husky Corp	Wireway / Husky Corp	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG030499	Crane Resistoflex	Crane Resistoflex	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	McDowell	Asheville
NCG050037	Shurtape Technologies, LLC	Shurtape Tech Incorporated-Hickory	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG050048	Gd Satcom Technologies Inc	Prodelin Catawba Molding Facility	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG050083	Buckeye Fire Equipment	Buckeye Fire Equipment	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG050136	Sunterrace Casual Furniture	Sunterrace Casual Furniture	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG050169	International Paper Company	International Paper-Charlotte Container Plant	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050190	Hickory Springs Manufacturing Company	Hickory Springs-Conover Complex	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG050194	Constar International	Constar International	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050218	Foamex Innovations Inc	Foamex Innovations, Inc.	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050220	Packaging Corp of America	Packaging Corporation Of America	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Burke	Asheville
NCG050225	Triad Packaging Inc	Triad Packaging Inc	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG050240	Molded Fiber Glass Comp	Molded Fiber Glass Comp	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Burke	Asheville
NCG050251	Chambers Container Co	Chambers Container Co-Gaston	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Gaston	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG050276	Shurtape Technologies, LLC	Shurtape Tech Incorporated-Hudson	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG050324	Blachford RP Corporation	Blachford RP Corporation	Non-Government	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Minor	Cleveland	Mooresville
NCG060083	Arrochem Inc	Arrochem Incorporated	Non-Government	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG060173	Valley Proteins Inc	Carolina By-Products - Gastonia Division	Non-Government	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG060232	Earthgrains Baking Co Inc	Earthgrains Baking Co Incorporated	Non-Government	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Minor	Burke	Asheville
NCG070004	Jason Inc - Jackson Lea	Jackson Lea	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG070009	Cemex Construction Materials Atlantic LLC	Cemex-Hickory-Lyle Creek	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG070033	Taylorsville Precast Molds Inc	Taylorsville Precast Molds Inc	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Alexander	Mooresville
NCG070038	Bethlehem Manufacturing Co Inc	Bethlehem Manufacturing Co Inc	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Alexander	Mooresville
NCG070085	Hairfield Wilbert Burial Vault	Hairfield Wilbert Burial Vault	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG070112	Statesville Brick Co	Statesville Brick Co-Iredell	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Iredell	Mooresville
NCG070129	Cemex Construction Materials Atlantic LLC	Cemex-Marion-Forsyth Creek	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	McDowell	Asheville
NCG070147	Dellinger Precast Inc	Dellinger Precast Inc.	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG070158	Precast Construction Products	Precast Construction Products	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080052	Automotive Carrier Services	Automotive Carrier Services - Mt Holly	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG080064	Fedex Ground	Fedex Ground	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080087	Commscope Inc	Commscope Incorporated	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG080175	Century Furn Ind	Century Furn Ind - Hildebran	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Burke	Asheville
NCG080210	Republic Services Of NC LLC	Garbage Disposal Service-Burke	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Burke	Asheville
NCG080211	Republic Services of NC LLC	Garbage Disposal Ser-Catawba	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080318	Wilson Trucking Corp	Wilson Trucking Corp-Conover	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080323	Wilson Trucking Corp	Wilson Trucking Corp-Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080354	Institution Food House Inc	Institution Food House Incorporated	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080426	Cargo Transporters Inc	Cargo Transporters, Inc.	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080428	A T Williams Oil Co	A T Williams Oil Co.-#351	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080448	Republic Services of NC LLC	Republic Services Of NC LLC	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080501	N C National Guard	NC Nat Gd- Morganton	Government - State	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Burke	Asheville
NCG080534	N C National Guard	NC Nat Gd- Belmont	Government - State	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG080551	N C National Guard	NC Nat Gd- Hickory/Oms # 3	Government - State	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080577	Yrc Inc	YRC, Inc.-Conover	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG080584	Larry Campbell's Towing & Recovery Inc	Larry Campbell's Towing & Recovery, Inc	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080599	Saia Motor Freight Line Inc	Saia Motor Freight Line Incorporated	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080613	Sea Lane Express Inc	Sea Lane Express, Inc.	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080624	Fedex Freight East Inc	Fedex Freight - Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080626	Southeastern Freight Line	Southeastern Freight Line-Claremont	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG080689	Town of Mooresville	Mooresville Public Works	Government - Municipal	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Iredell	Mooresville
NCG080724	City of Morganton	Morganton City-Warehouse and Garage	Government - Municipal	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Minor	Burke	Asheville
NCG090013	BASF Corporation	BASF Morganton plant	Non-Government	Paints, Varnishes, Lacquers Stormwater Discharge COC	Minor	Burke	Asheville
NCG090019	Chemical Coatings Inc	Chemical Coatings Incorporated	Non-Government	Paints, Varnishes, Lacquers Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG100036	Schronce Used Parts Inc	Schronce Used Parts Incorporated	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG100042	Stagecoach Ltd	Stagecoach Ltd - Import Auto Sales	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	McDowell	Asheville
NCG100069	Highway 10 Auto Parts Inc	Highway 10 Auto Parts Inc	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG100071	J & T Auto Parts Inc	J & T Auto Parts Inc	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	McDowell	Asheville
NCG100074	I 40 Auto Parts Inc	I 40 Auto Parts Incorporated	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Burke	Asheville
NCG110011	Charlotte-Mecklenburg Utilities	McDowell Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Mecklenburg	Mooresville
NCG110023	City of Belmont	Belmont WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Gaston	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG110055	City of Gastonia	Crowders Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Gaston	Mooresville
NCG110072	Town of Valdese	Lake Rhodiss WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Burke	Asheville
NCG110083	City of Morganton	Catawba River Pollution Control Facility	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Burke	Asheville
NCG110098	City of Lenoir	Lower Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Caldwell	Asheville
NCG110099	City of Lenoir	Gunpowder Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Caldwell	Asheville
NCG110102	City of Marion	Corpening Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	McDowell	Asheville
NCG120060	Republic Services Of NC LLC	Republic Services Of NC LLC - Lenoir	Non-Government	Landfill Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG130017	Sonoco Products Co	Sonoco Products Co-Hickory	Non-Government	Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG140033	Thomas Concrete Of Carolina Inc	Thomas Concrete of Carolina, Inc.	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Gaston	Mooresville
NCG140048	Concrete Supply Co	Concrete Supply Co-Denver	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Lincoln	Mooresville
NCG140053	Concrete Supply Co	Concrete Supply Co-Croft Plt	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140097	Hamby Brothers Concrete Inc	Hamby Brothers Concrete Incorporated	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Caldwell	Asheville
NCG140104	Kerr's Hickory Ready Mixed Con	Kerr's Hickory Ready Mixed Con	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Catawba	Mooresville
NCG140117	R H Loven Co Inc	R H Loven Co Incorporated	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Avery	Asheville
NCG140133	Cemex Construction Materials Atlantic LLC	Cemex-Gastonia	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Gaston	Mooresville
NCG140173	Ready Mixed Concrete	Ready Mixed Concrete Co - Hickory	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Catawba	Mooresville
NCG140176	Ready Mixed Concrete	Ready Mixed Concrete Co - Denver	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Lincoln	Mooresville
NCG140205	Cemex Construction Materials Atlantic LLC	Cemex-Morganton-Little Silver Creek	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Burke	Asheville
NCG140264	Thomas Concrete Of Carolina Inc	Thomas Concrete of Carolina, Inc. -Denver Plant	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Lincoln	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG140290	Thomas Concrete Of Carolina Inc	Thomas Concrete of Carolina, Inc.-Mooresville Plant	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Iredell	Mooresville
NCG140303	Caldwell Ready-Mix Inc	Caldwell Ready Mix Incorporated	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	Caldwell	Asheville
NCG140326	Explosives Supply Co	Explosives Supply Co-Woodlawn	Non-Government	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Minor	McDowell	Asheville
NCG160018	Carolina Paving Of Hickory Inc	Carolina Asphalt	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG160021	Maymead Materials Inc	Maymead Materials, Inc.-Barber Green Asphalt	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Burke	Asheville
NCG160034	Blythe Construction Inc	Blythe Construction, Inc.-N. Plant	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG160069	Maymead Materials Inc	Maymead Materials, Inc.-Morganton	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Burke	Asheville
NCG160114	Maymead Materials Inc	Maymead Materials Inc	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Avery	Asheville
NCG160116	Blythe Construction Inc	Blythe Construction Inc	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Lincoln	Mooresville
NCG170030	Meridian Specialty Yarn Group Inc	Meridian Specialty Yarn Group, Inc.	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170056	Pisgah Yarn And Dyeing Corp	Pisgah Yarn And Dyeing Corporation	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	McDowell	Asheville
NCG170073	Valdese Weavers Inc	Valdese Weavers Incorporated	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170097	Tefron USA, Inc.	Pineburr	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170098	Valdese Warehouse LLC	Valdese Warehouse, LLC	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170111	Meridian Industries Inc. dba Meridian Specialty Yarns	Meridian Specialty Yarns	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170126	Valdese Weavers Inc	Valdese Weavers, Inc.	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170218	Shuford Yarns LLC	Shuford Yarns, LLC-Hickory Spinners Plant	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG170220	Shuford Mills LLC	Shuford Mills Inc - Hudson Cloth	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG170225	Shuford Yarns LLC	Dudley Shoals Plant	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG170227	Belmont Riverside Complex LLC	Belmont Riverside Complex	Unknown	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170269	Coats American Inc	Coats American-Sevier Plant	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	McDowell	Asheville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG170297	Iac Group North America	IAC Old Fort, LLC	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	McDowell	Asheville
NCG170310	Unifour Finishers Inc	Unifour Finishers Incorporated-Plt 2	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG170313	American & Efird Inc	American & Efird Incorporated-Nelson	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG170314	American & Efird Inc	Dyeing & Finishing Plant #15	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170319	Specialty Textile Interiors	Specialty Textile Interiors	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Cleveland	Mooresville
NCG170339	Parkdale America	Parkdale Mills Incorporated-Plt 1&2	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170340	Parkdale America	Parkdale Mills Incorporated-Plt 8	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170341	Parkdale America	Parkdale Mills Incorporated-Plt 9	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170343	Parkdale America	Parkdale Mills Inc- Plant 60	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170346	Parkdale America	Parkdale Mills Inc- Plant 15	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170347	Parkdale America	Parkdale Mills Incorporated-Plt 17	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170361	Spartan Dyers Inc	Spartan Dyers Incorporated	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170362	American & Efird Inc	American & Efrid Inc-Gastoni	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG170364	Valdese Weavers Inc	Valdese Weavers Inc-F&D Plant	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG170391	Firestone Fibers & Textiles LLC	Firestone Fibers & Textiles Company	Non-Government	Textile Mill Products Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG180029	Jasper Seating Company Inc	Jasper Seating Company-Plant #8	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Alexander	Mooresville
NCG180031	Universal Furniture Limited	Universal Furniture Limited	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	McDowell	Asheville
NCG180033	Furniture Brands/ Henredon	Furniture Brannds/ Henredon	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Burke	Asheville
NCG180054	Clayton Marcus Co Inc	Clayton Marcus Co Incorporated-Plt1	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Alexander	Mooresville
NCG180062	CV Industries Century Furn Ind	CV Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG180063	CV Industries Century Furn Ind	Cu Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180064	CV Industries Century Furn Ind	Cu Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180065	CV Industries Century Furn Ind	CV Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180066	CV Industries Century Furn Ind	CV Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180068	CV Industries Century Furn Ind	CV Industries Century Furn Ind - Hickory	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180080	Broyhill Furniture Industries Inc	Broyhill Furniture Ind-Whitnel	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180090	Drexel Heritage Furniture Ind., Inc.	Drexel Heritage Furnishings-60	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Burke	Asheville
NCG180092	Westwood NC, LLC	Westwood Plant #2	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	McDowell	Asheville
NCG180098	Center 190 LLC	Adden Furniture	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Burke	Asheville
NCG180100	Ethan Allen Inc - Pine Valley Div	Ethan Allen Inc. - Pine Valley Div.	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	McDowell	Asheville
NCG180102	Hammary Furniture Co	Kincaid Furniture Co Inc - Plant 14	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180105	Baker Furniture Company	Baker Furniture Company	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Burke	Asheville
NCG180110	Kincaid Furniture Co	Kincaid Furniture Co-Plants1&6	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180112	Hni Corporation	Hickory Business Furniture	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180117	Southern Furniture Co	Southern Furniture Co-Conover	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180118	Southern Furniture Co	Southern Furniture Co-Conover	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180123	Bassett Furniture Industries	Bassett Furniture Industries	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180153	Bernhardt Furniture Co	Bernhardt Furniture Co-Plt 5	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180154	Bernhardt Furniture Co	Bernhardt Furniture Co-Plt 7	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180155	Bernhardt Furniture Co	Bernhardt Furniture Co-Plt 3	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG180156	Bernhardt Furniture Co	Bernhardt Furniture Co-Plt 2	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180157	Minton Ventures LLC	Minton Ventures, LLC-Plant 1	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180169	Thomasville Furniture Industries, Inc.	Lenoir Plant	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180178	Sherrill Furniture	Sherrill Furniture- Hickory	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180179	CTH Sherrill Occasional	CTH Sherrill Occasional	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180189	Fairfield Chair Co	Fairfield Chair Co-Plnt #2	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180190	Fairfield Chair Co	Fairfield Chair Co-Plt #1	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG180198	CV Industries Century Furn Ind	CV Industries Century Furn Ind	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Alexander	Mooresville
NCG180201	Hickory Hill Furniture	Hickory Hill Furniture	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Burke	Asheville
NCG180209	Regency Leather	Regency Leather	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG180227	Kroehler Furniture Mfg Co Inc	Kroehler Furniture Mfg Co Inc	Non-Government	Furniture and Fixtures Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG190004	Kings Point Marina Inc	Kings Point Marina Incorporated	Non-Government	Ship and Boat Building Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG190042	Lake Norman Marina Inc	Lake Norman Marina Incorporated	Non-Government	Ship and Boat Building Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG200350	Bruces Iron & Metal	Bruces Iron & Metal	Non-Government	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Minor	Gaston	Mooresville
NCG200355	Griffin Gordon Recycling LLC	Mountain Recylcing	Non-Government	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG200448	Griffin-Gordon Recycling	Mountain Recycling, LLC	Non-Government	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Minor	Burke	Asheville
NCG210241	Sonoco Products Co	Sonoco Products Co-Granite Fal	Non-Government	Timber Products Stormwater Discharge COC	Minor	Caldwell	Asheville
NCG210256	Brackett Brothers Corp	Brackett Brothers Corporation	Non-Government	Timber Products Stormwater Discharge COC	Minor	Burke	Asheville
NCG210307	Cramer Lumber Co Inc	Cramer Lumber Co Inc	Non-Government	Timber Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG210330	Tradewinds International Inc	Tradewinds International Inc	Non-Government	Timber Products Stormwater Discharge COC	Minor	Catawba	Mooresville
NCG210386	Blue Ridge Panels Inc	Blue Ridge Panels, Inc.	Non-Government	Timber Products Stormwater Discharge COC	Minor	Caldwell	Asheville
NCGNE0019	Ladd Furniture Inc	Clayton Marcus Co. Inc-Plant 5 & 9	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCGNE0021	L & P Polyester Fibers LLC	Cameo Fibers	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0026	Chiron America Inc	Chiron America Inc	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0030	Dynisco Extrusion LLC	Dynisco Extrusion LLC	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0031	Reliance Electric Ind. Co	Dodge Rockwell Automation	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	McDowell	Asheville
NCGNE0034	DEBS SBS Inc	DEB SBS Inc	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0038	Hickory Springs Manufacturing Company	Dixie-Regency Division-Hickory Springs Mfg. Co.	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0039	Hickory Springs Manufacturing Company	Allen-Beck Division-Hickory Springs Mfg. Co	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0045	Hickory Springs Manufacturing Company	Hickory Springs Mfg. Co.-Lenior	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0050	Hickory Springs Manufacturing Company	Hickory Springs Mfg. Co.-HS Converting Division	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0062	Hickory Springs Manufacturing Company	Allen-Beck Sewing	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0065	Rock-Tenn Packaging and Paperboard, LLC	Rock-Tenn Company-Claremont Folding	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0077	Hickory Springs Manufacturing Company	Hickory Springs Fibers	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0078	INX International Ink Company	INX International Ink Company	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0085	Kawneer Company Incorporated	Kawneer Company Incorporated	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0092	Livingstone Coating Corporation	Livingstone Coating Corporation	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0109	AAA Cooper Transport	AAA Cooper Transport-Mecklenburg	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0115	Joseph Riddle	Bernhardt Furniture Company	Individual	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0124	Rock-Tenn Packaging and Paperboard, LLC	Rock-Tenn Company-Marion Folding	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	McDowell	Asheville
NCGNE0128	EBM Textiles	EBM Textiles LLC	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Burke	Asheville
NCGNE0142	Sonoco Products Co	Sonoco Products Company-Long Shoals Plant	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0189	Media General Inc.	The News Herald	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Burke	Asheville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCGNE0193	Media General Inc.	The McDowell News	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	McDowell	Asheville
NCGNE0218	Torque Traction Int Tech Inc	Torque Traction Int Tech Inc	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0221	Hunter Douglas Designer Shade	Hunter Douglas Designer Shades	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0258	Bsn-Jobst Inc	BSN-Jobst, Inc.	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Burke	Asheville
NCGNE0276	Sonoco Products DBA Keating	Keating Gravure USA	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0283	Bassett Furniture Industries	Bassett Furniture Industries-Plant 31	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0306	Blue Ridge Products Inc	Blue Ridge Products, Inc.	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0331	Carpenter Co	Carpenter Co.-Long View Plant	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0346	Cekal Specialties Inc	Cekal Specialties	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0349	Wix Corporation	Wix Corporation- Ozark Plant	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0350	McCreary Modern	McCreary Modern	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Caldwell	Asheville
NCGNE0363	Estes Express Lines	Estes Express Lines-Truck Wash	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0376	N C National Guard	NC Nat Gd- Belmont	Government - State	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0389	N C National Guard	NC Nat Gd- Gastonia	Government - State	Stormwater Discharge, No Exposure Certificate	Minor	Gaston	Mooresville
NCGNE0399	N C National Guard	NC Nat Gd- Mooresville	Government - State	Stormwater Discharge, No Exposure Certificate	Minor	Iredell	Mooresville
NCGNE0414	N C National Guard	NC Nat Gd- Taylorsville	Government - State	Stormwater Discharge, No Exposure Certificate	Minor	Alexander	Mooresville
NCGNE0487	Gough Econ Inc	Gough Econ WWTP	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0501	Commscope Inc	Commscope Incorporated-Catawba	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Catawba	Mooresville
NCGNE0661	Cumulus Fibres Polyester Fibers LLC	Cumulus Fibres	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCR002037	Town of Blowing Rock	The Blowing Rock Art and History Museum	Government - Municipal	Construction Stormwater	Minor	Watauga	Winston-Salem
NCS000009	Sgl Carbon LLC	SGL Carbon Corporation	Non-Government	Stormwater Discharge, Individual	Minor	Burke	Asheville
NCS000020	Duke Energy Carolinas LLC	McGuire Nuclear Power Plant	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville

Table 1E-3: NPDES Stormwater Permits in the Catawba River Headwaters Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCS000021	Siemens Energy Inc	Charlotte Turbine Generator Service Center	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000041	Clariant Corporation	Mount Holly West (MHW) Facility	Non-Government	Stormwater Discharge, Individual	Minor	Gaston	Mooresville
NCS000061	Lenoir Mirror Company	Lenoir Mirror Co-Caldwell Site	Non-Government	Stormwater Discharge, Individual	Minor	Caldwell	Asheville
NCS000066	Neptune Inc	Neptune Inc	Non-Government	Stormwater Discharge, Individual	Minor	Caldwell	Asheville
NCS000161	Emerald Carolina Chemicals	Noveon Textile Chemical, Inc.	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000163	Color Mate Inc	Color Mate Incorporated	Non-Government	Stormwater Discharge, Individual	Minor	Gaston	Mooresville
NCS000304	Gerdau Ameristeel Corporation	Ameristeel Corporation	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000321	Lubrizol Advanced Materials Inc	Lubrizol Advanced Materials Inc	Non-Government	Stormwater Discharge, Individual	Minor	Gaston	Mooresville
NCS000332	Hexion Specialty Chemicals, Inc.	Hexion Specialty Chemicals	Non-Government	Stormwater Discharge, Individual	Minor	Burke	Asheville
NCS000334	JCI - Jones Chemicals	Jci Jones Chemicals Incorporated	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000359	Iac Group North America	Iac, Old Fort, LLC	Non-Government	Stormwater Discharge, Individual	Minor	McDowell	Asheville
NCS000407	City of Mount Holly	Mount Holly city - Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Gaston	Mooresville
NCS000409	City of Belmont	Belmont city - Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Gaston	Mooresville
NCS000426	City of Hickory	Hickory city - Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Catawba	Mooresville
NCS000429	City of Gastonia	Gastonia city - Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Gaston	Mooresville
NCS000431	City of Conover	Conover city - Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Catawba	Mooresville
NCS000474	County of Caldwell	Caldwell County-Small MS4	Government - County	Stormwater Discharge, Individual (MS4)	Minor	Caldwell	Asheville
NCS000480	Town of Rutherford College	Town of Rutherford College-Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Burke	Asheville
NCS000498	City of Morganton	Morganton City--Small MS4	Government - Municipal	Stormwater Discharge, Individual (MS4)	Minor	Burke	Asheville

Table 1E-4: Animal Feeding Operations in the Catawba River Headwaters (HUC: 03050101)

Permit Number	Facility Name	Permit Type	County	Region
AWC020002	Herman Dairy Farm, Inc.	Cattle State COC	Alexander	Mooresville
AWC020003	Payne Dairy	Cattle State COC	Alexander	Mooresville
AWC020005	Superior Jersey Farm	Cattle State COC	Alexander	Mooresville
AWC020007	Reese Dairy Farm	Cattle State COC	Alexander	Mooresville
AWC020008	Idlenot Farm	Cattle State COC	Alexander	Mooresville
AWC020013	Chapman Farms	Cattle State COC	Alexander	Mooresville
AWC490030	Grayhouse Farms, Inc	Cattle State COC	Iredell	Mooresville
AWC550001	Lewis Eddie Smith Farm	Cattle State COC	Lincoln	Mooresville
AWC550016	Lynch's Dairy, Inc.	Cattle State COC	Lincoln	Mooresville
AWC590004	Harold P. McKinney Dairy Farm	Cattle State COC	McDowell	Asheville
AWI590001	Honey Brook Dairy	Animal Individual State	McDowell	Asheville
AWS140003	B.G. Looper and Sons / Wesley Looper	Swine State COC	Caldwell	Asheville

CHAPTER TWO

South Fork of the Catawba River Subbasin

HUC 03050102

Includes: Henry Fork, Jacob Fork, Clark Creek & South Fork Catawba River

General Subbasin Description

This eight-digit hydrologic unit code (HUC) subbasin, with an area of about 661 square miles, is the second largest eight-digit HUC in the Catawba River basin and includes DWQ subbasins 03-08-35 and 03-08-36 (See map in *Appendix 2-D*). This HUC begins with the Henry and Jacob Forks watersheds in the southern portion of Burke County flowing east then merges with the South Fork Catawba River flowing south before merging with the Catawba River at the North and South Carolina state line.

Land cover in this subbasin is largely forest (47%), with a considerable amount of agricultural (30%) and urban (18%) areas further south. The majority of forested areas are found in the upper portions of this subbasin. The major municipal areas include Hickory, Newton, Lincolnton, Gastonia, and Belmont.

The most populated areas within this subbasin are along the South Fork Catawba River. The City of Gastonia has the most densely populated areas with roughly 600 to 1,000 people per square mile. See the *Population & Land Cover Section* of this chapter for additional information.

There are 11 major NPDES facilities operating in this HUC, with a total discharge of nearly 60 MGD. The largest of these dischargers are municipal WWTPs that serve Hickory (9 MGD to Henry Fork), Newton (7.5 MGD to Clarks Creek), Lincolnton (6MGD to the South Fork Catawba River), Gastonia (16 MGD to Long Creek), and Cramerton (4 MGD to the South Fork Catawba River). There are also about 20 other minor NPDES dischargers in this HUC with discharges of less than 1 MGD.

Subbasin at a Glance

Counties:

Burke, Catawba, Lincoln, and Gaston

Municipalities:

Belmont, Bessemer City, Brookford, Cherryville, Conover, Cramerton, Dallas, Gastonia, Hickory, High Shoals, Hildebran, Kings Mountain, Lincolnton, Long View, Lowell, Maiden, McAdenville, Newton, Ranlo, Spencer Mountain and Stanley

Ecoregions:

Eastern Blue Ridge Foothills, Kings Mountain, Southern Outer Piedmont & Northern Inner Piedmont

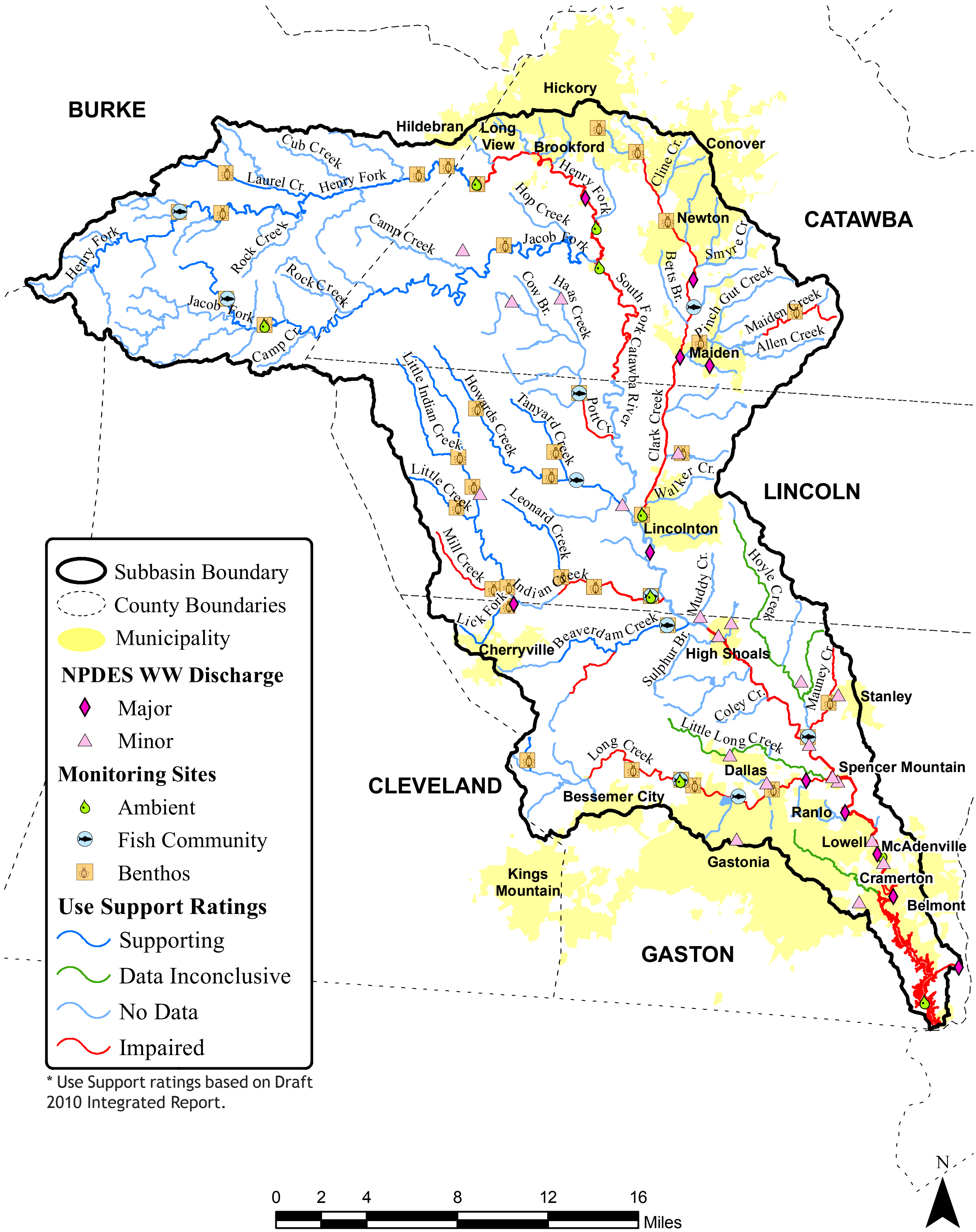
Permitted Facilities:

NPDES WWTP:	**31**
Major	11
Minor	20
NPDES NonDischarge:	**10**
Stormwater:	**137**
General	124
Individual	13
Animal Operations:	**12**

Population: 189,487

% of Impervious Surface: 4.5%

FIGURE 2-1: SOUTH FORK CATAWBA RIVER SUBBASIN - 03050102



* Use Support ratings based on Draft 2010 Integrated Report.

Water Quality Overview

Water Quality within this subbasin is influenced by ecoregions, land use and population. Water Quality is generally better in the upper non-developed regions and more impacted in the lower portion of this subbasin near urban centers. The major water quality issues in this subbasin include urban development, excess nutrient loading and nonpoint source runoff. The subbasin headwaters are experiencing impacts from urban and agricultural stormwater runoff, excess fecal coliform bacteria levels and low pH. These impacts are accumulating as water flows downstream with additional impacts from out-dated WWTP's as well as failing septic systems. The lower South Fork Catawba River, as it flows into Lake Wylie, receives nutrient enriched discharge from point sources and agricultural runoff. Fecal coliform bacteria and turbidity levels increase in the lower portion of the subbasin where urban sprawl consumes agricultural and forested areas.

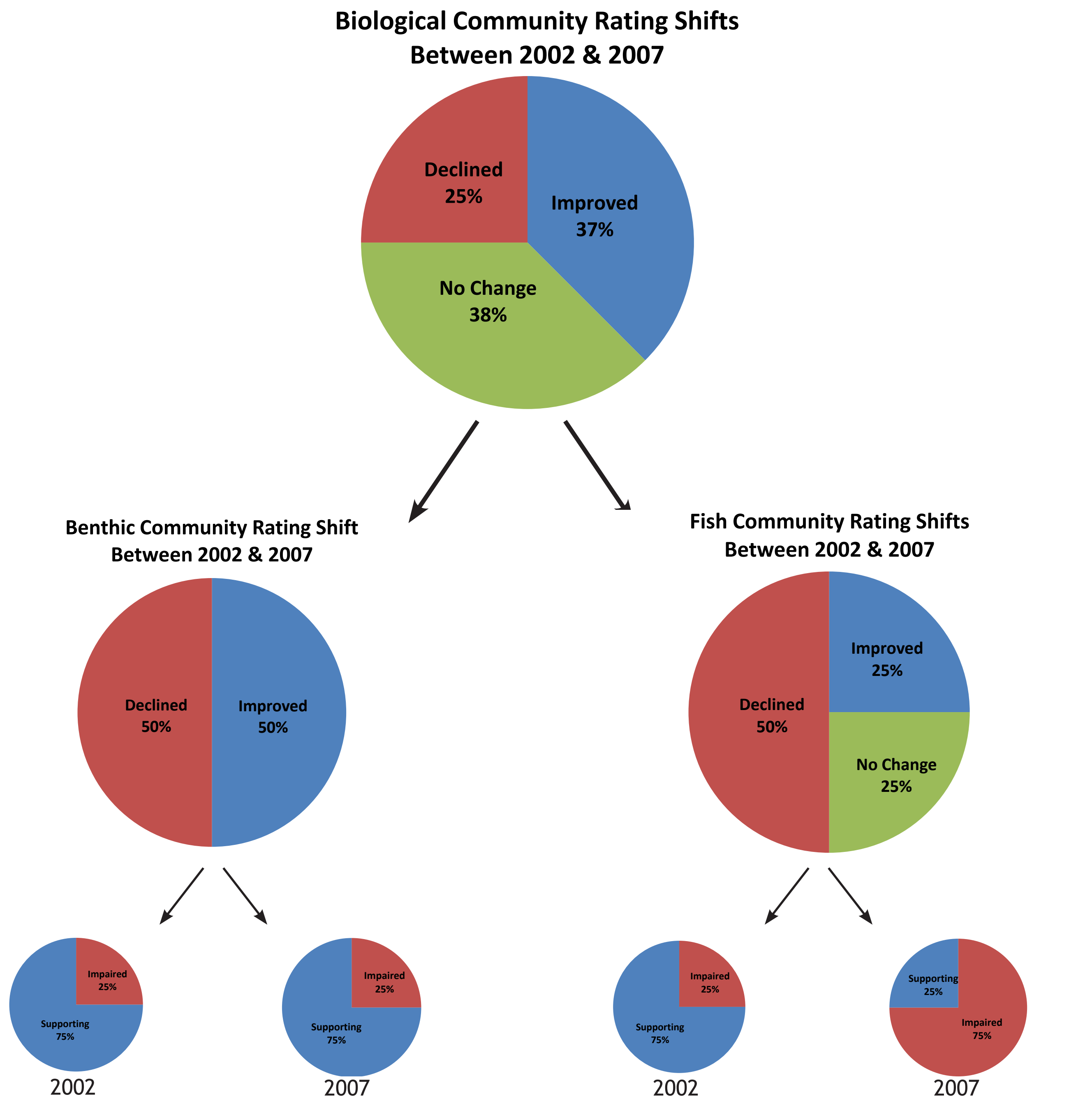
Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess certain watersheds and develop implementation plans to deal with these issues. Many of these efforts are currently on-going; however, others have resulted in measurable water quality improvements. The Soil & Water Conservation Districts have installed numerous best management practices mostly between NC-10 and NC-150 to address many of the agricultural impacts. The Ecosystem Enhancement Program has also focused efforts in that area on monitoring and other restoration projects. These topics and others are discussed in greater detail throughout this Chapter.

Biological Data

Biological samples were collected during the spring and summer months of 2004 and 2007 by DWQ-Environmental Sciences Section as part of the five year basinwide sampling cycle with exception to special studies. Overall, 14 biological sampling sites were monitored within the South Fork Catawba River Watershed. Of those 14 sites, six were benthos stations and eight were fish community stations. Of those sites, three (all fish community) were sampled for the first time. Each site is given a rating or bioclassification of Excellent, Good, Good-Fair, Fair, Poor or Not Rated. The Excellent, Good, Good-Fair and Not Rated are ratings given to streams which are Supporting aquatic life. Streams that are given a Fair or Poor rating are Impaired and do not support aquatic life. The ratings for each five year sampling cycle station can be seen in Table 2-1. The last column of this table includes the results of the current cycle (2003-2007) and the results of the previous sampling cycle (1998-2002) taken.

Figure 2-2 shows a comparison between 2002 and 2007 sample cycle data. The top graph compares all biological samples taken as part of the past two five year sampling cycles. Thirty-three percent of samples in both cycles received the same rating, 22% received lower ratings than its previous sample and 45% received higher ratings. The second row of graphs split the biological samples into benthic and fish community. Of these two, the fish community had the only decline (50%) in ratings and benthic samples had the largest improvement (60%). The third row breaks the fish and benthic graphs into the percent of results which are Supporting or Impaired for each sample cycle. Benthos samples which are Supporting gained 3% and fish samples lost 25% Supporting.

FIGURE 2-2: SHIFTS IN BIOLOGICAL RATINGS BETWEEN 2002 & 2007 FOR 03050102



* Numbers in this figure represent biological samples taken in both the last and current sampling cycles. Results of first time samples can be found in Table 2-1.

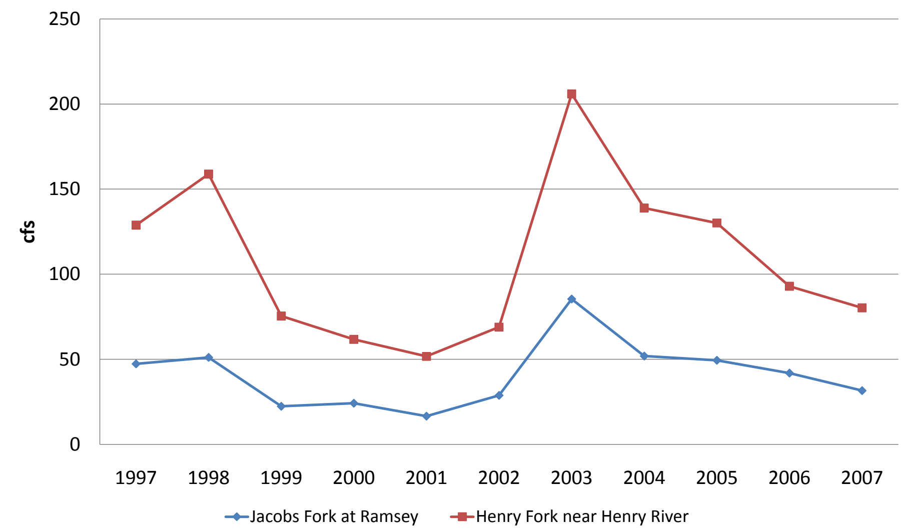
Table 2-1: Biological Sampling Locations and Ratings for 03050102, 2002 - 2007

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
BENTHOS SAMPLE SITES						
CB178	Henry Fork	11-129-1-(12.5)b	From SR-1124 to State Route 1143	Catawba	SR-1124	`06 - Good `02 - Good
CB192	Jacob Fork	11-129-2-(4)	From Little River to Camp Creek	Burke	SR-1924	`06 - Excellent `02 - Good
CB185	Howard Cr.	11-129-4	From source to South Fork Catawba River	Lincoln	SR-1200	`08 - Good-Fair `06 - Good `02 - Good-Fair
CB165	Clark Cr.	11-129-5-(9.5)	From a point 0.9 mile upstream of Walker Creek to South Fork Catawba R.	Lincoln	SR-1008	`07 - Fair `02 - Fair
CB188	Indian Cr.	11-129-8-(6.5)	From a point 0.3 mile upstream of Lincoln County SR-1169 to South Fork Catawba River	Lincoln	SR-1252	`08 - Good-Fair `06 - Good `02 - Not Rated
CB224	Long Cr.	11-129-16-(4)	From Mountain Creek to South Fork Catawba River	Gaston	SR-1456	`07 - Good-Fair `97 - Good-Fair
FISH COMMUNITY SAMPLE SITES						
CF18	Henry Fork	11-129-1-(2)	From Morganton Water Intake to Laurel Creek	Burke	SR-1922	`07 - Good `98 - Good
CF48	Pott Cr.	11-129-3-(0.7)	From a point 0.3 mile upstream of Lincoln County SR-1217 to South Catawba Fork River	Lincoln	SR-1217	`06 - Fair `02 - Good
CF61*	Howard Cr.	11-129-4	From source to South Fork Catawba River	Lincoln	SR-1185	`07 - Good
CF7*	Clark Cr.	11-129-5-(0.3)b	From Miller Branch to 0.9 mile upstream of Walker Creek	Catawba	SR-2012	`04 - Poor
CF21	Indian Cr.	11-129-8-(6.5)	From a point 0.3 mile upstream of Lincoln County SR-1169 to South Fork Catawba River	Lincoln	SR-1252	`06 - Fair `02 - Fair
CF2	Beaverdam Cr.	11-129-9-(0.7)	From a point 0.3 mile upstream of Gaston County SR-1626 to South Fork Catawba River	Gaston	SR-1609	`06 - Excellent `02 - Good
CF19	Hoyle Cr.	11-129-15-(6)	From a point 0.2 mile downstream of Mauney Creek to South Fork Catawba River	Gaston	SR-1836	`06 - Fair `02 - Good-Fair
CF29*	Long Cr.	11-129-16-(4)	From Mountain Creek to South Fork Catawba River	Gaston	SR-1456	`04 - Excellent

* = New station location; therefore, no data for 2002.
** = See Figure 2-1 for locations on map

Stream Flow & Drought

Figure 2-3: Yearly Average Flow Rates of Two USGS Gage Stations in HUC 03050102 Between 1997 & 2007



The rate at which a volume of water moves through a stream (the flow rate) can have a negative impact on water quality. In particular, droughts can have major effects on water quality parameters such as dissolved oxygen, turbidity, pH, and others due to extremely low stream flow. Therefore, it is useful to track changes in stream flow over the course of the assessment period to see when drought or high flow events might be present. A significant drought affected the Catawba River Basin from March 2007 to beyond the end of the assessment period.

Figure 2-3 shows the yearly averages for two different USGS gage stations in the 03050102 HUC between 1997 and 2007. The figure also shows the drought that impacted the basin between 1999 and 2002 as well as the impact from heavy rain events in 2003 and the three hurricanes that occurred between mid 2004 to mid 2005.

Ambient Data

Chemical and physical samples are taken by DWQ throughout the basin once a month. A majority of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities and are not random. There are also portions of the watershed where no water quality data is collected; therefore, conclusions can not be drawn on the value of water quality in those areas. Parameters collected at each site depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrient measurements, metals, and fecal coliform bacteria. Each classification has an associated set of standards the parameters must meet in order to be considered as supporting its designated uses. For more information on waterbody classifications, see Section 2.2 of the *Supplemental Guide to North Carolina's Basinwide Planning*. Ten sample results are required within the five year data collection window in order to evaluate the water quality parameter and compare it to the water quality standards. For more information on ambient monitoring and seasonal variation in this basin, see the *Catawba River Basin Ambient Monitoring System Report*.

The ambient data is used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2008 version and is based on data collected between 2002 and 2006. The ambient data reported in this basin plan was collected between 2004 and 2008 and will be used for the 2010 IR. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The Catawba portion of the Draft 2010 IR can be found in *Appendix 2-A* and the Final 2008 IR can be found on the *Modeling and TMDL Unit's website*.

During the current sampling cycle (January 2004 and January 2008), nine Ambient Monitoring System (AMS) stations collected ten or more samples and were used for use support assessment (see Figure 2-1 for station locations). There were four Random Ambient Monitoring System (RAMS) stations sampled within the basin between 2007 and 2008, one of which was located in this subbasin and is listed at the bottom of Table 2-2.

Eight of the ambient stations are rated Impaired for exceeding low pH, copper, high temperature and/or turbidity standards (See Table 2-2). A station is rated Impaired if 10.1% of the samples collected in a given sampling cycle are over the State's standards for any given parameter. For example, if 10.3% of samples taken between 2004 and 2008 are over the 50 NTU standard for turbidity, that stream segment is then rated as Impaired and placed on the 303(d) Impaired Waters List.

Of the nine ambient stations, one station is Impacted for turbidity (See Table 2-2). For the purposes of this plan, any site with 7.1% to 10.0% of samples over a parameter's State standard will be considered Impacted. The term *Impacted* is not an official rating by DWQ and is used to indicate streams with potential of becoming impaired in the near future. These impacted waters are identified to allow targeting of resources to prevent further degradation.

Table 2-2: Ambient Monitoring Stations in the HUC 03050102

Station ID	Current Status	Waterbody	AU#	Location	Impaired* (by Parameter)	Impacted (by Parameter)
C4300000	Active	Henry Fork	11-129-1-(12.5)b	SR-1124 near Henry River	Low pH (25.4%) Turbidity (10.2%)	---
C4360000	Active	Henry Fork	11-129-1-(12.5)c	SR-1143 near Brookford	Turbidity (10.2%)	---
C4370000	Active	Jacob Fork	11-129-2-(4)	SR-1924 at Ramsey	---	---
C4380000	Active	S Fk Catawba R.	11-129-(0.5)	NC-10 near Startown	Low pH (22%) Turbidity (11.9%)	---
C4800000	Active	Clark Cr.	11-129-5-(9.5)	SR-1008 Grove St at Lincolnton	Turbidity (15.3%) Copper (15.4%)	---
C5170000	Active	Indian Cr.	11-129-8-(6.5)	SR-1252 near Laboratory	Low pH (15.3%) Turbidity (10.2%)	---
C5900000	Active	Long Cr.	11-129-16-(4)	SR-1456 near Bessemer City	Low pH (11.9%)	Turbidity (8.5%)
C6500000	Active	S Fk Catawba R.	11-129-(15.5)	NC-7 at McAdenville	Low pH (10.2%) Turbidity (11.9%)	---
C7000000	Active	S Fk Catawba R.	11-(123.5)b	SR-2524 near South Belmont	High Temp (27.1%) Copper (69.2%)	---
C4368900	`07-`08 RAMS	Little R.	11-129-2-5	S Mt. Baptist Camp near Pleasant Grove	---	---

* Data collected between 2004-2008 and will be reflected on the 2010 Draft Integrated Report. Impaired segments may be seen as category 4 or 5. For more details about the Integrated Report and category definitions see the *Methodology Chapter.*

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for all ambient stations in this watershed for a specific parameter over each year. These graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use conditions or climate changes can effect 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 2002 and 2007 by DWQ's Environmental Sciences Section (ESS) and can be found in the *Catawba River Basin Ambient Monitoring System Report*.

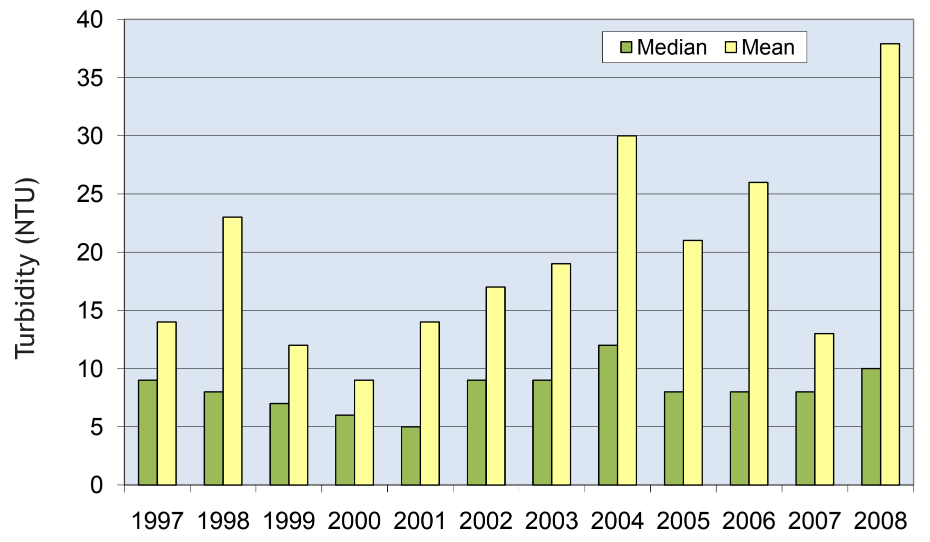
Turbidity

Turbidity is a measure of cloudiness in water and is often accompanied by excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), reduce fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can make it more difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can cause taste and odor problems, block water supply intakes, foul water treatment systems, and fill reservoirs (USEPA, 1999 and Waters, 1995).

The NC standard for turbidity in freshwater streams is 50 NTUs. As seen in Table 2-2, six stream segments are Impaired and one segment is Impacted for turbidity in this watershed. The highest percent of turbidity violations can be seen on Clark Creek at site C4800000 with 15% of samples exceeding the standard. For more specific information about this sample site, see the *Clark Creek Watershed (0305010203)* Section below.

Figure 2-4 shows the mean and median of turbidity levels for all samples taken over the course of 12 years in the South Fork Catawba River subbasin. The highest yearly averages for turbidity were recorded in 2004, 2006 and 2008 which were the same years with highest percent of turbidity standard violations (10%, 12%, and 11% respectively).

FIGURE 2-4: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050102



Soil erosion is the most common source of turbidity and sedimentation and, 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, excessive stormwater flow off impervious surfaces are all potential sources. The distribution of turbidity violations and sample locations make it difficult to isolate a single source of erosion in the South Fork Catawba River watershed. It appears, however, violations are highest near urban areas. Violations are lowest where land cover is predominantly forest. This trend demonstrates the importance of *protecting and conserving stream buffers and natural areas*.

pH

pH is a measure of hydrogen ion concentration that is used to express whether a solution is acidic or alkaline (basic). Lower values can have chronic effects on the community structure of macroinvertebrates, fish and phytoplankton. Changes in the pH of surface waters occur primarily through point source discharges and natural fluctuations. Changes can also occur during accidental spills, acid deposition (i.e.; rain, snow) and algal blooms.

The water quality standards for pH in surface freshwater is 6.0 to 9.0 su. Low pH was one the most common reason for Impairment in this subbasin. Five stream segments are Impaired because of low pH levels. Station C4300000 (Henry Fork) had the highest percent (25%) of samples violating the standard between 2004 and 2008 (See Table 2-2). For more specific information about this sample site, see *Appendix 2-C*.

FIGURE 2-5: SUMMARIZED pH VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050102

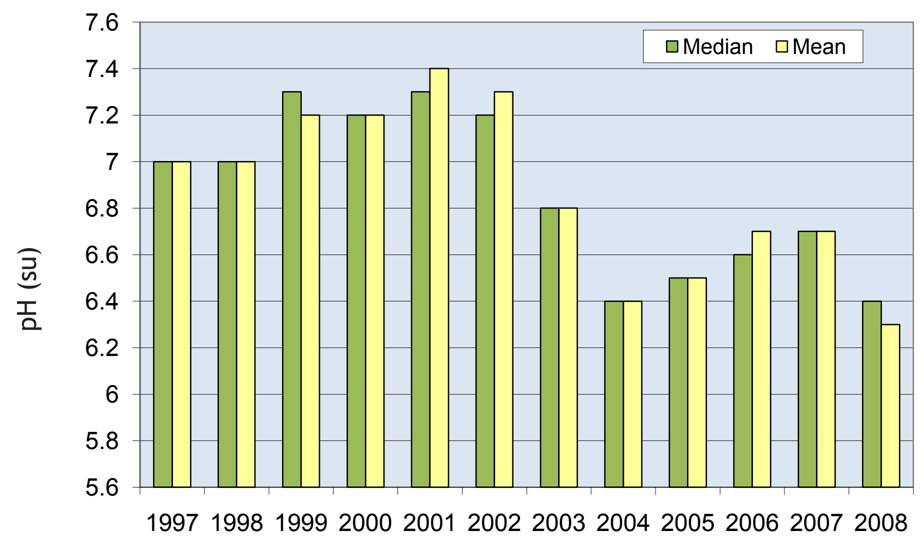
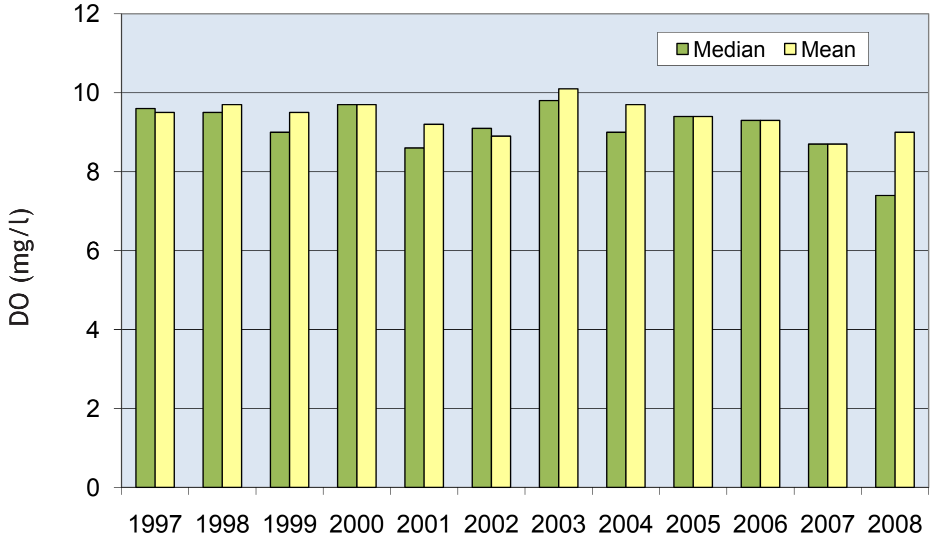


Figure 2-5 shows the mean and median of pH levels for all samples taken over the course of 12 years in the South Fork Catawba River subbasin. The lowest pH yearly average recorded and the year with the most standard violations was 2008. The overall basin trend during this 12 year period is a significant decline in pH levels. In this subbasin, yearly averages dropped from low to mid 7's to mid 6's starting around 2003. For a more detailed discussion of what may be causing this trend basinwide, see the *Basin Overview Chapter.*

Dissolved Oxygen

Dissolved Oxygen (DO) can be produced by turbulent actions, such as waves, rapids or waterfalls that mix air into the water. High levels are found mostly in cool swift moving waters and low levels are found in warm slow moving waters. In slow moving waters, such as reservoirs and estuaries, depth is also a factor. Wind action and plants can cause these waters to have a higher dissolved oxygen concentration near the surface and decline to as low as zero at the bottom.

Figure 2-6: Summarized DO Values for All Data Collected at Ambient Sampling Stations in HUC 03050102



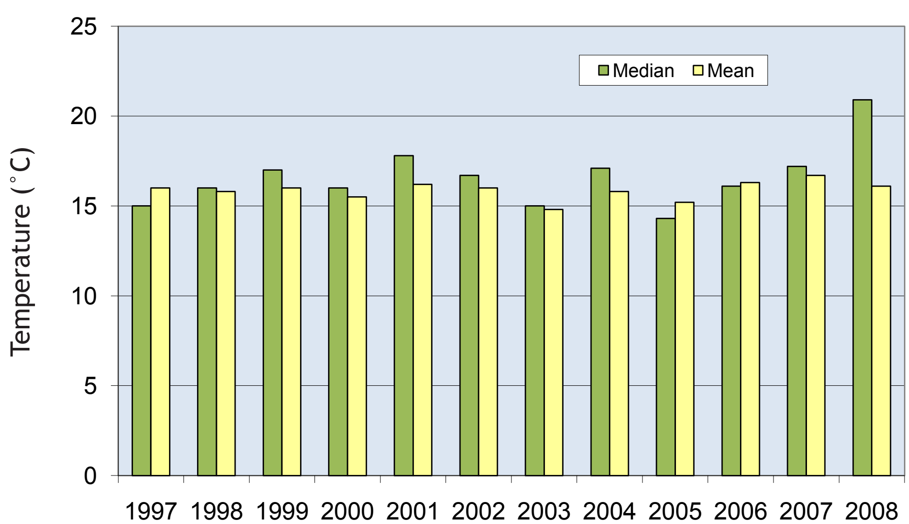
The NC standard for DO in freshwater is no less than a daily average of 5.0 mg/l (milligrams per liter of water) with a minimum instantaneous value of no less than 4 mg/l. Trout waters (Tr) should not have less then 6.0 mg/l DO. Trout waters in this subbasin are found in the headwaters. For more information on Trout water classifications and where they are located in the Catawba River basin, see the *Buffer Rules Chapter*. As seen in Table 2-2, no stream segments in this subbasin are Impaired or Impacted due to DO levels.

Figure 2-6 shows the mean and median of DO levels for all samples taken over the course of 12 years in the South Fork Catawba River subbasin. The lowest yearly average for DO was recorded in 2007. The highest percent of DO standard violations during the 12 years occurred in 2002 (6%).

Temperature

All aquatic species require specific temperature ranges in order to be healthy and reproduce. An aquatic species becomes stressed when water temperatures exceed their preferred temperature range, and stressed fish are more susceptible to injury and disease.

Figure 2-7: Summarized Temperature Values for All Data Collected at Ambient Sampling Stations in HUC 03050102



Water quality standards state that discharge from permitted facilities should not exceed the natural temperature of the water by more than 2.8°C (5.04°F) and that waters should never exceed 32°C (89.6°F) for the lower piedmont area. The only station in this subbasin to exceed the standard during this cycle was C7000000 (see Table 2-2). It should also be noted that between 1997 and 2008, C7000000 (South Fork Catawba River) was the only station within this subbasin to exceed the standard. For more specific information about this sample site, see the *Lower South Fork Catawba River Watershed (0305010206)* Section below.

Figure 2-7 shows the mean and median of temperature levels for all samples taken over the course of 12 years in the South Fork Catawba River subbasin. The highest yearly average for temperature was recorded in 2007. The highest percent of temperature standard violations occurred in 2004 and 2007 (4% for both years).

Fecal Coliform Bacteria

The presence of fecal coliform bacteria (FCB) in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other warm blooded animals and, its associated pathogens or disease producing bacteria or viruses. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient 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 5 samples have been taken in a span of 30 days. Only results from 5 samples in 30 days (5-in-30) are to be used to indicate whether the stream is Impaired or Supporting. Five out of the nine ambient stations in the South Fork Catawba River subbasin recorded FCB levels above a geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of samples taken between 2004 and 2008 (Table 2-3). However, since none of the stations received a 5-in-30 study during this time period, none will be Impaired for FCB on the 2008 or 2010 Impaired Waters List. For additional information about theses sample sites, see *Appendix 2-C*.

Table 2-3: Waters with Elevated FCB Levels & Without 5-in-30 Studies.

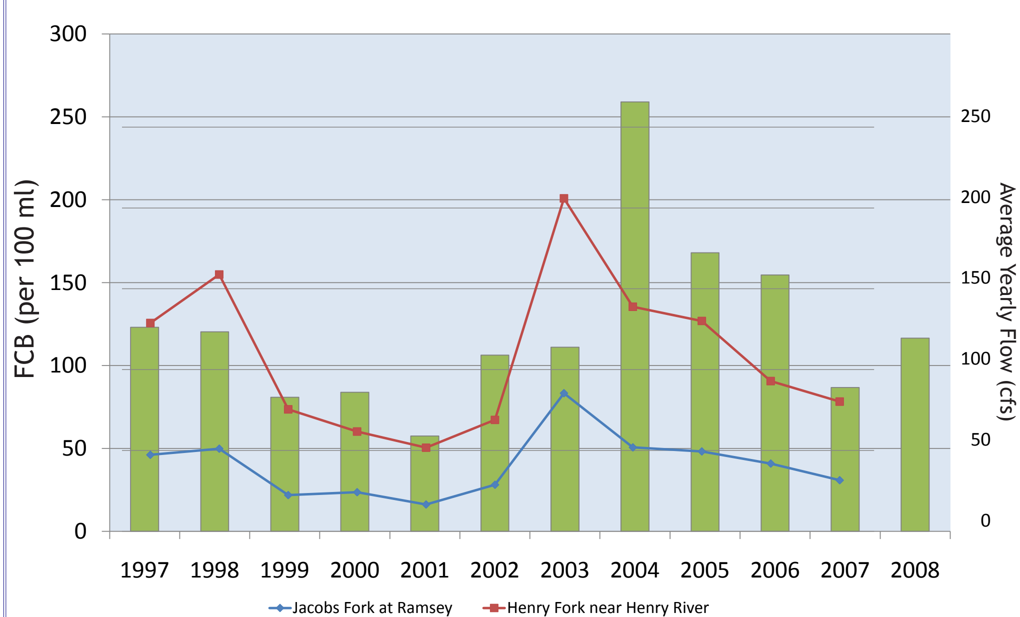
Station ID	Waterbody	Class.	AU#	Location	Geometric Mean	# of Samples Above 400 colonies/100ml	% of Samples Above 400 colonies/100ml
C4380000	S. Fork Cat. R.	WS-IV	11-129-(0.5)	NC-10 near Startown	181	15 out of 58	26%
C4800000	Clark Cr.	WS-IV	11-129-5-(9.5)	SR-1008 Grove St at Lincolnton	610	30 out of 59	51%
C5170000	Indian Cr.	WS-IV	11-129-8-(6.5)	SR-1252 near Laboratory	354	22 out of 59	37%
C5900000	Long Cr.	C	11-129-16-(4)	SR-1456 near Bessemer City	428	23 out of 58	40%
C6500000	S. Fork Cat. R.	WS-V	11-129-(15.5)	NC-7 at McAdenville	160	12 out of 59	20%

Figure 2-8 shows the geometric mean of FCB levels for all samples taken over the course of 12 years in the South Fork Catawba River subbasin. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers.

The highest yearly average for FCB was recorded in 2004. This figure also includes the yearly average stream flow as seen in Figure 2-3 to how flow can be linked to FCB levels.

For more information regarding any of the parameters listed above, see Section 3.3 of the *Supplemental Guide to North Carolina's Basinwide Planning*. Data sheets for each of the ambient monitoring stations in this watershed can be found in *Appendix 2-C* of this Chapter.

Figure 2-8: Summarized Fecal Coliform Bacteria Values for All Data Collected at Ambient Sampling Stations in HUC 03050102 with Overlaying Rainfall



10-Digit HUC Watershed Breakdown

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 10-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 subbasin can be seen in Figure 2-1, and a Use Support list of all monitored waters in this basin can be found in *Appendix 2-A*. Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories and then by 12-digit subwatersheds. The three designations are described below. These designations do not indicate the Use Support rating (Supporting, Impaired or No Data) for a waterbody. The Use Support rating can be found at the top of the *Use Support and monitoring box* (Figure 2-10) which is provided for each waterbody to the right of the waterbody discussion, as described below.

Hydrologic Unit Codes (HUC):

DWQ has recently made a change from the State designated subbasin lines (e.g., 03-08-30) to the nationally recognized HUC lines. This Plan is organized by HUCs to provide, not only a detailed look at a particular waterbody, but also how that waterbody fits into the larger watershed picture. Table 2-4 provides a brief description of the different HUC sizes and names. There are three 8-digit subbasins within the Catawba River Basin (03050101, 03050102 & 03050103). Due to the large size of these 8-digit subbasins, each chapter is broken down even further into 10-digit watersheds for a more local water quality analysis. Within each 10-digit watershed section of the Chapter, waterbodies are grouped by 12-digit subwatershed to better identify specific stressors and sources. A comparison map of the State designated subbasin lines used in the past verses the new nationally recognized HUC lines is included in the *Maps Chapter.*

Table 2-4: HUC Quick Reference

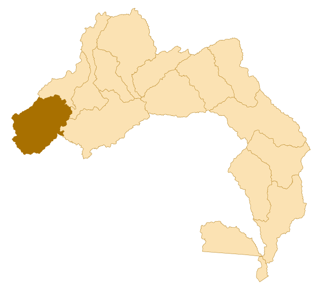
HUC Digit	HUC Name	Average Size[1]
2-digit	Region	177,560
4-digit	Subregion	16,800
6-digit	Basin	10,596
8-digit	Subbasin	700
10-digit	Watershed	227
12-digit	Subwatershed	40

[1] In approximate square miles

The 10-Digit Watershed Map:

At the beginning of each 10-digit watershed section is a small reference map as seen in Figure 2-9. **These maps are also a hyperlink to a full page detailed map of that particular watershed**. Click on the map to view the full page map, then when you wish to return back to the text, click the inset map on the full page map. If you are viewing a hardcopy version of this Plan, these maps can be found at the end of this chapter or in *Appendix 2-D*. **Interactive elements** have been incorporated within all 10-digit watershed maps. To use the new features click on the *Layers* tab on the left side of the Adobe Reader window. Expand the folder tree by clicking on the (+) sign to the left of the map name. Each item in the subsequent folder tree is a layer on the map. These layers can be turned on or off by clicking the symbol to the left of the layer name. This allows you to view all layers or select only layers of interest and decrease the amount of symbols and labels for a cleaner look. Reminder: to return to your previous place within the text, just click the smaller map in the upper left hand corner of the 10-digit watershed map.

Figure 2-9: Example of the 10-Digit HUC Map



Restoration Opportunities, Protection Priorities & Success Stories:

Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories. This grouping is used to provide a better understanding of what types of actions, if any, need to be taken for a particular body of water based on known water quality information.

Restoration Opportunities:
The term *Restoration Opportunities* refers to waters which are degraded and are in need of restoration to return the water quality back to natural conditions. This designation is given to not only waters already on the Impaired Waters List, but also waters that are predicted to be on the Impaired Waters List in the future if no restoration action is taken. Impacted waters, as defined by the DWQ Planning Section (see Acronyms & Definitions), are often included in this group. Restoration efforts may include development and implementation of a watershed restoration plan, installation of appropriate best management practices (BMPs), implementation of local ordinances, educational efforts and/or extending monitoring efforts among many others.

Protection Priorities:

The term *Protection Priorities* refers to waters which are in need of protection to keep it from becoming impacted or Impaired in the future. This includes waters that are currently supporting aquatic life, but are within watersheds that have recently undergone a land use change or other changes that may have a negative impact on water quality in that stream. This designation is given to assist DWQ and other water quality agencies in being more proactive about protecting water quality and minimize stream degradation. Protection efforts may include among others, finding the sources of degradation, educating local communities of water quality concerns, developing and implementing an action plan and developing a local ordinance that requires environmentally sound development and land use changes. Protecting these waterbodies not only ensures continued stability of aquatic life and associated habitat, but also saves local, state and federal agencies from a costly and time consuming restoration effort after the waterbody has become Impaired.

Success Stories:

The term *Success Stories* refers to waters that have shown long term improvement for a known reason. This includes improvements on all levels, whether it's a stream that has been removed from the Impaired Waters List or that a source of pollution, which may have been negatively impacting the stream, has been removed or no longer has an impact. However, not all streams that have been removed from the Impaired Waters List are listed in this Plan as a success due to the fact that the reasons for some improvements are not known and may be due to temporary changes in the watershed. This designation is also used to discuss streams that have undergone restoration or protection efforts that have resulted in measured water quality improvements or are expected to in the near future. Not all efforts show instantaneous results and may be designed for gradual long term improvement. However, those efforts should be recognized to increase awareness of what other water quality groups and agencies are doing and to promote cooperation among those groups and agencies with the same goal.

Assessment Unit Numbers [AU#]:

Each waterbody throughout the state is given one or more assessment unit (AU) number(s). These identification numbers are assigned to a particular stream or portion of a stream for many reasons. One of those reasons is to reduce confusion when different streams have the same name. For example, there are five different streams in different parts of the Catawba River Basin named Big Branch. Another reason is to identify a particular segment of a stream. A longer stream may be split into multiple segments to provide more accurate assessments, classifications and reporting of a particular portion of that stream.

These AU numbers are indicated at the beginning of each new waterbody discussion following the stream name in [brackets]. If multiple segments of a stream are included in that discussion, each AU# will be listed. To reduce space, some AU numbers may be abbreviated. For example, the North Fork Catawba River is split into four segments, 11-24-(1), 11-24-(2.5)a, 11-24-(2.5)b, and 11-24-(13). This is then abbreviated to 11-24-(1), (2.5)a, (2.5)b & (13) where the common numbers are removed from the first part of the AU.

Use Support & Monitoring Box:

To reduce confusion and provide a quick reference, each waterbody discussed in the Restoration Opportunities and Protection Priorities sections have a corresponding Use Support and Monitoring Box (Figure 2-10). The top row indicates the draft 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 draft 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 Figure 2-10 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.

FIGURE 2-10: 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%

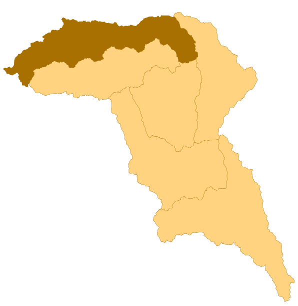
Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Figure 2-10) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

Table 2-5: Waterbodies & the Section(s) Where Discussed Within This Subbasin Chapter

Stream Name	AU#	10-Digit HUC	Integrated Report Category[1]	Restoration/Protection/ Success[2]
Henry Fk	11-129-1-(12.5)b & c	0305010201	5	Restoration
Henry Fk	11-129-1-(12.5)a	0305010201	2	Success
Jacobs Fk	11-129-2-(4)	0305010202	2	Protection
Maiden Cr	11-129-5-7-2-(1)	0305010203	5	Restoration
Clark Cr	11-129-5-(0.3)b & (9.5)	0305010203	5	Restoration
Town Cr	11-129-5-4	0305010203	2	Protection
Potts Cr	11-129-3-(0.3) & (0.7)	0305010204	5	Restoration
S Fk Catawba R	11-129-(0.5)	0305010204	5	Restoration
Howard Cr	11-129-4	0305010204	2	Protection
Indian Cr	11-129-8-(6.5)	0305010205	5	Restoration
Beaverdam Cr	11-129-9-(0.7)	0305010205	2	Protection
Hoyle Cr	11-129-15-(6)	0305010206	5	Restoration
Mauney Cr	11-129-15-5	0305010206	5	Restoration
Long Cr	11-129-16-(4)	0305010206	5	Restoration
Dallas Br	11-129-16-7b	0305010206	5	Restoration
S Fk Catawba R	11-129-(10.5) & (14.5)	0305010206	5	Restoration
S Fk Catawba R	11-129-(15.5)	0305010206	5	Restoration

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality. For more information on these designations see *Understanding This Section*.

Henry Fork (0305010201)



Restoration Opportunities

Lower Henry Fork (030501020103)

Henry Fork [AUs: 11-129-1-(12.5)b & c]:
The segments of Henry Fork within this 12-Digit subwatershed are a combined length of 13.4 miles and flow from State Route 1124 to Jacobs Fork. The majority of the stream drains residential areas as well as some forested and agricultural areas. The first segment in this subwatershed [AU: 11-129-1-(12.5)b] has been rated Good for benthos (CB178) since 1989 as it did in 2006.

Use Support: Impaired (13 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB178)	Good (2006)
AMS (C4300000)	Low pH - 25% Turbidity - 10.2% FCB - 14%
AMS (C4360000)	Turbidity - 10.2% FCB - 18%

Data from the ambient monitoring station (C4300000) located on the middle portion of Henry Fork [AU: 11-129-1-(12.5)b] shows the creek is being impacted by both high turbidity and low pH, which are two parameters heavily influenced by rainfall. AMS site C4360000 on the lower portion of Henry Fork [AU: 11-129-1-(12.5)c]; however, only had a few readings of low pH. The turbidity readings spike during and shortly after rainfall events suggesting these violations are from nonpoint sources and natural causes; however, further study should be done to confirm. Both segments will be Impaired for turbidity and the upper segment will also be Impaired for low pH.

Both of these segments are also showing signs of being impacted by fecal coliform bacteria (FCB). The City of Hickory's WWTP (NC0040797) is located on the lower portion of Henry Fork in between the two AMS sites. This facility has received no NPDES permit violations for excess FCB. While it may be the cause of some high nutrients and suspended solids, it does not appear to be causing the high levels for this waterbody.

Watershed Restoration & Success Stories

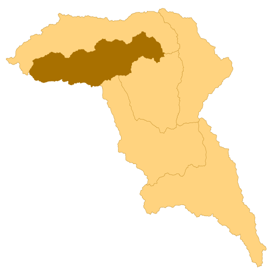
Middle Henry Fork (030501020102):

Henry Fork [AU: 11-129-1-(12.5)a]:

This segment was on the 2006 303(d) list for biological impairment. It has seen significant and steady improvement among the benthic community since 2001 when it received a Fair rating. Sampling was initiated here due to a large release of sand and sediment from behind the Henry River Dam in June 2001. The sand and sediment smothered the habitat by several feet shortly after being released causing the Impaired rating. Effects from the release are still being seen; however, it is significantly less than previous years. The site downstream of the dam now has the highest habitat score (84) of the five sites along Henry Fork.

Use Support: Supporting (10 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB181) (CB180)	Good (2006) Good (2006)

Jacobs Fork (0305010202)



Protection Priorities

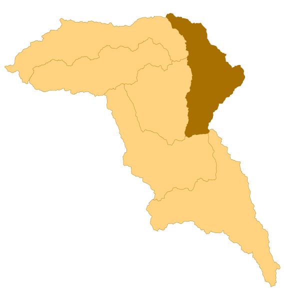
Upper Jacobs Fork (030501020201)

Jacobs Fork [AU: 11-129-2-(4)]:

In May of 2006, biological sampling for a Watershed Stressor Study[1] was conducted, and Jacobs Fork received a benthic community rating of Excellent. However, ambient samples indicate a decrease in overall pH levels and a slight increase in fecal coliform bacteria levels. This section of Jacobs Fork is considered a high priority for protection due to a discovery made by DWQ biologist of the appearance of *Baetopus trishae*, a rare mayfly known previously in only two locations (both in Jackson County, NC) and only four specimens have been seen in North America. This finding extends the eastern range of this mayfly in North Carolina by more than 90 miles. Biological samples taken further upstream on Jacobs Fork and the Little River show the water quality and habitat are fully supporting aquatic life. For this reason, the entire Upper Jacobs Fork watershed should be actively protected from human impacts. DWQ will continue to monitor the benthic station (CB192) to help further understand the extent of this mayfly's existence and to ensure it continues to have supporting habitat.

Use Support: Supporting (7 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB192)	Excellent (2006)
AMS (C4370000)	No Exceedances

Clark Creek (0305010203)



Restoration Opportunities

Maiden Creek (030501020301)

Maiden Creek [AU: 11-129-5-7-2-(1)]:

Maiden Creek flows southwest for 7.5 miles before merging with Allen Creek around the Town of Maiden and drains mostly agricultural land. In 1993, Maiden Creek's benthic community was rated Good; however the fish community was given Good-Fair. Since than, the creek was sampled once in 2002 and received a benthic rating of Fair. Upstream of the 2002 sampling location, there is one registered impoundment and at least two other agricultural impoundments. During the 2002 sampling biologist noted that the flow of Maiden Creek was reduced by half during the time it took to sample the creek. The benthic community showed signs of severe impact due to inconsistent flow as noted in the 2002 special study[2]. DWQ will re-sample this site (CB193) during the next sampling cycle, and will work with SWCD and property owners to ensure adequate flow remains in Maiden Creek.

Use Support: Impaired (5 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB193)	Good (2002)

1 *Results of Biological Sampling from the Watershed Stressor Study in the Catawba River Basin: Burke, Catawba, and Lincoln counties, Subbasin 35 and 36 (BF-20061207).* Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

2 Biological Monitoring of Maiden Creek (Catawba Subbasin 35), August 2002. (B-20021210). Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Upper & Lower Clark Creek (030501020302 & 030501020303)

Clark Creek [AUs: 11-129-5-(0.3)a, (0.3)b & (9.5)]:
Clark Creek runs a little over 20 miles south from the source near the southeast portion of the City of Hickory to its confluence with the South Fork Catawba River on the west side of the City of Lincolnton. The creek is split into three segments which drain a variety of landscapes including mostly agricultural land with a mixture of residential areas. In August of 2002, a fecal coliform bacteria TMDL was completed for the entire length of Clark Creek and its watershed. This is discussed further in the Section below.

Use Support: Impaired (17 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB166)	Good-Fair (2001)
Fish Com (CF7)	Poor (2004)

Clark Creek [AU: 11-129-5-(0.3)b]: The longest of the three segments of Clark Creek is AU: 11-129-5-(0.3)b (16.6 miles) and has been on the Impaired Waters list since 1998 for biological integrity. The most recent benthic sample, taken in 2001 at station CB166 in Newton, received a Good-Fair rating which suggests improvement. However, the most recent fish community sample, taken in 2004, rated the creek as Poor. This low rating may be a result of both point and nonpoint pollutants. A cattle exclusion fence, which are designed to run parallel with the stream, crosses the channel giving cattle full access. Urban debris is scattered across the banks and channel.

This segment also receives effluent from the Town of Maiden's WWTP (NC0039594) which could be causing the lack of pollution intolerant species due to the high levels of biological oxygen demand (BOD) and suspended solids found in the WWTP's effluent. The pure oxygen plant had numerous maintenance issues due to problems getting spare parts, issues with operations, and the pretreatment program for industrial users. One of these issues was elevated BOD coming into the plant that could not be treated. Per previous agreements unrelated to Maiden's violations, the high BOD contributor was rerouted to a neighboring WWTP in July 2008. The Town of Maiden had planned for an upgrade but refused to apply for a SOC during construction. New management, operators, and pre-treatment program coordinator were employed and the Town began operation of the new Sequencing Batch Reactor (SBR) Treatment System as of September of 2008. During start-up there were problems setting up the SBR to properly mix, settle, and decant but no violations were generated. There have been no violations issued to the plant since July 2008. The Mooresville Regional Office inspected the plant in February of 2009 and although a few issues were raised relating to influent/effluent sampling and grit removal the facility was found to be in compliance.

Use Support: Impaired (2 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB165)	Fair (2007)
AMS (C4800000)	Copper - 15% Turbidity - 15% FCB - 51%

Clark Creek [AU: 11-129-5-(9.5)]: The last segment of Clark Creek is the most downstream segment before it flows into the South Fork Catawba River. It was originally placed on the Impaired Waters list for fecal coliform bacteria (FCB) standard violations in 1998. A *TMDL for FCB* was completed in August of 2002 as a result of this listing and is discussed below. The same month the TMDL report was published, the segment was biologically sampled and received a Fair benthic rating which caused it to remain on the Impaired Waters list. The impairments continue with a Fair benthic rating in 2007 and physical/chemical standard violations accumulated between 2004 and 2008.

Ambient monitoring (2004 - 2008) resulted in 51% of samples above the action level for FCB of 400 colonies per 100 ml (details below). The copper standard of 7 µg/l was exceeded in 15% of samples which is 2% higher than the previous sampling cycle. A copper study was conducted in 2004 to determine the impact of copper on Clark Creek and concluded that the amount of copper in the water column at that time was not significant enough to impair the creek. However, more recent sampling has documented increasing copper exceedances; therefore, Clark Creek has been placed on the 2008 and 2010 Impaired Waters list for copper. Eight percent of lead and zinc samples were exceeding the standard as well. Clark Creek will not be impaired for lead or zinc but the exceedance indicates the creek is being impacted by metal toxicity. This toxicity is believed to be caused by urban land use activities.

In July of 2002, the Clean Water Management Trust Fund funded the *Assessment Report: Biological Impairment in the Upper Clark Creek Watershed* which analyzed a broad range of data about the watershed to determine the most probable stressors and sources of the impairment. Once three main sources were determined (habitat degradation, toxicity from nonpoint sources and toxicity due to chlorine discharge from the Newton WWTP), the report recommended ten steps to address current sources of impairment and prevent further degradation. These steps are summarized in the *2004 Catawba River Basinwide Water Quality Report* in *Section B, Chapter 6*. Recommendations and action plans for Clark Creek are discussed below.

Protection Priorities

Upper Clark Creek (030501020302)

Town Creek [AU: 11-129-5-4]:
Town Creek is just under four miles long and mostly drains dense urban areas from the Town of Newton. This creek was sampled once (2000) and received a benthic rating of Good-Fair. The somewhat low rating likely reflects impacts from toxic urban stormwater runoff and residential nonpoint source pollution. DWQ will re-sample this site during the next sampling cycle. DWQ will also work with the City of Newton to reduce the impacts of stormwater and residential runoff to Town Creek. This creek receives a high priority for protection since it drains into Clark Creek [AU: 11-129-5-(0.3)b] which is on the Impaired Waters list.

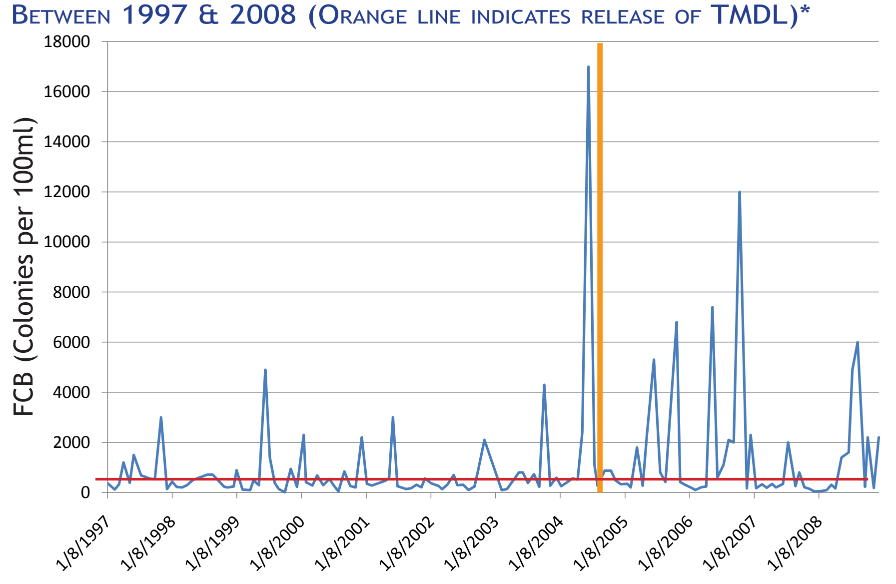
Use Support: Supporting (4 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB204)	Good-Fair (2000)

Watershed Recommendations & Action Plans

Clark Creek FCB TMDL:

In 2002, a TMDL was developed and approved for Clark Creek to address the excessive fecal coliform bacteria (FCB) levels sampled in the creek. Figure 2-11 shows each sample taken by DWQ between 1997 and 2008. The orange line indicates the approval of the TMDL and the red line roughly indicates the standard of 400 colonies per 100ml in 20% of samples. Potential nonpoint sources of FCB loading and calculated reductions in the watershed include urban development (53%), animal grazing (22%), and failing septic systems (15%). The study called for a total FCB loading reduction of 77% from nonpoint sources. Point sources were noted as contributing less than 5%; therefore, reductions are not recommended for FCB loading from point sources.

Figure 2-11: C4800000 Fecal Coliform Bacteria Sample Results Between 1997 & 2008 (Orange line indicates release of TMDL)*

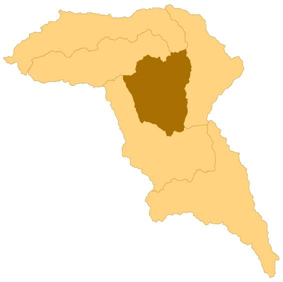


* The orange line indicates the approval of the TMDL and the red line roughly indicates the standard of 400 colonies per 100ml in 20% of samples.

Clark Creek Action Plan:

Local agencies have recommended this watershed as a potential DWQ Use Restoration Watershed due to the amount of urban and nonpoint source FCB issues impacting this creek which DWQ has recently approved. A group of local agencies (Carolina Land & Lakes RC&D, Catawba County and City of Hickory) has recently formed to begin developing a Watershed Restoration Plan. Focus will be placed on the headwater portions of the watershed at first, then the group will gradually move downstream. This will ensure activities in the headwaters will not degrade efforts being made downstream. This Watershed Restoration Plan will reconfirm the sources found during the 2002 Biological Assessment Report (as discussed above) as well as design a plan of implementation. The group will use resources already developed to address excessive FCB levels and expand the study range to include other parameters of interest in this watershed. Study will begin in the upper headwaters of the watersheds and work downstream. A more wholistic approach to this watersheds restoration is over all less costly and increases the ability for success. DWQ will assist with this restoration effort and supports the need for funding to develop and implement the Watershed Restoration Plan. For more information and progress on this effort visit the *DWQ Use Restoration Watershed webpage*.

Upper South Fork Catawba River (0305010204)



Restoration Opportunities

Pott Creek (030501020401)

Pott Creek [AUs: 11-129-3-(0.3) & (0.7)]:
Pott Creek is about 13 miles in total length and drains rural agricultural lands into the South Fork Catawba River [AU: 11-129-(2.5)]. Historically, the lower section of this creek has received Good fish community ratings (1997 & 2002). However, a 2006 sample from a Watershed Stressor Study[1], conducted by ESS, resulted in a drop to a Fair rating. This may be in part due to limited avenues for recolonization. During the same study, a benthic sample received a Good rating. Hurricanes in 2004 caused a significant amount of erosion from the creek banks and are likely causes of the fish community impairment. Poor habitat, also caused by the hurricanes, was then further stressed by low flows in 2007. Nutrient tolerant species found in the benthic samples indicate the creek is also being effected by excess nutrients. The source of this excess nutrients could have originated from the large amounts of agricultural drainage found in this watershed. The local SWCD has placed nine agricultural BMPs (mostly sediment and nutrient removal measures) just downstream of the monitoring stations between 2004 and 2008. Improvements to the biological community are expected in the next couple of years due to these BMPs. DWQ will continue to work with SWCD to further assess the need for additional agricultural BMPs as well as work to identify other sources in this subwatershed.

Use Support: Impaired (13 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthic (CB197)	Good (2006)
Fish Com (CF48)	Fair (2006)

Town of Startown-South Fork Catawba River (030501020403)

South Fork Catawba River [AU: 11-129-(0.5)]:
The South Fork Catawba River is just over 56 miles in total length and drains into Lake Wylie just before reaching the City of Belmont. The river is split into eight different segments to better assess its ability to support its designated uses and overall health. Each segment is discussed in its corresponding 10-Digit watershed. The river begins at the confluence of Jacob Fork and Henry Fork. This segment [AU: 11-129-(0.5)] was first placed on the Impaired Waters list in 2008 for a low pH standard violations. It will remain on the DRAFT 2010 list for low pH as well as for turbidity violations between 2004 and 2008. The pH violations at this ambient monitoring station closely follow the basinwide trend of dropping significantly in 2003. The AMS data also showed elevated FCB levels. The segment has not been biologically monitored since 1997; therefore, it is recommended to be sampled during the next cycle to determine if there has been an impact to the biological community.

Use Support: Impaired (8 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
AMS (C4380000)	Low pH - 22% Turbidity - 12% FCB - 26%

Protection Priorities

Howards Creek (030501020402)

Howards Creek [AU: 11-129-4]:
Howards Creek is a 13.5 mile creek that drains rural agricultural areas and empties into the South Fork Catawba River [AU: 11-129-(3.7)] just west of the City of Lincolnton. In 2007, the fish community in this creek was sampled for the first time and received a Good rating. It was also sampled for benthic community in 2006 as part of a Watershed Stressor Study[1] conducted by ESS, and was rated Good. At that time, biologist noted a large hole (>2 meters deep) created by a dip crane in support of an ongoing sand mining operation. This constant disturbance of sediment has caused the substrate, in which the benthic community lives, to become embedded. Samples were taken in June and October of 2008 to assist the Ecosystem Enhancement Program (EEP) with a Local Watershed Plan (LWP) for Howards and Indian Creek. The benthic community dropped to a Good-Fair rating. According to findings from the LWP, Good-Fair Bioclassifications reflect the overall marginal aquatic habitat conditions found in Howards Creek that would be improved through planting of stream buffers and stabilizing of stream banks.

Use Support: Supporting (14 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthic (CB185)	Good-Fair (2008)
Fish Com (CF61)	Good (2007)

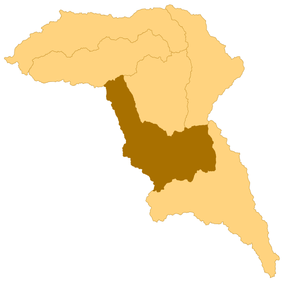
1 *Results of Biological Sampling from the Watershed Stressor Study in the Catawba River Basin: Burke, Catawba, and Lincoln counties, Subbasin 35 and 36 (BF-20061207).* Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

In 2008, EEP identified this watershed, as well as the neighboring Indian Creek subwatersheds (030501020501 & 030501020502), as high priority areas for EEP's detailed watershed assessment and planning process. EEP will complete it's 3-phase Local Watershed Planning (LWP) initiative, culminating in production of a final Project Atlas and final Watershed Management Plan, in the spring of 2010. The Preliminary Findings Report, Wetland Assessment Report, Detailed Assessment Report and LWP Fact Sheet can be found on the *EEP-Catawba River Basin webpage*.

Watershed Recommendations & Action Plans

Howards Creek is part of the Indian/Howards Creek's EEP *Local Watershed Plan* which started in 2006. This is discussed in greater detail in the Warrior Fork (0305010205) Watershed Recommendations & Action Plans section below.

Warrior Fork - Catawba River (0305010205)



Restoration Opportunities

Lower Indian Creek (030501020501)

Use Support: Impaired (6 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB187) (CB188)	 Good-Fair (2008) Good-Fair (2008)
Fish Com (CF21)	 Fair (2006)
AMS (C5170000)	Low pH - 15% Turbidity - 10.2% FCB - 37%

Indian Creek [AUs: 11-129-8-(6.5)]:
Indian Creek begins at the county line between Lincoln and Catawba County and flows 23 miles downstream to South Fork Catawba River [AU: 11-129-(3.7)]. This subwatershed drains mostly agricultural and forested lands. The creek was part of a Watershed Stressor Study[1] conducted by ESS in 2006 in which two benthic sites and one fish community site were sampled on Indian Creek. Of the two benthic sites, the one most upstream (CB187) rated significantly lower than the site downstream (CB188). The habitat scores for both sites were almost identical which indicates it is not significantly contributing to the degradation. In 2006, a fish community sample was taken at the same location as the lower benthic sample and it was rated Fair as well. The most significant impact to the fish community was the low flows from prolonged drought. Also, the dams located just upstream and downstream of the confluence with the South Fork Catawba River are impeding the recolonization of the fish community. The likely causes of the biological impairment is nonpoint source pollution (urban runoff, agricultural practices and historic stream channelization). For more specific details about the 2006 samples, see the Watershed Stressor Study[1].

Samples were also taken on Indian Creek in June and October of 2008 (outside the regular sampling cycle) to assist EEP with a Local Watershed Plan (see below) for Howard and Indian Creek. Both benthic sites were rated Good-Fair during that time. When comparing the samples from 2006 and 2008, which had very similar results, it suggests the sites may continue to vacillate between Fair and Good-Fair ratings. The 2008 study also indicates that water levels were even lower than during the 2006 study due to a more severe drought in 2007.

The AMS data indicated that the creek is suffering from low pH levels and excess turbidity. FCB levels were also higher than normal. A 5-in-30 study (five samples taken within 30 days) should be conducted to determine if the creek is impaired for FCB. The creek will remain on the Impaired Waters list for 2008 and 2010 for biological integrity, low pH and turbidity.

Protection Priorities

Beaverdam Creek (030501020503)

Use Support: Supporting (8 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB159)	 Good (2006)
Fish Com (CF2)	 Excellent (2006)

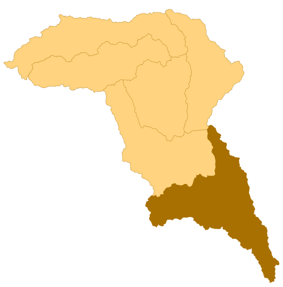
Beaverdam Creek [AU: 11-129-9-(0.7)]:
Beaverdam Creek is approximately 8 miles in length and begins in the southern portion of the City of Cherryville draining to the South Fork Catawba River [AU: 11-129-(3.7)]. This creek is fully supporting for both benthic and fish communities as sampled during this cycle. However, signs of sedimentation impacting the streams health are beginning to emerge. Considering the current high biological quality this creek, it is a top priority for protection. DWQ will investigate the source of the sedimentation during the next sampling cycle.

1 *Results of Biological Sampling from the Watershed Stressor Study in the Catawba River Basin: Burke, Catawba, and Lincoln counties, Subbasin 35 and 36 (BF-20061207).* Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Watershed Recommendations & Action Plans

Indian Creek is part of EEP's Indian/Howards Creek Local Watershed Plan, which started in 2008. NC DENR's Source Water Protection Program, the Catawba Lands Conservancy and local resource professionals in Lincoln and Gaston Counties are partnering with EEP to develop a consensus set of recommendations for watershed improvement and protection. The final Watershed Management Plan will be completed in spring of 2010. See *EEP's project website* for all LWP documents EEP will begin its implementation phase (acquisition, design and construction of priority stream and wetland restoration projects) by the summer of 2010. EEP will continue to work with Lincoln and Gaston County stakeholders to help implement other project opportunities, such as stormwater BMPs, identified within priority sub-watersheds. In total, 60 project sites (including approximately 13 miles of degraded streams and 200 acres of impacted wetlands) have been identified as potential mitigation projects within the final LWP Project Atlas. Visit *EEP's website* for more information about LWP initiative.

Lower South Fork Catawba River (0305010206)



Restoration Opportunities

Hoyle Creek (030501020601)

Hoyle Creek [AUs: 11-129-15-(6)]:

Use Support: Impaired (0.5 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB186)	Good (2006)
Fish Com (CF19)	Fair (2006)

Hoyle Creek begins on the east side of the City of Lincolnton, flowing south for 13.5 miles and drains mostly agricultural and residential lands before merging with the South Fork Catawba River [AU: 11-129-(14.5)]. The creek is split into five different segments [AUs: 11-129-15-(1), (1.5), (3.5), (4) & (6)]. The last half mile of Hoyle Creek [AU: 11-129-15-(6)] was biologically sampled in 2006 and received a Good benthic rating; however, the fish community sample at the same location received a Fair rating. The number of fish collected during 2006 was only one third of those collected in 2002 which was a low flow year. The species found in 2006 were all pollution tolerant with little diversity. Less than half a mile upstream of the sampling stations, Mauney Creek flows into Hoyle Creek which is the receiving waters for the Town of Stanley's WWTP. This facility has been listed as a possible cause of declining aquatic life in the Watershed Stressor Study[1] completed in 2006. During the next biological sampling cycle, DWQ will monitor the current sites as well as an additional site upstream of Mauney Creek to help identify the sources of stressors to the aquatic life in this creek.

Mauney Creek [AU: 11-129-15-5]:

Use Support: Impaired (4 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthic (CB195)	Poor (2006)

Mauney Creek is a four mile creek which runs along the west side of the Town of Stanley before its confluence with Hoyle Creek [AU: 11-129-15-(4)]. In 1997, the creek's benthic community was sampled twice, both receiving a Fair rating. The community was sampled again in 2006 as part of the Watershed Stressor Study[1] which resulted in a Poor rating. Toxic indicator species were abundant which suggests the rating was not due to poor habitat alone. Biologists noted that the gills of the caddisfly Cheumatopysche appeared as stumps instead of their usual branched morphology, a deformity caused by toxins. The source(s) and the actual agent(s) cannot be ascertained without additional biological and chemical sampling within the immediate catchment.

Mauney Creek is the receiving waters for the Town of Stanley's WWTP which received numerous NPDES permit violations. This facility also failed nine out of 31 aquatic toxicity tests between 2003 and 2007. These violations are due to lack of proper operations at the WWTP, and the facility has received multiple NOVs and penalty assessments. DWQ will continue to work with this facility to ensure compliance with its permit. This creek will continue to be monitored until the facility is in full compliance or until the benthic community has fully recovered. For more information about how the toxins in the facility's effluent are causing these deformities in caddisflies, refer to the Watershed Stressor Study[1].

1 *Results of Biological Sampling from the Watershed Stressor Study in the Catawba River Basin: Burke, Catawba, and Lincoln counties, Subbasin 35 and 36 (BF-20061207)*. Requests for a copy of this and other special studies must submitted to ESS via phone (919-743-8400) or e-mail (jay.sauber@ncdenr.gov).

Upper & Lower Long Creek (030501020602 & 030501020603)

Long Creek [AUs: 11-129-16-(4)]:

Long Creek is approximately 20 miles long and is split into three segments [AUs: 11-129-16-(1), (2.3) & (4)]. The creek flows from the western Gaston County line to the South Fork Catawba River [AU: 11-129-(15.5)] and drains agricultural lands in the headwaters and dense urban areas in the lower portions. The lower 15 mile stretch of Long Creek [AU: 11-129-16-(4)] was placed on the 1996 Impaired Waters list for biological integrity and was delisted in 2000. The delisting was due to a variety of restoration efforts and verification by scientific investigations of the creek. This investigation/study was led by Gaston County Cooperative Extension Services and sponsored by 13 other agencies including DWQ. The study, which was completed in 2002, included in-depth monitoring and implementation of over 350 BMPs, as well as multiple educational projects. The final report, published in 2002, indicated that the installation of the 350 BMPs greatly reduced levels of nutrients, sediment and fecal coliform bacteria. More information about this project can be found in the *Final Report*.

Use Support: Impaired (15 mi)	
2008 IR Cat.	3a
2010 IR Cat.	5
Benthic (CB224) (CB218)	Good-Fair (2007) Good-Fair (2007)
Fish Com (CF29)	Excellent (2004)
AMS (C5900000)	Low pH - 12% FCB - 40%

Current biological sampling indicates the benthic community has yet to fully recover. A temporary benthic site (CB218), in addition to CB224, was evaluated in 2007. That site received the same Good-Fair rating; however, the diversity within the community had greatly decreased. This decline may be a result of the building and operating of the Apple Creek Executive Golf Course Club, which opened in 2006. The site should be adopted as a regularly monitored site to evaluate the effects of increased development. Less than a mile upstream of CB218, the AMS data showed the creek was Impaired for low pH and aquatic life was being impacted by sedimentation. Fecal coliform bacteria results were elevated in a large portion of the samples taken. A 5-in-30 study should be prioritized and conducted, if necessary, to determine if the creek is impaired for FCB. With in this subwatershed there are 14 impoundments and four dairy cattle farms with a rough total of over 600 head of cattle which drains into the 15 mile segment of Long Creek. DWQ will work with SWCD and Gaston County to assist in evaluating the need for additional BMPs or maintenance of existing BMPs. Further study is needed to determine the full impacts of a large number of impoundments in one subwatershed on the biological community during times of drought.

Dallas Branch [AUs: 11-129-16-7b]:

Dallas Branch is less than a mile long and flows along the southern portion of the Town of Dallas in the Lower Long Creek subwatershed (030501020603). This waterbody was first listed on the Impaired Waters list in 1992 due to a Fair benthic rating. It was sampled again in 2006 and received a rating of Not Rated due to a policy change stating that streams with less than a 3 square mile drainage area should not be given a rating. Biologist noted that if it was rated, it would have received a Poor or Fair rating. The extremely poor quality of this stream is mostly due to the fact that as of 2006 94% of the overall stream flow was effluent from the Town of Dallas' WWTP. This facility has received numerous NPDES permit violations and failed 16% of the aquatic toxicity tests between 2003 and 2007. DWQ worked closely with this facility to bring it back into permit compliance and help to reduce future violations.

Use Support: Impaired (0.6 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB213)	Not Rated (2006)

Coley Creek-South Fork Catawba River (030501020604):

South Fork Catawba River [AU: 11-129-(10.5) & (14.5)]:

The South Fork Catawba River is just over 56 miles in total length which begins in subwatershed 030501020403 and drains into Lake Wylie just before reaching the City of Belmont. The river is split into eight different segments to better assess the river's ability to support its designated uses and health. The two segments within this subwatershed are combined 11 miles long. The first two miles of AU 11-129-(10.5) are within HUC 030501020504.

Use Support: Impaired (11 mi)	
2008 IR Cat.	3c
2010 IR Cat.	5
Gaston Co. (GAS15) (GAS16)	Turbidity - 17% Turbidity - 17%

In 2007, Gaston County began sampling physical/chemical parameters at 17 sites through out the county. The County submitted the data to DWQ in 2009 for inclusion in the 2010 use assessment process. Twelve samples each were taken at GAS15 and GAS16 (See *Appendix 2-D*) located on Hardin Road and Dallas Stanley Hwy. between October 2007 and September 2008. During this time period, data shows turbidity to be impairing the river. These sites provide valuable data in areas DWQ does not have the resources to monitor and greatly assists with efforts to prioritize restoration and protection needs. For more information about submitting data to DWQ, visit *DWQ's TMDL Modeling Unit website*. A map of all 17 sites monitored by Gaston County can be found in *Appendix 2-D*.

Duharts Creek-South Fork Catawba River (030501020605):

South Fork Catawba River [AU: 11-129-(15.5)]:

Use Support: Impaired (18 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
AMS (C6500000)	Low pH - 10.2% Turbidity - 12% FCB - 20%

The South Fork Catawba River is just over 56 miles in total length which begins in subwatershed 030501020403 and drains into Lake Wylie just before reaching the City of Belmont. The river is split into eight different segments to better assess the river's ability to support its designated uses and health. The last stretch of the South Fork Catawba River is 18 miles long and receives drainage from some forested land but mostly dense urban areas.

This segment was last biologically monitored in 1997 and received a Good-Fair benthic rating. An Ambient Monitoring Systems (AMS) station is located in the center of the Town of McAdenville. Results from this AMS station indicates the river segment will be impaired for low pH and high turbidity. The listing for low pH is new to the 2010 Impaired Waters list; however the river has been listed for turbidity since 2006. Copper and zinc levels were elevated with 8% of samples above the standard for both parameters. Between 2004 and 2008, fecal coliform bacteria levels more than double what was monitored between 1998 and 2002. Elevated FCB appears to have been originating mainly from point sources with possible contributions from nonpoint sources further upstream.

Along this 18 mile stretch of the South Fork Catawba River, six NPDES discharger facilities discharge directly into the river. Two of these facilities (Spencer Mountain WWTP - NC0020966 & Pharr Yarns Industrial WWTP - NC0004812) discharge effluent just upstream of the AMS site C6500000 and are likely contributors of the higher FCB levels monitored between 2006 and 2008. The Spencer Mountain facility also had numerous chlorine violations between January and December of 2008. Two other facilities (Town of Cramerton's Eagle Road WWTP - NC0006033 & Town of McAdenville's WWTP - NC0020052) are located below the AMS site; therefore their effluent would not affect the results of this station's samples. However, FCB levels measured in the effluent of these two facilities were believed to be adding to the FCB loading within the River during this time period. As of mid to late 2008, three of the facilities (Eagle Road WWTP, McAdenville WWTP & Spencer Mountain WWTP) have corrected the excessive FCB levels as a result of state enforcement actions and facility upgrades.

Pharr Yarns Industrial WWTP (NC0004812):

Beginning in 2006, this facility has had trouble staying in compliance with its NPDES Discharge permit. The main parameter of noncompliance was FCB with the majority of violations occurring in 2008. The Mooresville Regional Office met with the facility in October of 2008 to discuss the issues the facility was having and how to prevent further noncompliance. After installing an upgraded disinfection system, FCB violations persisted. A second meeting with the facility and its consultant (WK Dickson & Company) in May of 2009 brought to light personnel issues, a 20% increase in dye influent and one of three filters was also offline. The Regional Office conducted a Technical Advisory visit the following month to make suggestions which also included hiring a consultant to troubleshoot. Again, violations persisted. Despite efforts to correct some issues causing the noncompliance, the continuous violations landed the facility on the EPA Watch List which lead to a Show Cause meeting in November 2009. Physical plant upgrades were then planned which included a possible change in the dechlorination chemical that could have been causing the sulfide violations. Since that time, the facility has had no FCB violations but seven violations for sulfide. The percent of the reported calculated value of sulfide has dropped from 348% to 34%, indicating the facility is still actively working on a solution.

Watershed Recommendations & Action Plans

South Fork Catawba River [AUs: 11-129-(3.7) & (10.5)]:

Two segments of the South Fork Catawba River, between Howards Creek and Hoyle Creek, have not been biologically sampled since the mid-1980's due to heavy rainfalls and deep runs. Biologist will make all efforts to take samples along these sections during the next sampling cycles. Due to new impairments upstream as well as overall new growth and development, it is critical to sample these two segments during the next sampling cycle. These additional samples will assist in evaluating areas of concern and areas to protect.

Subbasin Recommendations & Action Plans

Update of 7Q10 Flows in NPDES Permits

It is important that 7Q10 flow values be updated to include changing climatic conditions and water withdrawals that impact stream flow conditions. All NPDES permitted facilities use 7Q10's as critical flow in determining permit limits for toxicants. These critical flow values used to determine permit limits for all NPDES facilities may need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions induced by drought impacts the health of aquatic life as demonstrated in this basin for roughly seven years between 1997 and 2007 (see Figure 2-3: stream flow graph). Droughts as well as the demand on water resources are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with DWR and other agencies to discuss the need and resource availability to update 7Q10 values.

Suggested Studies for Upcoming Planning Cycle

Nutrient Load within the South Fork Catawba River

During the next planning cycle, DWQ will be working with other agencies to reevaluate the nutrient loading on the South Fork Catawba River to determine if the Lake Wylie TMDL is being met. Portions of this river are included in the Lake Wylie chlorophyll *a* TMDL (including the amendment of total phosphorus loading), which is discussed in-depth within the *Chain of Lakes Chapter*. There are several NPDES discharge facilities as well as runoff from agricultural land that could be impacting the nutrient loading within the lake. Additional nutrient sampling will provide critical information to the future direction of restoration efforts.

South Fork Catawba River Watershed Toxics Review

In the 1999 Catawba River Basinwide Plan discussed how copper and silver were thought to be a major issue within the South Fork Catawba River. A study was conducted by DWQ & USGS to evaluate the levels of copper and silver within Clark Creek which is a major tributary to the South Fork Catawba River. Results reported in the 2004 Catawba River Basinwide Plan indicated that copper and silver levels were not elevated enough for cause harm to human or aquatic life. Since that study was completed in 2003, copper levels have increased at two AMS sites within this subbasin. Site C4800000 increased the number of samples exceeding copper standards from 13% between 1997-2002 to 15.4% between 2004-2008 and site C7000000 increased to 70% of samples exceeding the standard between 2004-2008. It is suggested that a watershed stressor study be conducted to not only determine if copper is negatively impacting the South Fork Catawba River and its tributaries, but also to help pinpoint the source of the excessive levels. Main points of focus should be on these two stations as well as Long Creek.

Main potential sources of copper are urban runoff and industrial and/or municipal WWTPs. By determining the source of the copper, DWQ can work with municipalities to find better stormwater controls or place additional limits on facilities with excessive copper in their effluent.

Point Source Contributors

National Pollutant Discharge Elimination System Permit Program

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, as authorized by the Clean Water Act. Non-compliance with permit limits on wastewater flow and constituents can lead to discharge of pollutants that degrade surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES Permitting and Compliance Programs of North Carolina's DWQ are responsible for administering the program for the state. These permits are reviewed and are potentially renewed every 5 years, a list and map of NPDES permits can be found in *Appendix 2-E & 2-D*, respectively.

There are a total of 31 NPDES Dischargers within this subbasin. Eleven of those are Major Dischargers which means the facility discharges greater than one million gallons of wastewater a day (1 MGD). Twenty of the facilities are Minor facilities which discharge less than 1 MGD. The Major facilities discharge mainly to the major streams in this subbasin. If a facility is impacting water quality or has made improvements to minimize the impact of their waste load, it is discussed in the 10 Digit HUC watershed sections.

Implementation of New Water Quality Standard for Total Residual Chlorine:

On April 1, 2003, a new aquatic life surface water quality standard for total residual chlorine (TRC) became effective in North Carolina. Previously, TRC had been a freshwater Action Level standard, except in designated Trout waters where the aquatic life standard of 17 ug/l was implemented as a permit limit. The new standard removes the Action Level status and sets the new instream standard for TRC for all freshwater streams at 17 µg/L including those classified as Tr. After April 1, 2003, as existing permits were renewed and new permits issued, TRC limits were included in the permits. Facilities that do not use chlorine for disinfection did not receive TRC limits; however, the presence of a chlorine back-up system to augment Ultraviolet (UV) and other disinfection treatments resulted in a TRC permit limit. Facilities that discharge to streams with a 7Q10 flow <0.05 cfs (considered zero-flow streams) received a limit of 17 µg/L. TRC permit limits are capped at 28 µg/L in freshwater discharges to protect against acute impacts.

Facilities were given 18 months to add dechlorination or other means of disinfection to become compliant with the new standard. The 18 month period for most facilities in the Catawba River basin fell between 2004 and 2007, depending on when the permit was renewed. All facilities in the Catawba basin are beyond this 18 month period. It should be noted that meeting the new TRC limits has been difficult for some facilities; however, DWQ has been working with all facilities to assist with compliance.

Special Order by Consent (SOC):

Special Order by Consent may be an appropriate course of action if a facility is unable to consistently comply with the terms, conditions, or limitations in an NPDES Permit. However, SOCs can only be issued if the reasons causing the non compliance are not operational in nature (i.e., they must be tangible problems with plant design or infrastructure). Should a facility and the Environmental Management Commission enter into an SOC, limits set for particular parameters under the NPDES Permit may be relaxed, but only for a time determined to be reasonable for making necessary improvements to the facility.

Pretreatment

The Federal and State Pretreatment Program gives regulatory authority for EPA, States, and Municipal Governments to control the discharge of industrial wastewater into municipal Wastewater Treatment Plants (WWTPs) or Publicly Owned Treatment Works (POTWs). The objectives of the Pretreatment Program are to prevent pass-through, interference, or other adverse impacts to the POTW, its workers or the environment; to promote the beneficial reuse of biosolids; and to assure all categorical pretreatment standards are met. There are currently around 700 Significant Industrial Users (SIUs) who discharge industrial wastewater to over 120 POTWs throughout the State of North Carolina. The WWTPs covered by POTW Pretreatment Programs are indicated in *Appendix 2-E* by an asterisk (*) next to the permit number. If a facility's Pretreatment Program is impacting water quality or has made improvements to minimize the impact of their industrial user waste load, it is discussed in the 10-digit HUC watershed sections.

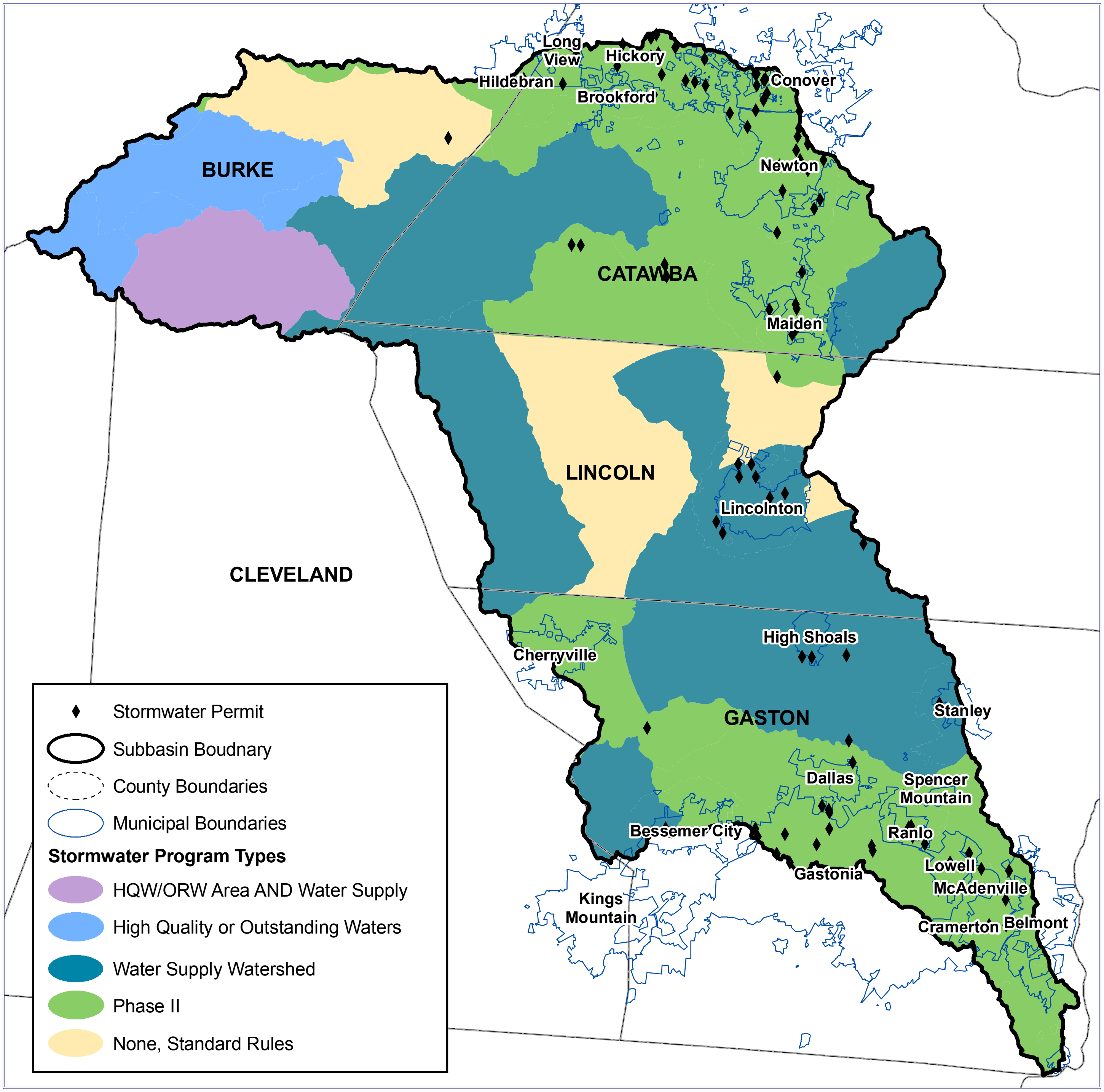
Nonpoint Source Contributors

Stormwater

There are many different stormwater programs administered by DWQ. One or more of these affects many communities in the Catawba River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include NPDES Phase II, HQW/ORW stormwater, and Water Supply Watershed Program. Figure 2-12 indicates the different stormwater programs in this subbasin.

HQW/ORW Stormwater Program is implemented in the headwaters and Water Supply Watershed Stormwater Programs are scattered throughout this subbasin. Catawba and Gaston counties are covered under the NPDES Phase II Stormwater program as well as Cherryville, Hickory, Gastonia and surrounding cities. The Phase II programs are delegated to the counties in these areas. For more information on stormwater permits and the requirements of each, see *Chapter 5.3 of the Supplemental Guide to NC's Basinwide Planning* or *DWQ's Stormwater Permitting Unit's website.*

FIGURE 2-12: STORMWATER PROGRAM AREAS IN SUBBASIN 03050102



INDUSTRIAL STORMWATER

The Division has renewed several industrial stormwater permits with a revised monitoring strategy in the past few years, including the majority of General NPDES Stormwater Permits. These permits now incorporate benchmark concentrations to provide permittees a tool with which to assess the effectiveness of best management practices (BMPs). These benchmark concentrations are not effluent limits but instead provide guidance for responses under the facility's Stormwater Pollution Prevention Plan (SPPP). The basis for each benchmark varies depending on the type of pollutant; values are based on thresholds like acute effects to aquatic life (e.g., metals), water quality standards (e.g., pH), secondary treatment standards (e.g., BOD and COD), or other reference levels.

Exceedances of stormwater benchmark values require the permittee to respond in a tiered program with increased monitoring, increased management actions, increased record keeping, and/or installation of stormwater BMPs. In previous versions of these general permits, "cut-off concentrations" were used to minimize the required analytical monitoring. The arithmetic mean of all monitoring data collected during the term of the permit was compared to the cut-off concentration. If the mean was less than the cut-off concentration, then the facility could discontinue analytical monitoring for that parameter at that outfall until the final year of the permit.

The Division revised that strategy to incorporate benchmarks with (typically) semi-annual monitoring throughout the permit term on the basis that (1) so few data points over the term of a permit were insufficient to provide confidence in an average concentration and justify discontinuation of monitoring; (2) industrial processes or activities may change during the period of the permit that the facility is not monitoring; and (3) periodic monitoring encourages maintained attention to stormwater management.

Non-Discharge

Non-discharge wastewater treatment options include spray irrigation, animal waste management systems, rapid infiltration basins, drip irrigation systems, land application of residuals programs, wastewater collection systems and beneficial reuse of wastewater systems. These systems are operated without a discharge to surface waters; however, they still require a DWQ permit. Sanitary sewer collection systems used to collect the wastewater from NPDES discharge wastewater treatment facilities and non-discharge wastewater treatment facilities are both permitted by Non-Discharge Permitting Unit (NDPU). The land application of residuals program and the distribution and marketing program are also permitted by NDPU. The permit insures that treated wastewater is applied to the land at a rate that is protective of groundwater, and does not produce ponding or runoff into a waterbody. A list of Non-Discharge Permits in this watershed are listed in *Appendix 2-E*. More information about land application and non-discharge requirements and how it impacts water quality can be found in Section 9.3.2 of the *Supplemental Guide to North Carolina's Basinwide Planning* or the DWQ Aquifer Protection Section-*Land Application Unit* website. A map of these permits can be seen in *Chapter 11*.

Wetland Or Surface Water Disturbance (401 Certification)

The "401" refers to Section 401 of the Clean Water Act. The North Carolina Division of Water Quality (DWQ) is the state agency responsible for issuing 401 water quality certifications (WQC) (Table 2-6). When the state issues a 401 certification this certifies that a given project will not degrade Waters of the State or violate State water quality standards. A 401 WQC is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Typically, if the USACE determines that a 404 Permit or Section 10 Permit is required because your proposed project involves impacts to wetlands or surface waters, then a 401 WQC is also required. Examples of activities that may require permits include:

- Any disturbance to the bed (bottom) or banks (sides) of a stream.
- Any disturbance to a wetland.
- The damming of a stream channel to create a pond or lake.
- Placement of any material within a stream, wetland or open water, including material that is necessary for construction, culvert installation, causeways, road fills, dams, dikes or artificial islands, property protection, reclamation devices and fill for pipes or utility lines.
- Temporary impacts including dewatering of dredged material prior to final disposal and temporary fill for access roads, cofferdams, storage and work areas.

Table 2-6: 401 Permits Within the Catawba River Subbasin (03050102) Issued Between 2004 & 2009

Impact Category	Project Type	Approved Area
Open Water	Water Line	0.47 ac
Total Open Water		**0.47 ac**
Buffer	Residential	3,405 sq ft
Total Buffer		**3,405 sq ft**
Stream	Residential	702 ft
	Commercial	10,879 ft
	Roads	1,086 ft
	Sewer/Piping	2,457 ft
	Other	800 ft
Total Stream Feet		**15,924 ft**
Wetland	Commercial	2.1 ac
	Residential	0.3 ac
	Roads	0.6 ac
	Other	1.1 ac
Total Wetland Acres		**4.1 ac**

In streams and wetlands (in accordance with 15A NCAC 02H .0506(h) and 15A NCAC 02H .1305(g)) the DWQ requires compensatory mitigation (Table 2-7) for losses of streams and wetlands (404 jurisdictional wetlands as well as isolated and other non-404 jurisdictional wetlands) as follows:

- For all non-linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet of perennial and intermittent streams or impacts equal to or exceeding one acre of wetlands.
- For linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet per stream or one acre of wetlands.

Buffer mitigation may be required for any project within a Riparian Buffer Protection Rule for impacts to the protected riparian buffer listed as “(potentially) allowable with mitigation” or “prohibited” within the Table of Uses require mitigation. For more information about the Riparian Buffer Protection Rules including the Table of Uses, *click here*.

Options for compensatory mitigation:

- **Mitigation banks:** Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- **In-lieu fee mitigation:** Applicant satisfies the mitigation requirement by purchasing mitigation credits through the N.C. Ecosystem Enhancement Program (NCEEP).
- **Project-specific mitigation:** Applicant satisfies the mitigation requirement him/herself, either at the project site or at an off-site location.

For impacts to federally jurisdictional waters requiring compensatory mitigation, information on mitigation options can be viewed at the U.S. Army Corps of Engineers Mitigation *website*.

TABLE 2-7: 401 MITIGATION WITHIN THE CATAWBA RIVER SUBBASIN (03050102) ISSUED BETWEEN 2004 & 2005*

Impact Category	Mitigation Type	Amount
Buffer	WRP/EEP (Zone 1)	3,405 sq ft
Total Buffer Mitigation (Square Feet)		**3,405 sq ft**
Stream	Restoration	2,200 ft
	WRP/EEP	3,800 ft
	Preservation	3,755 ft
	Enhancement	2,250 ft
Total Stream Mitigation (Feet)		**12,005 ft**
Wetland	Enhancement	0.7 ac
	Preservation	7.0 ac
Total Wetland Mitigation (Acres)		**7.7 ac**

For more information about 401 certifications and 404 federal permits, see the DWQ's *401 Oversight & Express Permitting Unit* website.

AGRICULTURE

Agriculture is North Carolina's leading industry and is abundant in this subbasin of the Catawba River basin. The approach taken in North Carolina for addressing agriculture's contribution to the nonpoint source water pollution problem is to primarily encourage voluntary participation by the agricultural community. This approach is supported by financial incentives, technical and educational assistance, research, and regulatory programs.

The conversion of agricultural lands to developed lands with large amounts impervious surfaces is another major contributing factor to nonpoint source pollution. A report by the American Farmland Trust organization identifies this subbasin as having high quality farmland with areas threatened by development. A *map of these areas* is available from their website. However, other farmers are protecting their land through the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pasture land. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements.

NC Agriculture Cost Share Program

The NC Agriculture Cost Share Program (ACSP) started in 1984 to help reduce the sources of agricultural nonpoint source pollution to the state's waters. The program assists owners and renters of established agricultural operations to improve their on-farm management by using Best Management Practices (BMPs). It is a voluntary program that reimburses farmers up to 75% of the cost of installing an approved BMP. The Division of Soil and Water Conservation implements the program on both a county district (SWCD) and state level. The Division has been very active in this basin as can be seen in the number of BMPs and benefits gained from them (Table 2-8 and Table 2-9 and Figure 2-13).

Table 2-8: List of BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050102

Purpose of BMP	Total Implemented	Cost-Shared Funds	Total Project Costs
Agri-Chemical Pollution Prevention	--	$18,073	$24,097
Number of Facilities	1	--	--
Drought Response	--	$33,685	$44,913
Well-Confined Supply	1	--	--
Irrigation Well	3	--	--
Conservation Irrigation	1600 feet	--	--
Erosion/Nutrient Loss Reduction from Fields	--	$179,345	$239,127
Acres Treated	4,476	--	--
Sediment/Nutrient Delivery Reduction from Fields	--	$27,503	$36,671
Stream Protection	--	$182,526	$243,368
Linear Feet Treated	29,722	--	--
Waste Management	--	$163,277	$217,703
Number of Units Installed	14	--	--
Grand Total	**35,895**	**$608,517**	**$811,356**

Table 2-9: BMP Benefits Gained Between January 2003 to June 2009 by 10-Digit HUC

10 Digit Hydrologic Unit	Acres Affected	Nitrogen Saved (lb.)	Phosphorus Saved (lb.)	Soil Saved (tons)	Waste-N Managed (lb.)	Waste-P Managed (lb.)
0305010201	322.6	978.0	--	5.1	19,015	49,647
0305010202	2,429.4	42,984.0	28,706.5	29,173.5	293,120	209,104
0305010203	682.6	121,861.6	41,572.0	2,922.3	--	--
0305010204	2,881.5	4,790.9	3,633.3	2,648.6	101,571	99,159
0305010205	1,409.6	8,114.5	8,284.9	5,090.0	49,832	64,079
0305010206	360.6	673.0	7.0	184.0	--	--

Animal Operations

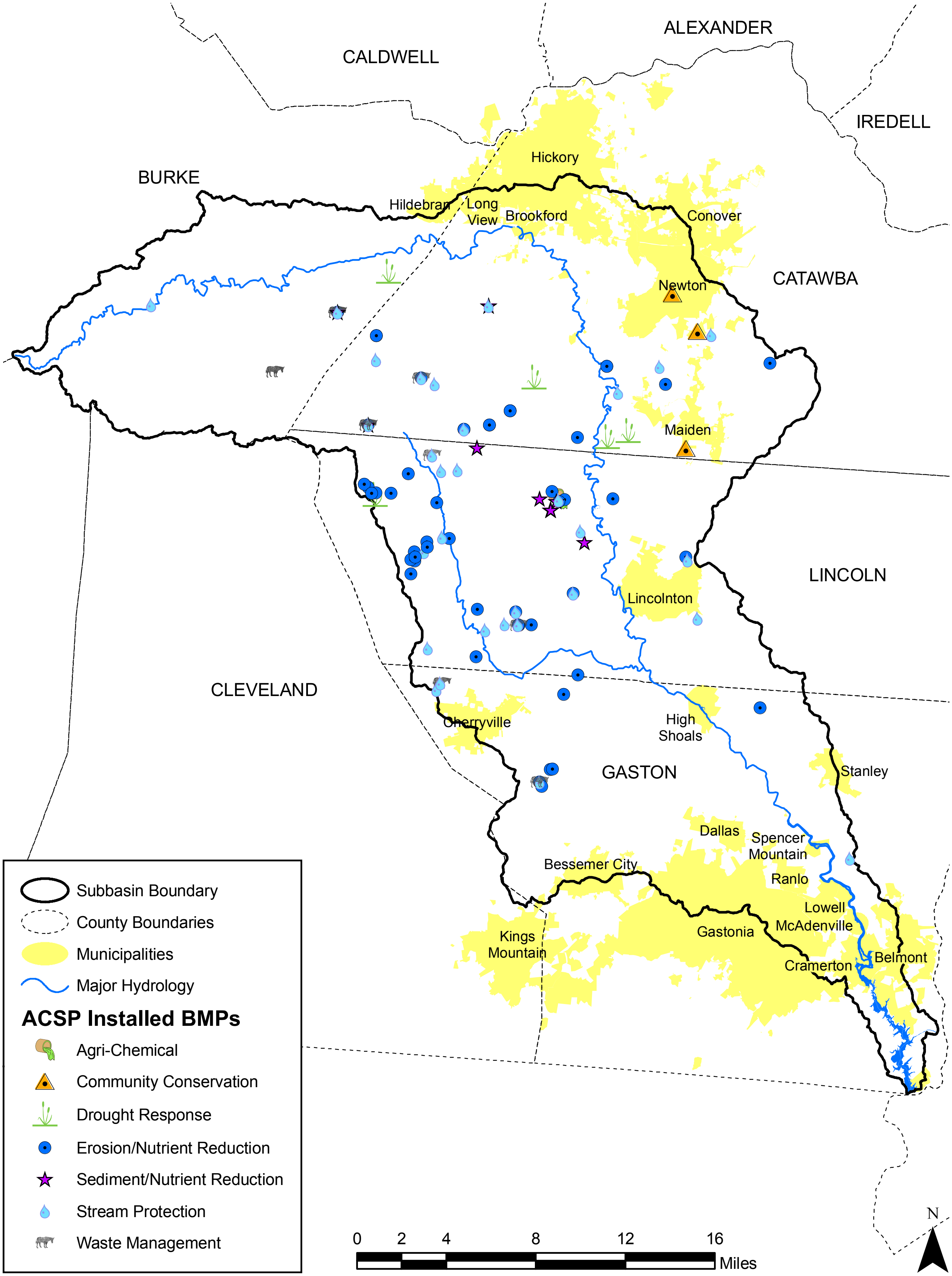
DWQ's Animal Feeding Operations Unit is responsible for the permitting and compliance activities of animal feeding operations across the state. Table 2-10 summarizes the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight (SSLW) in this subbasin. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in the subbasin. For more details about animal operation permits in North Carolina, see Section 6.3.3 of the *Supplemental Guide to NC's Basinwide Planning*.

Table 2-10: Animal Operations in 03050102

Type	# of Facilities	# of Animals	SSLW
Cattle	11	5,115	6,746,350
Swine	0	0	0

*Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service (NRCS) guidelines. Since the amount of waste produced varies by hog size, this is the best way to compare the sizes of the farms.

Figure 2-13: BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050102



On-Site Wastewater Treatment Systems (Septic Systems)

Wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits. Instead, it is treated on-site through the use of permitted septic systems. Poorly planned and/or maintained systems can fail and contribute to nonpoint source pollution. Wastewater from failing septic systems makes its way to streams or contaminates groundwater. Failing septic systems are illegal discharges of wastewater into waters of the State. Information about the proper installation and maintenance of septic tanks can be obtained by calling the environmental health sections of the local county health departments. Precautions should be taken by local health departments to ensure that new systems are sited and constructed properly and an adequate repair area is available. County, town and city planners need to understand the economic and human health ramifications caused by failing septic systems and plan for long-term septic system sustainability. For more information on how septic systems impact water quality, see 9.1.3 of the *Supplemental Guide to North Carolina's Basinwide Planning*.

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin. When compared to the other 16 river basins in the state, the Catawba River Basin had the most septic systems per square mile. The results for this subbasin based on 1990 census data indicate a population of 170,981 people using 95,219 septic systems resulting in a nitrogen loading of 952,189 lbs/yr and nitrogen loading rate of 3,627 lbs/mi^2/yr. These numbers reflect the total N discharged to the soil from the septic system and does not account for N used because of soil processes and plant uptake (Pradhan et al. 2007). The full study (*Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*) can be viewed on the North Carolina State University website or the link above.

Population & Land Cover

Population

The 2000 census estimated population for this subbasin is 189,488. This estimate is expected to increase with the results of the 2010 census. As population increases so does our demand for clean water from aquifer and surface water sources for the land and water to assimilate wastes. Table 2-11 list the populations for the 10-Digit HUCs in this subbasin and the estimates for future population values.

Table 2-11: Population and Estimated Populations for 2000 to 2030 for Subbasin 03050102

10-Digit HUC	2000 Population	2000 Population Density (per sq mi)	2010 Estimated Population	2020 Estimated Population	2030 Estimated Population
0305010201	26,978	832	29,061	31,156	33,286
0305010202	10,459	205	11,410	12,364	13,335
0305010203	36,744	1,172	41,869	46,982	52,144
0305010204	9,375	319	10,949	12,516	14,081
0305010205	29,882	998	34,609	39,152	43,560
0305010206	76,050	2,450	83,293	89,547	95,188
Total	**189,488**	**5976**	**211,191**	**231,717**	**251,594**

* Source: 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.

Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. For more information on how population impacts water quality, see *Chapter 12 of the Supplemental Guide to NC's Basinwide Planning*.

Land Cover

Table 2-12 to the right, displays the percentage of each land cover type within this subbasin according to 2001 land cover data. The data shows the majority of the South Fork of the Catawba River subbasin is just under 50% forested land. Total agricultural land is about 30% and developed land is about 18% (Homer, 2004).

Developed land accounts for a relatively small portion of this subbasin; however, the way the land is developed may have some of the largest impacts to water quality. In municipal areas, impervious surfaces (those which water can not penetrate, like asphalt) can prevent rainfall from filtering into the ground. Instead, the stormwater is sent at high velocities into storm drains which empty into the nearest waterbody without treatment. This can cause multiple negative water quality impacts including elevated water temperature, eroding streambanks from high velocity runoff, toxic urban runoff in the streams, etc. For more information on how to better understand these issues and find solutions see Chapter 5 of the *Supplemental Guide to NC's Basinwide Planning*. A full page subbasin land cover map can be seen in *Appendix 2-D*.

Table 2-12: Land Cover Percentages

Land Cover Type	Percentage
Developed Open Space	8.7
Developed Low Intensity	6.9
Developed Medium Intensity	1.6
Developed, High Intensity	0.6
Total Developed	**17.8**
Deciduous Forest	37.9
Evergreen Forest	6.8
Mixed Forest	2.4
Total Non-Wetland Forest	**47.1**
Pasture/Hay	29.0
Cultivated Crops	0.6
Total Agriculture	**29.6**
Wooded Wetlands	0.5
Emergent Wetlands	0.0
Total Wetlands	**0.5**
Bare Earth or Transitional	0.1
Scrub/Shrub	1.5
Grasslands	3.4
Other	**5**

Restoration, Protection & Conservation Planning

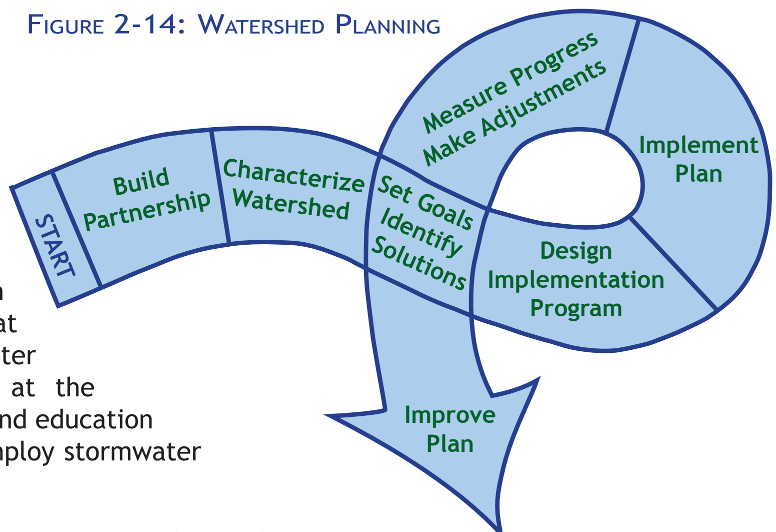
One NC Naturally Conservation Planning Tool

NCDENR's One North Carolina Naturally initiative promotes and coordinates the long-term conservation of North Carolina's threatened land and water resources. Each DENR division specializes in management of a specific natural resource, while the collaborative coordination and planning process results in cost effective implementation and management of multiple resources. Natural resource planning and conservation provides the science and incentives to inform and support conservation actions of North Carolina's conservation agencies and organizations. The Conservation Planning Tool was developed to assist in building partnerships through the exchange of conservation information and opportunities, support stewardship of working farms and forests, inform conservation actions of agencies and organizations, and guide compatible land use planning. A link to the interactive map view is found in the *Conservation Planning Tool website*.

Watershed Planning

Figure 2-14 illustrates a general process for developing watershed restoration plans. This process can and should be applied to streams suffering from habitat degradation and pollution. Interested parties should contact the Basinwide Planning Program to discuss opportunities to begin the planning and restoration process in their chosen watershed. Many tools are available to address habitat degradation and pollution including; urban stormwater BMPs, agricultural BMPs, ordinance/rule changes at the local, state, and federal levels, volunteer activism, and education programs. New and existing development should employ stormwater BMPs wherever practical.

Figure 2-14: Watershed Planning



DWQ believes land conservation accompanied with stream restoration projects can be very successful. Prevention and protection activities are known to be more cost effective than retrofits and restoration. DWQ strongly encourages conservation in this watershed. Many programs and organizations can assist with these projects. Additionally, there are significant tax incentives landowners can take advantage of. Many of these programs allow and encourage owners to maintain control and exclusive use or their land.

Some provide opportunities to ensure farmland remains productive and is not converted into commercial development and subdivisions. Local land trusts can help landowners explore conservation options and identify potential funding sources. For more information about land trusts in North Carolina, see the *Conservation Trust for North Carolina's* website.

Local Initiatives

Sediment & Erosion Control Local Programs

The North Carolina Sedimentation Control Commission may delegate authority to implement the Sedimentation Pollution Control Act to cities and counties that adopt a qualifying local erosion and sediment control ordinance in compliance with State requirements. Local program staff perform plan reviews and enforce compliance with plans within their jurisdictions. S&EC Local Programs in this subbasin include: Catawba County, Gaston County, Lincoln County and the City of Newton. Programs such as the one in Gaston County, can make a significant impact in reducing site runoff. The County has reviewed 1,835 soil and erosion control plans since 2003 and collected $267,720 in violation fines. Within the past year (April 2009 - April 2010) nearly 90% of all plans submitted had no recorded violations proving the Program to be successful in its continued efforts. More information about this program and its activities can be found in the *Local Initiative Chapter*. For more information about the Division of Land Resources and Local Programs visit the *Local Programs* page of their website.

Local initiatives covering more than one subbasin are discussed in the *Local Initiative Chapter*.

Construction Grants & Loans

The NC Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades and expansion of wastewater collection and treatment systems. As a financial resource, the section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriations for a specific "special needs" project within NC. The High Unit Cost Grant (SRG) Program, the State Emergency Loan (SEL) Program and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of $2,246,532. These funds are administered according to existing SRF procedures. All projects (Table 2-13) must be eligible under title VI of the Clean Water Act. For more information, please see the *CG&L* website.

Table 2-13: Construction Grants & Loan Projects Between 2004 & 2009 in Subbasin 03050102

Location	Project Description	Date	~ Amount
Gastonia	Armstrong Sanitary Sewer Rehabilitation	2/19/2007	$173,500
Cherryville	Cherryville-Lincolnton Water interconnection	1/5/2009	$241,100
Gastonia, City of	Sewer Pipe Lining at Catawba River Pump Station	5/8/2009	$308,532
Hickory, City of	Cripple Creek Sewer Replacement	5/8/2009	$1,938,000
Total Funded:			**$2,661,132**

Clean Water Management Trust Fund

Created in 1996, the Clean Water Management Trust Fund (CWMTF) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the South Fork Catawba River subbasin. Table 2-14 includes a list of recent (2004-2008) projects and their cost. These projects include several land acquisitions and WWTP upgrades.

Table 2-14: Clean Water Management Trust Fund Projects Between 2004 - 2008 in Subbasin 03050102

Application ID	Project Name	Project Description	County	Amount Funded
2004A-004	Catawba Lands Conservancy - Acq./ Pott Creek	Acquire through fee simple purchase 39 acres along Pott Creek. Purchase is part of a larger protection effort on the South Fork Catawba River and its tributaries.	Lincoln	$169,000
2004B-010	Catawba Lands Conservancy - Acq/ Northbrook Tract, South Fork Catawba	Protect through fee simple purchase 55.5 acres (including 55 riparian acres) along the South Fork Catawba River. This Northbrook tract is adjacent to other protected tracts and compliments an extensive acquisition effort in the watershed.	Gaston	$273,000
2005B-006	Catawba Lands Conservancy - Acq/ Jack Moore Nature Preserve, Hoyle Creek	Protect through fee simple purchase 92.4 acres along Hoyle Creek. CWMTF funds will be used to purchase 80.6 riparian acres. Landowner will donate 11.8 upland acres. Located just upstream of water intake.	Gaston	$461,000
2005D-012	Catawba Lands Conservancy - Donated Mini/ Waters Tract, Hoyle Creek (Withdrawn)	Minigrant to pay for transactional and stewardship costs for a donated conservation easement on 66.7 acres of the Waters tract on Hoyle Creek.	Lincoln	$17,000
2006B-511	Maiden, Town of - WW/ WWTP Upgrades, Clark Creek	Design, permit & construct major upgrades to the Town's antiquated 1 MGD WWTP which is not in compliance with permit limits. Significantly reduce BOD, TSS, and nutrient loadings to Clark Creek, a 303(d)-listed tributary to the South Fk Catawba River.	Catawba	$1,856,000
2007S-005	Dallas, Town of - Storm/ Mini/ South Fork		Gaston	$20,000
2008S-009	Lincolnton, City of - Mini/ Storm/ Planning/ S. Fork Catawba River		Lincoln	$50,000
2008S-005	Carolina Land & Lakes RC & D - Mini/Storm/Planning		Burke	$50,000
Total Funded:				**$2,896,000**

Section 319-Grant Program

The Section 319 Grant Program was established per the Federal Clean Water Act to provide funding for efforts to reduce nonpoint source (NPS) pollution, including that which occurs though stormwater runoff. The U.S. Environmental Protection Agency provides funds to state and tribal agencies, which are then allocated via a competitive grant process to organizations to address current or potential NPS concerns. Each fiscal year North Carolina is awarded nearly 3 million dollars to address nonpoint source pollution through its 319 Grant Program. Thirty percent of the funding supports ongoing state nonpoint source programs. The remaining seventy percent is made available through a competitive grants process. No 319 contracts were issued in this subbasin between 2004 and 2008. More information can be found about these contracts and the *319 Grant Program* on their website.

Ecosystem Enhancement Program (EEP)

EEP uses watershed planning at two scales (basinwide and local) to identify the best locations to implement stream, wetland and riparian buffer restoration/enhancement and preservation projects. The planning process considers where mitigation is needed and how mitigation efforts might contribute to the improvement of water quality, habitat and other vital watershed functions in the state. Watershed planning requires GIS data analysis, stakeholder involvement, water quality monitoring, habitat assessment and consideration of local land uses and ordinances. It is a multi-dimensional process which considers science, policy and partnership.

River Basin Restoration Priorities

EEP River Basin Restoration Priorities (RBRPs) are focused on the identification of Targeted Local Watersheds (TLWs) within the 8-digit Cataloging Units (subbasins) that comprise individual river basins. TLWs represent priority areas (14-digit HUCs) for the implementation of stream and wetland mitigation projects. GIS screening factors considered in the selection of TLWs include: documented water quality impairment and habitat degradation, the presence of critical habitat or significant natural heritage areas, the presence of water supply watersheds or other high-quality waters, the condition of riparian buffers, estimates of impervious cover, existing or planned transportation projects, and the opportunity for local partnerships. Recommendations from local resource agency professionals and the presence of existing watershed projects are given significant weight in the selection of TLWs. RBRP documents (and TLW selections) for each of the 17 river basins in North Carolina are updated periodically to account for changing watershed conditions, increasing development pressures and local stakeholder priorities.

The most recent updates to the Catawba River Basin TLWs occurred in 2007 for the lower Catawba and in 2009 for the upper Catawba. In total, 41 14-digit HUCs have been designated TLWs by EEP in the Catawba Catalog Units (Table 2-15). These updated RBRPs, including a summary table of Targeted Local Watersheds, can be found at EEP's website for the *2007* and *2009* reports.

Table 2-15: Catawba River TLWs & LWPs by Subbasin (as of February 2010).

HUC	TLWs (#)	LWPs (# - Names)
03050101	26	3 - Muddy Creek, Lower Creek, & Charlotte (partial)
03050102	9	1 - Indian/Howard Creeks
03050103	6	1 - Charlotte (partial)
Total:	**41**	**4**

Local Watershed Planning

EEP Local Watershed Planning (LWP) initiatives are conducted in specific priority areas (typically a cluster of two or three Targeted Local Watersheds) where EEP and the local community have identified a need to address critical watershed issues. The LWP process typically takes place over a two-year period, covers a planning area around 50 to 150 square miles, and includes three distinct phases: I - existing data review and preliminary watershed characterization (largely GIS-based); II – detailed watershed assessment (including water quality & biological monitoring and field assessment of potential mitigation sites); and III – development of a final Project Atlas and Watershed Management Plan. EEP collaborates with local stakeholders and resource professionals throughout the process to identify projects and management strategies to restore, enhance and protect local watershed resources. EEP is currently conducting LWP Phase IV activities (project site evaluation and landowner outreach) in the Lower Creek, Hunting Creek and Muddy Creek watersheds within the Catawba 03050101 subbasin.

More information about the River Basin Restoration Priorities and LWP project areas within the *Catawba River Basin* can be found on the EEP website.

EEP Projects in the Catawba Basin

As of February 2010, EEP had a total of 40 mitigation projects in some stage of being completed in the Catawba Basin. These stages include identification/acquisition; design; construction; monitoring (construction complete); and long-term stewardship. Table 2-16 provides details on these project that include stream and wetland restoration/enhancement and preservation projects. In total, EEP is in some stage of restoration or enhancement on over 191,000 feet of stream and 127 acres of wetlands in the Catawba. In addition, the program is in some stage of preservation on over 97,000 feet of stream and 43 acres of wetlands. For additional information about EEP's Project Implementation efforts, go to the *EEP Project Implementation* webpage. To view the locations of these project sites, go to *EEP's Web Map site*.

Table 2-16: EEP Projects in Some Stage of Completion in the Catawba River Basin by Subbasin

HUC	Projects (#)	Stream Restoration/ Enhancement (ft)	Stream Preservation (ft)	Wetland Restoration/ Enhancement (ac)	Wetland Preservation (ac)
03050101	30	151,829	97,597	71.1	38.7
03050102	6	27,848	0	52.0	4.5
03050103	4	11,500	0	4.7	0
Total:	**40**	**191,177**	**97,597**	**127.7**	**43.2**

For more information on EEP mitigation projects in the Catawba 03050101 and 03050101 subbasins, contact Paul Wiesner or Julie Cahill in EEP's western field office (Asheville) at, respectively, 828-273-1673 or 828-230-5172. For 03050103 subbasin, contact Robin Dolin at 919-715-5836.

References

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. www.mrlc.gov

North Carolina Department of Environment and Natural Resources (DENR). Division of Water Quality (DWQ). Planning Section. September 2004. *Catawba River Basinwide Water Quality Plan*. Raleigh, NC. http://portal.ncdenr.org/web/wq/ps/bpu/basin/catawba.

____. DWQ. Environmental Science Section. Biological Assessment Unit. April 2008. *Basinwide Assessment Report: Catawba River Basin*. Raleigh, NC.

____. DWQ. Environmental Science Section. Biological Assessment Unit. December 2008. *Catawba River Basin Ambient Monitoring Systems Report*. Raleigh, NC.

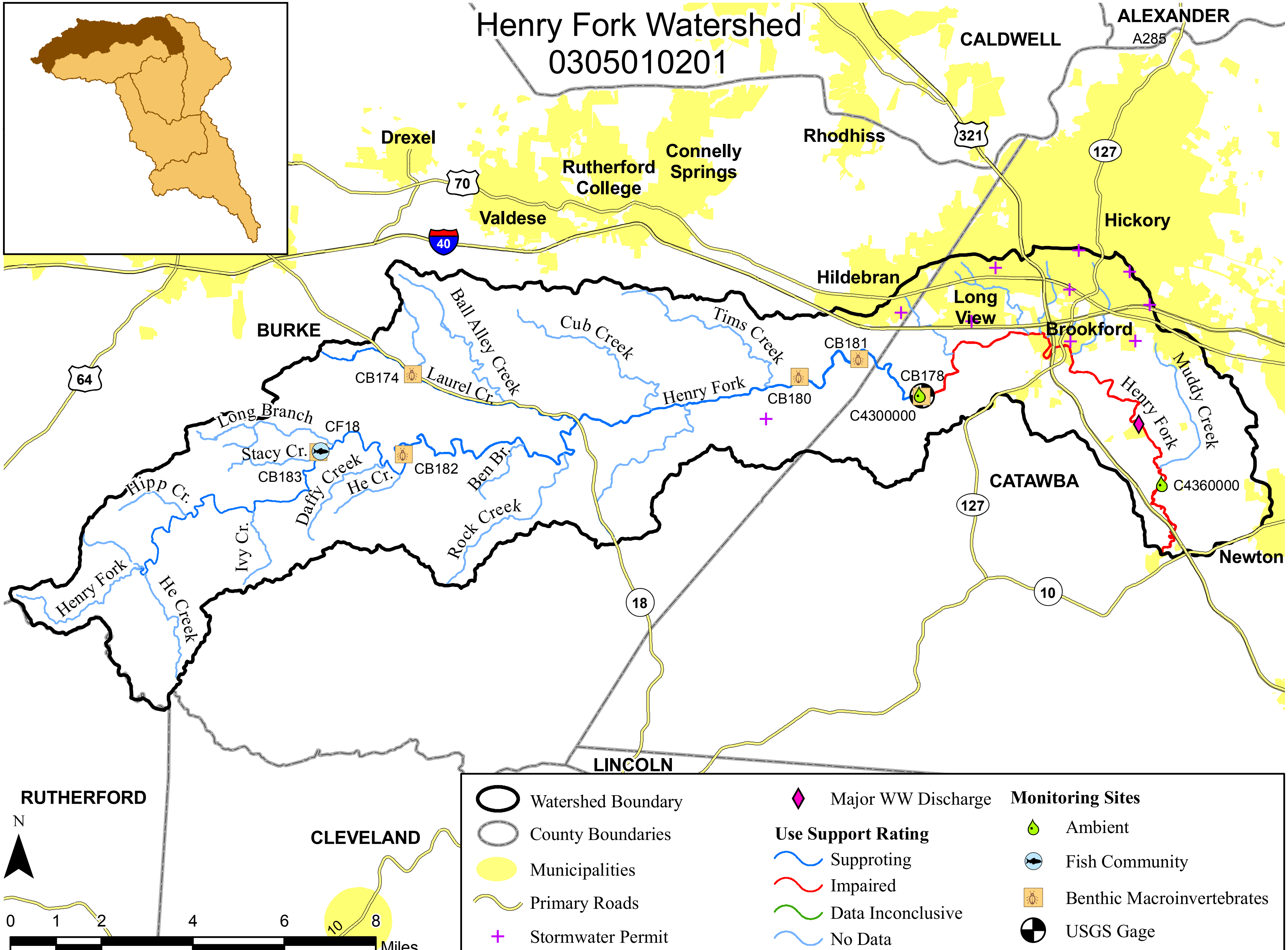
Pate, Travis. 2009. *Watershed Assessment in North Carolina: Building a Watershed Database with Population, Land Cover, and Impervious Cover Information*. Master Theses, University of North Carolina at Chapel Hill.

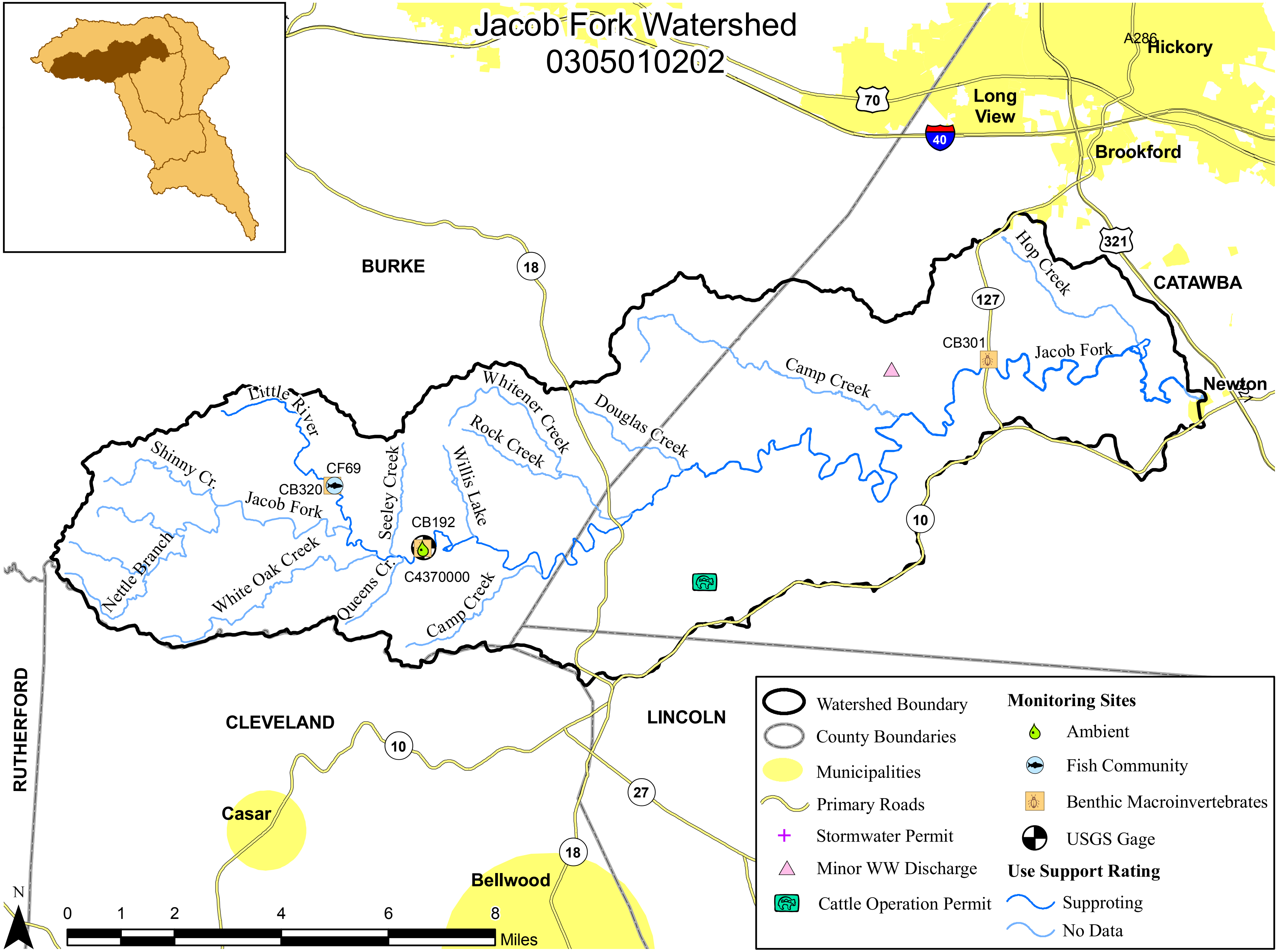
Pradhan, S. S., M. T. Hoover, R. E. Austin, and H. A. Devine. May 2007. *Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*. North Carolina State University, Raleigh, North Carolina. North Carolina Agricultural Research Service. Technical Bulletin 324.

Rajbhandari, Narayan. DENR. DWQ. June 2, 2004. *Delisting copper from the DWQ 303(d) list for the Clark Creek watershed, Catawba County and Lincoln County (Sub-basin 03-08-35)*. Memorandum. Raleigh, NC.

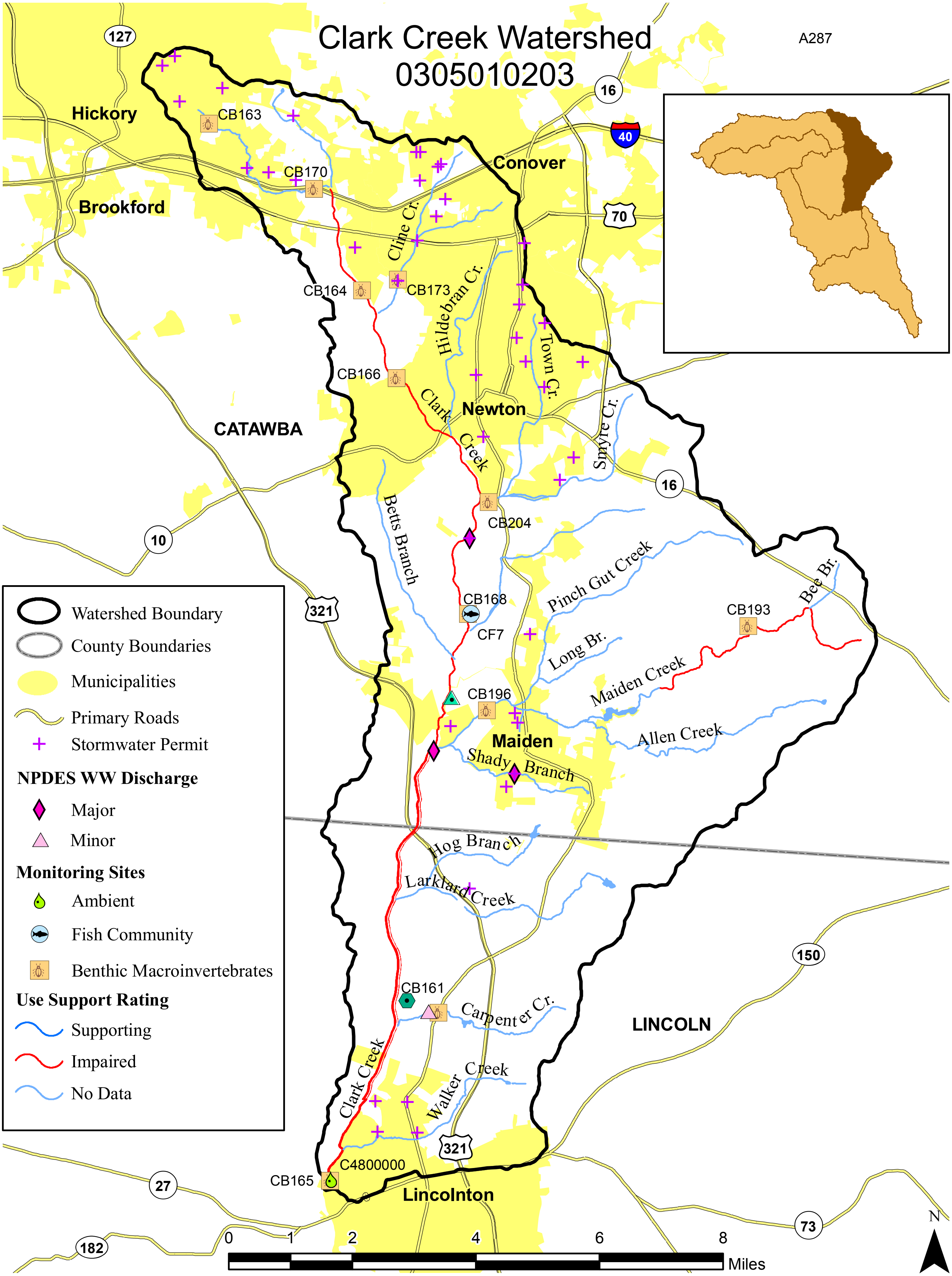
U.S. Environmental Protection Agency (USEPA) 1999. *Protocol for Developing Sediment TMDLs*. First Edition. EPA 841-B-99-044. U.S. EPA, Office of Water, Washington D.C.

Waters, T.F. 1995. *Sediment in streams—Sources, biological effects, and control*. American Fisheries Society Monograph7. American Fisheries Society, Bethesda, MD.

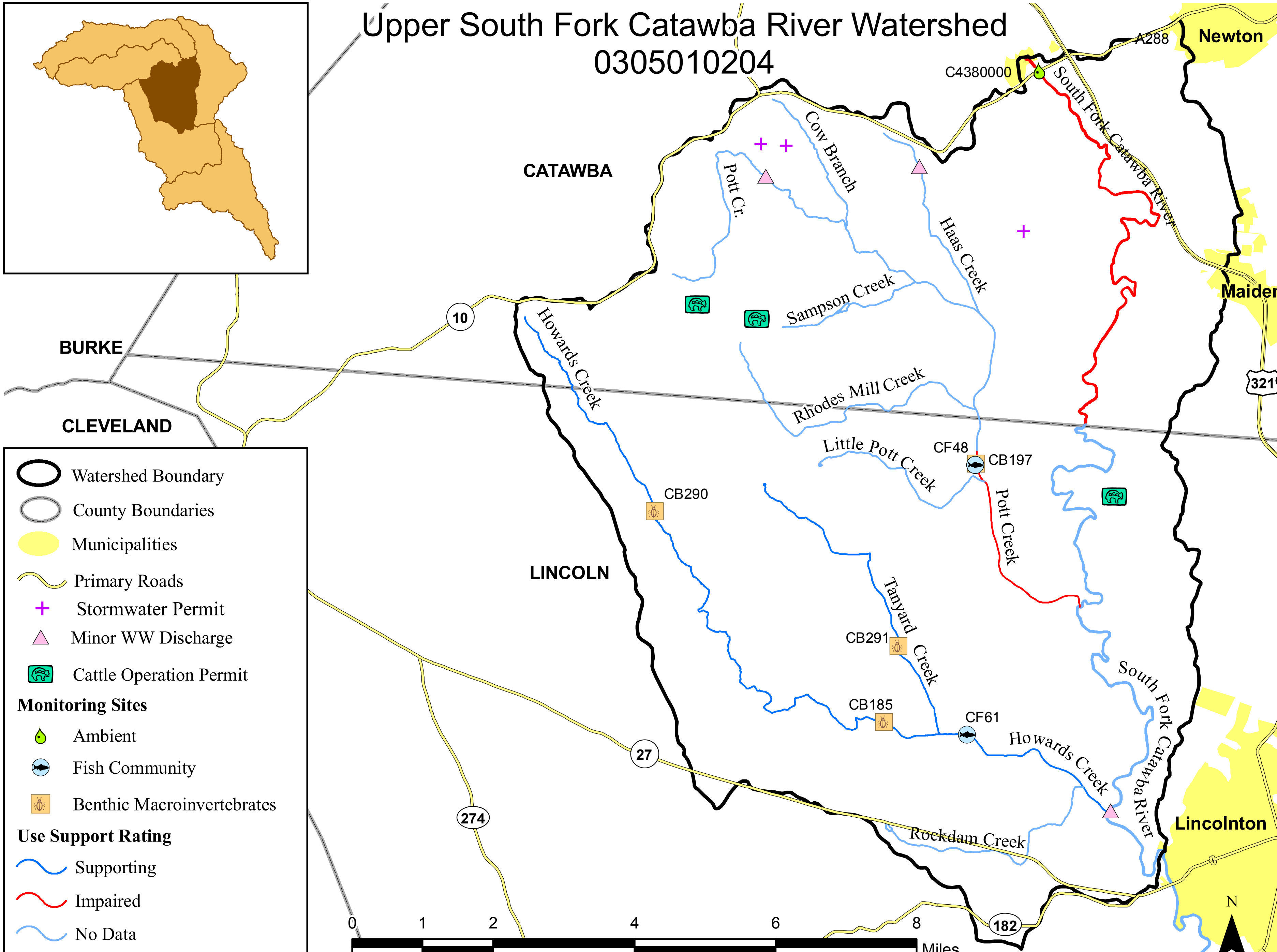

Henry Fork Watershed
0305010201
CALDWELL
ALEXANDER
A285
Drexel
Rutherford
College
Connelly
Springs
Rhodhiss
321
127
70
Valdese
Hickory
40
Hildebran
Long
View
Brookford
BURKE
64
CB181
Tims Creek
Cub Creek
Ball Alley Creek
Laurel Cr.
CB174
CB178
CB180
Henry Fork
C4300000
Long Branch
CF18
Stacy Cr.
CB183
Daffy Creek
He Cr.
CB182
Ben Br.
Hipp Cr.
Ivy Cr.
Rock Creek
Henry Fork
He Creek
Muddy Creek
CATAWBA
C4360000
127
18
10
Newton
LINCOLN
RUTHERFORD
CLEVELAND
N
0 1 2 4 6 8
Miles
10
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Major WW Discharge
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage

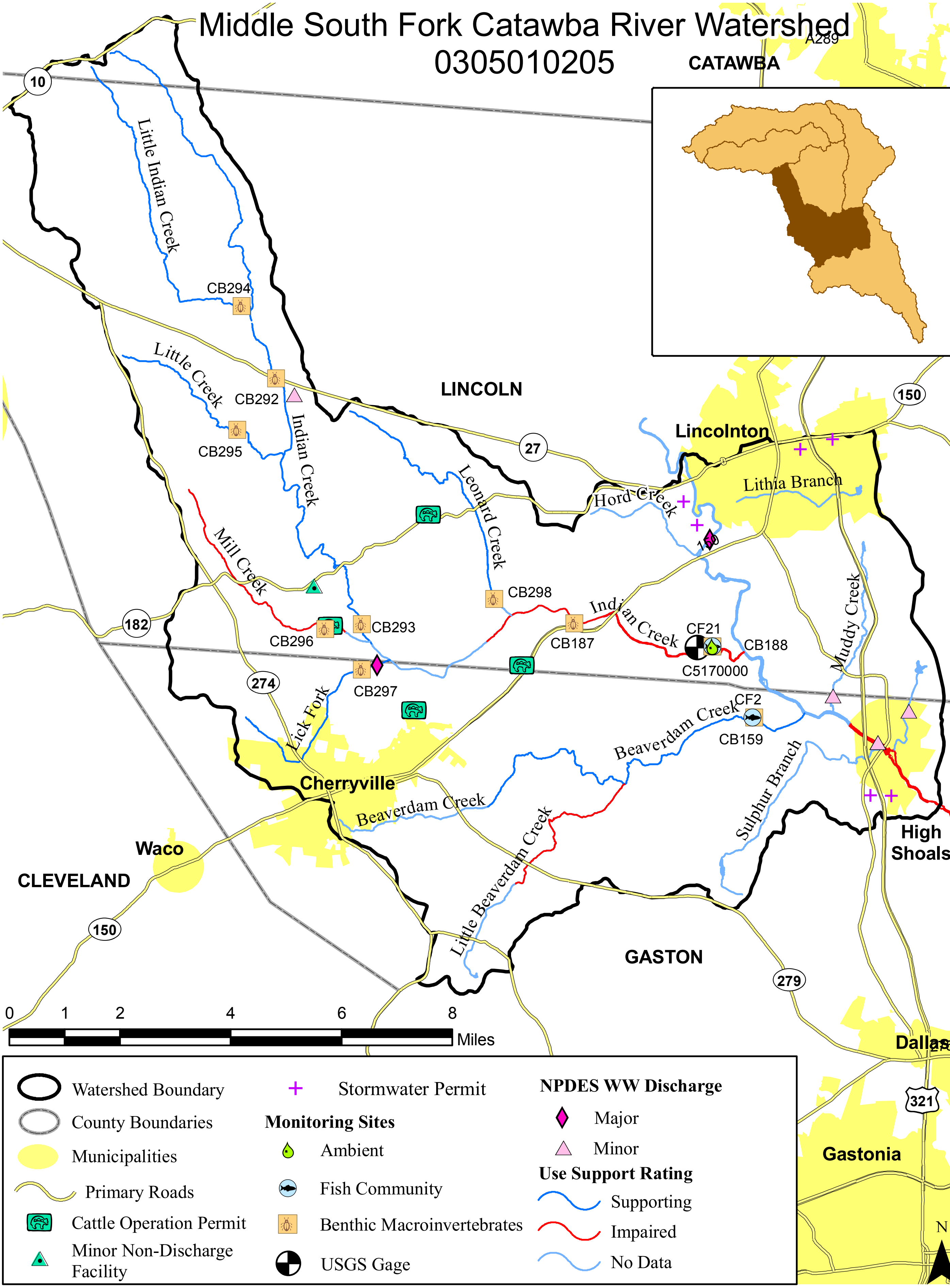


Jacob Fork Watershed
0305010202
BURKE
CATAWBA
CLEVELAND
LINCOLN
RUTHERFORD
Hickory
Long View
Brookford
Newton
Casar
Bellwood
A286
70
40
321
127
18
10
27
Hop Creek
Camp Creek
Jacob Fork
Douglas Creek
Whitener Creek
Rock Creek
Willis Lake
Seeley Creek
Little River
Shinny Cr.
Nettle Branch
White Oak Creek
Queens Cr.
CB301
CF69
CB320
CB192
C4370000
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Minor WW Discharge
Cattle Operation Permit
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
Use Support Rating
Supproting
No Data
N
0 1 2 4 6 8
Miles

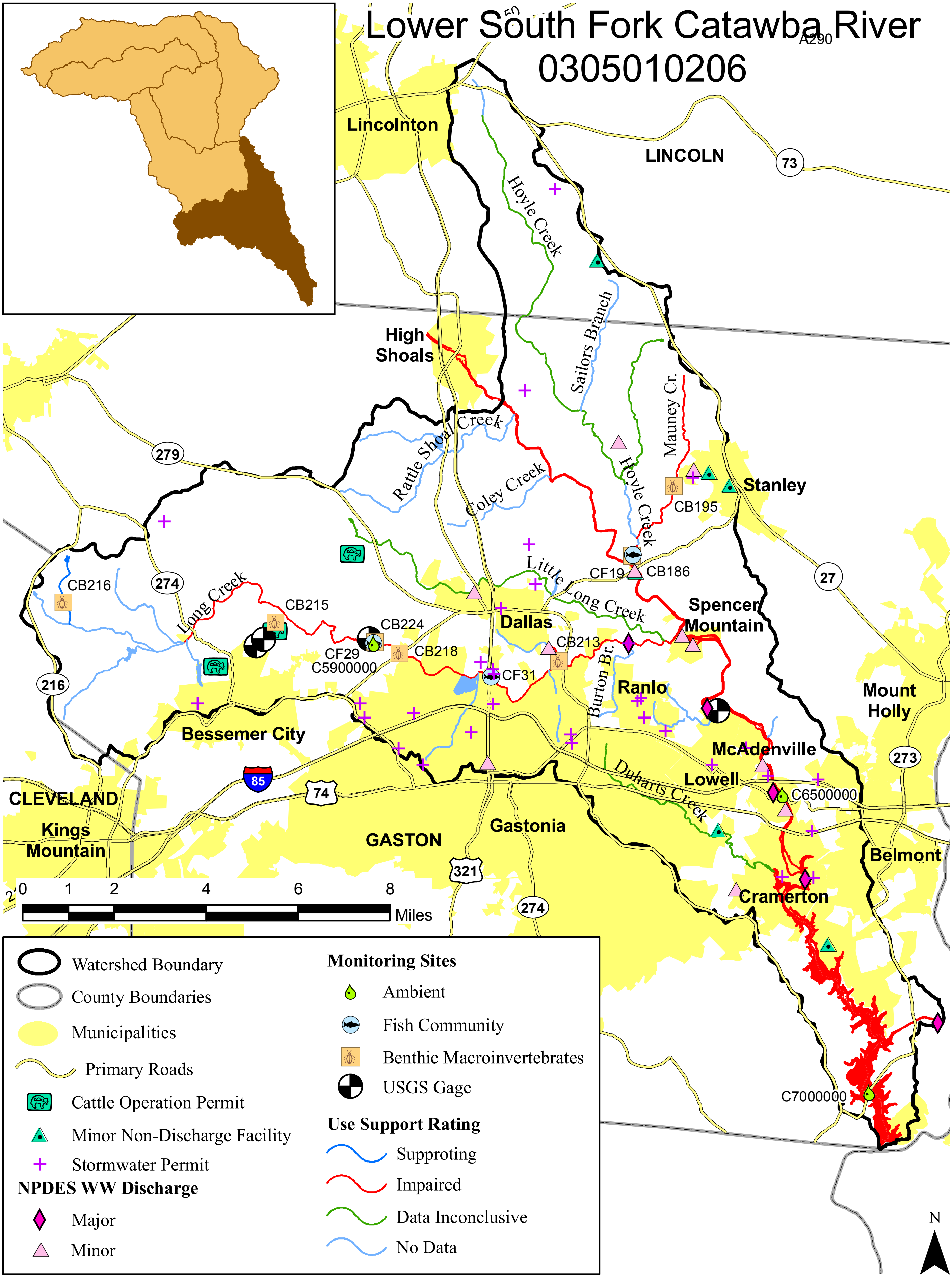


Clark Creek Watershed
0305010203
A287
Hickory
Brookford
Conover
Newton
CATAWBA
Maiden
LINCOLN
Lincolnton
127
16
40
70
10
321
150
27
73
182
CB163
CB170
CB164
CB173
CB166
CB204
CB168
CF7
CB196
CB193
CB161
CB165
C4800000
Cline Cr.
Hildebran Cr.
Town Cr.
Clark Creek
Smyre Cr.
Betts Branch
Pinch Gut Creek
Long Br.
Maiden Creek
Bee Br.
Allen Creek
Shady Branch
Hog Branch
Larkard Creek
Carpenter Cr.
Walker Creek
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Use Support Rating
Supporting
Impaired
No Data
0
1
2
4
6
8
Miles
N


Upper South Fork Catawba River Watershed
0305010204
CATAWBA
BURKE
CLEVELAND
LINCOLN
Newton
Maiden
Lincolnton
A288
C4380000
South Fork Catawba River
Cow Branch
Pott Cr.
Haas Creek
Sampson Creek
Howards Creek
Rhodes Mill Creek
Little Pott Creek
CF48
CB197
Pott Creek
CB290
Tanyard Creek
CB291
CB185
CF61
Howards Creek
Rockdam Creek
10
27
274
182
321
0 1 2 4 6 8
Miles
N
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Minor WW Discharge
Cattle Operation Permit
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
Use Support Rating
Supporting
Impaired
No Data



Middle South Fork Catawba River Watershed
0305010205
CATAWBA
A289
LINCOLN
CLEVELAND
GASTON
Lincolnton
Cherryville
Waco
High Shoals
Dallas
Gastonia
10
27
150
182
274
279
321
Little Indian Creek
Little Creek
Indian Creek
Leonard Creek
Mill Creek
Hord Creek
Lithia Branch
Muddy Creek
Lick Fork
Beaverdam Creek
Little Beaverdam Creek
Sulphur Branch
CB294
CB292
CB295
CB296
CB293
CB297
CB298
CB187
CF21
C5170000
CB188
CF2
CB159
0
1
2
4
6
8
Miles
N
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Cattle Operation Permit
Minor Non-Discharge Facility
Stormwater Permit
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
NPDES WW Discharge
Major
Minor
Use Support Rating
Supporting
Impaired
No Data



Lower South Fork Catawba River
0305010206
Lincolnton
LINCOLN
73
Hoyle Creek
Sailors Branch
Mauney Cr.
High Shoals
Rattle Shoal Creek
Coley Creek
Stanley
CB195
279
CB186
CF19
Little Long Creek
27
CB216
274
Long Creek
CB215
CB224
Dallas
Spencer Mountain
CF29
C5900000
CB218
CB213
Burton Br.
CF31
Ranlo
216
Bessemer City
Mount Holly
McAdenville
273
Lowell
Duharts Creek
C6500000
85
74
CLEVELAND
Kings Mountain
GASTON
Gastonia
Belmont
321
Cramerton
274
0 1 2 4 6 8
Miles
C7000000
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Cattle Operation Permit
Minor Non-Discharge Facility
Stormwater Permit
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
Use Support Rating
Supproting
Impaired
Data Inconclusive
No Data
N

Appendix 2-A

Use Support Ratings for All Monitored Waterbodies

2010 DRAFT

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 metfirst 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

Catawba River Basin 2010 NC 305(b) Report

All 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
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year

Catawba River Basin — South Fork of the Catawba River Subbasin — 03050102

Catawba River Basin — Henry Fork Watershed — 0305010201

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-129-1-(12.5)a	**Henry Fork**	From Laurel Creek to State Route 1124	**10.3**	**FW Miles**	C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
11-129-1-(12.5)b	**Henry Fork**	From State Route 1124 to State Route 1143	**4.8**	**FW Miles**	C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2008
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010

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

11-129-1-(2)	**Henry Fork**	From Morganton Water Intake to Laurel Creek	**19.5**	**FW Miles**	C;ORW
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2006	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2007	
11-129-1-13	**Laurel Creek**	From source to Henry Fork	**6.6**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Not Impaired Bioclassification	Aquatic Life	2005	

Catawba River Basin — Jacob Fork Watershed 0305010202

11-129-2-(4)	**Jacob Fork**	From Little River to Camp Creek	**6.8**	**FW Miles**	WS-III;ORW
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2006	
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-129-2-(9.5)	**Jacob Fork**	From Camp Creek to a point 0.6 mile upstream of mouth	**40.5**	**FW Miles**	WS-III
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2007	
11-129-2-5	**Little River**	From source to Jacob Fork	**5.2**	**FW Miles**	WS-III;Tr,OR
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	

Catawba River Basin — Clark Creek Watershed 0305010203

11-129-5-(0.3)b	**Clark Creek (Shooks Lake)**	From Miller Branch to 0.9 mile upstream of Walker Creek	**16.6**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2000	1998
11-129-5-7-2-(1)	**Maiden Creek**	From source to a point 0.7 mile upstream from backwaters of Maiden Reservoir	**4.9**	**FW Miles**	WS-II;HQW
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	2006

Catawba River Basin — Upper South Fork Catawba River Watershed 0305010204

11-129-1-(12.5)c	**Henry Fork**	From State Route 1143 to Jacob Fork	**8.6**	**FW Miles**	C
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
4t	**Turbidity**	Standard Violation	Aquatic Life	2008	2008
11-129-4	**Howards Creek**	From source to South Fork Catawba River	**13.8**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008	
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	

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

11-129-3-(0.7)	**Pott Creek**	From a point 0.3 mile upstream of Lincoln County SR 1217 to South Catawba Fork River	**3.2**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2006	2008
11-129-(0.5)	**South Fork Catawba River**	From source to Catawba-Lincoln County Line	**8.4**	**FW Miles**	WS-V
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2008
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-129-4-1	**Tanyard Creek**	From source to Howards Creek	**4.9**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008	

Catawba River Basin — **Middle South Fork Catawba River Watershed 0305010205**

11-129-9-(0.7)	**Beaverdam Creek**	From a point 0.3 mile upstream of Gaston County SR 1626 to South Fork Catawba River	**8.3**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2006	
11-129-5-(9.5)	**Clark Creek**	From a point 0.9 mile upstream of Walker Creek to South Fork Catawba R.	**1.8**	**FW Miles**	WS-IV
5	**Copper**	Standard Violation	Aquatic Life	2006	2010
4s	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2006
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2008
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2008
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-8-(1)	**Indian Creek**	From source to a point 0.5 mile upstream of Mill Creek	**14.8**	**FW Miles**	WS-II;HQW
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
11-129-8-(1)	**Indian Creek**	From source to a point 0.5 mile upstream of Mill Creek	**14.8**	**FW Miles**	WS-II;HQW
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-129-8-(3.5)	**Indian Creek**	From a point 0.5 mile upstream of Mill Creek to a point 0.4 mile upstream of mouth of Lick Fork (Town of Cherryville water supply intake)	**0.5**	**FW Miles**	WS-II;HQW,CA
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
11-129-8-(6.5)	**Indian Creek**	From a point 0.3 mile upstream of Lincoln County SR 1169 to South Fork Catawba River	**6.0**	**FW Miles**	WS-IV
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008	
4s	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2006	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		
11-129-8-7-(1)	**Leonard Creek**	From source to a point 0.2 mile downstream of Lincoln County SR 1180	**5.4**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
11-129-8-6	**Lick Fork**	From source to Indian Creek	**4.1**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2008	
11-129-9-1-(2)	**Little Beaverdam Creek**	From a point 0.5 mile upstream of N.C. Hwy. 277 to Beaverdam Creek	**3.4**	**FW Miles**	WS-IV
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-8-3	**Little Creek**	From source to Indian Creek	**4.2**	**FW Miles**	WS-II;HQW
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
11-129-8-2	**Little Indian Creek**	From source to Indian Creek	**6.3**	**FW Miles**	WS-II;HQW
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2008	
11-129-8-4-(1)	**Mill Creek**	From source to a point 0.5 mile upstream of mouth	**4.6**	**FW Miles**	WS-II;HQW
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2008	2010

Catawba River Basin | **Lower South Fork Catawba River Watershed** | **0305010206**

11-129-16-7b	**Dallas Branch**	From Dallas WWTP to Long Creek	**0.8**	**FW Miles**	C
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1992	1998

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-129-19	**Duharts Creek**	From source to South Fork Catawba River	**6.6**	**FW Miles**	WS-V
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-15-(1.5)	**Hoyle Creek**	From a point 0.5 mile upstream of Lincoln County SR 1321 to a point 0.2 mile downstream of Little Hoyle Creek	**10.1**	**FW Miles**	WS-IV
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-15-(6)	**Hoyle Creek**	From a point 0.2 mile downstream of Mauney Creek to South Fork Catawba River	**0.5**	**FW Miles**	WS-IV;CA
1	**Ecological/biological Integrity Benthos**	Good Bioclassification	Aquatic Life	2006	
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2006	2008
11-129-16-2	**Limekiln Creek**	From source to Long Creek	**1.9**	**FW Miles**	WS-II;HQW
1	**Ecological/biological Integrity Benthos**	Excellent Bioclassification	Aquatic Life	2001	
11-129-15-3	**Little Hoyle Creek**	From source to Hoyle Creek	**4.2**	**FW Miles**	WS-IV
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-16-9	**Little Long Creek**	From source to Long Creek	**10.0**	**FW Miles**	C
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
11-129-16-(4)	**Long Creek**	From Mountain Creek to South Fork Catawba River	**15.3**	**FW Miles**	C
1	**Ecological/biological Integrity Benthos**	Good-Fair Bioclassification	Aquatic Life	2007	
1	**Ecological/biological Integrity FishCom**	Excellent Bioclassification	Aquatic Life	2001	
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
11-129-15-5	**Mauney Creek**	From source to Hoyle Creek	**4.4**	**FW Miles**	WS-IV
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2006	2000

All 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
IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-129-(10.5)	**South Fork Catawba River**	From Town of High Shoals water supply intake to a point 0.6 mile upstream of N.C. Hwy. 275	**8.1**	**FW Miles**	WS-IV
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-(14.5)	**South Fork Catawba River**	From a point 0.6 mile upstream of N.C. Hwy. 275 to a point 0.4 mile upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes)	**2.5**	**FW Miles**	WS-IV;CA
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	
11-129-(15.5)	**South Fork Catawba River**	From a point 0.4 mile upstream of Long Creek to Cramerton Dam and Lake Wylie at Upper Armstrong Bridge	**18.1**	**FW Miles**	WS-V
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2008
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		

Appendix 2-B

Biological (Benthic & Fish) Sample Site Sheets

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HENRY FORK	SR 1922	05/23/07	CF18	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	35	03050102	35.66194444	-81.63611111	11-129-1-(2)	Eastern Blue Ridge Foothills

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C;ORW	19.2	1300	11	0.3	Yes

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	90	5 (rural residential)	5	0

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

Water Quality Parameters

Temperature (°C)	15.6
Dissolved Oxygen (mg/L)	9.2
Specific Conductance (µS/cm)	26
pH (s.u.)	5.5

Water Clarity: Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	18
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	15
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	**90**

Substrate: cobble, sand, bedrock

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/23/07	2007-63	13	52	Good
09/28/98	98-72	12	52	Good

Most Abundant Species: Central Stoneroller

Exotic Species: Rock Bass and Smallmouth Bass

Species Change Since Last Cycle: **Gains** -- Central Stoneroller, White Sucker, and Warpaint Shiner. **Losses** -- Sandbar Shiner and Creek Chub.

Data Analysis

Watershed -- headwaters of the South Fork Catawba River; drains south-central Burke County below Morganton, including a portion of the South Mountain State Park lands. **Habitat** -- shallow runs with boulder eddies, riffles, chutes, and side snags; low flow; low conductivity; low morning pH from overnight respiration; densely forested riparian zones, with the exception of a hay field above the right bank. **2007** -- an abundant (n = 463) and fairly diverse community of fish including 4 intolerant species were collected, but with few darters; 84% of the sampled fish were minnows, about half of which were Central Stonerollers and Warpaint Shiners. **1998 - 2007** -- this site has maintained very stable NCIBI metrics over a 9 year period. Fifteen species of fish are known from this watershed including 7 species of minnows, 2 species of suckers, and 2 species of darters. This ORW catchment is showing no apparent water quality issues.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HENRY FK	SR 1124	CB178	05/01/06	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CATAWBA	35	3050102	354103	812410	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	81	970	20	0.75

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

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

Water Quality Parameters

Temperature (°C)	14.4
Dissolved Oxygen (mg/L)	9.8
Specific Conductance (µS/cm)	29
pH (s.u.)	6.7
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	12
Pool Variety (10)	8
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	3
Right Riparian Score (5)	4
Total Habitat Score (100)	71

Site Photograph

Substrate Moderate amount of sand with some boulder, rubble and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
05/01/06	9857	126	61	4.13	3.06	Good
08/22/02	8952	94	38	4.81	3.34	Good
08/18/97	7428	76	38	4.10	3.49	Good
08/22/92	6005	74	38	4.55	3.76	Good

Taxonomic Analysis

No major changes in the benthic community were observed. Abundant taxa included *Pseudocloeon propinquum* , *Epeorus rubidus* , *Heptagenia marginalis* , *Isonychia* , *Rhithrogena uhari* , *Maccaffertium modestum* , *Acroneuria abnormis* , *Perlesta* , *Cheumatopsyche* , *Dolophilodes* , *Micrasema wataga* , *Ceratopsyche sparna* , *Dubiraphia* , *Helichus* , *Boyeria vinosa* , *Progomphus obscurus* , *Corydalus cornutus* , *Ablabesmyia parajanta/janta* , *Conchapelopia* , *Parametriocnemus lundbecki* , *Tanytarsus* , *Simulium* , *Corbicula fluminea* and *Elimia* .

Data Analysis

This site is located south of the city of Hickory and the town of Icard. Since this location had been sampled in 2006, those data were used for this basinwide cycle. When corrected for seasonality, the 2006 sampled had an EPT richness of 43 and Biotic Index of 4.52 thereby placing it in the Good category. Henry Fork has consistently rated Good since 1992. Based on the benthic data no major changes in water quality have been observed.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
JACOB FK	SR 1924	CB192	05/02/06	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
BURKE	35	3050102	353526	813402	0	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-III; Tr, ORW	25.4	1150	14	0.2

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

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

Water Quality Parameters

Temperature (°C)	16.6
Dissolved Oxygen (mg/L)	9.8
Specific Conductance (µS/cm)	21
pH (s.u.)	6.8
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	11
Pool Variety (10)	8
Riffle Habitat (16)	14
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	81

Site Photograph

Substrate: Mostly rubble and gravel with some sand and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
05/02/06	9862	136	60	3.92	2.37	Excellent
08/22/02	8953	---	35	---	3.31	Good
08/18/97	7427	100	47	4.26	3.51	Excellent
08/20/92	6006	106	48	4.36	3.22	Good

Taxonomic Analysis

With the exception of 2002, no major changes in the benthic community were observed. In 2002, mayfly taxa richness decreased from previous years but had recovered in 2006. Abundant EPT taxa included *Drunella cornutella*, *Epeorus rubidus*, *Isonychia*, *Leucrocuta*, *Rhithrogena uhari*, *Maccaffertium modestum*, *Stenacron pallidum*, *Acroneuria abnormis*, *Isoperla holochlora*, *Perlesta*, *Dolophiloides*, *Glossosoma*, *Lepidostoma*, *Neophylax oligius*, *Rhyacophila fuscula*, *R. nigrita* and *Ceratopsyche sparna*.

Data Analysis

This site is located downstream of South Mountains State Park and was designated ORW in 1989. With the exception of 2002, a dry year, the water quality appears to be stable. Although the site received a Good rating in 1992, EPT taxa richness and EPT Biotic Index scores are consistent with values recorded in 1997 and 2006 when the site received Excellent ratings suggesting the site was borderline Good/Excellent.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
POTT CR	SR 1217	05/31/06	CF48	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	03050102	35.55166667	-81.31916667	11-129-3-(0.7)	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	21	840	9	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	24.6
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	61
pH (s.u.)	6.1
Water Clarity	Slightly turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	13
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	2
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**55**

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/31/06	2006-69	13	40	Fair
05/21/02	2002-50	20	50	Good
05/21/97	97-49	15	50	Good

Most Abundant Species: Bluehead Chub and Bluegill

Exotic Species: Fathead Minnow

Species Change Since Last Cycle: **Gains** -- Fathead Minnow and Eastern Mosquitofish. **Losses** -- Greenfin Shiner, Santee Chub, Greenhead Shiner, Creek Chub, Notchlip Redhorse, Flat Bullhead, Pumpkinseed, and Largemouth Bass.

Data Analysis

Watershed -- tributary to the South Fork Catawba River; drains southern Catawba and northern Lincoln counties; no municipalities in the watershed; two small permitted dischargers within the watershed (combined flow = 0.045 MGD). **Habitat** -- seemed to be more severely eroded in 2006 than in 2002 as a result of 2004 hurricane flows; eroding banks; only snag and log riffles and one gravel riffle. **2006** -- 18 of 20 species collected in 2002 declined in number (e.g. Rosyside Dace, Bluehead Chub, Sandbar Shiner, and White Sucker) or were not collected in 2006 Creek Chub); number of fish decreased from 265 to 73, the fewest ever collected at the site and the fewest of any site in the basin 2004 - 2007; only one-third of the species were represented by multiple age groups; sampled as part of a Catawba River Basin Biological TMDL Study (Biological Assessment Unit Memorandum F-20061207). **1997 - 2006** -- conductivity has ranged from 47 to 61 µS/cm; 22 species are known from the site, including the intolerant Santee Chub, Highback Chub, and Seagreen Darter; no exotic species known from the site until 2006; community affected by flow extremes and by limited avenues for recolonization.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
HOWARDS CR	SR 1200	CB185	05/03/06	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	3050102	352954	812026	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	17	800	712	0.5

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

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

Water Quality Parameters

Temperature (°C)	15.7
Dissolved Oxygen (mg/L)	9.8
Specific Conductance (µS/cm)	48
pH (s.u.)	7.2
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	7
Bottom Substrate (15)	4
Pool Variety (10)	6
Riffle Habitat (16)	3
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	2
Right Riparian Score (5)	5
Total Habitat Score (100)	51

Site Photograph

Substrate Mostly sand with a moderate amount of gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
05/03/06	9864	121	40	5.63	4.64	Good
08/21/02	8947	---	17	---	4.58	Good-Fair
08/19/97	7431	---	25	---	4.16	Good
08/17/92	5977	---	25	---	4.07	Good

Taxonomic Analysis

When corrected for season, EPT taxa richness increased in 2006 from previous samples. Several EPT taxa either Common or Rare in 2006 were not previously collected from this site: *Plauditus dubius* group, *P. cestus*, *Habrophlebioides*, *Procloeon, Ironoquia punctatissima*, *Lepidostoma* and *Rhyacophila fuscula*. Other Abundant EPT taxa at this site were: *Baetis pluto*, *Pseudocloeon propinquum*, *Isonychia*, *Stenacron interpunctatum*, *Perlesta*, *Cheumatopsyche* and *Triaenodes ignitus*.

Data Analysis

Howards Creek drains the northwestern portion of Lincoln County. Since this location had been sampled in 2006, those data corrected for season were used for the 2007 basinwide cycle. The water quality at this site appears to be fairly stable with Good bioclassifications in 1992, 1997, and 2006. During the drought of 2002, the bioclassification dropped to Good-Fair with only 17 EPT taxa collected.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HOWARDS CR	SR 1185	04/24/07	CF61	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	03050102	35.496116	-81.319681	11-129-4	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	17.1	790	11	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.7
Specific Conductance (µS/cm)	54
pH (s.u.)	6.8

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	14
Bottom Substrate (15)	4
Pool Variety (10)	6
Riffle Habitat (16)	7
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	8
Left Riparian Score (5)	0
Right Riparian Score (5)	1
Total Habitat Score (100)	**52**

Substrate: Soft sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/24/07	2007-28	20	48	Good

Most Abundant Species: Bluehead Chub

Exotic Species: Green Sunfish and Redear Sunfish

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the South Fork Catawba River; drains northwest Lincoln County and the extreme southwestern portion of Catawba County; no municipalities in the watershed. **Habitat** -- sandy/gravely runs; snags; cattle with access to the stream on the left; poor riparian zones, widths were only one-tree wide. **2007** -- conductivity was relatively low; a very diverse community for a stream of its size, including 6 species of sunfish and 3 species of darters, but the percentage of tolerant fish (Creek Chub, White Sucker, Flat Bullhead, Eastern Mosquitofish, Redbreast Sunfish, and Green Sunfish) and the trophic metrics (elevated percentage of omnivores) were indicative of some slight nutrient enrichment; two intolerant species were present, Seagreen Darter and Piedmont Darter.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
CLARK CR	SR 2012	07/14/04	CF7	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
CATAWBA	35	03050102	35.60861111	-81.23083333	11-129-5-(0.3)b	Northern Inner Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	30.8	840	7	0.3	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Newton's Clark Creek WWTP (~1.5 miles upstream)	NC0036196	7.5

Water Quality Parameters

Temperature (°C)	23.1
Dissolved Oxygen (mg/L)	7.1
Specific Conductance (µS/cm)	221
pH (s.u.)	6.6
Water Clarity	Slightly turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	14
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	1
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	9
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	**47**

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/14/04	2004-119	9	34	Poor

Most Abundant Species: Redbreast Sunfish

Exotic Species: None

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the South Fork Catawba River; drains portions of the cities of Hickory, Conover, and Newton in central Catawba County; sand dipping operations downstream from the bridge. **Habitat** -- very shallow sandy runs; stick riffles; side deadfalls, snags, roots, and undercuts; cattle with access to stream; cattle exclusion barrier across the channel; urban debris in the stream. **2004** -- conductivity elevated; low diversity and very low fish abundance (n = 75) for a stream of its size; intolerant species were absent; only one species of sucker and darter were collected; percentage of tolerant fish (White Sucker, Flat Bullhead, and Redbreast Sunfish) was high; data were also used as part of a NCSU Urban Fish Study.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
CLARK CR	SR 1008	CB165	07/09/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	3050102	352830	811603	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
WS-IV	91	775	20	0.3

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Clark Creek WWTP	NC0036196	7.5
Delta Apparel/Maiden	NC0006190	1.0
Maiden WWTP	NC0039594	1.0

Water Quality Parameters

Temperature (°C)	24.4
Dissolved Oxygen (mg/L)	0
Specific Conductance (µS/cm)	586
pH (s.u.)	7.4
Water Clarity	clear

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	15
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	14
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	74

Site Photograph

Substrate Mix of boulder, rubble, gravel and sand with a fair amount of silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/09/07	10234	49	12	6.21	5.87	Fair
08/21/02	8948	47	9	6.20	5.19	Fair
08/19/97	7432	48	16	5.98	5.50	Good-Fair
08/05/92	5968	48	10	6.42	5.39	Fair

Taxonomic Analysis

The mayfly taxa richness had significantly decreased from eight taxa in 1997 to two taxa in 2002. In 2007, the mayfly taxa richness increased to four, possibly showing some signs of recovery from the drought. The decrease in the number of mayfly taxa may have been due to drought effects alone or a combination of drought effects and effluent from three dischargers located upstream of this site. Absent in 2002 were the tolerant caddisfly *Hydropsyche venularis* and the ubiquitous and tolerant mayfly *Maccaffertium modestum*, which had been Common or Abundant in previous samples. Both taxa were present in 2007. *Maccaffertium modestum* were Abundant and *Hydropsyche venularis* were Common.

Data Analysis

This site is located downstream of three dischargers, two WWTPs and a textile mill. In 1997 and 2002, it was noted that the water in Clark Creek was red, possibly from dyes used in the textile mill. However, the water was clear in 2007. The Biotic Index and the EPT Biotic Index indicate that water quality has remained fairly constant for the previous 15 years. The Good-Fair rating in 1997 was borderline Fair/Good-Fair.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
INDIAN CR	SR 1252	CB188	05/03/06	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	3050102	352522	811533	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	69.7	780	15	0.3

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

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

Water Quality Parameters

Temperature (°C)	17.5
Dissolved Oxygen (mg/L)	8.9
Specific Conductance (µS/cm)	42
pH (s.u.)	7.1
Water Clarity	turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	4
Pool Variety (10)	0
Riffle Habitat (16)	5
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	7
Left Riparian Score (5)	5
Right Riparian Score (5)	3
Total Habitat Score (100)	53

Site Photograph

Substrate: Mostly sand and hardpacked clay with some gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
05/03/06	9866	81	26	5.52	4.86	Good
08/21/02	8946	---	13	---	4.81	Not Rated
08/19/97	7433	73	24	5.38	4.93	Good
08/17/92	5978	79	29	5.78	5.18	Good

Taxonomic Analysis

Taxa observed in the 2006 sample indicated an increase in mayfly and caddisfly taxa which had decreased significantly in 2002 due to drought conditions. Abundant EPT taxa included *Baetis intercalaris* , *Pseudocloeon propinquum* , *Hexagenia* , *Maccaffertium modestum* , *Perlesta* , *Oecetis persimilis* and *Triaenodes ignitus* .

Data Analysis

The Indian Creek watershed includes western Lincoln County and the extreme northwestern corner of Gaston County. In 2002, the site was moved 1.5 miles upstream due to low flows at SR 1252. However, 2002 was a dry year and BAU staff decided not to rate this site in 2002. With the exception of 2002, water quality has remained stable and Indian Creek has consistently rated Good.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
INDIAN CR	**SR 1252**	**06/01/06**	**CF21**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
LINCOLN	35	03050102	35.42277778	-81.25916667	11-129-8-(6.5)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	69.2	760	13	0.5	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
City of Cherryville's Cherryville WWTP	NC0044440	2

Water Quality Parameters

Temperature (°C)	20.7
Dissolved Oxygen (mg/L)	7.4
Specific Conductance (µS/cm)	76
pH (s.u.)	6.0

Water Clarity	Turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	10
Left Bank Stability (7)	6
Right Bank Stability (7)	4
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**72**

Substrate Sand, gravel, cobble, and boulder

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
06/01/06	2006-70	14	38	Fair
05/21/02	2002-51	11	38	Fair
07/01/97	97-67	11	38	Fair

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

Species Change Since Last Cycle **Gains** -- Margined Madtom and Eastern Mosquitofish. **Losses** -- None.

Data Analysis

Watershed -- tributary to the South Fork Catawba River; historically impounded by the Laboratory Mill Dam; watershed includes western Lincoln County and the extreme northwestern corner of Gaston County encompassing the north side of the Town of Cherryville; site is ~ 1.1 miles upstream from the creek's confluence with the river. **Habitat** -- Carolina Slate Belt type stream; outcrops; riffles with *Podostemum.* **2006** -- total number of fish declined from 207 to 111 between 2002 and 2006; darters and intolerant species absent; sampled as part of a Catawba River Basin Biological TMDL Study (Biological Assessment Unit Memorandum F-20061207). **1997 - 2006** -- conductivity has ranged from 75 to 86 µS/cm; very low diversity for a stream of its size; only 15 species are known from the site, but no darters or intolerant species have ever been collected; percentage of tolerant fish (Creek Chub, White Sucker, Flat Bullhead, Eastern Mosquitofish, Redbreast Sunfish, and Green Sunfish) has increased from 16% to 29% to 49% since 1997; community affected by extremes in flows and by limited avenues for recolonization.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
BEAVERDAM CR	**SR 1609**	**05/31/06**	**CF2**	**Excellent**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	35	03050102	35.40444444	-81.24583333	11-129-9-(0.7)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	23	750	10	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	19.8
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	75
pH (s.u.)	6.2

Water Clarity	Turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	9
Riffle Habitat (16)	7
Left Bank Stability (7)	7
Right Bank Stability (7)	7
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**72**

Substrate Bedrock, sand, and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/31/06	2006-68	18	54	Excellent
05/21/02	2002-52	13	50	Good

Most Abundant Species Redbreast Sunfish

Exotic Species Green Sunfish

Species Change Since Last Cycle

Gains -- Whitefin Shiner, Golden Shiner, Spottail Shiner, Green Sunfish, Pumpkinseed, Warmouth, and Piedmont Darter. **Losses** -- Rosyside Dace and Highback Chub.

Data Analysis

Watershed -- tributary to the South Fork Catawba River; drains the northwestern portion of Gaston County, including the eastern and southeastern portion of the Town of Cherryville; site is ~ 1.3 miles above the creek's confluence with the river. **Habitat** -- good pools; bedrock outcrops; riffle at end of reach; forested riparian zones. **2006** -- total number of fish decreased, but the diversity was greater in 2006 than in 2002; 10 of 13 species collected in 2002 declined in number or were not collected in 2006; large suckers abundant and continued to use the creek as a spawning and nursery tributary; sampled as part of a Catawba River Basin Biological TMDL Study (Biological Assessment Unit Memorandum F-20061207). **2002 & 2006** -- 20 species known from the site, including the intolerant Highback Chub, Seagreen Darter, and Piedmont Darter.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
HOYLE CR	SR 1836	05/31/06	CF19	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	35	03050102	35.335	-81.13361111	11-129-15-(6)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
WS-IV	27.5	695	7	0.3	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	55	10 (rural residential)	35	0

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

Water Quality Parameters

Temperature (°C)	19.0
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	84
pH (s.u.)	6.0
Water Clarity	Turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	8
Riffle Habitat (16)	1
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	9
Left Riparian Score (5)	3
Right Riparian Score (5)	3
Total Habitat Score (100)	**50**

Site Photograph

Substrate: Sand and gravel

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
05/31/06	2006-67	15	40	Fair
05/22/02	2002-53	15	42	Good-Fair
06/12/97	97-59	14	48	Good

Most Abundant Species: Spottail Shiner

Exotic Species: Green Sunfish

Species Change Since Last Cycle: **Gains** -- Pumpkinseed and Warmouth. **Losses** -- Highback Chub, Greenhead Shiner, Flat Bullhead, Fantail Darter, and Piedmont Darter.

Data Analysis

Watershed -- tributary to the South Fork Catawba River; drains south central Lincoln County and north central Gaston County, west of the Town of Stanley; two small permitted dischargers within the watershed (combined flow = 0.5 MGD); site is ~ 0.4 miles above the creek's confluence with the river. **Habitat** -- sandy, shallow runs; undercuts; stick riffles; entrenched with easily eroded banks, especially the left bank. **2006** -- number of fish declined from 600 in 2002 (a low flow year) to 218 in 2006; 11 of 15 species collected in 2002 declined in number (e.g. Bluehead Chub and Sandbar Shiner) or were not collected in 2006 (Greenhead Shiner); due to proximity to the river, the number of species of sunfish increased from 1 in 2002 to 6 in 2006; intolerant species absent; sampled as part of a Catawba River Basin Biological TMDL Study (Biological Assessment Unit Memorandum F-20061207). **1997 - 2006** -- conductivity has ranged from 68 to 88 µS/cm; 23 species are known from the site; community affected by extremes in flows and by limited avenues for recolonization.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LONG CR	SR 1456	07/15/04	CF29	Excellent

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	36	03050102	35.30527778	-81.23277778	11-129-16-(4)	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	31.1	695	7	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	75	5 (developed)	0	20 (church lawn)

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

Water Quality Parameters

Temperature (°C)	22.5
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	115
pH (s.u.)	6.3

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	3
Pool Variety (10)	7
Riffle Habitat (16)	3
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	**55**

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/15/04	2004-122	17	54	Excellent

Most Abundant Species: Redbreast Sunfish

Exotic Species: Redear Sunfish

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the South Fork Catawba River; drains central Gaston County, including portions of the municipal areas of Kings Mountain, Bessemer City, and Gastonia; site is ~ 3.4 miles above the basinwide site monitored in 1993, 1997, and 2002. **Habitat** -- sandy runs; snags; undercuts; deadfalls; good canopy; below a natural bedrock shelves/waterfall. **2004** -- community was diverse and abundant; percentage of tolerant fish (White Sucker, Flat Bullhead, Eastern Mosquitofish, and Redbreast Sunfish) slightly elevated; percentage of species with multiple age groups slightly lower than expected; intolerant species included Highback Chub and Seagreen Darter; data were also used as part of a NCSU Urban Fish Study.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
LONG CR	SR 1456	CB224	07/10/07	Good-Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
GASTON	36	3050102	351820	811356	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	31.1	700	13	0.3

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

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

Water Quality Parameters

Temperature (°C)	23.3
Dissolved Oxygen (mg/L)	0
Specific Conductance (µS/cm)	135
pH (s.u.)	6.9

Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	3
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	3
Total Habitat Score (100)	71

Site Photograph

Substrate	Mostly sand with some gravel and silt

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/10/07	10235	74	23	6.13	5.51	Good-Fair
08/20/97	7437	62	21	5.95	5.10	Good-Fair
07/25/90	5395	67	18	6.18	5.22	Good-Fair

Taxonomic Analysis

No major changes in the benthic community were observed. Abundant taxa included *Baetis flavistriga* , *B. intercalaris* , *Isonychia* , *Maccaffertium modestum* , *Cheumatopsyche* , *Hydropsyche betteni* , *Triaenodes ignitus* , *Ancyronyx variegatus* , *Dineutus* , *Macronychus glabrus* , *Boyeria vinosa* , *Ophiogomphus* , *Progomphus obscurus* , *Tribelos fusicorne* and *Corbicula fluminea* .

Data Analysis

Long Creek drains the western portion of Gaston County. This particular location is also an ambient monitoring site. It was not sampled for benthos in 2002 due to low flows. Althogh EPT taxa richness has gradually increased since 1990, the bioclassification has remained at Good-Fair.

Appendix 2-C

Ambient Station Summary Sheets

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

Location: HENRY FORK RIV AT SR 1124 NR HENRY RIVER
Station #: C4300000 **Hydrologic Unit Code:** 03050102
Latitude: 35.68483 **Longitude:** -81.40346 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-129-1-(12.5)

Time period: 01/13/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		5.8	7.3	8.2	9.5	11.1	12.4	13.7
	59	0	<5	0	0		5.8	7.3	8.2	9.5	11.1	12.4	13.7
pH (SU)	59	0	<6	15	25.4	100	5.1	5.6	5.9	6.4	6.7	7.1	7.8
	59	0	>9	0	0		5.1	5.6	5.9	6.4	6.7	7.1	7.8
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				26	27	28	31	33	34	94
Water Temperature (°C)	59	0	>32	0	0		1.3	4.4	8.3	15.1	20.6	25.2	25.9
Other													
TSS (mg/L)	20	7	N/A				2.5	2.5	3.2	6.2	9.6	62.9	101
Turbidity (NTU)	59	0	>50	6	10.2	62.3	1.4	1.9	2.9	5	11	55	150
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				62	75	140	220	620	4020	5300
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	11	>7	0	0		2	2	2	2	2	4	4
Iron, total (Fe)	13	0	>1000	2	15.4	86.6	240	244	305	480	855	4100	5300
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	14	17

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
57	74	8	14	

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

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

Location: HENRY FORK RIV AT SR 1143 NR BROOKFORD
Station #: C4360000 **Hydrologic Unit Code:** 03050102
Latitude: 35.65832 **Longitude:** -81.30838 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-129-1-(12.5)

Time period: 01/13/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		6.2	7.1	8	9.2	10.8	12.3	13.9
	59	0	<5	0	0		6.2	7.1	8	9.2	10.8	12.3	13.9
pH (SU)	59	0	<6	4	6.8		5.5	6	6.2	6.5	6.7	7	7.4
	59	0	>9	0	0		5.5	6	6.2	6.5	6.7	7	7.4
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				42	54	65	76	109	151	249
Water Temperature (°C)	59	0	>32	0	0		2	5	8.8	16.1	21.5	25.6	27.2
Other													
TSS (mg/L)	20	3	N/A				2.5	4	6.2	11	45.5	89.9	109
Turbidity (NTU)	59	0	>50	6	10.2	62.3	2.3	2.7	4.5	9	23	60	400
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				60	84	240	590	1395	4300	4500
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	8	>7	0	0		2	2	2	2	4	6	6
Iron, total (Fe)	13	0	>1000	7	53.8	100	360	392	605	1100	1900	5080	5200
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	5	>50	0	0		10	10	10	10	17	28	32

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	133	11	19	

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

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

Location: JACOB FORK AT SR 1924 AT RAMSEY
Station #: C4370000 **Hydrologic Unit Code:** 03050102
Latitude: 35.59055 **Longitude:** -81.56712 **Stream class:** WS-III ORW
Agency: NCAMBNT **NC stream index:** 11-129-2-(4)

Time period: 01/20/2004 to 12/15/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	45	0	<4	0	0		7.6	8.2	8.9	10.2	12	14.2	16.8
	45	0	<5	0	0		7.6	8.2	8.9	10.2	12	14.2	16.8
pH (SU)	49	0	<6	3	6.1		5.3	6.1	6.4	6.6	6.7	6.9	7.1
	49	0	>9	0	0		5.3	6.1	6.4	6.6	6.7	6.9	7.1
Spec. conductance (umhos/cm at 25°C)	47	0	N/A				19	19	22	23	25	29	30
Water Temperature (°C)	50	0	>32	0	0		1.8	4.6	8	14.2	20	22.3	26.6
Other													
TSS (mg/L)	20	17	N/A				2.5	2.5	2.5	2.5	6.2	9.2	26
Turbidity (NTU)	51	7	>50	0	0		1	1	1.1	1.7	3.3	4.5	19
Nutrients (mg/L)													
NH3 as N	51	50	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.04
NO2 + NO3 as N	51	6	>10	0	0		0.02	0.02	0.03	0.05	0.07	0.09	0.12
TKN as N	51	49	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.27
Total Phosphorus	51	30	N/A				0.01	0.02	0.02	0.02	0.02	0.03	0.05
Metals (ug/L)													
Aluminum, total (Al)	13	1	N/A				50	51	56	95	150	442	590
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	12	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	13	0	>1000	0	0		76	76	91	160	230	484	620
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	9	>200	0	0		10	10	10	10	12	15	16
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	12	>50	0	0		10	10	10	10	10	23	32

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
51	69	2	4	

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

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

Location: S FORK CATAWBA RIV AT NC 10 NR STARTOWN
Station #: C4380000 **Hydrologic Unit Code:** 03050102
Latitude: 35.63311 **Longitude:** -81.30531 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-129-(0.5)

Time period: 01/13/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		5.5	6.5	7.7	9	10.8	12.3	14.2
	59	0	<5	0	0		5.5	6.5	7.7	9	10.8	12.3	14.2
pH (SU)	59	0	<6	13	22	99.8	5.5	5.7	6	6.4	6.6	6.8	7.3
	59	0	>9	0	0		5.5	5.7	6	6.4	6.6	6.8	7.3
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				37	46	54	58	86	107	190
Water Temperature (°C)	59	0	>32	0	0		1.8	4.9	8.8	16	20.8	24.8	26.7
Other													
TSS (mg/L)	20	1	N/A				2.8	3	5.6	10.4	38.8	53.9	180
Turbidity (NTU)	59	0	>50	7	11.9	76.6	1.9	3.1	5	8.7	24	76	500
Nutrients (mg/L)													
NH3 as N	1	0	N/A				0.04	0.04	0.04	0.04	0.04	0.04	0.04
NO2 + NO3 as N	1	0	>10	0	0		0.49	0.49	0.49	0.49	0.49	0.49	0.49
TKN as N	1	1	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Phosphorus	1	0	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
Metals (ug/L)													
Aluminum, total (Al)	12	0	N/A				92	106	210	585	1625	5690	6800
Arsenic, total (As)	12	12	>10	0	0		5	5	5	5	9	10	10
Cadmium, total (Cd)	12	12	>2	0	0		1	1.3	2	2	2	2	2
Chromium, total (Cr)	12	12	>50	0	0		10	14	25	25	25	25	25
Copper, total (Cu)	12	6	>7	0	0		2	2	2	2	3	6	6
Iron, total (Fe)	12	0	>1000	6	50	100	420	438	540	965	2225	5910	7200
Lead, total (Pb)	12	12	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	12	0	>200	1	8.3		45	45	50	60	89	211	260
Mercury, total (Hg)	11	11	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	12	12	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	12	9	>50	0	0		10	10	10	10	12	22	24

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	181	15	26	89.7

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

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

Location: CLARK CRK AT SR 1008 GROVE ST AT LINCOLNTON
Station #: C4800000 **Hydrologic Unit Code:** 03050102
Latitude: 35.47532 **Longitude:** -81.26719 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-129-5-(9.5)

Time period: 01/13/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		6	6.5	7	8.7	10.3	11.2	12.4
	59	0	<5	0	0		6	6.5	7	8.7	10.3	11.2	12.4
pH (SU)	59	0	<6	0	0		6	6.2	6.4	6.6	7	7.2	7.4
	59	0	>9	0	0		6	6.2	6.4	6.6	7	7.2	7.4
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				72	136	190	269	369	491	1023
Water Temperature (°C)	59	0	>32	0	0		3.7	6.4	9.8	14.4	20	23.2	25.2
Other													
TSS (mg/L)	20	3	N/A				4.2	5.1	6.2	11	19.8	122.6	229
Turbidity (NTU)	59	0	>50	9	15.3	93.3	2.5	5.7	9.2	16	32	210	570
Nutrients (mg/L)													
NH3 as N	58	4	N/A				0.02	0.04	0.07	0.1	0.13	0.22	0.34
NO2 + NO3 as N	58	0	>10	0	0		0.16	0.8	1.17	1.55	2.02	2.42	4.5
TKN as N	58	0	N/A				0.28	0.34	0.39	0.5	0.64	0.86	3
Total Phosphorus	58	0	N/A				0.13	0.16	0.19	0.24	0.33	0.58	1.6
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				190	218	280	660	1330	5520	6400
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	6	>7	2	15.4	86.6	2	2	2	2	5	11	13
Iron, total (Fe)	13	0	>1000	8	61.5	100	640	680	845	1300	1850	6400	7200
Lead, total (Pb)	13	12	>25	1	7.7		10	10	10	10	10	21	28
Manganese, total (Mn)	13	0	>200	1	7.7		59	62	84	110	130	234	290
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	6	>50	1	7.7		10	10	10	11	12	78	110

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	610	30	51	100

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

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

Location: INDIAN CRK AT SR 1252 NR LABORATORY
Station #: C5170000 **Hydrologic Unit Code:** 03050102
Latitude: 35.42280 **Longitude:** -81.25920 **Stream class:** WS-IV
Agency: NCAMBNT **NC stream index:** 11-129-8-(6.5)

Time period: 01/13/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		5.9	7.2	7.6	9.6	10.8	12.4	13.4
	59	0	<5	0	0		5.9	7.2	7.6	9.6	10.8	12.4	13.4
pH (SU)	59	0	<6	9	15.3	93.3	5.5	5.8	6.1	6.4	6.6	7	7.5
	59	0	>9	0	0		5.5	5.8	6.1	6.4	6.6	7	7.5
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				57	60	62	70	74	90	149
Water Temperature (°C)	59	0	>32	0	0		2.8	6	9.3	14.9	20	23.7	25.2
Other													
TSS (mg/L)	20	4	N/A				3	3.6	6	7.2	11.8	19.8	456
Turbidity (NTU)	59	0	>50	6	10.2	62.3	2.9	4.6	6.1	11	17	55	230
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				120	128	200	390	605	816	880
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	10	>7	0	0		2	2	2	2	2	4	5
Iron, total (Fe)	13	0	>1000	7	53.8	100	620	624	805	1100	1450	1620	1700
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	19	25
Manganese, total (Mn)	13	0	>200	0	0		65	67	70	88	108	120	120
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	12	>50	0	0		10	10	10	10	10	12	14

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	354	22	37	99.9

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

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

Location: LONG CRK AT SR 1456 NR BESSEMER CITY
Station #: C5900000 **Hydrologic Unit Code:** 03050102
Latitude: 35.30518 **Longitude:** -81.23264 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-129-16-(4)

Time period: 01/14/2004 to 12/11/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	3	5.1		2.9	5.2	6.9	8.2	10	12.3	14.6
	59	0	<5	4	6.8		2.9	5.2	6.9	8.2	10	12.3	14.6
pH (SU)	59	0	<6	7	11.9	76.6	5.1	5.7	6.1	6.5	6.8	7.1	7.5
	59	0	>9	0	0		5.1	5.7	6.1	6.5	6.8	7.1	7.5
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				59	85	92	105	123	144	179
Water Temperature (°C)	59	0	>32	0	0		3.1	6	9.8	16.1	20.8	23	24
Other													
TSS (mg/L)	20	4	N/A				2.5	3.5	4.2	6.2	9.4	11.8	46
Turbidity (NTU)	59	0	>50	5	8.5		2.1	3.7	5.4	8.8	14	39	450
Nutrients (mg/L)													
NH3 as N	58	26	N/A				0.02	0.02	0.02	0.02	0.05	0.09	0.23
NO2 + NO3 as N	58	0	N/A				0.02	0.15	0.33	0.44	0.51	0.57	0.67
TKN as N	58	11	N/A				0.2	0.2	0.21	0.28	0.33	0.62	1.6
Total Phosphorus	58	0	N/A				0.02	0.03	0.04	0.06	0.08	0.19	0.78
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				76	102	145	290	615	1632	2100
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	10	>7	0	0		2	2	2	2	2	4	5
Iron, total (Fe)	13	0	>1000	6	46.2	100	540	564	660	1000	1300	2600	3400
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	11	12
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	17	20

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	428	23	40	100

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

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

Location: S FORK CATAWBA RIV AT NC 7 AT MCADENVILLE
Station #: C6500000 **Hydrologic Unit Code:** 03050102
Latitude: 35.26014 **Longitude:** -81.07390 **Stream class:** WS-V
Agency: NCAMBNT **NC stream index:** 11-129-(15.5)

Time period: 01/14/2004 to 12/03/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.4	6.5	7.4	9.1	11	12.3	14.8
	58	0	<5	0	0		5.4	6.5	7.4	9.1	11	12.3	14.8
pH (SU)	59	0	<6	6	10.2	62.3	5.5	5.9	6.4	6.7	7	7.1	7.7
	59	0	>9	0	0		5.5	5.9	6.4	6.7	7	7.1	7.7
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				66	79	90	112	155	192	291
Water Temperature (°C)	59	0	>32	0	0		3.3	5.6	9.5	17	22.9	26.2	28.6
Other													
TSS (mg/L)	20	3	N/A				2.5	2.6	6	9.6	18.8	59.7	360
Turbidity (NTU)	59	0	>50	7	11.9	76.6	3.4	5	10	16	25	85	370
Nutrients (mg/L)													
NH3 as N	59	7	N/A				0.02	0.02	0.04	0.05	0.07	0.11	0.23
NO2 + NO3 as N	59	0	>10	0	0		0.31	0.58	0.65	0.78	0.87	1.1	1.4
TKN as N	59	1	N/A				0.2	0.23	0.29	0.37	0.48	0.68	1.5
Total Phosphorus	59	0	N/A				0.04	0.06	0.08	0.1	0.16	0.21	0.6
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				130	142	180	850	1700	8160	11000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	6	>7	1	7.7		2	2	2	2	4	10	14
Iron, total (Fe)	13	0	>1000	8	61.5	100	570	606	675	1400	2250	10560	15000
Lead, total (Pb)	13	11	>25	0	0		10	10	10	10	10	11	11
Manganese, total (Mn)	13	0	>200	1	7.7		37	42	50	58	88	470	710
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	8	>50	1	7.7		10	10	10	10	14	37	51

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	160	12	20	60.2

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

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

Location:	S FORK CATAWBA RIV AT SR 2524 NR SOUTH BELMONT				
Station #:	C7000000			**Hydrologic Unit Code:**	03050102
Latitude:	35.16666	**Longitude:**	-81.03825	**Stream class:**	WS-V B
Agency:	NCAMBNT			**NC stream index:**	11-(123.5)

Time period: 02/18/2004 to 12/08/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		5.2	6.2	6.8	7.9	9.1	9.9	10.7
	59	0	<5	0	0		5.2	6.2	6.8	7.9	9.1	9.9	10.7
pH (SU)	59	0	<6	2	3.4		5.5	6	6.3	6.6	7.3	7.8	8.3
	59	0	>9	0	0		5.5	6	6.3	6.6	7.3	7.8	8.3
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				54	67	73	83	100	115	128
Water Temperature (°C)	59	0	>32	16	27.1	100	9.6	14.3	18.3	24.5	33.5	34.5	38.1
Other													
Chlorophyll a (ug/L)	2	0	>40	0	0		8	8	8	8	8	8	8
TSS (mg/L)	20	5	N/A				4	5	5.9	6.4	9	32.7	50
Turbidity (NTU)	59	0	>25	4	6.8		4.4	5.5	6.8	8.5	11	16	150
Nutrients (mg/L)													
NH3 as N	1	0	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	>10	0	0		0.35	0.35	0.35	0.35	0.35	0.35	0.35
TKN as N	1	0	N/A				0.36	0.36	0.36	0.36	0.36	0.36	0.36
Total Phosphorus	1	0	N/A				0.04	0.04	0.04	0.04	0.04	0.04	0.04
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				180	184	260	290	985	3620	5100
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	13	1	>7	9	69.2	100	2	3	6	8	8	9	10
Iron, total (Fe)	13	0	>1000	3	23.1	96.6	270	294	365	480	1050	3940	5500
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	13	0	>200	0	0		35	35	38	45	68	96	110
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	10	>50	0	0		10	10	10	10	10	19	25

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	15	3	5	

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

APPENDIX 2-D

WATERSHED MAPS

Appendix 2-E

Permits

Table 2E-1: Wastewater Discharge Permits in the South Fork Catawba River Watershed

Permit #	Owner	Facility Name	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0004812	Pharr Yarns Inc	Pharr Yarns Industrial WWTP	Industrial Process & Commercial	Major	Gaston	Mooresville	1000000
NC0004979	Duke Energy Carolinas LLC	Allen Steam Station	Industrial Process & Commercial	Major	Gaston	Mooresville	1000000
NC0005274	Kings Mountain Venture #1 LLC	Kings Mountain Venture #1, LLC	Industrial Process & Commercial	Major	Gaston	Mooresville	400000
NC0006033	Town of Cramerton	Eagle Road WWTP	Municipal, Large	Major	Gaston	Mooresville	4000000
NC0006190	Delta Apparel, Inc.	Delta Apparel / Maiden	Industrial Process & Commercial	Major	Catawba	Mooresville	1000000
NC0020036*	Town of Stanley	Lola Street WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	500000
NC0020052	Town of McAdenville	McAdenville WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	130000
NC0020184*	City of Gastonia	Long Creek WWTP	Municipal, Large	Major	Gaston	Mooresville	16000000
NC0020966	Town of Spencer Mountain	Spencer Mountain WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	50000
NC0022934	UCS, Inc	UCS, Inc - Main Plant	Industrial Process & Commercial	Minor	Gaston	Mooresville	5300
NC0023761	National Fruit Product Company, Inc.	National Fruit Product Company	Industrial Process & Commercial	Minor	Lincoln	Mooresville	not limited
NC0024155	City of High Shoals	River Street WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	18000
NC0025496*	City of Lincolnton	Lincolnton WWTP	Municipal, Large	Major	Lincoln	Mooresville	6000000
NC0025861	City of Lowell	Lowell WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	600000
NC0029297	Catawba County Schools	Fred T. Foard High School	100% Domestic < 1MGD	Minor	Catawba	Mooresville	30000
NC0032760	Carolina Water Service, Inc. of North Carolina	Kings Grant WWTP	100% Domestic < 1MGD	Minor	Gaston	Mooresville	70000
NC0033421	Carolina Water Service, Inc. of North Carolina	College Park WWTP	100% Domestic < 1MGD	Minor	Gaston	Mooresville	22000
NC0036196*	City of Newton	Clark Creek WWTP	Municipal, Large	Major	Catawba	Mooresville	7500000
NC0036935	Pine Mountain Property Owners Assoc	Pine Mountain Lakes WWTP	100% Domestic < 1MGD	Minor	Burke	Asheville	69600
NC0039594*	Town of Maiden	Maiden WWTP	Municipal, Large	Major	Catawba	Mooresville	1000000
NC0040070	City of Gastonia	Gastonia WTP	Water Treatment Plant	Minor	Gaston	Mooresville	1200000
NC0040797*	City of Hickory	Henry Fork WWTP	Municipal, Large	Major	Catawba	Mooresville	9000000
NC0041246	Lincoln County Schools	West Lincoln High School	100% Domestic < 1MGD	Minor	Lincoln	Mooresville	14000
NC0044440	City of Cherryville	Cherryville WWTP	Municipal, Large	Major	Gaston	Mooresville	2000000
NC0066141	Town of Spencer Mountain	Spencer Mountain WTP	Water Treatment Plant	Minor	Gaston	Mooresville	10000
NC0068888	Town of Dallas	Dallas WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	600000
NC0071447	The Diocese of Charlotte	Catholic Conference Center WWTP	100% Domestic < 1MGD	MInor	Catawba	Mooresville	20000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 2E-1: Wastewater Discharge Permits in the South Fork Catawba River Watershed

Permit #	Owner	Facility Name	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0072940	City of High Shoals	State Street WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	15900
NC0074233	Catawba County Schools	Blackburn Elementary School	100% Domestic < 1MGD	Minor	Catawba	Mooresville	15000
NC0076643	General Electric Company - Hickory	Hickory Plant	Groundwater Remediation	Minor	Catawba	Mooresville	120000
NC0077763	City of Belmont	Belmont WTP	Water Treatment Plant	Minor	Gaston	Mooresville	not limited
NC0080195	Forest Hills Mobile Home Estate	Forest Hills Mobile Home Estate WTP	Water Treatment Plant	Minor	Gaston	Mooresville	not limited
NC0082694	Town of Dallas	Dallas WTP	Water Treatment Plant	Minor	Gaston	Mooresville	not limited
NC0085588	City of Lincolnton	Lincolnton WTP	Water Treatment Plant	Minor	Lincoln	Mooresville	not limited
NC0088374	City of High Shoals	River Street WWTP	Municipal, < 1MGD	Minor	Gaston	Mooresville	60000
NC0088684	Daniel Jonathan Stowe Conservancy	Daniel Stowe Botanical Garden	Water Treatment Plant	Minor	Gaston	Mooresville	3800

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 2E-2: Non-discharge Permits in the South Fork Catawba River Watershed

Permit #	Owner	Facility Name	Owner Type	Permit Type	Class	County	Region
WQ0000430	City of Cherryville	City of Cherryville Residuals Land Application Program	Local Government	Land Application of Residual Solids	Minor	Gaston	Mooresville
WQ0001793	City of Gastonia	City of Gastonia Residuals Land Application Program (D)	Local Government	Land Applicatio of Residual Solids	Major	Gaston	Mooresville
WQ0002264	City of Bessemer City	City of Bessemer City Residuals Land Application Program	Local Government	Land Application of Residual Solids (503 exempt)	Minor	Gaston	Mooresville
WQ0002544	Clariant Corporation	Mount Holly West Facility	Private	Land Application of Residual Solids	Minor	Gaston	Mooresville
WQ0002618	Town of Cramerton	Town of Cramerton Residuals Land Application Program	Local Government	Land Application of Residual Solids	Minor	Gaston	Mooresville
WQ0002712	City of Lincolnton	City of Lincolnton Residuals Land Application Program	Local Government	Land Application of Residual Solids	Major	Lincoln	Mooresville
WQ0003902	City of Newton	City of Newton Residuals Land Application Program	Local Government	Land Application of Residual Solids	Major	Catawba	Mooresville
WQ0006984	Delta Apparel Inc.	Maiden, NC Plan Residuals Land Application Program (D)	Private	Land Application of Rsidual Solids (503 exempt)	Minor	Catawba	Mooresville

Table 2E-3: NPDES Stormwater Permits in the South Fork Catawba River Watershed

Permit #	Facility Name	Owner	Permit Type	Region	County
NCG020054	Benchmk Carolina Agg-Bess	Benchmk Carolina Agg	Mining Activities Stormwater Discharge COC	Mooresville	Gaston
NCG020085	Hickory Quarry	Martin Marietta Materials Inc	Mining Activities Stormwater Discharge COC	Mooresville	Catawba
NCG020135	Martin Marietta-Bessimer City	Martin Marietta Materials Inc	Mining Activities Stormwater Discharge COC	Mooresville	Gaston
NCG020199	Martin Marietta-Gaston Hwy 321	Martin Marietta Materials Inc	Mining Activities Stormwater Discharge COC	Mooresville	Gaston
NCG020286	Maiden Quarry	Martin Marietta Materials Inc	Mining Activities Stormwater Discharge COC	Mooresville	Catawba
NCG020579	Rea Contracting Co. - Sand Pit 104	Rea Contracting LLC	Mining Activities Stormwater Discharge COC	Mooresville	Gaston
NCG020638	Deal Property		Mining Activities Stormwater Discharge COC	Mooresville	Lincoln
NCG030021	Danaher Tool Group	Danaher Tool Group	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030130	Gastonia Components & Logistics	Gastonia Components & Logistics	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030164	Hickory Springs Metals Complex	Hickory Springs Manufacturing Company	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG030166	Timken Co-Lincolnton	The Timken Company	Metal Fabrication Stormwater Discharge COC	Mooresville	Lincoln
NCG030167	Vermont American Corporation	Robert Bosch Corp	Metal Fabrication Stormwater Discharge COC	Mooresville	Lincoln
NCG030233	A T S Remanufacturing Incorporated	A T S Remanufacturing Inc	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030243	Corning Cable Systems LLC, OAP	Corning Cable Systems	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG030246	Corning Cable Systems LLC - Hickory	Corning Cable Systems LLC	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG030345	Metso Minerals Inc	Metso Minerals Inc	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030380	Jenkins Metal Corportion	Jenkins Metal Corportion	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030413	Wix Corporation- Ozark Plant	Wix Corporation	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030475	Getrag Corp	Getrag Corporation	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG030482	Commscope Inc-Tech Info Center	Commscope Inc	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG030483	CMC Rebar Carolinas	Cmc Rebar Carolinas	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030492	Stabilus	Stabilus	Metal Fabrication Stormwater Discharge COC	Mooresville	Gaston
NCG030535	Z.F. Lemforder	Z.F. Lemforder	Metal Fabrication Stormwater Discharge COC	Mooresville	Catawba
NCG050163	R R Donnelley Printing Co	R R Donnelley Printing Co	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Catawba
NCG050180	UCS, Inc - Main Plant	UCS, Inc	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Gaston
NCG050190	Hickory Springs-Conover Complex	Hickory Springs Manufacturing Company	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Catawba

Table 2E-3: NPDES Stormwater Permits in the South Fork Catawba River Watershed

Permit #	Facility Name	Owner	Permit Type	Region	County
NCG050292	Shurtape Tech Incorporated-Highland	Shurtape Technologies, LLC	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Catawba
NCG050297	Klingspor Abrasives Incorporated	Klingspor Abrasives Inc	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Catawba
NCG050329	International Cushioning Company LLC	International Cushioning Company LLC	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Catawba
NCG050339	Temp Vent, Corp.	Air Vent, Inc.	Apparel/Printing/Paper/Leather/Rubber Stormwater Discharge COC	Mooresville	Lincoln
NCG060044	National Fruit Product Company	National Fruit Product Company Inc	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Mooresville	Lincoln
NCG060157	Orograin Bakeries Manufacturing, Inc.	Orograin Bakeries Manufacturing Inc	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Mooresville	Gaston
NCG060158	Midstate Mills Incorporated	Midstate Mills Inc	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Mooresville	Catawba
NCG060298	Flowers Baking Company of Newton, LLC	Flowers Baking Company of Newton LLC	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Mooresville	Catawba
NCG060307	Target Distribution Center #3811	Target Distribution Center #3811	Food/Tobacco/Soaps/Cosmetics/Public Warehousing Stormwater Discharge COC	Mooresville	Catawba
NCG070008	American Slate & Marble - Hickory	American Slate & Marble	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Mooresville	Catawba
NCG070063	Hairfield Vault Co-Catawba	Hairfield Vault Co	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Mooresville	Catawba
NCG080034	Poteat Motor Lines Incorporated	Poteat Motor Lines Inc	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080117	Roadway Services-Conover	Roadway Services Inc	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Asheville	Buncombe
NCG080174	AAA Cooper Transport-Mecklenburg	AAA Cooper Transport	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Mecklenburg
NCG080175	Century Furn Ind - Hildebran	Century Furn Ind	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Asheville	Burke
NCG080180	United Parcel Service-Gastonia	United Parcel Service	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Gaston
NCG080275	Gaines Motor Lines Inc-Hickor	Gaines Motor Lines Inc	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080285	Zenith Freight Lines LLC	Zenith Freight Lines LLC	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080402	Hickory Vehicle Maintenance Facility	US Postal Service - Vmf	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba

Table 2E-3: NPDES Stormwater Permits in the South Fork Catawba River Watershed

Permit #	Facility Name	Owner	Permit Type	Region	County
NCG080446	Advance Auto Parts 25	Advance Auto Parts	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Gaston
NCG080494	NC Nat Gd- Lincolnton	N C National Guard	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Lincoln
NCG080504	NC Nat Gd- Newton	N C National Guard	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080631	Fedex Freight - Conover	Fedex Freight East Inc	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080669	Newton City - Public Works Complex	City of Newton	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080680	Hagan Kennington Oil	Hagan Kennington Oil	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Gaston
NCG080701	Gastonia Vehicle Maintenance Facility	City of Gastonia	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Gaston
NCG080825	Fedex Ground Home Delivery	Fedex Ground Package System	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Mooresville	Catawba
NCG080830	A & G Terminals, LLC	A & G Terminals LLC	Transportation w/Vehicle Maintenance/Petroleum Bulk/Oil Water Separator Stormwater Discharge COC	Asheville	Burke
NCG090002	Premium Coatings Incorporated	Premium Coatings Inc	Paints, Varnishes, Lacquers Stormwater Discharge COC	Mooresville	Catawba
NCG110033	Clark Creek WWTP	City of Newton	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Catawba
NCG110034	Hickory City - Regional Compost Facility	City of Hickory	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Catawba
NCG110037	Hickory City-Henry Fork WWTP	City of Hickory	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Catawba
NCG110056	Long Creek WWTP	City of Gastonia	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Gaston
NCG110125	Town of Cramerto WWTP	Town of Cramerton	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Gaston
NCG110130	Town of Stanley WWTP	Town of Stanley	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Gaston
NCG110132	Town of Maiden WWTP	Town of Maiden	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Catawba
NCG110134	City of Lincolnton WWTP	City of Lincolnton	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Lincoln
NCG110135	Cherryville WWTP	Cherryville WWTP	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Mooresville	Gaston
NCG120001	Catawba Co- Landfill	Catawba Co	Landfill Stormwater Discharge COC	Mooresville	Catawba
NCG120012	Gaston Co Landfill	Gaston County	Landfill Stormwater Discharge COC	Mooresville	Gaston
NCG120081	Lincoln County Landfill	Lincoln County	Landfill Stormwater Discharge COC	Mooresville	Lincoln
NCG140051	Concrete Supply Co-Gastonia Pl	Concrete Supply Co	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Mooresville	Gaston
NCG140230	Ready Mixed Concrete Co - Maiden	Ready Mixed Concrete	Ready Mix Concrete Stormwater/Wastewater Discharge COC	Mooresville	Catawba

Table 2E-3: NPDES Stormwater Permits in the South Fork Catawba River Watershed

Permit #	Facility Name	Owner	Permit Type	Region	County
NCG160070	Maymead Materials, Inc.-Hickory	Maymead Materials Inc	Asphalt Paving Mixture Stormwater Discharge COC	Mooresville	Catawba
NCG160086	Action Demolition & Recycling, LLC	Action Demolition & Recycling LLC	Asphalt Paving Mixture Stormwater Discharge COC	Mooresville	Gaston
NCG170024	Joan Fabrics Corp-Newton Plant	Joan Fabrics Corp	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170028	Travis Knits Incorporated- Maiden	Travis Knits Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170072	Artee Wrapspun	Culp, Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Lincoln
NCG170088	Galey & Lord Indust-Gaston	Galey & Lord Industries	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170118	Carolina Mills Inc- Plant #1	Carolina Mills	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170125	Carolina Mills Incorporated-Plant 8	Carolina Mills	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170262	Ithaca Industries-Gastonia	Ithaca Industries	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170272	Armtex Inc-Gastonia Dye&Finish	Armtex Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170311	American & Efird Incorporated-Maiden	American & Efird Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170312	American & Efird Inc-Gastonia	American & Efird Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170397	Century Textile Manufacturing Inc	Century Textile Manufacturing Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170408	Meridian Specialty Yarn Group, Inc.	Meridian Specialty Yarn Group Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Gaston
NCG170414	Delta Apparel / Maiden	Delta Apparel Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Catawba
NCG170417	South Fork Industries, Inc.	South Fork Industries Inc	Textile Mill Products Stormwater Discharge COC	Mooresville	Lincoln
NCG180014	Null Industries Incorporated	Null Industries Inc	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180016	Lee Industries Incorporated-Catawba	Lee Industries Inc	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180017	C R Laine Furniture Co	C R Laine Furniture Co	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180020	Master Carvers Of NC	Master Carvers Of NC	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180028	Alexvale Furniture Co-Plt 3	Alexvale Furniture Co	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180059	Hooker Furniture Corp-Maiden	Hooker Furniture Corporation	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180061	Laneventure # 10	Lane Furniture Industries	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180086	Hws Co Inc-DBA Hickory White	Hws Co Inc	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180087	Laneventure #14	Lane Furniture Industries	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180186	Cochrane Furniture Co Inc - Cochrane Rd	Cochrane Furniture Co Inc	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Lincoln
NCG180188	Cochrane Furniture Company	Cochrane Furniture Co Inc	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Lincoln
NCG180209	Regency Leather	Regency Leather	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba

Table 2E-3: NPDES Stormwater Permits in the South Fork Catawba River Watershed

Permit #	Facility Name	Owner	Permit Type	Region	County
NCG180232	RSI Home Products	RSI Home Products	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Lincoln
NCG180239	Geiger International-Hickory	Geiger International-Hickory	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180240	Thomasville Plant 9	David Stout of Furniture Brands	Furniture and Fixtures Stormwater Discharge COC	Mooresville	Catawba
NCG180242	Baker Furniture	Kohler Company	Furniture and Fixtures Stormwater Discharge COC	Asheville	Burke
NCG200334	Webb Metals	Webb Metals	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Mooresville	Gaston
NCG200452	Action A1 Recycling, Inc.	Action A1 Recycling Inc	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Mooresville	Gaston
NCG210147	Terra Mulch Products LLC	Terra Mulch Products LLC	Timber Products Stormwater Discharge COC	Mooresville	Catawba
NCG210150	Universal Forest Products Eastern Division, Inc.	Universal Forest Products Eastern Division Inc	Timber Products Stormwater Discharge COC	Mooresville	Gaston
NCG210382	Innovative Recycling Serices, Inc.	Innovative Recycling Services Inc	Timber Products Stormwater Discharge COC	Mooresville	Catawba
NCG210384	Pallet One	Pallet One	Timber Products Stormwater Discharge COC	Mooresville	Catawba
NCG210390	R-Anell Housing	R-Anell Housing Group	Timber Products Stormwater Discharge COC	Mooresville	Gaston
NCS000029	Hickory Springs Manufacturing Company - Hickory	Hickory Springs Manufacturing Company	Stormwater Discharge, Individual	Mooresville	Catawba
NCS000074	Radici Spandex Corporation	Radici Spandex Corp	Stormwater Discharge, Individual	Mooresville	Gaston
NCS000304	Ameristeel Corporation	Gerdau Ameristeel Corporation	Stormwater Discharge, Individual	Mooresville	Mecklenburg

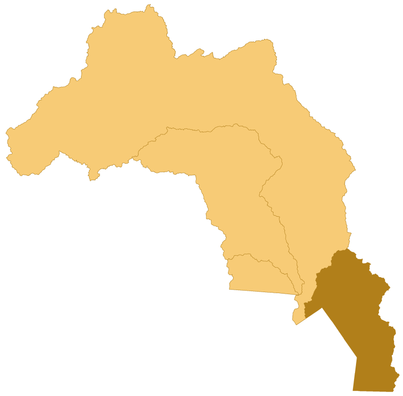
Table 2E-4: Animal Feeding Operations in the South Fork Catawba River (HUC: 03050102)

Permit Number	Facility Name	Permit Type	County	Region
AWC180010	Sunny Hill Farm	Cattle State COC	Catawba	Mooresville
AWC180012	Gladden Dairy	Cattle State COC	Catawba	Mooresville
AWC180013	Hunsucker Dairy	Cattle State COC	Catawba	Mooresville
AWC180023	Virgil Shull Dairy	Cattle State COC	Catawba	Mooresville
AWC360004	Eaker Dairy	Cattle State COC	Gaston	Mooresville
AWC360006	Proctor Dairy	Cattle State COC	Gaston	Mooresville
AWC360017	Melvin Kiser Dairy	Cattle State COC	Gaston	Mooresville
AWC550002	Gar-Mac Dairy	Cattle State COC	Lincoln	Mooresville
AWC550007	Beam Dairy	Cattle State COC	Lincoln	Mooresville
AWC550018	Treasure Chest Jerseys	Cattle State COC	Lincoln	Mooresville
AWC550021	Piedmont Jerseys	Cattle State COC	Lincoln	Mooresville
AWI360011	Dameron Dairy, Inc.	Animal Individual State	Gaston	Mooresville

CHAPTER THREE

Catawba River Subbasin

HUC 03050103



Includes Sugar Creek, Twelvelmile Creek, Cane Creek & Fishing Creek

General Subbasin Description

This eight-digit hydrologic unit code (HUC) subbasin, with an area of about 406 square miles, is the smallest eight-digit HUC in the Catawba River basin and includes DWQ subbasins 03-08-33 (the lower portion), 03-08-34 and 03-08-38 (See map in *Appendix 3-D*). Irwin, Sugar, Little Sugar, McMullen, McAlpine, Sixmile, Twelvemile, and Waxhaw Creeks begin within this subbasin and flow southwest into South Carolina.

The land cover in the subbasin is mostly developed land (52%), with some agricultural lands (31%) and little forested lands (14%) further south. The major municipal area is the City of Charlotte which covers roughly half of this HUC. This subbasin has the largest percentage of impervious surface (in which water cannot penetrate) than any other subbasin in the Catawba River basin. This can cause some unique water quality issues and is discussed further throughout the Chapter.

Despite the fact that this subbasin is the smallest in size, it has a population of only 23,000 less than the largest subbasin (03050101) according to the most recent population data from the 2000 census. Population density in the upper two-thirds of the subbasin are roughly 1,000 to 3,265 persons per square mile. The lower third ranges from four to 150 persons per square mile. See the *Population & Land Cover Section* of this chapter for additional information.

Subbasin at a Glance

Counties:

Mecklenburg and Union

Municipalities:

Charlotte, Indian Trail, Marvin, Matthews, Mineral Springs, Mint Hill, Monroe, Pineville, Stallings, Waxhaw, Weddington, and Wesley Chapel

Ecoregions:

Southern Outer Piedmont and Carolina Slate Belt

Permitted Facilities:

NPDES WWTP:................. 14
- Major 4
- Minor 10

NPDES NonDischarge: 9

Stormwater:................. 171
- General 138
- Individual 33

Animal Operations: 0

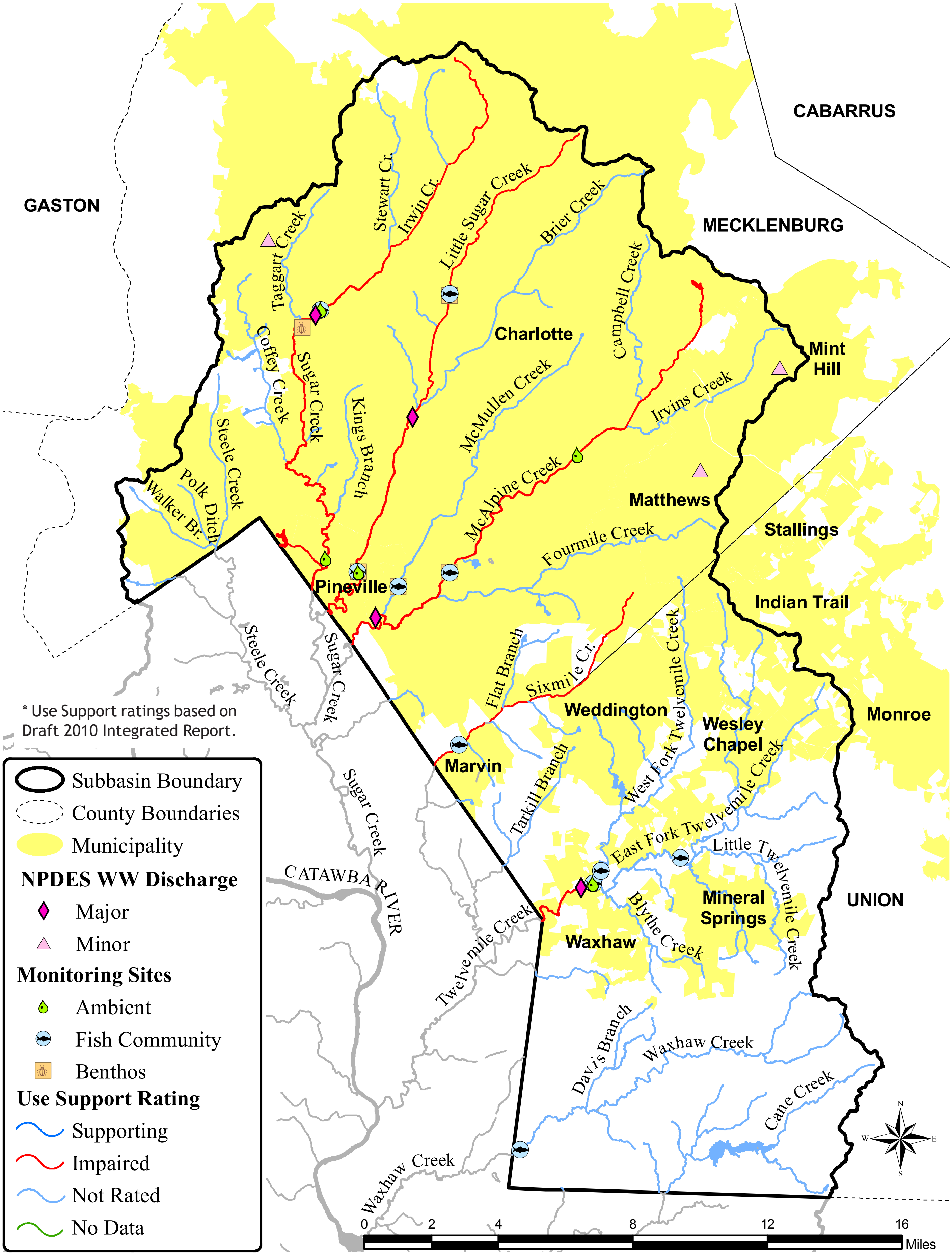
Population:

534,539

% of Impervious Surface:

14.9%

Figure 3-1: Catawba River Subbasin - 03050103



Water Quality Overview

Water quality within this subbasin is influenced by ecoregions, land use and population. Water Quality is generally greater in the lower non-developed regions than the upper portion of this subbasin near major urban centers. The major water quality issues in this subbasin originate from the effects of a densely populated area with large amounts of impervious surfaces. This subbasin had the highest levels of nutrients and fecal coliform bacteria measured within the Catawba basin. These impacts as well as high turbidity levels are common for large urban areas. The lower portion of this subbasin had high levels of turbidity due to increasing development. This portion also includes the Waxhaw Creek watershed which DWQ has recognized as one of the most biologically important aquatic habitats in the basin due to the presents of the endangered Carolina Heel splitter Mussel among other reasons.

Local governments, watershed groups, natural resource agencies and local stakeholders have been actively working throughout this subbasin to assess some of these issues and develop implementation plans to deal with these impacts. Many of these efforts are currently on-going and others have been completed and resulted in measurable water quality improvements. These topics and others are discussed in greater detail throughout this Chapter.

Biological Data

Biological samples were collected during the spring and summer months of 2004 and 2007 by DWQ-Environmental Sciences Section as part of the five year basinwide sampling cycle with exception to special studies. Overall, nine biological sampling sites were monitored within the Catawba River Watershed. Of those nine sites, two were benthic stations and seven were fish community stations. Five of those nine sites (all fish) were sampled for the first time. Each site is given a rating or bioclassification of Excellent, Good, Good-Fair, Fair, Poor or Not Rated. The Excellent, Good, Good-Fair and Not Rated are ratings given to streams which are Supporting aquatic life. Streams that are given a Fair or Poor rating are Impaired and do not support aquatic life. The ratings given for each five year sampling cycle station can be seen in Table 3-1. The last column of this table includes the results of the current cycle (2003-2007) and the results of the previous sampling cycle (1998-2002) taken.

Little Sugar Creek and Waxhaw Creek were not sampled for fish and Waxhaw Creek and McAlpine Creek were not sampled for macroinvertebrates due to low flows in 2002 and 2007. Sugar Creek at SC-160 was not sampled in 2007 due to high flows. Due to the number of new sampling sites in 2007, there is not enough data for a pie chart comparison (as seen in previous chapters).

Table 3-1: Biological Sampling Locations and Ratings for 03050103, 2002 - 2007

Station ID**	Waterbody	Assessment Unit #	Description	County	Site Location	Sample Results
BENTHOS SAMPLE SITES						
CB157	Sugar Cr.	11-137b	From SR-1156 Mecklenburg to Hwy 51	Mecklenburg	SR-1156	`07 - Fair `02 - Poor
CB146	Little Sugar Cr.	11-137-8b	From Archdale Rd to NC-51	Mecklenburg	NC-51	`07 - Fair `02 - Poor
FISH COMMUNITY SAMPLE SITES						
CF23*	Irwin Cr.	11-137-1	From source to Sugar Creek	Mecklenburg	off US-521	`04 - Poor
CF28	Little Sugar Cr.	11-137-8b	From Archdale Rd to NC-51	Mecklenburg	NC-51	`07 - Fair `99 - Good-Fair
CF39*	McAlpine Cr.	11-137-9c	From NC-51 to NC-521	Mecklenburg	NC-51	`04 - Fair
CF71*	McMullen Cr.	11-137-9-5	From source to McAlpine Creek	Mecklenburg	off NC-51	`07 - Good
CF59*	W FK Twelvemile Cr.	11-138-1	From source to Twelvemile Creek	Union	SR-1321	`07 - Good
CF60*	E FK Twelvemile Cr.	11-138-2	From source to Twelvemile Creek	Union	SR-1008	`07 - Good
CF58	Waxhaw Cr.	11-139	From source to North Carolina-South Carolina State Line	Union	SR-1103	`07 - Good `97 - Excellent

* = New station location; therefore, no data for 2002.
** = See Figure 3-1 for locations on map.

Fish Kills in the Catawba River Subbasin

Between 2003 and 2007, two fish kills were investigated within the Catawba River subbasin. Below is a brief description of each investigation. For more detailed information see *pages 76 & 77* of the 2008 Catawba Basinwide Assessment Report.

Stewarts Creek:

In July of 2007, a sanitary sewer overflow from an industrial property was responsible for a relatively small fish kill event which resulted in the mortality of about 40 sunfish. The overflow, which lasted about two or three hours, contained at least one type of dye which colored the water a purple/blue.

Little Sugar Creek:

In September 2007, ValleyCrest Landscape Development, Inc. was contracted by Carolina Medical Center (CMC) in Charlotte to clean the concrete areas around the facility. The company used a degreaser (Orange Tough 90) to power-wash the area. The degreaser continuously drained into the stormwater system for the 11 hour duration of the cleaning. The stormwater system discharged into Little Sugar Creek killing up to 15,000 fish in a 1.19 mile stretch of the creek. Enforcement action was initiated by DWQ-MRO. The landscaping company was issued an NOV/NRE and subsequently fined $8,508.22 for the release of pressure washing wastewater, a stream standard violation and a large fish kill. The penalty was paid in full on in February of 2008.

Stream Flow & Drought

The rate at which a volume of water moves through a stream (the flow rate) can have a negative impact on water quality. In particular, droughts can have major effects on water quality parameters such as dissolved oxygen, turbidity, pH, and others due to extremely low stream flow. Therefore, it is useful to track changes in stream flow over the course of the assessment period to see when drought or high flow events might be present. A significant drought affected the Catawba River Basin from March 2007 to beyond the end of the assessment period.

Figure 3-2: Flow Rates of Five USGS Gage Stations in HUC 03050103 Between 1997 & 2007

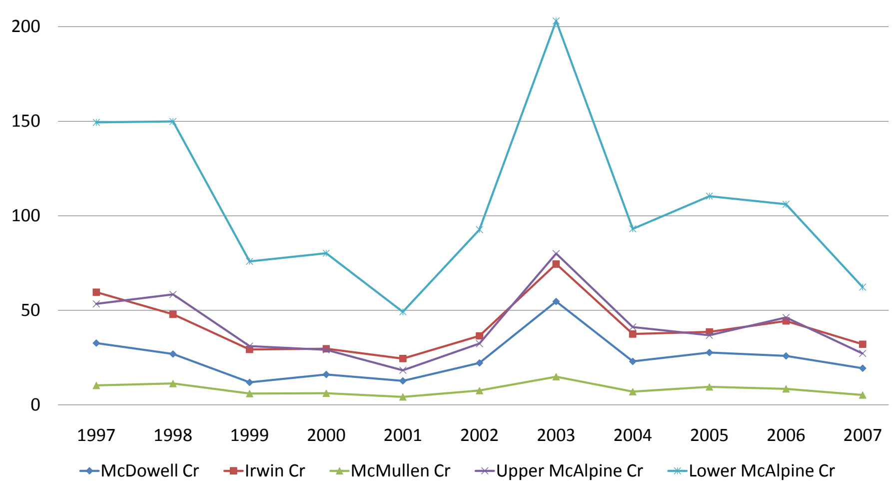


Figure 3-2 shows the yearly averages for five different USGS gage stations spread through the 03050103 HUC between 1997 and 2007. The figure also shows the drought that impacted the basin between 1999 and 2002 as well as the impact from heavy rain events in 2003 and the three hurricanes that occurred between mid 2004 to mid 2005.

Ambient Data

Chemical and physical samples are taken by DWQ throughout the basin once a month. A majority of the ambient stations are associated with waterbody locations where potential pollution could occur from known land use activities and are not random. There are also portions of the watershed where no water quality data is collected; therefore, conclusions can not be drawn on the value of water quality in those areas. Parameters collected at each site depend on the waterbody classification, but typically include conductivity, dissolved oxygen, pH, temperature, turbidity, nutrient measurements, metals, and fecal coliform bacteria. Each classification has an associated set of standards the parameters must meet in order to be considered as supporting its designated uses. For more information on waterbody classifications, see Section 2.2 of the *Supplemental Guide to North Carolina's Basinwide Planning*. Ten sample results are required within the five year data collection window in order to evaluate the water quality parameter and compare it to the water quality standards. For more information on ambient monitoring and seasonal variation in this basin, see the *Catawba River Basin Ambient Monitoring System Report*.

The ambient data is used to develop use support ratings every two years, which are then reported to the EPA via the Integrated Report (IR). The IR is a collection of all monitored waterbodies in North Carolina and their water quality ratings. The most current IR is the 2008 version and is based on data collected between 2002 and 2006. The ambient data reported in this basin plan was collected between 2004 and 2008 and will be used for the 2010 IR. If a waterbody receives an Impaired rating, it is then placed on the 303(d) Impaired Waters List. The Catawba portion of the Draft 2010 IR can be found in *Appendix 3-A* and the Final 2008 IR can be found on the *Modeling and TMDL Unit's website*.

During the current sampling cycle (January 2004 and January 2008), five Ambient Monitoring Systems (AMS) stations collected ten or more samples and were used for use support assessment (see Figure 3-1 for station locations). There were four Random Ambient Monitoring Systems (RAMS) stations sampled within the basin between 2007 and 2008, two of which were located in this subbasin and are listed at the bottom of Table 3-2.

Five of the ambient stations are rated Impaired for exceeding copper, lead, zinc, mercury and/or turbidity standards (Table 3-2). A station is rated Impaired if 10.1% of the samples collected in a given sampling cycle are over the State's standards for any given parameter. For example, if 10.3% of samples taken between 2004 and 2008 are over the 50 NTU standard for turbidity, that stream segment is then rated as Impaired and placed on the 303(d) Impaired Waters List.

Of the seven total ambient stations, none are Impacted (See Table 3-2). For the purposes of this plan, any site with 7.1% to 10.0% of samples over a parameters State standard will be considered Impacted. The term *Impacted* is not an official rating by DWQ and is used to indicate streams with potential of becoming impaired in the near future. These impacted waters are identified to allow targeting of resources to prevent further degradation.

Table 3-2: Ambient Monitoring Stations in the HUC 03050103

Station ID	Current Status	Waterbody	AU#	Location	Impaired* (by Parameter)	Impacted (by Parameter)
C8896500	Active	Irwin Cr.	11-137-1	Irwin Creek WWTP near Charlotte	Turbidity (15.3%) Copper (38.5%) Lead (23.1%) Zinc (23.1%)	---
C9050000	Active	Sugar Cr.	11-137c	NC-51 at Pineville	Copper (46.2%)	---
C9210000	Active	Little Sugar Cr.	11-137-8b	NC-51 at Pineville	Copper (30.8%)	---
C9370000	Active	McApline Cr.	11-137-9	SR-3356 Sardis Rd near Charlotte	---	---
C9819500	Active	Twelvemile Cr.	11-138	NC-16 near Waxhaw	Turbidity (13.3%) Copper (23.1%)	---
C9085000	`07-`08 RAMS	Little Sugar Cr.	11-137-8a	East Morehead St. in Charlotte	Turbidity (20.8%) Copper (33.3%) Mercury (12.5%)	---
C9620000	`07-`08 RAMS	McMullen Cr.	11-137-9-5	Park Vista Cr. in Pineville	---	---

* Data collected between 2004-2008 and will be reflected on the 2010 Draft Integrated Report. Impaired segments may be seen as category 4 or 5. For more details about the Integrated Report and category definitions see the *Methodology Chapter*.

The following discussion of ambient monitoring parameters includes graphs showing the median and mean concentration values for all ambient stations in this watershed for a specific parameter over a 12 year period (1997-2008). Each major parameter is discussed in this Section even if no current impairment exists. These graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use conditions or climate conditions can effect 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 2002 and 2007 by DWQ's Environmental Sciences Section (ESS) and can be found in the *Catawba River Basin Ambient Monitoring System Report*.

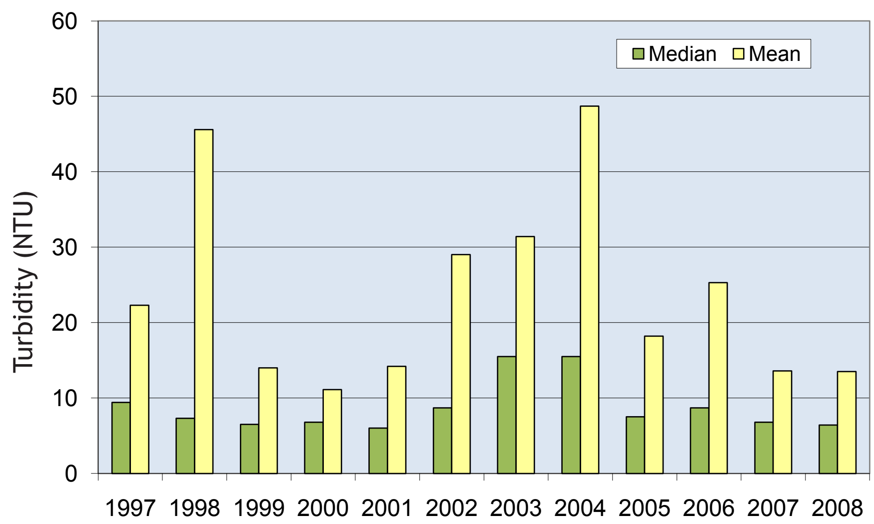
Turbidity

Turbidity is a measure of cloudiness in water and is often accompanied by excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), reduce fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can make it more difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can cause taste and odor problems, block water supply intakes, foul water treatment systems, and fill reservoirs (USEPA, 1999 and Waters, 1995).

The NC standard for turbidity in freshwater streams is 50 NTUs. As seen in Table 3-2, three stream segments are Impaired for turbidity in this subbasin. The highest percent of turbidity exceedances can be seen at site C9085000 (Little Sugar Creek) with 20.8% of samples exceeding the standard. For more specific information about this sample site, see *Sugar Creek (0305010301)* watershed discussion below.

Figure 3-3 shows the mean and median of turbidity levels for all samples taken over the course of 12 years in the Catawba River subbasin. The highest yearly averages for turbidity were recorded in 1998 and 2004. However, the highest percent of standard violations for turbidity were in 2003, 2004 and 2006 (15%, 15% and 13% respectively).

FIGURE 3-3: SUMMARIZED TURBIDITY VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050103



Soil erosion is the most common source of turbidity and sedimentation and, 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, excessive stormwater flow off impervious surfaces are all potential sources. The distribution of turbidity violations and sample locations make it difficult to isolate a single source of erosion in the Catawba River watershed. It appears, however, that violations are highest near urban areas and transitional suburban areas. This trend demonstrates the importance of *protecting and conserving stream buffers and natural areas*.

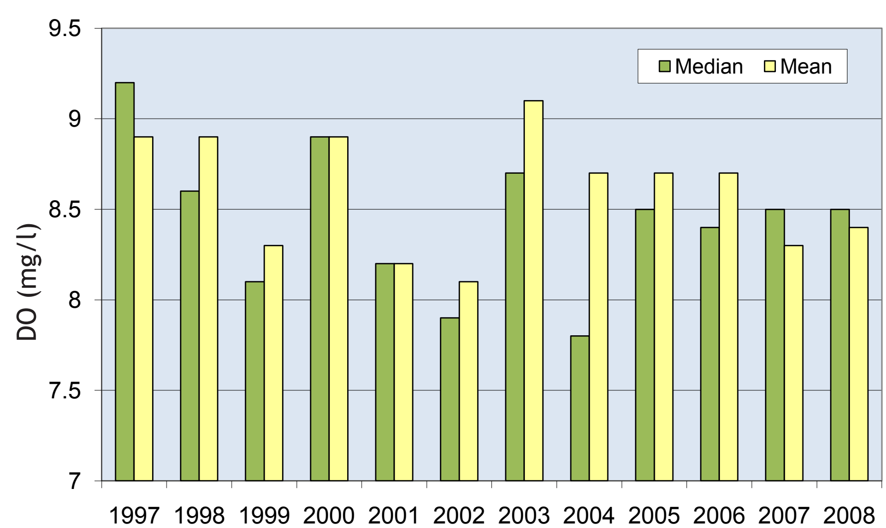
Dissolved Oxygen

Dissolved Oxygen (DO) can be produced be turbulent actions, such as waves, rapids or waterfalls that mix air into the water. High levels are found mostly in cool swift moving waters and low levels are found in warm slow moving waters. In slow moving waters, such as reservoirs and estuaries, depth is also a factor. Wind action and plants can cause these waters to have a higher dissolved oxygen concentration near the surface and decline to as low as zero at the bottom.

The NC standard for DO in freshwater is no less than a daily average of 5.0 mg/l (milligrams per liter of water) with a minimum instantaneous value of no less than 4 mg/l.

Figure 3-4 shows the mean and median of DO levels for all samples taken over the course of 12 years in the Catawba River subbasin. The lowest yearly average for DO was recorded in 2002. The highest percent of standard violations for DO occurred in 2001, 2002 and 2007 (7%, 7% and 8% respectively). Dissolved Oxygen can be strongly influenced by water temperature and drought. The low average recorded in 2002 was likely caused by drought.

FIGURE 3-4: SUMMARIZED DO VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050103



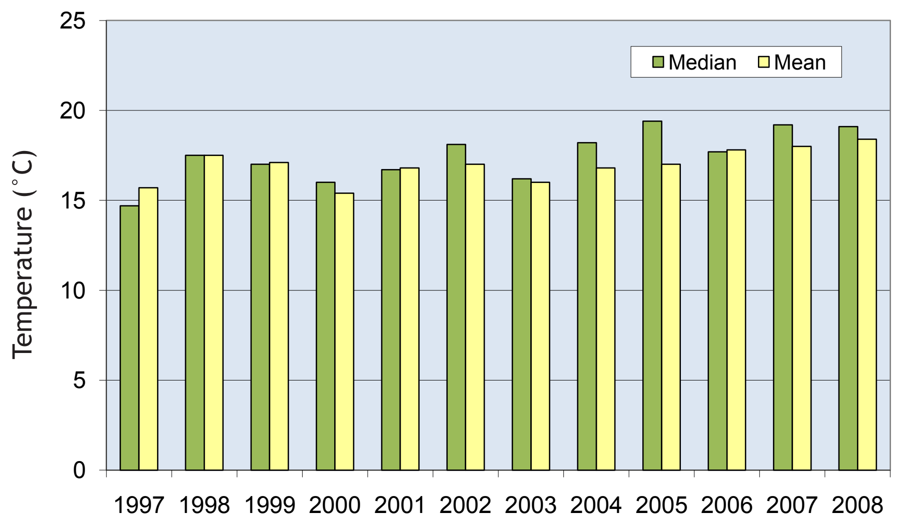
Temperature

All aquatic species require specific temperature ranges in order to be healthy and reproduce. An aquatic species becomes stressed when water temperatures exceed their preferred temperature range, and stressed fish are more susceptible to injury and disease.

NC Water quality standards state that discharge from permitted facilities in the lower piedmont/coastal plain should not exceed the natural temperature of the water by more than 2.8°C (5.04°F) and that waters should never exceed 32°C (89.6°F) for the upper piedmont area. No stations in this subbasin exceeded state standards for temperature during this sampling cycle (see Table 3-2).

Figure 3-5 shows the mean and median of temperature levels for all samples taken over the course of 12 years in the Catawba River subbasin. The highest yearly average for temperature was recorded in 2008. During this sampling cycle, there was only one sample over the temperature standard which was at station C9210000 - Little Sugar Creek.

FIGURE 3-5: SUMMARIZED TEMPERATURE VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050103



Fecal Coliform Bacteria

The presence of fecal coliform bacteria (FCB) in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other warm blooded animals and its associated pathogens or disease producing bacteria or viruses. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to this water. Fecal coliform bacteria may occur in ambient 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 5 samples have been taken in a span of 30 days. Only results from 5 samples in 30 days (5-in-30) are used to indicate whether the stream is Impaired or Supporting. Four of the AMS stations in the Catawba River subbasin recorded FCB levels above a geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of samples taken between 2004 and 2008 Table 3-3. However, since none of the stations received a 5-in-30 study during this time period, none will be Impaired for FCB on the 2008 or 2010 Impaired Waters List. For more specific information about these sample sites, see *Appendix 3-C*.

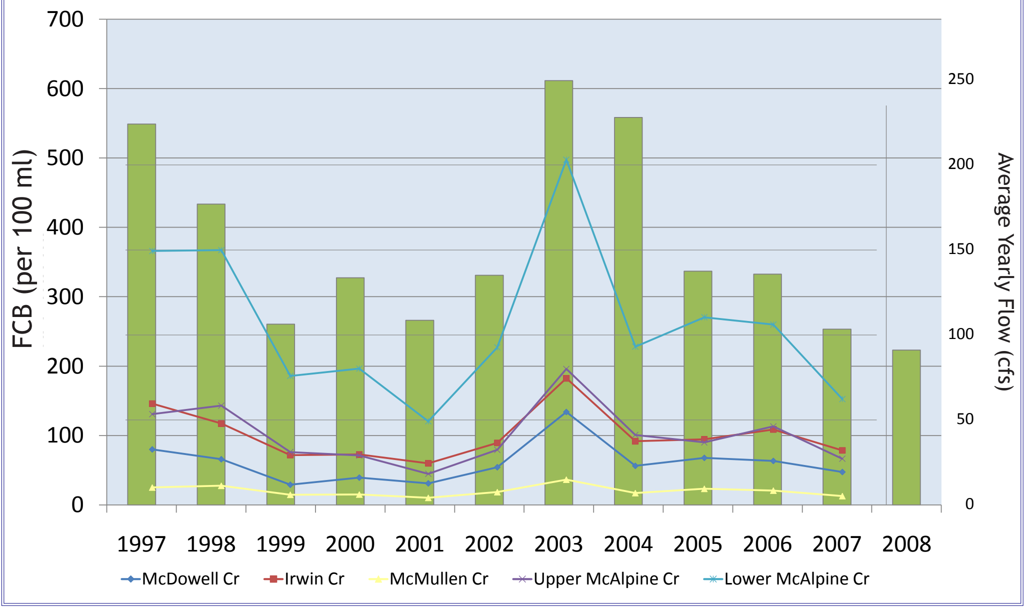
TABLE 3-3: WATERS WITH ELEVATED FCB LEVELS & WITHOUT 5-IN-30 STUDIES.

STATION ID	WATERBODY	CLASS.	AU#	LOCATION	GEOMETRIC MEAN	# OF SAMPLES ABOVE 400 COLONIES/100ML	% OF SAMPLES ABOVE 400 COLONIES/100ML
C8896500	Irwin Cr.	C	11-137-1	Irwin Creek WWTP near Charlotte	328	22 out of 58	38%
C9050000	Sugar Cr.	C	11-137c	NC-51 at Pineville	376	21 out of 58	36%
C9210000	Little Sugar Cr.	C	11-137-8b	NC-51 at Pineville	347	24 out of 58	41%
C9370000	McApline Cr.	C	11-137-9	SR-3356 Sardis Rd near Charlotte	373	23 out of 60	38%

Figure 3-6 shows the geometric mean of FCB levels for all samples taken over the course of 12 years in the Catawba River subbasin. The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers.

The highest yearly geometric mean for FCB was recorded in 2003. This figure also includes the yearly average stream flow, as seen in Figure 3-2, to show how flow can be closely linked to FCB levels.

Figure 3-6: Summarized Fecal Coliform Bacteria Values for All Data Collected at Ambient Sampling Stations in HUC 03050103 with Overlaying Flow



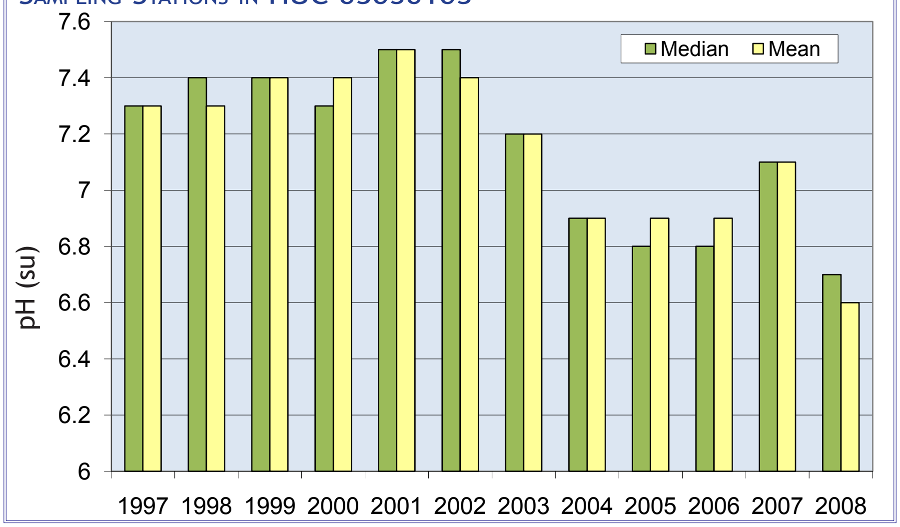
pH

pH is a measure of hydrogen ion concentration that is used to express whether a solution is acidic or alkaline (basic). Lower values can have chronic effects on the community structure of macroinvertebrates, fish and phytoplankton. Changes in the pH of surface waters occur primarily through point source discharges and natural fluctuations. Changes can also occur during accidental spills, acid deposition (i.e.; rain, snow) and algal blooms.

The water quality standards for pH in surface freshwater is 6.0 to 9.0su. As seen in Table 3-2, no stations had pH standard violations during this sampling cycle.

Figure 3-7 shows the mean and median of pH levels for all samples taken over the course of 12 years in the Catawba River subbasin. The lowest pH yearly average recorded and the year with the most standard violations was 2008. The overall basin trend during this 12 year period is a significant decline in pH levels. In this subbasin, yearly averages dropped from mid 7's to high 6's starting around 2003. For a more detailed discussion of what may be causing this trend basinwide, see the *Basin Overview Chapter.*

Figure 3-7: Summarized pH Values for All Data Collected at Ambient Sampling Stations in HUC 03050103



10-Digit HUC Watershed Breakdown

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 10-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 subbasin can be seen in Figure 3-1, and a Use Support list of all monitored waters in this basin can be found in *Appendix 3-A*. Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories and then by 12-digit subwatersheds. The three designations are described below. These designations do not indicate the Use Support rating (Supporting, Impaired or No Data) for a waterbody. The Use Support rating can be found at the top of the *Use Support and monitoring box* (Figure 3-9)which is provided for each waterbody to the right of the waterbody discussion, as described below.

Hydrologic Unit Codes (HUC):

DWQ has recently made a change from the State designated subbasin lines (e.g., 03-08-30) to the nationally recognized HUC lines. This Plan is organized by HUCs to provide, not only a detailed look at a particular waterbody, but also how that waterbody fits into the larger watershed picture. Table 3-4 provides a brief description of the different HUC sizes and names. There are three 8-digit subbasins within the Catawba River Basin (03050101, 03050102 & 03050103). Due to the large size of these 8-digit subbasins, each chapter is broken down even further into 10-digit watersheds for a more local water quality analysis. Within each 10-digit watershed section of the Chapter, waterbodies are grouped by 12-digit subwatershed to better identify specific stressors and sources. A comparison map of the State designated subbasin lines used in the past verses the new nationally recognized HUC lines is included in *Chapter 11*.

Table 3-4: HUC Quick Reference

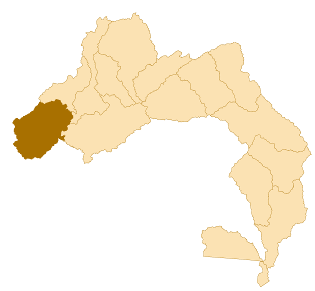
HUC Digit	HUC Name	Average Size[1]
2-digit	Region	177,560
4-digit	Subregion	16,800
6-digit	Basin	10,596
8-digit	Subbasin	700
10-digit	Watershed	227
12-digit	Subwatershed	40

[1] In approximate square miles

The 10-Digit Watershed Map:

At the beginning of each 10-digit watershed section is a small reference map as seen in Figure 3-8. **These maps are also a hyperlink to a full page detailed map of that particular watershed**. Click on the map to view the full page map, then when you wish to return back to the text, click the inset map on the full page map. If you are viewing a hardcopy version of this Plan, these maps can be found at the end of this chapter or in *Appendix 3-D*. **Interactive elements** have been incorporated within all 10-digit watershed maps. To use the new features click on the *Layers* tab on the left side of the Adobe Reader window. Expand the folder tree by clicking on the (+) sign to the left of the map name. Each item in the subsequent folder tree is a layer on the map. These layers can be turned on or off by clicking the symbol to the left of the layer name. This allows you to view all layers or select only layers of interest and decrease the amount of symbols and labels for a cleaner look. Reminder: to return to your previous place within the text, just click the smaller map in the upper left hand corner of the 10-digit watershed map.

Figure 3-8: Example of the 10-Digit HUC Map



Restoration Opportunities, Protection Priorities & Success Stories:

Within each 10-digit watershed section, waterbodies are grouped by a designation of Restoration Opportunities, Protection Priorities or Success Stories. This grouping is used to provide a better understanding of what types of actions, if any, need to be taken for a particular body of water based on known water quality information.

Restoration Opportunities:

The term *Restoration Opportunities* refers to waters which are degraded and are in need of restoration to return the water quality back to natural conditions. This designation is given to not only waters already on the Impaired Waters List, but also waters that are predicted to be on the Impaired Waters List in the future if no restoration action is taken. Impacted waters, as defined by the DWQ Planning Section (see Acronyms & Definitions), are often included in this group. Restoration efforts may include development and implementation of a watershed restoration plan, installation of appropriate best management practices (BMPs), implementation of local ordinances, educational efforts and/or extending monitoring efforts among many others.

Protection Priorities:

The term *Protection Priorities* refers to waters which are in need of protection to keep it from becoming impacted or Impaired in the future. This includes waters that are currently supporting aquatic life, but are within watersheds that have recently undergone a land use change or other changes that may have a negative impact on water quality in that stream. This designation is given to assist DWQ and other water quality agencies in being more proactive about protecting water quality and minimize stream degradation. Protection efforts may include among others, finding the sources of degradation, educating local communities of water quality concerns, developing and implementing an action plan and developing a local ordinance that requires environmentally sound development and land use changes. Protecting these waterbodies not only ensures continued stability of aquatic life and associated habitat, but also saves local, state and federal agencies from a costly and time consuming restoration effort after the waterbody has become Impaired.

Success Stories:

The term *Success Stories* refers to waters that have shown long term improvement for a known reason. This includes improvements on all levels, whether it's a stream that has been removed from the Impaired Waters List or that a source of pollution, which may have been negatively impacting the stream, has been removed or no longer has an impact. However, not all streams that have been removed from the Impaired Waters List are listed in this Plan as a success due to the fact that the reasons for some improvements are not known and may be due to temporary changes in the watershed. This designation is also used to discuss streams that have undergone restoration or protection efforts that have resulted in measured water quality improvements or are expected to in the near future. Not all efforts show instantaneous results and may be designed for gradual long term improvement. However, those efforts should be recognized to increase awareness of what other water quality groups and agencies are doing and to promote cooperation among those groups and agencies with the same goal.

Assessment Unit Numbers [AU#]:

Each waterbody throughout the state is given one or more assessment unit (AU) number(s). These identification numbers are assigned to a particular stream or portion of a stream for many reasons. One of those reasons is to reduce confusion when different streams have the same name. For example, there are five different streams in different parts of the Catawba River Basin named Big Branch. Another reason is to identify a particular segment of a stream. A longer stream may be split into multiple segments to provide more accurate assessments, classifications and reporting of a particular portion of that stream.

These AU numbers are indicated at the beginning of each new waterbody discussion following the stream name in [brackets]. If multiple segments of a stream are included in that discussion, each AU# will be listed. To reduce space, some AU numbers may be abbreviated. For example, the North Fork Catawba River is split into four segments, 11-24-(1), 11-24-(2.5)a, 11-24-(2.5)b, and 11-24-(13). This is then abbreviated to 11-24-(1), (2.5)a, (2.5)b & (13) where the common numbers are removed from the first part of the AU.

Use Support & Monitoring Box:

To reduce confusion and provide a quick reference, each waterbody discussed in the Restoration Opportunities and Protection Priorities sections have a corresponding Use Support and Monitoring Box (Figure 3-9). The top row indicates the draft 2010 Use Support and the length of that stream or stream segment. The next two rows indicate the <u>overall</u> Integrated Report category which further defines the Use Support for both the 2008 and the draft 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 Figure 3-9 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.

FIGURE 3-9: 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%

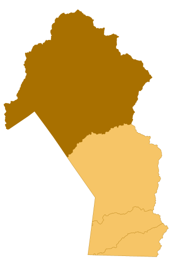
Please note any fecal coliform bacteria (FCB) listing in the last row (as seen in Figure 3-9) only indicates elevated levels and a study of five samples in 30 days (5-in-30) must be conducted before a stream becomes Impaired for FCB.

Table 3-5: Waterbodies & the Section(s) Where Discussed Within This Subbasin Chapter

Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/Success[2]
Irwin Cr	11-137-1	0305010301	5	Restoration
Little Sugar Cr	11-137-8a, b, & c	0305010301	5	Restoration
Sugar Cr	11-137a, b, & c	0305010301	5	Restoration
McCullough Br	11-137-7	0305010301	5	Restoration
McAlpine Cr	11-137-9a, b, c, & d	0305010301	5	Restoration
Sixmile Cr	11-138-3	0305010302	5	Restoration
Twelvemile Cr	11-138	0305010302	5	Restoration
Waxhaw Cr	11-139	0305010303	2	Protection

1. The Integrated Report category noted in this table refers to the category given on the DRAFT 2010 Report.
2. Waters monitored in the Catawba River basin are given a designation of Restoration Opportunities, Protection Priorities or Success Stories within this Plan to provide a broad indication of current water quality. For more information on these designations see *Understanding This Section*.

Sugar Creek (0305010301)



Restoration Opportunities

Irwin Creek (030501030101)

Irwin Creek [AU: 11-137-1]:

Irwin Creek is approximately 12 miles long beginning north of I-85 and flows along I-77 through downtown Charlotte before becoming Sugar Creek [AU: 11-137a]. The full length of the creek drains dense residential urban areas as well as industrial parks upstream. This creek was last sampled in 2004 and received a Poor fish community rating. A Poor benthic rating was given in 1992. In 2004, biologist noted elevated conductivity levels, which is typical of urban streams. The fish sample site had the fewest species of any fish community site in the entire basin. An Ambient Monitoring System (AMS) station is located about 1,300 feet upstream from the Irwin Creek WWTP (NC0024945). As seen in the table to the right, between 2004 and 2008, five physical/chemical parameters were elevated. This creek is Impaired for exceeding copper, lead, zinc, and turbidity standards as well as for receiving a Poor fish community rating.

Use Support: Impaired (12 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF23)	Poor (2004)
AMS (C8896500)	Copper - 39% Lead - 23% Turbidity - 15% Zinc - 23% FCB - 38%

The excess lead levels are thought to have originated from a point source discharger (Willard Industries) that is no longer in operation. Conductivity levels in the creek have experienced a very slight downward trend since the facility closed indicating it had a definite impact on the creek but may not be the only source. Scattered throughout this subwatershed are industrial transportation facilities (e.g., trucking, freight, railways and automotive industries) which are known to produce toxic metal-laden stormwater runoff, and could be another source of lead, copper and zinc contamination.

The Charlotte Mecklenburg Utility Department's (CMUD) Irwin Creek WWTP (NC0024945) is located just downstream of the AMS site. Even though this facility was not contributing to the AMS parameter violations discussed above, the effluent levels reported by the facility between 2004 and 2008 indicates that it was a small contributing factor to the FCB levels within the creek. Recent upgrades to the facility greatly reduced the level and occurrence of these FCB violations. This WWTP is included in the phosphorus load reduction strategy discussed below.

Irwin Creek is included in a fecal coliform bacteria TMDL discussed below in *Watershed TMDL's & Strategies*.

Little Sugar Creek (030501030102)

Little Sugar Creek [AUs: 11-137-8a, b & c]:

USE SUPPORT: IMPAIRED (20 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB146)	Fair (2007)
Fish Com (CF70) (CF28)	Poor (2007) Fair (2007)
AMS (C9210000)	Copper - 31% FCB - 41%
RAMS (C9085000)	Turbidity - 21% Copper - 33% Mercury - 13%

Little Sugar Creek is approximately 20 miles long and is split into three segments. The full length of the creek drains dense residential urban areas as well as industrial parks upstream. Little Sugar Creek was sampled in 2007 for fish and benthic communities. The low biological ratings which it received are not uncommon in a highly urban and densely populated area.

A Random Ambient Monitoring System (RAMS) station was placed on Little Sugar Creek (East Morehead Street). The fish community site, mentioned above, was placed at this same location to provide additional data about the RAMS location. RAMS stations are monitored for two years and are located based on a probabilistic approach, not based on any known concerns in the subwatershed. The parameters sampled at the RAMS sites do not match the normal parameters of at AMS sites. Roughly nine miles downstream of this RAMS site, the permanent AMS site which is located at NC-51. Two physical/chemical parameters were elevated, copper and FCB.

The differences between the two stations seem to indicate that the turbidity source is contained within the headwaters of the creek and the sources of copper are spread throughout the subwatershed. These elevated parameters at the RAMS site are most likely originating from industrial areas in the headwaters. The mercury samples taken at the RAMS and the AMS sites are not comparable due to differing methods; therefore, it is unknown if these levels are also being seen downstream. Mercury trapped in the sediment years ago may have been recently stirred up by construction activities just upstream of this site. The CMU Sugar Creek WWTP (NC0024937) may have been a contributing factor to the high FCB levels sampled at the AMS site between 2004 and 2008. However, no permit violations have been reported recently indicating the facility has address this problem. This WWTP is included in the phosphorus load reduction strategy discussed below. This creek is Impaired for exceeding copper, mercury and turbidity standards as well as biological integrity of fish and benthic communities.

This subwatershed is included in the same FCB TMDL as Irwin Creek. This TMDL and its implementation plans are discussed in more detail *below*.

Upper Sugar Creek (030501030103)

Sugar Creek [AUs: 11-137a, b & c]:

USE SUPPORT: IMPAIRED (14 MI)	
2008 IR Cat.	5
2010 IR Cat.	5
Benthos (CB157)	Fair (2007)
AMS (C9050000)	Copper - 46% FCB - 36%

Sugar Creek is approximately 14 miles long and is split into three segments. The subwatershed drains highly populated urban areas. The majority of the creek's length is in AU: 11-137b (10 miles) which was sampled in 2007 for benthos and 1999 for fish community (Poor). The last segment [AU: 11-137c] includes an AMS site which is showing elevated copper and FCB levels between 2004 and 2008. A portion of the copper is flowing downstream from Irwin Creek; however, there is evidence of a copper source within this subwatershed as well. This creek is Impaired for exceeding copper standards as well as biological integrity of the benthic community.

This subwatershed is included in the same FCB TMDLs as Irwin Creek. This TMDL and its implementation plan are discussed in more detail below. Sugar Creek is also included in the phosphorus load reduction strategy discussed below in *Watershed TMDL's & Strategies*.

McCullough Branch [AU: 11-137-7]:

USE SUPPORT: IMPAIRED (3 MI)	
2008 IR Cat.	5
2010 IR Cat.	5

McCullough Branch is a three mile creek that drains into Sugar Creek less than a mile upstream of South Carolina (SC). The stream receives runoff from Martin Marietta Aggregates quarry as well as a 6,619 acre agricultural property which has recently been cleared for residential development. This creek was last monitored in 1990 and received a Poor benthic (CB154) rating. DWQ will work with local DLR to ensure the development is adhering to all necessary sediment and erosion control measures. DWQ will monitor this stream during the next sampling cycle to determine if it should remain on the Impaired Waters list.

McAlpine Creek (030501030107)

Use Support: Impaired (20 mi)	
2008 IR Cat.	4a/4s
2010 IR Cat.	4s/4t
Fish Com (CF39)	Fair (2004)
AMS (C9370000)	FCB - 38%

McAlpine Creek [AUs: 11-137-9a, b, c & d]:
McAlpine Creek has a total length of about 20 miles and drains the southern portion of Charlotte which is a dense residential urban area. In 2002, a benthic sample resulted in a Fair rating. A fish community sample taken in 2004 was the only biological sampling done during this cycle. At that time, there was severe bank erosion, side undercuts and deep entrenchment. The only physical/chemical parameter with elevated levels was FCB. This creek is Impaired for biological integrity and has been placed in the IR category four due to an approved FCB TMDL.

This subwatershed is included in the same FCB TMDL as Irwin Creek. This TMDL and its implementation are discussed in more detail *below*. CMU's McAlpine Creek WWTP (NC0024970) is also included in the phosphorus load reduction strategy discussed *below*.

Watershed TMDLs & Strategies

Turbidity TMDL:

A *TMDL* was approved in February of 2005 to address the turbidity exceedances in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork and Mud Creek. However during the TMDL study window (1997-2004), the only creek exceeding the turbidity standard was Long Creek which is located in the headwaters subbasin (03050101). Therefore, this turbidity TMDL only covers Long Creek.

During the current data (2004-2008) window, ambient monitoring showed that Irwin Creek is once again exceeding the turbidity standard along with Long Creek. The majority of these exceedances for Irwin Creek occurred between 2003 and 2006. During that time period there were three hurricanes and one tropical storm which greatly increased the amount of sediment entering the streams. The City of Charlotte has adopted ordinances and other measures to protect the streams against further sedimentation.

Fecal Coliform Bacteria (FCB) TMDL:

In February of 2002, a *Fecal Coliform Bacteria TMDL* for the Irwin, McAlpine, Little Sugar and Sugar Creek Watersheds was approved by the EPA. This TMDL was developed through a stakeholder process which involved state and local agencies, Sierra Club, Catawba RiverKeeper and SCDHEC. Using data from 1999, the TMDL calls for individual total reductions from each watershed and is broken out by sources in Table 3-6. Beginning February 2005, the Charlotte-Mecklenburg Stormwater Services entered into a federal grant to develop the Mecklenburg County Surface Water Improvement and Management Program (SWIM). This program was formed to address implementation of a Watershed Plan developed by the stakeholder group to address this TMDL, among other water quality improvement efforts. This is discussed in more detail below.

Table 3-6: In-Stream FCB Load Reductions as Set in TMDL

Sources	Reductions (by watershed)				
	Irwin	McAlpine[1]	McAlpine[2]	Little Sugar	Sugar
Point Sources					
WWTP	3.6%	64%	0%	16.7%	7.2%
Sanitary Sewer Overflows	86.7%	78.2%	32.6%	53.2%	75.7%
Nonpoint Sources					
Wildlife	0%	0%	0%	0%	0%
Failing Septic Systems	60%	38.1%	50.7%	60%	61.7%
Dry Weather Flow from Storm Drain Systems	60%	39.7%	53.8%	60%	61.7%
Sewer Exfiltration	91.3%	89.1%	87.7%	88.7%	91.6%
All Sources	**58.9%**	**65.8%**	**52.1%**	**40.9%**	**59.2%**

[1] Downstream of Sardis Road; [2] Upstream of Sardis Road

Current Status of FCB levels:
Five compliance points were listed in this TMDL and can be seen as AMS sites C8896500 (Irwin Creek), C9050000 (Sugar Creek), C9210000 (Little Sugar Creek), C9370000 (McAlpine Creek) and C9680000 (McAlpine Creek) on the watershed map. These sites have been sampled monthly by DWQ for FCB as are most ambient monitoring stations. Figure 3-10 below displays each FCB sample taken by DWQ between 1997 and 2008 for each of these sites. The orange line in this figure represents 400 colonies per 100 ml. Table 3-7 compares the percent of samples taken which were over 400 colonies per 100 ml for the 2004 cycle (data window: 1997-2002) and the 2008 cycle (data window: 2004-2008). The table indicates that Irwin Creek and the upper McAlpine Creek sites resulted in fewer

Table 3-7: Site FCB Comparison of Previous & Current Cycle Samples

AMS #	2002 %>400	2008 %>400
C8896500	49%	38%
C9050000	36%	36%
C9210000	29%	41%
C9370000	41%	38%
C9680000	26%	28%

samples over 400 colonies/100 ml; however, samples taken at Little Sugar Creek and the lower McAlpine Creek sites are increasing in FCB levels. Even though these sample locations are still not meeting the 400 colonies/100 ml standard, actions have been taken to locate sources and correct the problem. It is critical that implementation of the TMDL Watershed Plan continue until the FCB levels drop below the standard.

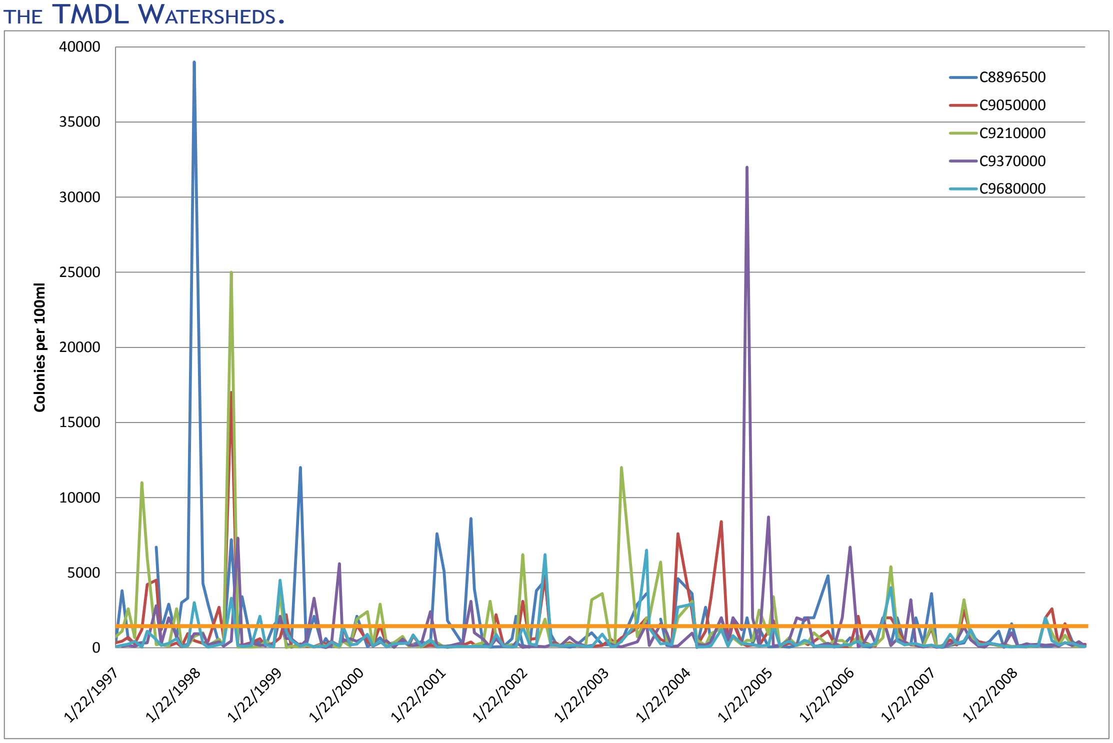
Implementation of TMDL Watershed Plan:

A 319 Federal Grant ($49,590) was awarded to Charlotte-Mecklenburg Stormwater Services (CMSWS) to begin Implementation of the TMDL Watershed Plan. The final report also listed the accomplishments CMSWS was able to make during the contract period (January 2005 - November 2007). These accomplishments include the following...

- The majority of effluent samples at the three WWTPs met the source reduction targets set within the Watershed Plan;
- Fecal coliform loading from SSOs only exceeded the source reduction targets for the watersheds on one occasion which lasted for 26 days on Little Sugar Creek;
- The number and duration of SSOs met targets but only within the Sugar Creek Watershed;
- Stream walks to help identify problem areas which led to the location and elimination of 72 failing septic systems within the TMDL watersheds and source reduction targets being met for Upper and Lower McAlpine Creek watersheds;
- Conducted ambient monitoring and 5-in-30 monitoring through the duration of the grant term; and
- Educational effort to advise the public of the TMDL and what it meant.

The results of these efforts are beginning to show signs of fecal reductions as seen in the figure above around mid 2007. Efforts to locate and eliminate sources of excess fecal coliform levels should be continued until the source reduction targets are met. DWQ will continue to assist local agencies in this effort as requested.

Figure 3-10: FCB Values Between 1997-2008 For Each Compliance Point* (AMS) Within the TMDL Watersheds.



***Compliance Point (AMS) Locations:**

- **C8896500** - Irwin Creek @ Irwin Creek WWTP
- **C9050000** - Sugar Creek @ NC-51, Pineville
- **C9210000** - Little Sugar Creek @ NC-51, Pineville
- **C9370000** - McAlpine Creek @ Sardis Rd.
- **C9680000** - McAlpine Creek in SC near Camp Cox

Phosphorus Load Reduction Strategy:

In the summer of 2001, the South Carolina Department of Health and Environmental Control (SCDHEC) filed a Petition for a Contested Case in the North Carolina Office of Administrative Hearings regarding the renewal of the Charlotte Mecklenburg Utilities Department (CMUD) McAlpine Creek WWTP. The primary complaint on the part of SCDHEC was that the permit was renewed without a phosphorus limit. Nearly all of South Carolina's municipal dischargers to the mainstem Catawba River (upstream of Lake Wateree) have been given phosphorus limits, generally equivalent to 1 mg/l. The McAlpine Creek WWTP permit had a phosphorus optimization study special condition that stipulated preparatory requirements for the facility to ready itself for the upcoming phosphorus TMDL.

In January 2002, SCDHEC, DWQ and CMUD reached an agreement on the terms of the phosphorus limits at the McAlpine treatment plant and expanded the permitting strategy to include the WWTPs on Sugar and Irwin Creeks. The final settlement agreement includes three main points as follows.

- A Bubble Limit: this refers to a mass limit for total phosphorous that applies to discharge at the three CMUD plants (McAlpine, Sugar and Irwin Creeks) *combined*. The bubble limit, as calculated by a 12-month rolling average, is 826 lbs/day of total phosphorous from all three plants. This corresponds to a 1 mg/l phosphorous limit at permitted discharge for the three plants.
- A Mass Cap: SCHEC requested that monthly mass caps also be included. The mass caps at the three plants take the form of a monthly average mass limit and correspond to a concentration limit of 2 mg/l at maximum permitted flow. At McAlpine Creek, this limit is 1,067 lbs/day of total phosphorous which began February of 2006. In addition, Irwin, Sugar and McAlpine combined must meet a 12-month rolling average of 823 lbs/day.
- Inclusion of a TMDL: SC has advised NC that a phosphorous TMDL will be developed. The settlement agreement states that NC and all parties that may be effected by the implementation of said TMDL must have the opportunity to be involved in the process of developing the TMDL. As of April 2010, the development of the TMDL has not started.

Separate from the settling agreement between the two states, an agreement was made to establish total phosphorous limits on the Twelvemile Creek WWTP in Union County. The facility has a mass limit equivalent to 1 mg/l at the permitted flow. As with the CMUD facilities, the limit will be judged on a rolling annual average.

At the end of 2009, the compliance evaluation indicated that all three CMUD facilities are in compliance and the Twelvemile Creek facility has been in compliance since mid 2007. The Union County facility had multiple violations between 2006 and mid 2007; however, the facility was undergoing construction upgrades and proper enforcement action was taken.

Watershed Recommendations & Action Plans

The City of Charlotte and Mecklenburg County have been working with DWQ for the past several years to find the most efficient and effective ways to protect water quality against urban and point source impacts. DWQ supports the city and county's watershed protection actions and will continue to assist local governments in finding ways to further reduce FCB and phosphorus levels within these streams. For more information on the *Charlotte/Mecklenburg water quality programs* see their website.

Twelvemile Creek (0305010302)

Restoration Opportunities

Sixmile Creek (030501030203)

Use Support: Impaired (9 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF52)	Fair (2002)

Sixmile Creek [AU: 11-138-3]:

Sixmile Creek flows roughly nine miles southwest mostly along the Mecklenburg/Union county boundaries. The land use in this drainage area is mostly dense residential area. This stream was sampled for fish community health in 2002 and received a Fair rating. It was not sampled during this cycle due to low stream flows. Since the 1999 plan, all NPDES point source dischargers have been removed from the creek. Sixmile Creek had the highest conductivity rating of any stream in the basin during the 2002 sampling cycle. It was also noted that cattle had full access to the stream. These two points and the natural low flow of this stream indicate its sensitivity to nonpoint source runoff. Both Mecklenburg and Union counties have made efforts to establish buffer zones around the creek. DWQ will re-sample this site during the next sampling cycle to determine if restoration efforts in this stream have improved the biological health.

Twelvemile Creek (030501030204)

Twelvemile Creek [AU: 11-138]:
The East and West Forks of Twelvemile Creek merge just upstream of NC-16 to create Twelvemile Creek. The creek is about three miles long and flows southwest from Union County into SC. The land use within the creek, as well as in the East and West Forks, includes agricultural lands that are being converted into densely populated residential areas. Much of this subwatershed is currently being developed. The last biological sampling done here was in 2002 when the creek received a Fair fish community rating. The AMS site is located just upstream of Union County's Twelvemile WWTP. Of the samples collected between 2004 and 2008, low dissolved oxygen was noted as a stressor but instantaneous readings exceeded the standard in only 6.7% of samples. Therefore, the creek will only be on the Impaired Waters list for copper, turbidity and biological integrity.

Use Support: Impaired (3 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF55)	Fair (2002)
AMS (C9819500)	Copper - 23% Turbidity - 13%

The turbidity violations recorded at this AMS site are not a new occurrence; however, recent use assessment methodology changes enable streams to be listed for individual parameters. Between 1997 and 2002, turbidity values exceeded the standard in 12.7% of the samples.

About a half mile downstream from the confluence of East and West Twelvemile Creeks is Union County's Twelve Mile Creek WWTP (NC0085359). This facility has received NPDES permit violations for BOD, FCB, discharge flow, nitrogen, phosphorus and TSS. The facility completed upgrades to address the majority of these issues and was back in compliance by late 2005 with the exception of FCB. There have been numerous FCB violations since 2003; however, the facility has only had four violations since 2007 and are working on necessary improvements to meet FCB limits.

Fishing Creek Reservoir - Catawba River (0305010306)

Protection Priorities

Waxhaw Creek (030501030603)

Waxhaw Creek [AU: 11-139]:
Waxhaw Creek flows approximately 16 miles southwest from across the lower portion of the basin. It is the only stream in the Catawba River basin that supports populations of the federally endangered Carolina Heelsplitter Mussel. The fish community sampled during this cycle received a Good rating. DWQ will sample the benthic community (CB251) again during the next sampling cycle to determine if it has changed from its 1992 rating of Good-Fair. DWQ has recognized this watershed as one of the most biologically important aquatic habitats in the basin and therefore should be a high protection priority.

Use Support: Supporting (16 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Fish Com (CF58)	Good (2007)

Subbasin Recommendations & Action Plans

Update of 7Q10 Flows in NPDES Permits

It is important that 7Q10 flow values be updated to include changing climatic conditions and water withdrawals that impact stream flow conditions. All NPDES permitted facilities use 7Q10's as critical flow in determining permit limits for toxicants. These critical flow values used to determine permit limits for all NPDES facilities may need to be reviewed as the permits come up for renewal. Currently, a 7Q10 is only evaluated in the initial application of the permit and upon expansion. Low flow conditions induced by drought impacts the health of aquatic life as demonstrated in this basin for roughly seven years between 1997 and 2007 (see Figure 3-2: stream flow graph). Droughts as well as the demand on water resources are very likely to increase; therefore, the reevaluation of stream flow will become more critical to water quality within the next decade or so. DWQ will work with DWR and other agencies to discuss the need and resource availability to update 7Q10 values.

Point Source Contributors

National Pollutant Discharge Elimination System Permit Program

The National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, as authorized by the Clean Water Act. Non-compliance with permit limits on wastewater flow and constituents can lead to discharge of pollutants that degrade surface waters making them unsafe for drinking, fishing, swimming, and other activities. The NPDES Permitting and Compliance Programs of North Carolina's DWQ are responsible for administering the program for the state. These permits are reviewed and are potentially renewed every 5 years, a list and map of NPDES permits can be found in *Appendix 3-E & 3-D*, respectively.

There are a total of 14 NPDES Dischargers within this subbasin. Four of those are Major Dischargers which means the facility discharges greater than one million gallons of wastewater a day (1 MGD). Ten of the facilities are Minor facilities which discharge less than 1 MGD. The Major facilities discharge mainly to the Catawba River and Irwin, Little Sugar, Sugar, McAlpine and Twelvemile Creeks. If a facility is impacting water quality or has made improvements to minimize the impact of their waste load, it is discussed in the 10 Digit HUC watershed sections.

Implementation of New Water Quality Standard for Total Residual Chlorine:

On April 1, 2003, a new aquatic life surface water quality standard for total residual chlorine (TRC) became effective in North Carolina. Previously, TRC had been a freshwater Action Level standard, except in designated Trout waters where the aquatic life standard of 17 ug/l was implemented as a permit limit. The new standard removes the Action Level status and sets the new instream standard for TRC for all freshwater streams at 17 μg/L including those classified as Tr. After April 1, 2003, as existing permits were renewed and new permits issued, TRC limits were included in the permits. Facilities that do not use chlorine for disinfection did not receive TRC limits; however, the presence of a chlorine back-up system to augment Ultraviolet (UV) and other disinfection treatments resulted in a TRC permit limit. Facilities that discharge to streams with a 7Q10 flow <0.05 cfs (considered zero-flow streams) received a limit of 17 μg/L. TRC permit limits are capped at 28 μg/L in freshwater discharges to protect against acute impacts.

Facilities were given 18 months to add dechlorination or other means of disinfection to become compliant with the new standard. The 18 month period for most facilities in the Catawba River basin fell between 2004 and 2007, depending on when the permit was renewed. All facilities in the Catawba basin are beyond this 18 month period. It should be noted that meeting the new TRC limits has been difficult for some facilities; however, DWQ has been working with all facilities to assist with compliance.

Special Order by Consent (SOC):

Special Order by Consent may be an appropriate course of action if a facility is unable to consistently comply with the terms, conditions, or limitations in an NPDES Permit. However, SOCs can only be issued if the reasons causing the non compliance are not operational in nature (i.e., they must be tangible problems with plant design or infrastructure). Should a facility and the Environmental Management Commission enter into an SOC, limits set for particular parameters under the NPDES Permit may be relaxed, but only for a time determined to be reasonable for making necessary improvements to the facility.

Pretreatment

The Federal and State Pretreatment Program gives regulatory authority for EPA, States, and Municipal Governments to control the discharge of industrial wastewater into municipal Wastewater Treatment Plants (WWTPs) or Publicly Owned Treatment Works (POTWs). The objectives of the Pretreatment Program are to prevent pass-through, interference, or other adverse impacts to the POTW, its workers or the environment; to promote the beneficial reuse of biosolids; and to assure all categorical pretreatment standards are met. There are currently around 700 Significant Industrial Users (SIUs) who discharge industrial wastewater to over 120 POTWs throughout the State of North Carolina. The WWTPs covered by POTW Pretreatment Programs are indicated in *Appendix 3-E* by an asterisk (*) next to the permit number. If a facility's Pretreatment Program is impacting water quality or has made improvements to minimize the impact of their industrial user waste load, it is discussed in the 10-digit HUC watershed sections.

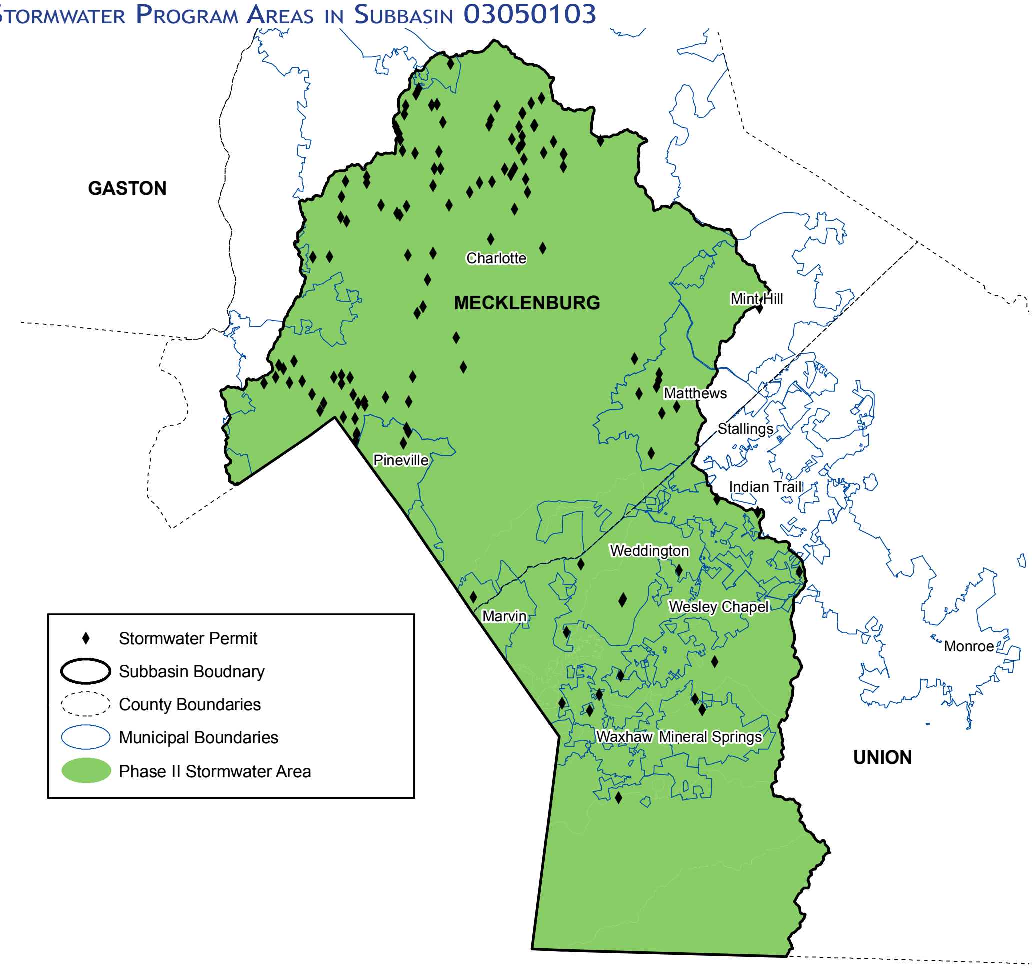
Nonpoint Source Contributors

Stormwater

There are many different stormwater programs administered by DWQ. One or more of these affects many communities in the Catawba River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include NPDES Phase II, HQW/ORW stormwater, and Water Supply Watershed Program. Figure 3-11 indicates the different stormwater programs in this subbasin.

This entire subbasin is covered under the NPDES Phase II Stormwater program. The Phase II programs are delegated to either the cities or the counties in this subbasin. The City of Charlotte and Mecklenburg County have one of the top Stormwater Programs in the state and remain active in keeping up to date with the most effective stormwater BMPs available. The *Charlotte/Mecklenburg website* also has educational materials available for interested citizens. For a brief discussion of the programs recent projects, see *Local Initiatives* Section. For more information on stormwater permits and the requirements of each, see *Chapter 5.3 of the Supplemental Guide to NC's Basinwide Planning* or *DWQ's Stormwater Permitting Unit's website.*

Figure 3-11: Stormwater Program Areas in Subbasin 03050103



Industrial Stormwater

The Division has renewed several industrial stormwater permits with a revised monitoring strategy in the past few years, including the majority of General NPDES Stormwater Permits. These permits now incorporate benchmark concentrations to provide permittees a tool with which to assess the effectiveness of best management practices (BMPs). These benchmark concentrations are not effluent limits but instead provide guidance for responses under the facility's Stormwater Pollution Prevention Plan (SPPP). The basis for each benchmark varies depending on the type of pollutant; values are based on thresholds like acute effects to aquatic life (e.g., metals), water quality standards (e.g., pH), secondary treatment standards (e.g., BOD and COD), or other reference levels.

Exceedances of stormwater benchmark values require the permittee to respond in a tiered program with increased monitoring, increased management actions, increased record keeping, and/or installation of stormwater BMPs. In previous versions of these general permits, "cut-off concentrations" were used to minimize the required analytical monitoring. The arithmetic mean of all monitoring data collected during the term of the permit was compared to the cut-off concentration. If the mean was less than the cut-off concentration, then the facility could discontinue analytical monitoring for that parameter at that outfall until the final year of the permit.

The Division revised that strategy to incorporate benchmarks with (typically) semi-annual monitoring throughout the permit term on the basis that (1) so few data points over the term of a permit were insufficient to provide confidence in an average concentration and justify discontinuation of monitoring; (2) industrial processes or activities may change during the period of the permit that the facility is not monitoring; and (3) periodic monitoring encourages maintained attention to stormwater management.

Non-Discharge

Non-discharge wastewater treatment options include spray irrigation, animal waste management systems, rapid infiltration basins, drip irrigation systems, land application of residuals programs, wastewater collection systems and beneficial reuse of wastewater systems. These systems are operated without a discharge to surface waters; however, they still require a DWQ permit. Sanitary sewer collection systems used to collect the wastewater from NPDES discharge wastewater treatment facilities and non-discharge wastewater treatment facilities are both permitted by Non-Discharge Permitting Unit (NDPU). The land application of residuals program and the distribution and marketing program are also permitted by NDPU. The permit insures that treated wastewater is applied to the land at a rate that is protective of groundwater, and does not produce ponding or runoff into a waterbody. A list of Non-Discharge Permits in this watershed are listed in *Appendix 3-E*. More information about land application and non-discharge requirements and how it impacts water quality can be found in Section 9.3.2 of the *Supplemental Guide to North Carolina's Basinwide Planning* or the DWQ Aquifer Protection Section-*Land Application Unit* website. A map of these permits can be seen in *Chapter 11*.

Wetland Or Surface Water Disturbance (401 Certification)

The "401" refers to Section 401 of the Clean Water Act. The North Carolina Division of Water Quality (DWQ) is the state agency responsible for issuing 401 water quality certifications (WQC) (Table 3-8). When the state issues a 401 certification this certifies that a given project will not degrade Waters of the State or violate State water quality standards. A 401 WQC is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Typically, if the USACE determines that a 404 Permit or Section 10 Permit is required because your proposed project involves impacts to wetlands or surface waters, then a 401 WQC is also required. Examples of activities that may require permits include:

- Any disturbance to the bed (bottom) or banks (sides) of a stream.
- Any disturbance to a wetland.
- The damming of a stream channel to create a pond or lake.
- Placement of any material within a stream, wetland or open water, including material that is necessary for construction, culvert installation, causeways, road fills, dams, dikes or artificial islands, property protection, reclamation devices and fill for pipes or utility lines.
- Temporary impacts including dewatering of dredged material prior to final disposal and temporary fill for access roads, cofferdams, storage and work areas.

Table 3-8: 401 Permits Within the Catawba River Subbasin (03050103) Issued Between 2004 & 2009

Impact Category	Project Type	Approved Area
Open Water	Shoreline Stabilization	7.1 ac
	Residential	5.2 ac
	Commercial	12.1 ac
	Recreational	5.9 ac
	Other	6.0 ac
Total Open Water Acres		**36.3 ac**
Buffer	Recreational	15,458 sq ft
	Shoreline Stabilization	54,602 sq ft
	Residential	1,368 sq ft
	Other	8,025 sq ft
Total Buffer Square Feet		**74,833 sq ft**
Stream	Recreational	188 ft
	Residential	16,151 ft
	Commercial	47,970 ft
	Roads	7,089 ft
	Sewer/Piping	9,186 ft
	Shoreline Stabilization	27,446 ft
	Stream Restoration	1,718 ft
	Other	32, 372 ft
Total Stream Feet		**142,120 ft**
Wetland	Residential	9.3 ac
	Commercial	45 ac
	Sewer/Piping	5.4 ac
	Roads	4.0 ac
	Shoreline Stabilization	0.1 ac
	Other	6.3 ac
Total Wetland Acres		**70.1 ac**

In streams and wetlands (in accordance with 15A NCAC 02H .0506(h) and 15A NCAC 02H .1305(g)) the DWQ requires compensatory mitigation (Table 3-9) for losses of streams and wetlands (404 jurisdictional wetlands as well as isolated and other non-404 jurisdictional wetlands) as follows:

- For all non-linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet of perennial and intermittent streams or impacts equal to or exceeding one acre of wetlands.
- For linear public transportation projects, mitigation shall be required for impacts equal to or exceeding 150 linear feet per stream or one acre of wetlands.

Buffer mitigation may be required for any project within a Riparian Buffer Protection Rule for impacts to the protected riparian buffer listed as "(potentially) allowable with mitigation" or "prohibited" within the Table of Uses require mitigation. For more information about the Riparian Buffer Protection Rules including the Table of Uses, *click here*.

Options for compensatory mitigation:

- **Mitigation banks:** Applicant satisfies the mitigation requirement by purchasing mitigation credits from an approved mitigation bank.
- **In-lieu fee mitigation:** Applicant satisfies the mitigation requirement by purchasing mitigation credits through the N.C. Ecosystem Enhancement Program (NCEEP).
- **Project-specific mitigation:** Applicant satisfies the mitigation requirement him/herself, either at the project site or at an off-site location.

For impacts to federally jurisdictional waters requiring compensatory mitigation, information on mitigation options can be viewed at the U.S. Army Corps of Engineers Mitigation *website*.

Table 3-9: 401 Mitigation Within the Catawba River Subbasin (03050103) Issued Between 2004 & 2005*

Impact Category	Mitigation Type	Amount
Buffer	Restoration (Zone 2)	4,673 sq ft
	WRP/EEP (Zone 1)	5,344 sq ft
Total Buffer Mitigation (Square Feet)		**10,017 sq ft**
Stream	Restoration	295 ft
	WRP/EEP	14,468 ft
	Mitigation Bank	5,811 ft
Total Stream Mitigation (Feet)		**20,574 ft**
Wetland	WRP/EEP	14.4 ac
Total Wetland Mitigation (Acres)		**14.4 ac**

For more information about 401 certifications and 404 federal permits, see the DWQ's *401 Oversight & Express Permitting Unit* website.

Agriculture

Agriculture is North Carolina's leading industry and is found scattered in this subbasin of the Catawba River basin. The approach taken in North Carolina for addressing agriculture's contribution to the nonpoint source water pollution problem is to primarily encourage voluntary participation by the agricultural community. This approach is supported by financial incentives, technical and educational assistance, research, and regulatory programs.

The conversion of agricultural lands to developed lands with large amounts impervious surfaces is another major contributing factor to nonpoint source pollution. A report by the American Farmland Trust organization identifies this subbasin as having high quality farmland with areas threatened by development. A *map of these areas* is available from their website. However, other farmers are protecting their land through the Conservation Reserve Enhancement Program (CREP). CREP is a voluntary program utilizing federal and state resources to achieve long-term protection of environmentally sensitive cropland and marginal pasture land. These voluntary protection measures are accomplished through 10-, 15-, 30-year and permanent conservation easements.

NC Agriculture Cost Share Program

The NC Agriculture Cost Share Program (ACSP) started in 1984 to help reduce the sources of agricultural nonpoint source pollution to the state's waters. The program assists owners and renters of established agricultural operations to improve their on-farm management by using Best Management Practices (BMPs). It is a voluntary program that reimburses farmers up to 75% of the cost of installing an approved BMP. The Division of Soil and Water Conservation implements the program on both a county district (SWCD) and state level. The Division has been very active in this basin as can be seen in the tables and figure below.

Animal Operations

DWQ's Animal Feeding Operations Unit is responsible for the permitting and compliance activities of animal feeding operations across the state. There are no registered animal operations in this subbasin. For more details about animal operation permits in North Carolina, see Section 6.3.3 of the *Supplemental Guide to NC's Basinwide Planning*.

Figure 3-12: BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050102

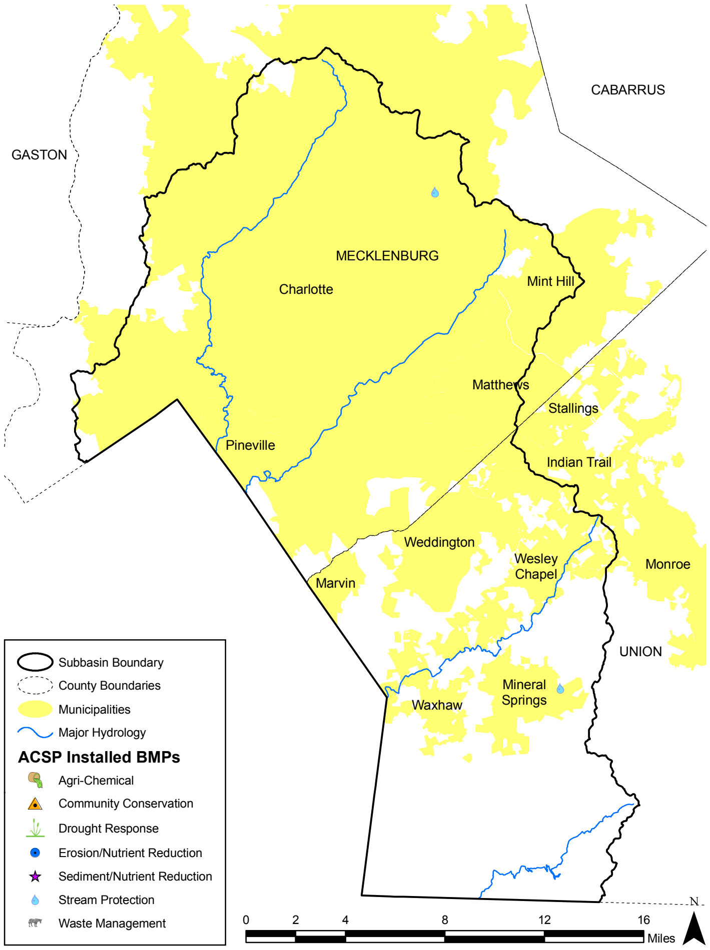


Table 3-10: List of BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050103

Purpose of BMP	Total Implemented	Cost-Shared Funds	Total Project Costs
Stream Protection	--	$25,107	$33,476
Linear Feet Treated	11,875	--	--
Grand Total	**11,875**	**$25,107**	**$33,476**

On-Site Wastewater Treatment Systems (Septic Systems)

Wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits. Instead, it is treated on-site through the use of permitted septic systems. Poorly planned and/or maintained systems can fail and contribute to nonpoint source pollution. Wastewater from failing septic systems makes its way to streams or contaminates groundwater. Failing septic systems are illegal discharges of wastewater into waters of the State. Information about the proper installation and maintenance of septic tanks can be obtained by calling the environmental health sections of the local county health departments. Precautions should be taken by local health departments to ensure that new systems are sited and constructed properly and an adequate repair area is available. County, town and city planners need to understand the economic and human health ramifications caused by failing septic systems and plan for long-term septic system sustainability. For more information on how septic systems impact water quality, see 9.1.3 of the *Supplemental Guide to North Carolina's Basinwide Planning.*

In 2007, North Carolina Agricultural Research Service completed a report concerning nitrogen contributions from on-site wastewater systems for each river basin. When compared to the other 16 river basins in the state, the Catawba River Basin had the most septic systems per square mile. The results for this subbasin based on 1990 census data indicate a population of 126,295 people using 19,227 septic systems resulting in a nitrogen loading of 483,214 lbs/yr and nitrogen loading rate of 4,731 lbs/mi^2/yr. These numbers reflect the total N discharged to the soil from the septic system and does not account for N used because of soil processes and plant uptake (Pradhan et al. 2007). The full study (*Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*) can be viewed on the North Carolina State University website or the link above.

Population & Land Cover

Population

The 2000 census estimated population for this subbasin is 534,539 and this number is expected to increase with the results of the 2010 census. As population increases so does our demand for clean water from aquifer and surface water sources and an increase in demand for the land and water to assimilate wastes. Table 3-11 lists the populations for the 10-Digit HUCs in this subbasin and the estimates for future population values.

Table 3-11: Population and Estimated Populations for 2000 to 2030 for Subbasin 03050103

10-Digit HUC	2000 Population	2000 Population Density (per sq mi)	2010 Estimated Population	2020 Estimated Population	2030 Estimated Population
0305010301	485,874	2,115	654,688	831,122	1,019,104
0305010302	42,764	362	67,494	93,267	121,092
0305010303	1,968	87	3,303	4,693	6,199
0305010306	3,933	111	6,602	9,381	12,390
Total	**534,539**	**2,675**	**732,086**	**938,463**	**1,158,784**

* Source: 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.

Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. For more information on how population impacts water quality, see *Chapter 12 of the Supplemental Guide to NC's Basinwide Planning.*

Land Cover

Table 3-12 to the right, displays the percentage of each land cover type within this subbasin according to 2001 land cover data. The data shows the majority of the Catawba River subbasin is just over 50% developed land. Total agricultural land is about 14% and forested land is about 31% (Homer, 2004). In municipal areas, impervious surfaces (those which water can not penetrate, like asphalt) can prevent rainfall from filtering into the ground. Instead, the stormwater is sent at high velocities into storm drains which empty into the nearest waterbody without treatment. This can cause multiple negative water quality impacts including elevated water temperatures, eroding streambanks from high velocity runoff, toxic urban runoff in the streams, etc. For more information on how to better understand these issues and find solutions see Chapter 5 of the *Supplemental Guide to NC's Basinwide Planning*. A full page subbasin land cover map can be seen in *Appendix 3-D*.

Table 3-12: Land Cover Percentages

Land Cover Type	Percentage
Developed Open Space	25.0
Developed Low Intensity	17.0
Developed Medium Intensity	6.1
Developed, High Intensity	4.0
Total Developed	**52.1**
Bare Earth or Transitional	0.0
Deciduous Forest	24.1
Evergreen Forest	6.1
Mixed Forest	1.0
Total Agriculture	**31.2**
Scrub/Shrub	0.2
Grasslands	1.5
Pasture/Hay	13.9
Cultivated Crops	0.4
Total Non-Wetland Forest	**14.3**
Wooded Wetlands	0.6
Emergent Wetlands	0.0
Total Wetlands	**0.6**
Bare Earth or Transitional	0.0
Scrub/Shrub	0.2
Grasslands	1.5
Other	**1.7**

Restoration, Protection & Conservation Planning

One NC Naturally Conservation Planning Tool

NCDENR's One North Carolina Naturally initiative promotes and coordinates the long-term conservation of North Carolina's threatened land and water resources. Each DENR division specializes in management of a specific natural resource, while the collaborative coordination and planning process results in cost effective implementation and management of multiple resources. Natural resource planning and conservation provides the science and incentives to inform and support conservation actions of North Carolina's conservation agencies and organizations. The Conservation Planning Tool was developed to assist in building partnerships through the exchange of conservation information and opportunities, support stewardship of working farms and forests, inform conservation actions of agencies and organizations, and guide compatible land use planning. For more information about land trusts in North Carolina, see the *Conservation Trust for North Carolina's* website.

Watershed Planning

Figure 3-13: Watershed Planning

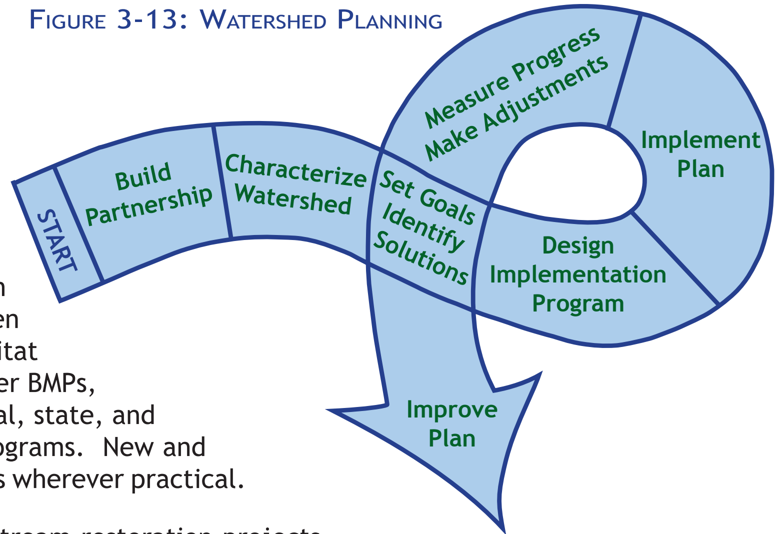


Figure 3-13 illustrates a general process for developing watershed restoration plans. This process can and should be applied to streams suffering from habitat degradation and pollution. Interested parties should contact the Basinwide Planning Program to discuss opportunities to begin the planning and restoration process in their chosen watershed. Many tools are available to address habitat degradation and pollution including; urban stormwater BMPs, agricultural BMPs, ordinance/rule changes at the local, state, and federal levels, volunteer activism, and education programs. New and existing development should employ stormwater BMPs wherever practical.

DWQ believes land conservation accompanied with stream restoration projects can be very successful. Prevention and protection activities are known to be more cost effective than retrofits and restoration. DWQ strongly encourages conservation in this watershed. Many programs and organizations can assist with these projects. Additionally, there are significant tax incentives landowners can take advantage of. Many of these programs allow and encourage owners to maintain control and exclusive use or their land. Some provide opportunities to ensure farmland remains productive and is not converted into commercial development and subdivisions. Local land trusts can help landowners explore conservation options and identify potential funding sources. For more information about land trusts in North Carolina, see the *Conservation Trust for North Carolina's* website.

Local Initiatives

Sediment & Erosion Control Local Programs

The North Carolina Sedimentation Control Commission may delegate authority to implement the Sedimentation Pollution Control Act to cities and counties that adopt a qualifying local erosion and sediment control ordinance in compliance with State requirements. Local programs' staff perform plan reviews and enforce compliance with plans within their jurisdictions. The City of Charlotte and Mecklenburg County administer the only S&EC Local Program in this subbasin. For more information about the Division of Land Resources and Local Programs visit the *Local Programs* page of their website.

Local initiatives covering more than one subbasin are discussed in the *Local Initiative Chapter*.

Construction Grants & Loans

The NC Construction Grants and Loans (CG&L) Section of DWQ provides grants and loans to local government agencies for the construction, upgrades and expansion of wastewater collection and treatment systems. As a financial resource, the section administers five major programs that assist local governments. Of these, two are federally funded programs administered by the state, the Clean Water State Revolving Fund (SRF) Program and the State and Tribal Assistance Grants (STAG). The STAG is a direct congressional appropriations for a specific "special needs" project within NC. The High Unit Cost Grant (SRG) Program, the State Emergency Loan (SEL) Program and the State Revolving Loan (SRL) Program are state funded programs, with the later two being below market revolving loan money. The Section also received an additional Capitalization Grant authorized by the American Recovery and Reinvestment Act of 2009 in the amount of $2,246,532. These funds are administered according to existing SRF procedures. All projects (Table 3-13) must be eligible under title VI of the Clean Water Act. For more information, please see the *CG&L* website.

Table 3-13: Construction Grants & Loan Projects Between 2004 & 2009 in Subbasin 03050103

Location	Project Description	Date	~ Amount
Charlotte, City of	McAlpine Creek WWMF-phase II, primary treatment improvement & effluent Filter rehabilitation	6/29/2007	$433,700
Charlotte, City of	Revolution Park Water Reuse Project	5/5/2009	$577,555
Union County	107,000 LF of drinking water lines.	8/17/2009	$1,961,300
Charlotte, City of	Wilora lake BMP construction.	1/6/2010	$1,319,982
Total Funded:			**$2,772,455**

Clean Water Management Trust Fund

Created in 1996, the Clean Water Management Trust Fund (CWMTF) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the South Fork Catawba River subbasin. Table 3-14 includes a list of recent (2004-2008) projects and their cost. These projects include several land acquisitions and WWTP upgrades.

Table 3-14: Clean Water Management Trust Fund Projects Between 2004 - 2008 in Subbasin 03050103

ID	Project Name	Project Description	County	Funded
2005B-404	Mecklenburg County - Rest/ Four Mile Creek Project (Withdrawn)	Design, permit and construct a natural channel stream enhancement project on 5,000 LF of Four mile Creek. County will conduct water quality monitoring. Complements upstream restoration work.	Mecklenburg	$542,000
2005B-704	Mecklenburg County - Storm/ Restoration Initiative Phase VII, Little Sugar Creek	Design, permit and construct 2 stormwater wetlands to reduce contamination to Little Sugar Creek from a 31 acre drainage area. Compliments other restoration and stormwater efforts in the watershed. Includes a greenway trail and water quality monitoring.	Mecklenburg	$280,000
2006A-404	Mecklenburg County-Rest/ Little Sugar Creek Restoration Initiative, Phase VIII	Design, permit & construct natural channel design stream enhancement project on 2,000 lf of Little Sugar Ck, a 303(d) stream. Construct 2 bioretention areas, 1 rain garden, & 1 water quality pool. Part of greenway system. Monitor water quality.	Mecklenburg	$1,000,000
2006A-405	Mecklenburg County-Rest/ McAlpine Creek Restoration Project	Design, permit & construct natural channel design stream enhancement project on 5,000 linear feet of McAlpine Creek, a 303(d)-listed stream. Includes stormwater BMPs in the buffer area. Will become part of a greenway system.	Mecklenburg	$845,000
2006B-702	Charlotte, City of - Storm/ Campbell Creek Stormwater Initiative, Muddy Creek	Design & permit 3 priority stormwater BMPs in Muddy Creek & Eastland Branch watersheds, tribs to 303(d)-listed McAlpine Creek. If constructed, could support goals established by the approved fecal coliform bacteria TMDL & phosphorus reduction strategy.	Mecklenburg	$125,000
2006B-811	Pineville, Town of - Plan/ Storm/ Bioretention and BMP Study, Sugar Creek	Fund a planning effort in the Town to identify potential stormwater BMP retrofit sites and the construction of a demonstration retrofit bioretention facility for an existing development.	Mecklenburg	$30,000
2007-021	Mineral Springs - Acq/ Greenway Project, Wolf & Bates Branches	Protect through conservation easement 47 acres, including 35 riparian acres along Wolfe Br and Bates Br. The property will become part of a greenway system	Union	$307,000
2007-404	Mecklenburg County - Rest/ Little Sugar Creek Restoration, Phase 9	Permit and construct/enhance 1,280 LF along Little Sugar Cr.; remove 750 LF of parking deck cap and create 820 LF of new channel.	Mecklenburg	$615,000
2008-702	Charlotte, City of - Storm/ Campbell Creek Watershed Restoration	Construct stormwater bmps and stream restoration on Muddy Cr., Campbell Cr., and tributaries to mitigate pollution sources in headwater streams tributary to McAlpine Cr.. Projects builds on design, permitting grant from CWMTF.	Mecklenburg	$219,000
2008-707	Mecklenburg SWC District - Storm/ Urban Cost-Share Program, McAlpine Creek	Construct or install selected BMPs on tributaries to McAlpine Cr.. This project provides an alternative to the Ag Cost Share in an urbanized county for encouraging property owners to protect and conserve resources.	Mecklenburg	$70,000
Total Amount				**$4,033,000**

Section 319-Grant Program

The Section 319 Grant Program was established per the Federal Clean Water Act to provide funding for efforts to reduce nonpoint source (NPS) pollution, including that which occurs though stormwater runoff. The U.S. Environmental Protection Agency provides funds to state and tribal agencies, which are then allocated via a competitive grant process to organizations to address current or potential NPS concerns. Each fiscal year North Carolina is awarded nearly 3 million dollars to address nonpoint source pollution through its 319 Grant Program. Thirty percent of the funding supports ongoing state nonpoint source programs. The remaining seventy percent is made available through a competitive grants process. No 319 contracts were issued in this subbasin between 2004 and 2008. More information can be found about these contracts and the *319 Grant Program* on their website.

Ecosystem Enhancement Program (EEP)

EEP uses watershed planning at two scales (basinwide and local) to identify the best locations to implement stream, wetland and riparian buffer restoration/enhancement and preservation projects. The planning process considers where mitigation is needed and how mitigation efforts might contribute to the improvement of water quality, habitat and other vital watershed functions in the state. Watershed planning requires GIS data analysis, stakeholder involvement, water quality monitoring, habitat assessment and consideration of local land uses and ordinances. It is a multi-dimensional process which considers science, policy and partnership.

River Basin Restoration Priorities

EEP River Basin Restoration Priorities (RBRPs) are focused on the identification of Targeted Local Watersheds (TLWs) within the 8-digit Cataloging Units (subbasins) that comprise individual river basins. TLWs represent priority areas (14-digit HUCs) for the implementation of stream and wetland mitigation projects. GIS screening factors considered in the selection of TLWs include: documented water quality impairment and habitat degradation, the presence of critical habitat or significant natural heritage areas, the presence of water supply watersheds or other high-quality waters, the condition of riparian buffers, estimates of impervious cover, existing or planned transportation projects, and the opportunity for local partnerships. Recommendations from local resource agency professionals and the presence of existing watershed projects are given significant weight in the selection of TLWs. RBRP documents (and TLW selections) for each of the 17 river basins in North Carolina are updated periodically to account for changing watershed conditions, increasing development pressures and local stakeholder priorities.

The most recent updates to the Catawba River Basin TLWs occurred in 2007 for the lower Catawba and in 2009 for the upper Catawba. In total, 41 14-digit HUCs have been designated TLWs by EEP in the Catawba Catalog Units (Table 3-15). These updated RBRPs, including a summary table of Targeted Local Watersheds, can be found at EEP's website for the *2007* and *2009* reports.

Table 3-15: Catawba River TLWs & LWPs by Subbasin (as of February 2010).

HUC	TLWs (#)	LWPs (# - Names)
03050101	26	3 - Muddy Creek, Lower Creek, & Charlotte (partial)
03050102	9	1 - Indian/Howard Creeks
03050103	6	1 - Charlotte (partial)
Total:	**41**	**4**

Local Watershed Planning

EEP Local Watershed Planning (LWP) initiatives are conducted in specific priority areas (typically a cluster of two or three Targeted Local Watersheds) where EEP and the local community have identified a need to address critical watershed issues. The LWP process typically takes place over a two-year period, covers a planning area around 50 to 150 square miles, and includes three distinct phases: I - existing data review and preliminary watershed characterization (largely GIS-based); II – detailed watershed assessment (including water quality & biological monitoring and field assessment of potential mitigation sites); and III – development of a final Project Atlas and Watershed Management Plan. EEP collaborates with local stakeholders and resource professionals throughout the process to identify projects and management strategies to restore, enhance and protect local watershed resources. EEP is currently conducting LWP Phase IV activities (project site evaluation and landowner outreach) in the Lower Creek, Hunting Creek and Muddy Creek watersheds within the Catawba 03050101 subbasin.

More information about the River Basin Restoration Priorities and LWP project areas within the *Catawba River Basin* can be found on the EEP website.

EEP Projects in the Catawba Basin

As of February 2010, EEP had a total of 40 mitigation projects in some stage of being completed in the Catawba Basin. These stages include identification/acquisition; design; construction; monitoring (construction complete); and long-term stewardship. Table 3-16 provides details on these project that include stream and wetland restoration/enhancement and preservation projects. In total, EEP is in some stage of restoration or enhancement on over 191,000 feet of stream and 127 acres of wetlands in the Catawba. In addition, the program is in some stage of preservation on over 97,000 feet of stream and 43 acres of wetlands. For additional information about EEP's Project Implementation efforts, go to the *EEP Project Implementation* webpage. To view the locations of these project sites, go to *EEP's Web Map site*.

Table 3-16: EEP Projects in Some Stage of Completion in the Catawba River Basin by Subbasin

HUC	Projects (#)	Stream Restoration/ Enhancement (ft)	Stream Preservation (ft)	Wetland Restoration/ Enhancement (ac)	Wetland Preservation (ac)
03050101	30	151,829	97,597	71.1	38.7
03050102	6	27,848	0	52.0	4.5
03050103	4	11,500	0	4.7	0
Total:	**40**	**191,177**	**97,597**	**127.7**	**43.2**

For more information on EEP mitigation projects in the Catawba 03050101 and 03050101 subbasins, contact Paul Wiesner or Julie Cahill in EEP's western field office (Asheville) at, respectively, 828-273-1673 or 828-230-5172. For 03050103 subbasin, contact Robin Dolin at 919-715-5836.

References

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. www.mrlc.gov.

North Carolina Department of Environment and Natural Resources (DENR). Division of Water Quality (DWQ). Planning Section. January, 2008. *Total Daily Maximum Loads (TMDLs) for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek in North Carolina*. Raleigh, NC. http://portal.ncdenr.org/c/document_library/get_file?uuid=21705c54-29c9-4065-a14a-66a475de2e1d&groupId=38364

____. DWQ. Planning Section. September 2004. *Catawba River Basinwide Water Quality Plan*. Raleigh, NC. http://portal.ncdenr.org/web/wq/ps/bpu/basin/catawba.

____. DWQ. Environmental Science Section. Biological Assessment Unit. April 2008. *Basinwide Assessment Report: Catawba River Basin*. Raleigh, NC.

____. DWQ. Environmental Science Section. Biological Assessment Unit. December 2008. *Catawba River Basin Ambient Monitoring Systems Report*. Raleigh, NC.

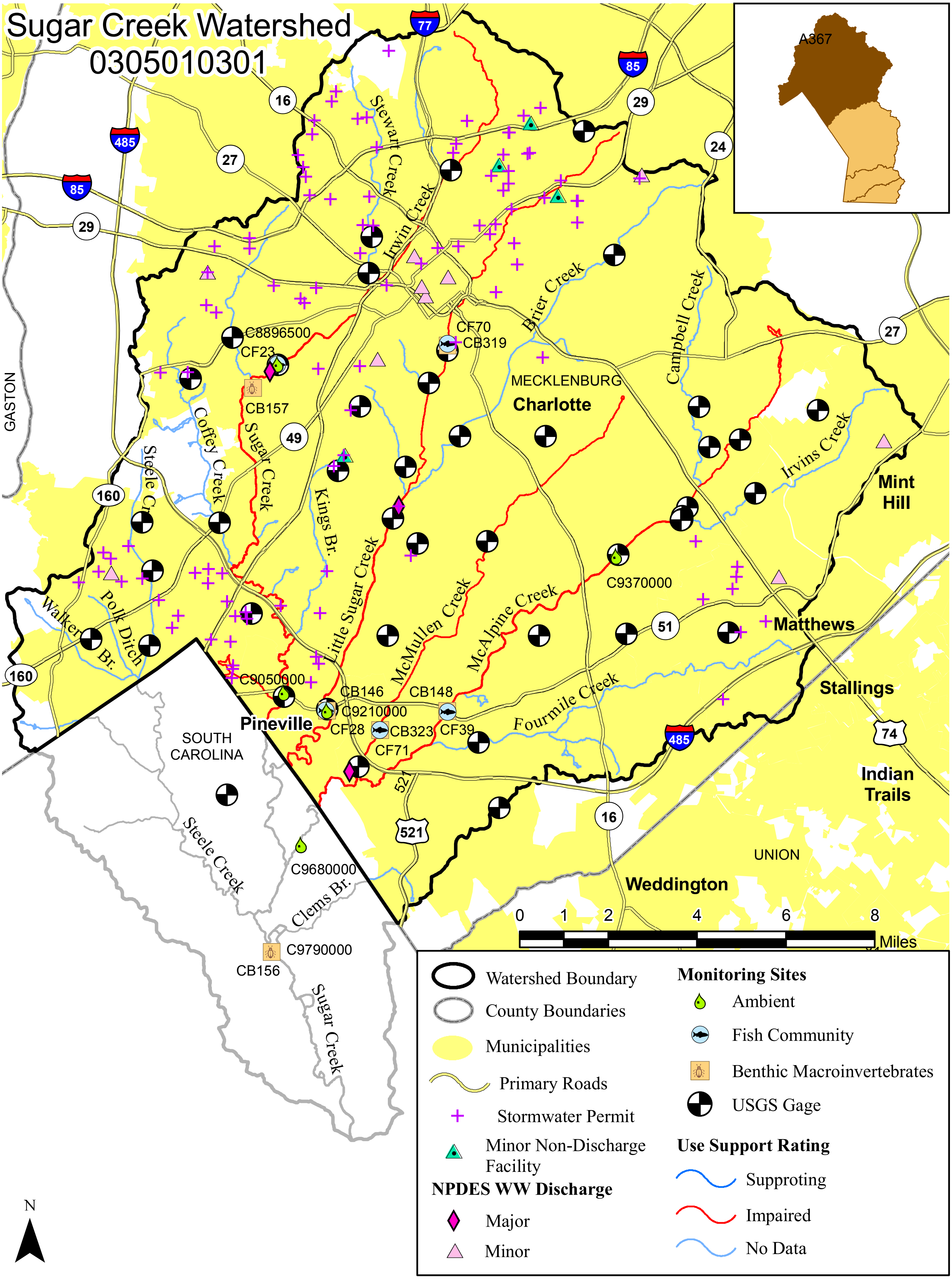
Pate, Travis. 2009. *Watershed Assessment in North Carolina: Building a Watershed Database with Population, Land Cover, and Impervious Cover Information*. Master Theses, University of North Carolina at Chapel Hill.

Pradhan, S. S., M. T. Hoover, R. E. Austin, and H. A. Devine. May 2007. *Potential Nitrogen Contributions from On-site Wastewater Treatment Systems to North Carolina's River Basins and Sub-basins*. North Carolina State University, Raleigh, North Carolina. North Carolina Agricultural Research Service. Technical Bulletin 324.

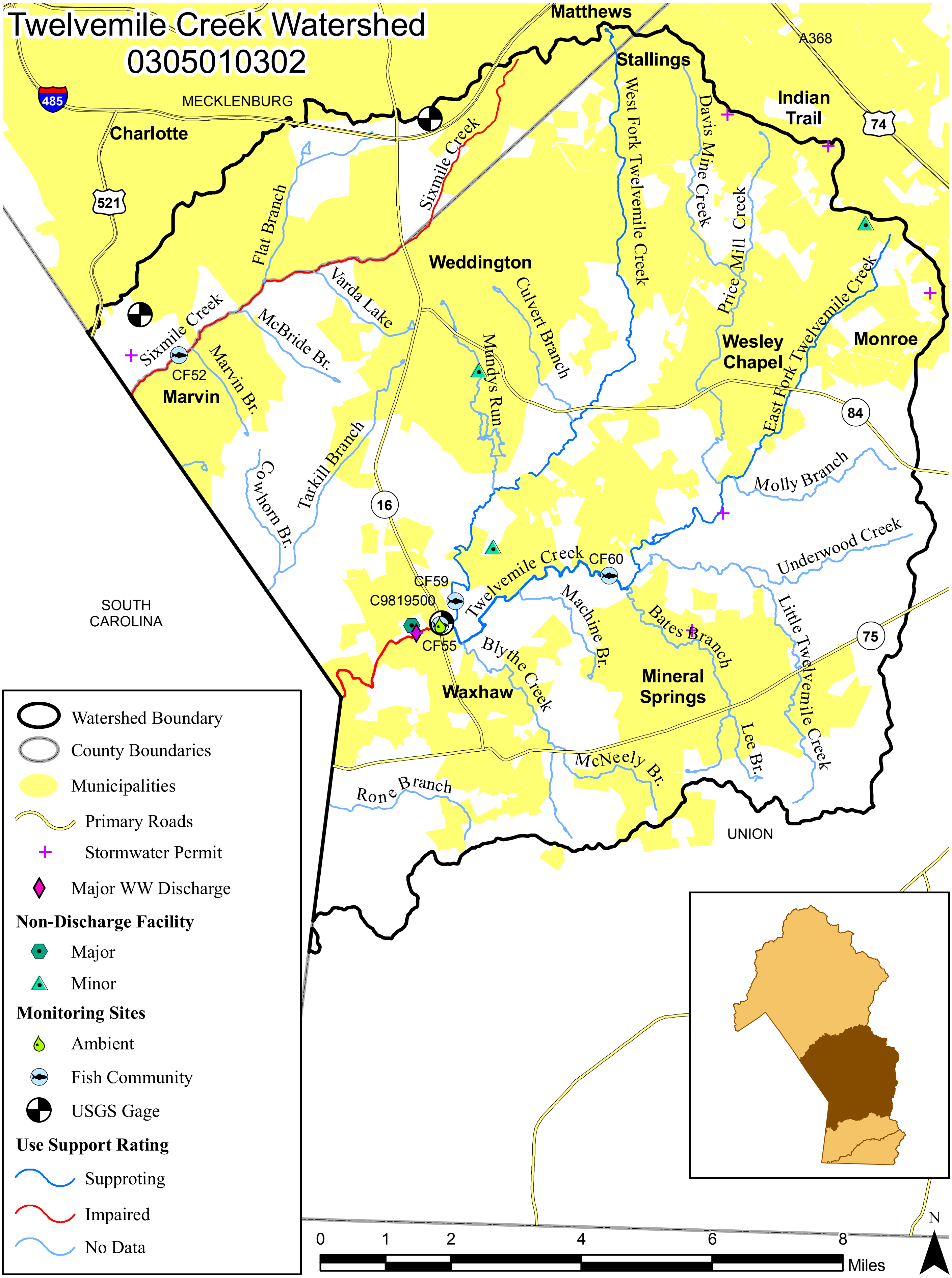
Rajbhandari, Narayan. DENR. DWQ. June 2, 2004. *Delisting copper from the DWQ 303(d) list for the Clark Creek watershed, Catawba County and Lincoln County (Sub-basin 03-08-35)*. Memorandum. Raleigh, NC.

U.S. Environmental Protection Agency (USEPA) 1999. *Protocol for Developing Sediment TMDLs*. First Edition. EPA 841-B-99-044. U.S. EPA, Office of Water, Washington D.C.

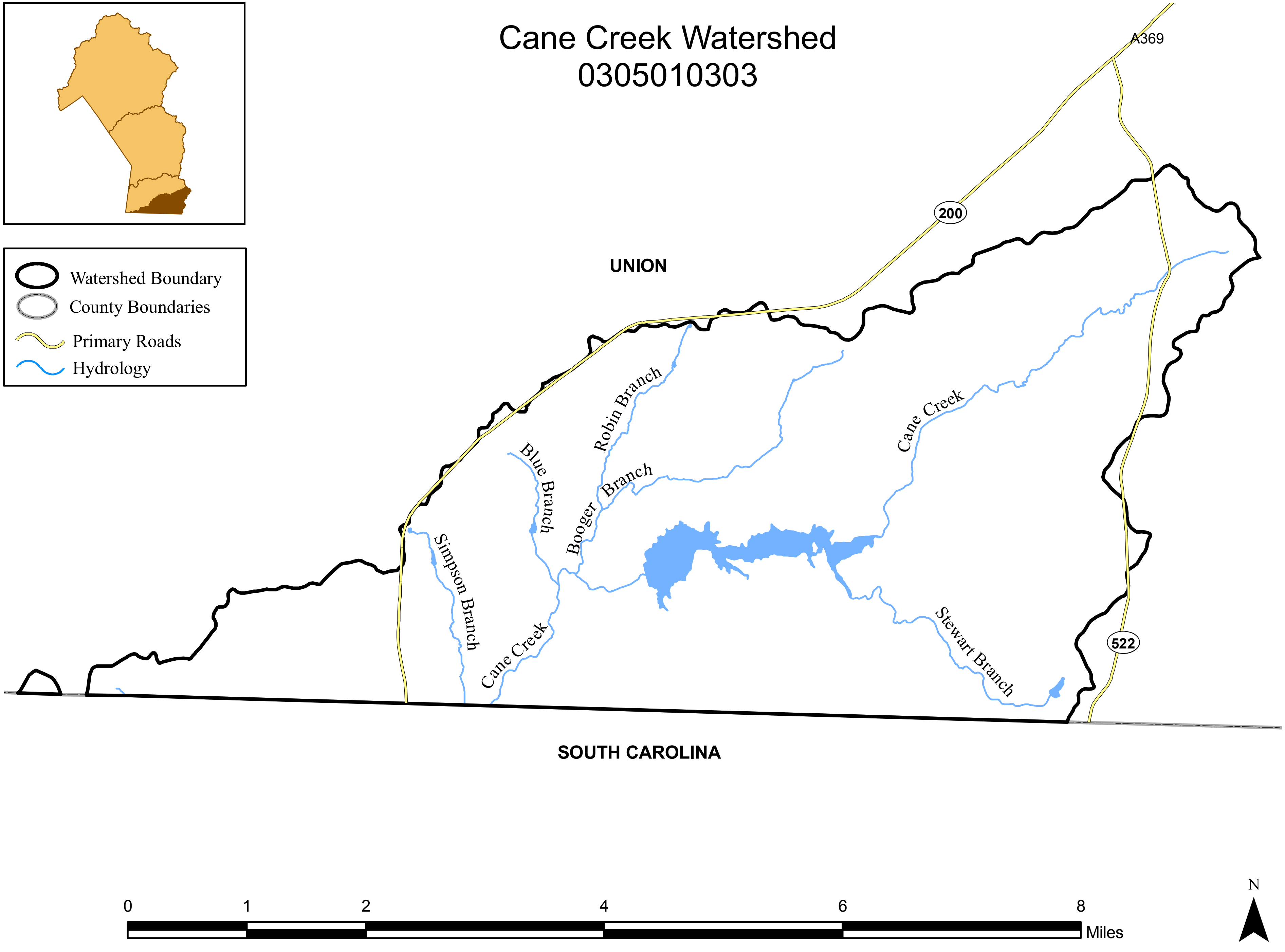
Waters, T.F. 1995. *Sediment in streams—Sources, biological effects, and control*. American Fisheries Society Monograph7. American Fisheries Society, Bethesda, MD.

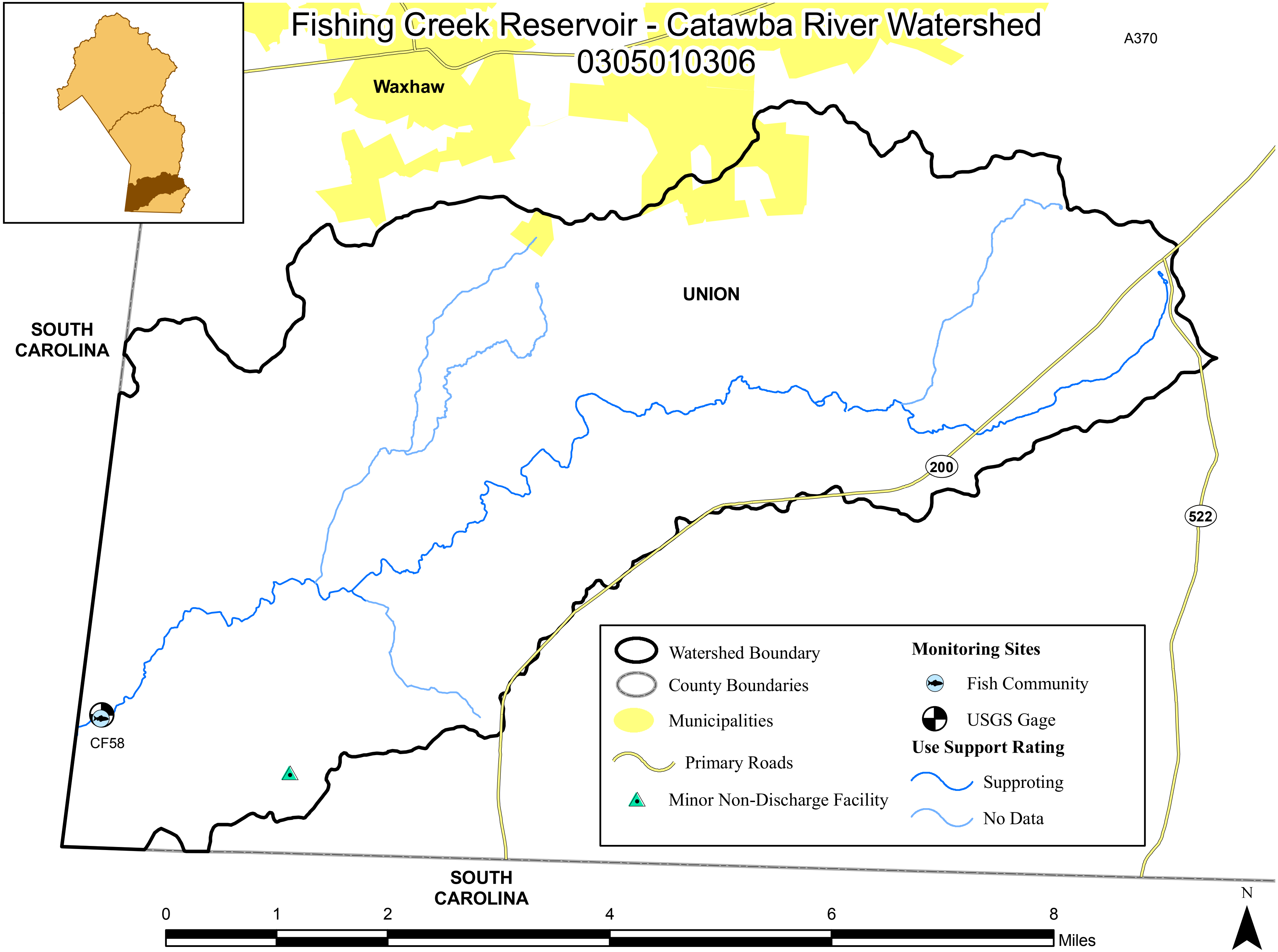


Sugar Creek Watershed
0305010301
A367
GASTON
MECKLENBURG
Charlotte
SOUTH CAROLINA
UNION
Pineville
Matthews
Mint Hill
Stallings
Indian Trails
Weddington
Stewart Creek
Irwin Creek
Brier Creek
Campbell Creek
Irvins Creek
Coffey Creek
Sugar Creek
Steele Cr.
Kings Br.
Little Sugar Creek
McMullen Creek
McAlpine Creek
Fourmile Creek
Walker Br.
Polk Ditch
Steele Creek
Clems Br.
C8896500
CF23
CB157
CF70
CB319
C9370000
C9050000
CB146
CB148
C9210000
CF28
CB323
CF39
CF71
C9680000
C9790000
CB156
0 1 2 4 6 8
Miles
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Minor Non-Discharge Facility
NPDES WW Discharge
Major
Minor
Monitoring Sites
Ambient
Fish Community
Benthic Macroinvertebrates
USGS Gage
Use Support Rating
Supproting
Impaired
No Data
N



Twelvemile Creek Watershed
0305010302
Matthews
Stallings
A368
Indian Trail
74
485
MECKLENBURG
Charlotte
521
Flat Branch
Sixmile Creek
Varda Lake
Weddington
West Fork Twelvemile Creek
Davis Mine Creek
Price Mill Creek
Culvert Branch
Mundys Run
McBride Br.
Marvin Br.
CF52
Marvin
Wesley Chapel
Monroe
East Fork Twelvemile Creek
84
Molly Branch
Tarkill Branch
Cowhorn Br.
16
Underwood Creek
Twelvemile Creek
CF60
CF59
C9819500
CF55
Machine Br.
Bates Branch
Little Twelvemile Creek
Blythe Creek
Waxhaw
Mineral Springs
75
McNeely Br.
Lee Br.
Rone Branch
UNION
SOUTH CAROLINA
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Stormwater Permit
Major WW Discharge
Non-Discharge Facility
Major
Minor
Monitoring Sites
Ambient
Fish Community
USGS Gage
Use Support Rating
Supproting
Impaired
No Data
0 1 2 4 6 8
Miles
N


Cane Creek Watershed
0305010303
Watershed Boundary
County Boundaries
Primary Roads
Hydrology
UNION
SOUTH CAROLINA
A369
200
522
Robin Branch
Blue Branch
Booger Branch
Simpson Branch
Cane Creek
Cane Creek
Stewart Branch
0
1
2
4
6
8
Miles
N


Fishing Creek Reservoir - Catawba River Watershed
03050103006
A370
Waxhaw
UNION
SOUTH CAROLINA
SOUTH CAROLINA
200
522
CF58
Watershed Boundary
County Boundaries
Municipalities
Primary Roads
Minor Non-Discharge Facility
Monitoring Sites
Fish Community
USGS Gage
Use Support Rating
Supproting
No Data
0
1
2
4
6
8
Miles
N

Appendix 3-A

Use Support Ratings for All Monitored Waterbodies

2010 DRAFT

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 metfirst 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

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

11-129-(10.5) **South Fork Catawba River** — From Town of High Shoals water supply intake to a point 0.6 mile upstream of N.C. Hwy. 275 — **8.1 FW Miles** — WS-IV

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	

11-129-(14.5) **South Fork Catawba River** — From a point 0.6 mile upstream of N.C. Hwy. 275 to a point 0.4 mile upstream of Long Creek (Towns of Dallas, Gastonia & Ranlo water supply intakes) — **2.5 FW Miles** — WS-IV;CA

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
1	**Fecal Coliform (recreation)**	No Criteria Exceeded	Recreation	2008	
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2010
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply	2008	

11-129-(15.5) **South Fork Catawba River** — From a point 0.4 mile upstream of Long Creek to Cramerton Dam and Lake Wylie at Upper Armstrong Bridge — **18.1 FW Miles** — WS-V

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
3a	**Fecal Coliform (recreation)**	Potential Standards Violation	Recreation	2008	
5	**Low pH**	Standard Violation	Aquatic Life	2008	2010
5	**Turbidity**	Standard Violation	Aquatic Life	2008	2008
1	**Water Quality Standards Water Supply**	No Criteria Exceeded	Water Supply		

Catawba River Basin — Catawba River Subbasin 03050103

Catawba River Basin — **Sugar Creek Watershed 0305010301**

11-137-1 **Irwin Creek** — From source to Sugar Creek — **11.8 FW Miles** — C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	**Copper**	Standard Violation	Aquatic Life	2006	2010
4s	**Ecological/biological Integrity FishCom**	Poor Bioclassification	Aquatic Life	2004	1998
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2008
5	**Lead**	Standard Violation	Aquatic Life	2006	2008
1t	**Low Dissolved Oxygen**	No Criteria Exceeded	Aquatic Life	1996	
4t	**Turbidity**	Standard Violation	Aquatic Life	2008	2000
5	**Zinc**	Standard Violation	Aquatic Life	2006	2010

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

11-137-8a | **Little Sugar Creek** | From source to Archdale Rd | **11.6** | **FW Miles** | C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Copper	Standard Violation	Aquatic Life	2008	2008
4s	Ecological/biological Integrity Benthos	Poor Bioclassification	Aquatic Life	2008	2008
4s	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2007	2010
4t	Fecal Coliform (recreation)	Standard Violation	Recreation	2008	1998
4t	Turbidity	Standard Violation	Aquatic Life	2008	2010
5	Water column Mercury	Standard Violation	Fish Consumption	2008	2010

11-137-8b | **Little Sugar Creek** | From Archdale Rd to NC 51 | **5.5** | **FW Miles** | C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Copper	Standard Violation	Aquatic Life	2006	2010
4s	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	2007	1998
4s	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2007	2010
4t	Fecal Coliform (recreation)	Standard Violation	Recreation	2008	1998

11-137-8c | **Little Sugar Creek** | From NC 51 to North Carolina-South Carolina State Line | **3.0** | **FW Miles** | C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
4s	Ecological/biological Integrity Benthos	Poor Bioclassification	Aquatic Life	1983	2000
4t	Fecal Coliform (recreation)	Standard Violation	Recreation	2008	1998
1t	Low Dissolved Oxygen	No Criteria Exceeded	Aquatic Life	1996	
4t	Turbidity	Data Inconclusive	Aquatic Life		2000

11-137-9a | **McAlpine Creek (Waverly Lake)** | From source to SR 3356, (Sardis Rd) | **8.5** | **FW Miles** | C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	1987	1998
4t	Fecal Coliform (recreation)	Standard Violation	Recreation	2008	1998
1t	Low Dissolved Oxygen	No Criteria Exceeded	Aquatic Life	1996	
1t	Turbidity	No Criteria Exceeded	Aquatic Life	2008	1998
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	

11-137-9b | **McAlpine Creek (Waverly Lake)** | From SR 3356 to NC 51 | **6.3** | **FW Miles** | C

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
5	Ecological/biological Integrity Benthos	Fair Bioclassification	Aquatic Life	1987	1998
4t	Fecal Coliform (recreation)	Standard Violation	Recreation	2008	1998
1t	Low Dissolved Oxygen	No Criteria Exceeded	Aquatic Life	1996	
1t	Turbidity	No Criteria Exceeded	Aquatic Life	2008	1998
1	Water Quality Standards Aquatic Life	No Criteria Exceeded	Aquatic Life	2008	

AU_Number	AU_Name	AU_Description	LengthArea	AU_Units	Classification

IR Cat	Parameter	Reason for Rating	Use Category	Collection Year	303(d)year
11-137-9c	**McAlpine Creek (Waverly Lake)**	From NC 51 to NC 521	**4.6 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	2000
5	**Ecological/biological Integrity FishCom**	Fair Bioclassification	Aquatic Life	2004	2000
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	1998
1t	**Low Dissolved Oxygen**	No Criteria Exceeded	Aquatic Life	1996	
1t	**Turbidity**	No Criteria Exceeded	Aquatic Life	2008	1998
11-137-9d	**McAlpine Creek (Waverly Lake)**	From NC 521 to North Carolina-South Carolina State Line	**1.0 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	1992	1998
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2006	1998
1t	**Low Dissolved Oxygen**	No Criteria Exceeded	Aquatic Life	1996	
1t	**Turbidity**	No Criteria Exceeded	Aquatic Life	2008	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
11-137-7	**McCullough Branch**	From source to Sugar Creek	**3.1 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	1990	1998
11-137-9-5	**McMullen Creek**	From source to McAlpine Creek	**13.8 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2008	2010
1	**Ecological/biological Integrity FishCom**	Good Bioclassification	Aquatic Life	2007	
1	**Water Quality Standards Aquatic Life**	No Criteria Exceeded	Aquatic Life	2008	
11-137a	**Sugar Creek**	From source to below WWTP, SR 1156, Mecklenburg	**0.3 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Poor Bioclassification	Aquatic Life	2002	1998
11-137b	**Sugar Creek**	From SR 1156 Mecklenburg to Hwy 51	**10.9 FW Miles**	C	
5	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2007	2000
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2000
1t	**Turbidity**	No Criteria Exceeded	Aquatic Life	2008	2000
11-137c	**Sugar Creek**	From Hwy 51 NC/SC border	**2.5 FW Miles**	C	
5	**Copper**	Standard Violation	Aquatic Life	2006	2010
4s	**Ecological/biological Integrity Benthos**	Fair Bioclassification	Aquatic Life	2002	1998
4t	**Fecal Coliform (recreation)**	Standard Violation	Recreation	2008	2000
1t	**Turbidity**	No Criteria Exceeded	Aquatic Life	2008	2000

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

Catawba River Basin — **Twelvemile Creek Watershed 0305010302**

AU_Number / IR Cat	AU_Name / Parameter	AU_Description / Reason for Rating	LengthArea / Use Category	AU_Units / Collection Year	Classification / 303(d)year
11-138-2	**East Fork Twelvemile Creek**	From source to Twelvemile Creek	**13.6**	**FW Miles**	C
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	
11-138-3	**Sixmile Creek**	From source to North Carolina-South Carolina State Line	**8.8**	**FW Miles**	C
5	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2002	2006
11-138	**Twelvemile Creek**	From source to North Carolina-South Carolina State Line	**3.0**	**FW Miles**	C
5	Copper	Standard Violation	Aquatic Life	2006	2008
4s	Ecological/biological Integrity FishCom	Fair Bioclassification	Aquatic Life	2002	2010
3a	Fecal Coliform (recreation)	Potential Standards Violation	Recreation	2008	
5	Turbidity	Standard Violation	Aquatic Life	2008	2008
11-138-1	**West Fork Twelvemile Creek**	From source to Twelvemile Creeek	**12.9**	**FW Miles**	C
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	

Catawba River Basin — **Fishing Creek Reservoir-Catawba River Watershed 0305010306**

AU_Number / IR Cat	AU_Name / Parameter	AU_Description / Reason for Rating	LengthArea / Use Category	AU_Units / Collection Year	Classification / 303(d)year
11-139	**Waxhaw Creek**	From source to North Carolina-South Carolina State Line	**16.3**	**FW Miles**	C
1	Ecological/biological Integrity FishCom	Good Bioclassification	Aquatic Life	2007	

APPENDIX 3-B

BIOLOGICAL (BENTHIC & FISH) SAMPLE SITE SHEETS

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
IRWIN CR	off US 521	07/15/04	CF23	Poor

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	03050103	35.19777778	-80.90472222	11-137-1	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	30.7	595	7	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	28.5
Dissolved Oxygen (mg/L)	9.7
Specific Conductance (µS/cm)	230
pH (s.u.)	8.2

Water Clarity: Clear

Site Photograph

Habitat Assessment Scores (max)

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

Substrate: Gravel, cobble, and sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/15/04	2004-124	8	32	Poor

Most Abundant Species: Redbreast Sunfish

Exotic Species: Green Sunfish

Species Change Since Last Cycle: N/A

Data Analysis

Watershed -- tributary to Sugar Creek; drains the northwest portion of the City of Charlotte; site is on the property of the Charlotte Mecklenburg Utility District's Irwin Creek WWTP, but above its discharge. **Habitat** -- an open canopy; gravel runs; thick periphyton; no deadfalls or snags; urban debris in stream and along the banks. **2004** -- elevated conductivity due to urban runoff; elevated pH and dissolved oxygen due to afternoon periphytic photosynthesis; typical urban stream -- almost 60% of all the fish were the tolerant Redbreast Sunfish; total diversity lower than expected; fewest species of any fish community site in the basin, 2004 - 2007; darters, suckers, and intolerant species were absent; skewed trophic structure, more than 90% of all the fish were insectivores; Creek Chubsucker was represented only by young-of-year; data were also used as part of a NCSU Urban Fish Study. Similar to downstream site on Sugar Creek at SR 1156 which was also rated Poor in 1999.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
SUGAR CR	SR 1156	CB157	07/11/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	3050103	351124	805451	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	37	600	13	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)
Irwin Creek WWTP	NC0024945	15.0

Water Quality Parameters

Temperature (°C)	25.9
Dissolved Oxygen (mg/L)	0
Specific Conductance (μS/cm)	294
pH (s.u.)	7.2
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	12
Bottom Substrate (15)	8
Pool Variety (10)	10
Riffle Habitat (16)	12
Left Bank Stability (7)	6
Right Bank Stability (7)	6
Light Penetration (10)	3
Left Riparian Score (5)	4
Right Riparian Score (5)	4
Total Habitat Score (100)	70

Site Photograph

Substrate Mix of boulder, rubble, gravel and sand

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10238	---	8	---	6.66	Fair
08/20/02	8929	---	5	---	7.00	Poor
08/21/97	7440	---	7	---	6.15	Fair
08/18/92	5982	45	4	7.97	7.03	Poor

Taxonomic Analysis

Minor shifts in the abundance and/or presence/absence of mayfly taxa have occurred between sampling events. *Baetis flavistriga* were Abundant in all four samples. *Baetis intercalaris* were not collected in 1992 or 1997 but were Common in 2002 and Abundant in 2007. *Pseudocloeon propinquum* had not been collected prior to 2007 and *Tricorythodes* had not been collected prior to 2002. *Maccaffertium modestum* were Common in 2007 but either absent or Rare in previous samples.

Data Analysis

This site is located in downtown Charlotte and below Irwin Creek WWTP. Although Sugar Creek has alternated between Poor and Fair bioclassifications the four times it has been sampled, there have been no major changes in water quality. The 1997 and 2007 samples were borderline Poor/Fair. For EPT samples taken in the Piedmont ecoregion, sites with less than six EPT taxa would receive a Poor rating.

BENTHIC MACROINVERTEBRATE SAMPLE

Waterbody	Location	Station ID	Date	Bioclassification
L SUGAR CR	NC 51	CB146	07/11/07	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	3050103	350506	805256	0	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Stream Depth (m)
C	49	545	20	0.2

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Sugar Creek WWTP	NC0024937	20.0

Water Quality Parameters

Temperature (°C)	30.4
Dissolved Oxygen (mg/L)	0
Specific Conductance (µS/cm)	338
pH (s.u.)	7.3
Water Clarity	slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	10
Bottom Substrate (15)	6
Pool Variety (10)	6
Riffle Habitat (16)	4
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	2
Total Habitat Score (100)	43

Site Photograph

Substrate: Mostly sand with some boulder, rubble and gravel

Sample Date	Sample ID	ST	EPT	BI	EPT BI	Bioclassification
07/11/07	10239	---	8	---	6.41	Fair
08/19/02	8925	---	6	---	6.71	Poor
08/21/97	7441	---	7	---	6.92	Fair
09/19/92	5983	43	3	8.11	6.37	Poor

Taxonomic Analysis

Taxa observed in 2007 indicated a gradual increase in mayfly taxa. Only one mayfly species was collected in 1992. Three mayfly taxa were collected in 1997. Four mayfly taxa were collected in 2002 and five mayfly taxa were collected in 2007. Mayfly taxa collected in 2007 that had not been previously collected include *Pseudocloeon propinquum* , *Maccaffertium modestum* and *Tricorythodes* .

Data Analysis

This site is located below Sugar Creek WWTP and its entire watershed is located within the city of Charlotte. The bioclassification rating has alternated between Poor and Fair since 1992. Although the site received Fair ratings in 1997 and 2007, the EPT taxa richness increased by one taxa in 1997 and by two taxa in 2007 to make it a borderline Fair/Poor rating.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
LITTLE SUGAR CR	NC 51	04/24/07	CF28	Fair

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	03050103	35.085	-80.88277778	11-137-8b	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	49.2	540	13	0.4	No

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

Upstream NPDES Dischargers (>1MGD or <1MGD and within 1 mile)	NPDES Number	Volume (MGD)
Charlotte Mecklenburg Utility District's Sugar Creek WWTP	0024937	20

Water Quality Parameters

Temperature (°C)	18.1
Dissolved Oxygen (mg/L)	6.9
Specific Conductance (µS/cm)	330
pH (s.u.)	6.9

Water Clarity	Clear

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	3
Instream Habitat (20)	9
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	3
Left Bank Stability (7)	2
Right Bank Stability (7)	2
Light Penetration (10)	2
Left Riparian Score (5)	2
Right Riparian Score (5)	3
Total Habitat Score (100)	**35**

Substrate: Sand and some cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/24/07	2007-25	14	40	Fair
04/15/99	99-16	12	42	Good-Fair
06/30/97	97-65	12	40	Fair

Most Abundant Species: Redbreast Sunfish

Exotic Species: Green Sunfish

Species Change Since Last Cycle: **Gains** -- Swallowtail Shiner, Brassy Jumprock, Margined Madtom, Warmouth, and Tessellated Darter. **Losses** - Creek Chubsucker, White Catfish, and Largemouth Bass

Data Analysis

Watershed -- tributary to Sugar Creek; drains southern Mecklenburg County, including the City of Charlotte metropolitan area. **Habitat** -- poor habitats; sandy, shallow runs with willow snags and rip/rap; urban debris and tires in the stream and along the banks; periphyton atop the rocks; slight sewage odor; black iron pipe across the stream created a riffle/plunge; artificial wetland constructed along the right shoreline. **2007** -- second highest conductivity at a fish community site in the basin in 2007; a very abundant, but tolerant community; diversity lower than expected for a streams of its size; all species gained in 2007 were collected for the first time from the site, but their numbers were 1-4 fish/species; Eastern Mosquitofish abundant in the shallow areas; intolerant species were absent. **1997 - 2007** -- conductivity has ranged from 330 to 552 µS/cm; 19 species known from the site; the tolerant Redbreast Sunfish has always been the dominant species; no intolerant species known from the site; total habitat scores have ranged from 30 to 35.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MCALPINE CR	**NC 51**	**07/16/04**	**CF39**	**Fair**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	03050103	35.08527778	-80.83416667	11-137-9c	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	52.6	550	13 (variable)	0.2	No

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

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

Water Quality Parameters

Temperature (°C)	23.5
Dissolved Oxygen (mg/L)	5.3
Specific Conductance (µS/cm)	158
pH (s.u.)	6.3
Water Clarity	Slightly turbid

Site Photograph

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	9
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	1
Left Bank Stability (7)	1
Right Bank Stability (7)	1
Light Penetration (10)	8
Left Riparian Score (5)	5
Right Riparian Score (5)	4
Total Habitat Score (100)	**42**

Substrate Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
07/16/04	2004-125	13	36	Fair

Most Abundant Species Redbreast Sunfish

Exotic Species Green Sunfish

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Sugar Creek; drains the southeastern portion of the City of Charlotte metropolitan area. **Habitat** -- very shallow, sandy, braided runs; stick riffles; side undercuts and snags; severe bank erosion and deeply entrenched; urban debris in stream and along the banks. **2004** -- elevated conductivity; low diversity for a stream of its size, only one species of darter and sucker collected; Bluehead Chub and White Sucker represented only by young-of-year; intolerant species absent; almost 60% of all the fish were Redbreast Sunfish; percentage of tolerant fish (White Catfish, Flat Bullhead, Eastern Mosquitofish, Green Sunfish, and Redbreast Sunfish) was high; skewed trophic structure, 95% of all the fish were insectivores; data were also used as part of a NCSU Urban Fish Study.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
MCMULLEN CR	off NC 51	03/27/07	CF71	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
MECKLENBURG	34	03050103	35.0789656	-80.8611333	11-137-9-5	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	13.9	540	5	0.4	No

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

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

Water Quality Parameters

Temperature (°C)	17.8
Dissolved Oxygen (mg/L)	7.8
Specific Conductance (µS/cm)	347
pH (s.u.)	6.1

Water Clarity	Clear

Habitat Assessment Scores (max)

Channel Modification (5)	4
Instream Habitat (20)	11
Bottom Substrate (15)	3
Pool Variety (10)	6
Riffle Habitat (16)	0
Left Bank Stability (7)	3
Right Bank Stability (7)	3
Light Penetration (10)	10
Left Riparian Score (5)	4
Right Riparian Score (5)	5
Total Habitat Score (100)	**49**

Site Photograph

Substrate: Sand

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
03/27/07	2007-01	14	50	Good

Most Abundant Species: Spottail Shiner

Exotic Species: Green Sunfish

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to the Catawba River; drains the southeastern portion of the City of Charlotte metropolitan area. **Habitat** -- sandy runs; side snags; wide and shallow with sand bars; eroding banks; no riffles; wide and forested riparian zones in a bottomland forest; good canopy. **2007** -- very low flow; elevated specific conductance due to urban runoff (no WWTP in the watershed), the highest conductivity of any fish community site in the basin in 2007; only one species of darter (Tessellated Darter) present; intolerant species were absent; moderately elevated percentage of tolerant fish (White Sucker, White Catfish, Flat Bullhead, Eastern Mosquitofish, Redbreast Sunfish, and Green Sunfish); data were also used as part of the 2007 Probabilistic Monitoring Special Study.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
W FK TWELVEMILE CR	SR 1321	04/23/07	CF59	Good

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
UNION	38	03050103	34.957603	-80.751853	11-138-1	Carolina Slate Belt

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	22.3	495	9	0.4	No

	Forested/Wetland	Urban	Agriculture	Other (describe)
Visible Landuse (%)	75	0	20	5 (sewer right-of-way)

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)	112
pH (s.u.)	6.9

Water Clarity: Clear

Site Photograph

Habitat Assessment Scores (max)

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

Substrate Gravel, sand, and a little bit of cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/23/07	2007-23	18	48	Good

Most Abundant Species Tessellated Darter

Exotic Species Black Bullhead and Green Sunfish

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

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Twelvemile Creek (and ultimately the Catawba River); drains southwestern Union County including the City of Charlotte metropolitan area suburbs, but no true municipalities in the watershed. **Habitat** -- side snags; riffle at sewer right-of-way; open canopy; a Carolina Slate Belt type stream. **2007** -- a very diverse and abundant community; intolerant species were absent, also absent from Twelvemile Creek at NC 16 and East Fork Twelvemile Creek at SR 1008; many Tessellated Darters were in the gravel and woody debris along the sides; Creek Chubsucker was abundant, but represented only by young-of-year; fauna typical of a lower piedmont Catawba River basin stream.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
E FK TWELVEMILE CR	**SR 1008**	**04/23/07**	**CF60**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
UNION	38	03050103	34.963781	-80.710425	11-138-2	Carolina Slate Belt

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	33.7	550	11	0.5	No

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

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

Water Quality Parameters

Temperature (°C)	18.0
Dissolved Oxygen (mg/L)	8.5
Specific Conductance (µS/cm)	180
pH (s.u.)	7.1

Water Clarity: Slightly turbid

Habitat Assessment Scores (max)

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

Site Photograph

Substrate: Gravel, sand, and some cobble

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/23/07	2007-24	14	48	Good

Most Abundant Species: Bluehead Chub and Carolina Darter

Exotic Species: Green Sunfish

Species Change Since Last Cycle: N/A

Data Analysis

This is the first fish community sample collected at this site. **Watershed** -- tributary to Twelvemile Creek (and ultimately the Catawba River); drains southwestern Union County; no municipalities in the watershed. **Habitat** -- entrenched and eroding banks; one large "blow-out" claypan deep pool; coarse woody debris; snags, roots, and undercuts. **2007** -- conductivity elevated, much greater than at nearby West Fork Twelvemile Creek, but no WWTPs in the watershed, probably from nonpoint source runoff; diversity slightly lower than expected, only one species of darter present; Redfin Pickerel represented by only young-of-year; intolerant species were absent, also absent from Twelvemile Creek at NC 16 and West Fork Twelvemile Creek at SR 1321.

FISH COMMUNITY SAMPLE

Waterbody	Location	Date	Station ID	Bioclassification
WAXHAW CR	**SR 1103**	**04/23/07**	**CF58**	**Good**

County	Subbasin	8 digit HUC	Latitude	Longitude	AU Number	Level IV Ecoregion
UNION	38	03050103	34.83666667	-80.79166667	11-139	Southern Outer Piedmont

Stream Classification	Drainage Area (mi2)	Elevation (ft)	Stream Width (m)	Average Depth (m)	Reference Site
C	35	495	7	0.3	No

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

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

Water Quality Parameters

Temperature (°C)	15.2
Dissolved Oxygen (mg/L)	8.3
Specific Conductance (µS/cm)	109
pH (s.u.)	6.8

Water Clarity	Slightly turbid

Habitat Assessment Scores (max)

Channel Modification (5)	5
Instream Habitat (20)	16
Bottom Substrate (15)	3
Pool Variety (10)	10
Riffle Habitat (16)	1
Left Bank Stability (7)	4
Right Bank Stability (7)	4
Light Penetration (10)	9
Left Riparian Score (5)	5
Right Riparian Score (5)	5
Total Habitat Score (100)	**62**

Site Photograph

Substrate Sand and clay

Sample Date	Sample ID	Species Total	NCIBI	Bioclassification
04/23/07	2007-22	14	48	Good
06/11/97	97-55	19	56	Excellent

Most Abundant Species Golden Shiner **Exotic Species** None

Species Change Since Last Cycle

Gains -- Golden Shiner, Coastal Shiner, Brassy Jumprock, and Carolina Darter. **Losses** -- Rosyside Dace, Greenfin Shiner, Greenhead Shiner, Spottail Shiner, Creek Chub, Flat Bullhead, Margined Madtom, Largemouth Bass, and Piedmont Darter.

Data Analysis

Watershed -- tributary to the Catawba River; drains the extreme southwestern corner of Union County; no municipalities within the watershed. **Habitat** -- snags; undercuts; roots; woody debris in the current creating stick riffles; Chinese privet in the riparian zones. **2007** -- lower than expected scores for abundance and diversity metrics; intolerant species were absent; percentage of tolerant fish (Golden Shiner and Redbreast Sunfish) was slightly elevated. **1997 & 2007** -- site was a reference site in 1997 (total habitat score = 74), but in 2007 the substrate was sandier than in 1997 and there was the loss of small gravelly riffles; 23 species known from the site, including 11 species of cyprinids and 3 species of darters; no exotic species known from the site; Greenfin Shiner, Greenhead Shiner, and Spottail Shiner were abundant in 1997 but absent in 2002; a naturally low flow affected stream.

Appendix 3-C

Ambient Station Summary Sheets

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

Location: IRWIN CRK AT IRWIN CRK WWTP NR CHARLOTTE
Station #: C8896500 **Hydrologic Unit Code:** 03050103
Latitude: 35.19801 **Longitude:** -80.90453 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-137-1

Time period: 01/15/2004 to 12/03/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		6.1	6.9	8	9.3	11.3	12.4	14.1
	58	0	<5	0	0		6.1	6.9	8	9.3	11.3	12.4	14.1
pH (SU)	59	0	<6	0	0		6	6.2	6.6	7	7.5	8	8.4
	59	0	>9	0	0		6	6.2	6.6	7	7.5	8	8.4
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				70	120	170	216	245	257	272
Water Temperature (°C)	59	0	>32	0	0		3	6.7	11.7	17.8	23.4	27.5	30.4
Other													
TSS (mg/L)	20	12	N/A				2.5	2.5	2.5	6.2	44	180.5	230
Turbidity (NTU)	59	0	>50	9	15.3	93.3	1.2	1.8	2.6	3.9	14	100	600
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				65	72	86	250	5450	13560	18000
Arsenic, total (As)	13	12	>10	0	0		5	5	5	5	10	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	12	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	5	>7	5	38.5	99.9	2	2	2	2	18	37	44
Iron, total (Fe)	13	0	>1000	5	38.5	99.9	110	170	310	450	6800	14880	19000
Lead, total (Pb)	13	10	>25	3	23.1	96.6	10	10	10	10	19	41	49
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	12	>88	0	0		10	10	10	10	10	12	14
Zinc, total (Zn)	13	4	>50	3	23.1	96.6	10	10	10	31	84	188	200

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	328	22	38	100

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

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

Location: SUGAR CRK AT NC 51 AT PINEVILLE
Station #: C9050000 **Hydrologic Unit Code:** 03050103
Latitude: 35.09067 **Longitude:** -80.89962 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-137

Time period: 01/15/2004 to 12/10/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	<4	0	0		5.3	6.2	6.8	8	9.6	10.8	12
	59	0	<5	0	0		5.3	6.2	6.8	8	9.6	10.8	12
pH (SU)	59	0	<6	0	0		6.1	6.4	6.6	6.8	7.1	7.3	7.6
	59	0	>9	0	0		6.1	6.4	6.6	6.8	7.1	7.3	7.6
Spec. conductance (umhos/cm at 25°C)	54	0	N/A				138	176	265	328	356	364	438
Water Temperature (°C)	59	0	>32	0	0		3.1	7.5	12.5	19.4	24	26.3	28.5
Other													
TSS (mg/L)	20	6	N/A				2.5	3.9	5.1	6.2	16.5	49.5	62
Turbidity (NTU)	60	0	>50	4	6.7		2.1	3.5	4.6	7	13.8	45	150
Nutrients (mg/L)													
NH3 as N	60	24	N/A				0.02	0.02	0.02	0.02	0.05	0.08	0.84
NO2 + NO3 as N	60	0	N/A				1	3.01	4.93	7.45	9.07	11	13
TKN as N	60	1	N/A				0.2	0.43	0.46	0.58	0.71	0.89	1.6
Total Phosphorus	60	0	N/A				0.31	0.37	0.53	0.66	0.92	1.1	1.5
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				87	108	190	240	740	2620	3100
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	1	>7	6	46.2	100	2	3	4	7	10	13	15
Iron, total (Fe)	13	0	>1000	3	23.1	96.6	320	320	430	670	1300	3280	3600
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	0	>50	0	0		16	16	20	24	32	41	44

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	376	21	36	99.9

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

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

Location: LITTLE SUGAR CRK AT NC 51 AT PINEVILLE
Station #: C9210000 **Hydrologic Unit Code:** 03050103
Latitude: 35.08502 **Longitude:** -80.88218 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-137-8

Time period: 01/15/2004 to 12/10/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<4	0	0		4.8	6.1	6.8	8.2	9.9	10.4	11.5
	60	0	<5	1	1.7		4.8	6.1	6.8	8.2	9.9	10.4	11.5
pH (SU)	60	0	<6	0	0		6.1	6.5	6.7	6.9	7.2	7.5	8.2
	60	0	>9	0	0		6.1	6.5	6.7	6.9	7.2	7.5	8.2
Spec. conductance (umhos/cm at 25°C)	55	0	N/A				139	205	307	348	388	446	495
Water Temperature (°C)	60	0	>32	1	1.7		7	8.6	14.7	21.1	26.4	28.6	32.2
Other													
TSS (mg/L)	20	4	N/A				2.5	2.5	4.8	6.5	16.2	21.7	50
Turbidity (NTU)	60	0	>50	2	3.3		1.8	2.6	3.8	5	14	25.9	95
Nutrients (mg/L)													
NH3 as N	59	15	N/A				0.02	0.02	0.02	0.04	0.09	0.15	0.62
NO2 + NO3 as N	59	0	N/A				0.93	2.6	4.6	6.6	8.3	11	14
TKN as N	59	0	N/A				0.25	0.62	0.69	0.79	0.93	1	1.8
Total Phosphorus	59	0	N/A				0.28	0.59	0.71	1	1.4	1.9	2.6
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				110	122	160	200	760	1536	2000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	0	>7	4	30.8	99.4	4	4	4	6	7	10	11
Iron, total (Fe)	13	0	>1000	2	15.4	86.6	290	310	370	450	910	1460	1700
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	0	>50	0	0		17	18	22	27	30	40	44

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	347	24	41	100

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

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

Location: MCALPINE CRK AT SR 3356 SARDIS RD NR CHARLOTTE
Station #: C9370000 **Hydrologic Unit Code:** 03050103
Latitude: 35.13725 **Longitude:** -80.76817 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-137-9

Time period: 01/08/2004 to 12/04/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<4	1	1.7		3	6.1	6.6	8	10.8	12.4	15.1
	60	0	<5	1	1.7		3	6.1	6.6	8	10.8	12.4	15.1
pH (SU)	60	0	<6	2	3.3		5	6.3	6.5	6.9	7.2	7.5	8.1
	60	0	>9	0	0		5	6.3	6.5	6.9	7.2	7.5	8.1
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				69	105	140	186	213	222	265
Water Temperature (°C)	60	0	>32	0	0		2.8	5.4	11.6	17.5	23.5	25.6	29.6
Other													
Chlorophyll a (ug/L)	1	0	>40	0	0		3	3	3	3	3	3	3
TSS (mg/L)	20	6	N/A				2.5	3.5	4.2	6.2	7.7	45.3	94
Turbidity (NTU)	60	0	>50	4	6.7		3.1	4.2	5.5	8.9	17	44.5	270
Nutrients (mg/L)													
NH3 as N	60	23	N/A				0.02	0.02	0.02	0.02	0.07	0.09	0.23
NO2 + NO3 as N	60	3	N/A				0.02	0.07	0.22	0.33	0.41	0.58	0.93
TKN as N	60	2	N/A				0.2	0.22	0.28	0.38	0.43	0.71	1.2
Total Phosphorus	60	0	N/A				0.02	0.04	0.05	0.06	0.08	0.14	0.36
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				87	108	145	220	550	2072	2900
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	6	>7	1	7.7		2	2	2	2	3	9	12
Iron, total (Fe)	13	0	>1000	5	38.5	99.9	670	734	880	1000	1200	3260	4500
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	10	>50	0	0		10	10	10	10	11	34	42

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
60	373	23	38	100

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

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

Location: MCALPINE CRK AT SC SR 2964 NR CAMP COX SC
Station #: C9680000 **Hydrologic Unit Code:** 03050103
Latitude: 35.04101 **Longitude:** -80.89162 **Stream class:** FW
Agency: NCAMBNT **NC stream index:**

Time period: 01/15/2004 to 12/10/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	N/A				3.9	5.3	5.7	6.4	7.6	8.7	10.1
pH (SU)	60	0	N/A				6.1	6.4	6.5	6.7	6.9	7.1	7.4
Spec. conductance (umhos/cm at 25°C)	55	0	N/A				155	297	362	435	485	562	685
Water Temperature (°C)	60	0	N/A				7	12.6	15.7	20.8	24.5	26.6	28.6
Other													
TSS (mg/L)	20	2	N/A				6	6.2	8	12	30	61.6	64
Turbidity (NTU)	60	0	N/A				3	4.6	6	8.1	12.8	26.9	80
Nutrients (mg/L)													
NH3 as N	60	1	N/A				0.02	0.04	0.05	0.1	0.16	0.44	2.3
NO2 + NO3 as N	60	0	N/A				2	5.77	8.12	13	16	20.9	22
TKN as N	60	0	N/A				0.39	0.79	1.02	1.2	1.4	1.89	3.6
Total Phosphorus	60	0	N/A				0.29	0.37	0.41	0.56	0.98	1.69	4.2
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				190	202	235	340	890	1680	2000
Arsenic, total (As)	13	13	N/A				5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	N/A				1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	N/A				10	16	25	25	25	25	25
Copper, total (Cu)	13	0	N/A				3	3	4	4	6	9	11
Iron, total (Fe)	13	0	N/A				520	600	735	870	1750	2800	3200
Lead, total (Pb)	13	13	N/A				10	10	10	10	10	10	10
Manganese, total (Mn)	3	0	N/A				100	100	100	180	330	330	330
Mercury, total (Hg)	12	12	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	N/A				10	10	10	10	10	10	10
Zinc, total (Zn)	13	0	N/A				15	17	28	40	52	65	67

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
58	242	16	28	94.1

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

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

Location: SUGAR CRK AT SC 160 NR FORT MILL SC
Station #: C9790000 **Hydrologic Unit Code:** 03050103
Latitude: 35.00592 **Longitude:** -80.90221 **Stream class:** FW
Agency: NCAMBNT **NC stream index:**

Time period: 01/15/2004 to 12/10/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	N/A				4.4	6.2	6.5	7.8	8.6	9.9	10.9
pH (SU)	60	0	N/A				5.9	6.5	6.6	6.9	7.1	7.3	7.6
Spec. conductance (umhos/cm at 25°C)	55	0	N/A				52	189	299	359	408	464	572
Water Temperature (°C)	60	0	N/A				5.6	9.7	14.1	19.6	24.2	26.6	30.6
Other													
TSS (mg/L)	20	0	N/A				7.3	8.3	9.6	13	42	96.3	133
Turbidity (NTU)	60	0	N/A				4.4	7.1	8.8	12	23.5	78	160
Nutrients (mg/L)													
NH3 as N	60	7	N/A				0.02	0.02	0.03	0.05	0.12	0.2	0.48
NO2 + NO3 as N	60	0	N/A				1.4	3.45	6.7	8.6	12	14	17
TKN as N	60	2	N/A				0.2	0.54	0.76	0.87	1.1	1.2	1.9
Total Phosphorus	60	0	N/A				0.36	0.43	0.52	0.66	0.9	1.1	2.5
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				260	276	340	490	845	3260	3900
Arsenic, total (As)	13	13	N/A				5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	N/A				1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	N/A				10	16	25	25	25	25	25
Copper, total (Cu)	13	0	N/A				4	4	4	5	7	10	11
Iron, total (Fe)	13	0	N/A				650	658	760	870	1750	4480	5200
Lead, total (Pb)	13	13	N/A				10	10	10	10	10	10	10
Manganese, total (Mn)	3	0	N/A				69	69	69	120	340	340	340
Mercury, total (Hg)	12	12	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	N/A				10	10	10	10	10	10	10
Zinc, total (Zn)	13	0	N/A				16	16	22	26	28	30	30

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
57	370	20	35	99.8

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

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

Location: TWELVE MILE CRK AT NC 16 NR WAXHAW
Station #: C9819500 **Hydrologic Unit Code:** 03050103
Latitude: 34.95225 **Longitude:** -80.75581 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 11-138

Time period: 01/15/2004 to 12/04/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<4	4	6.7		1.4	4.3	5.9	7.6	10.1	11.6	14.4
	60	0	<5	7	11.7	75.2	1.4	4.3	5.9	7.6	10.1	11.6	14.4
pH (SU)	60	0	<6	3	5		4.5	6	6.4	6.6	7	7.3	7.6
	60	0	>9	0	0		4.5	6	6.4	6.6	7	7.3	7.6
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				20	108	132	150	159	176	340
Water Temperature (°C)	60	0	>32	0	0		1.8	6	10.2	15.9	21.7	24.4	28.9
Other													
TSS (mg/L)	20	4	N/A				2.5	3.2	6	6.8	12	54.6	310
Turbidity (NTU)	60	0	>50	8	13.3	85.8	3.6	6.7	9.9	18	29	69	650
Nutrients (mg/L)													
NH3 as N	60	16	N/A				0.02	0.02	0.02	0.03	0.06	0.1	0.25
NO2 + NO3 as N	60	6	N/A				0.02	0.02	0.18	0.33	0.47	0.56	0.89
TKN as N	60	0	N/A				0.2	0.28	0.37	0.5	0.64	0.78	1.2
Total Phosphorus	60	0	N/A				0.02	0.05	0.06	0.08	0.11	0.16	0.56
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				85	163	400	570	2150	11040	16000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	4	>7	3	23.1	96.6	2	2	2	3	7	14	18
Iron, total (Fe)	13	0	>1000	11	84.6	100	810	854	1150	1500	2350	13080	18000
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	13	15
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	9	>50	0	0		10	10	10	10	11	29	39

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
59	213	11	19	

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

Appendix 3-D

Watershed Maps

Appendix 3-E

Permits

Table 3E-1: Wastewater Discharge Permits in the Catawba River Watershed

Permit #	Owner	Facility Name	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0024937*	Charlotte-Mecklenburg Utilities	Charlotte-Sugar Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	20,000,000
NC0024945*	Charlotte-Mechlenburg Utilities	Irwin Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	15,000,000
NC0024970*	Charlotte-Mechlenburg Utilities	McAlpine Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	64,000,000
NC0029181	Carolina Water Service Inc. of North Carolina	Forest Ridge WWTP	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	150,000
NC0063789	Heater Utilities Inc.	Mint Hill Festival WWTP	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	35,000
NC0079758	National Welders DBA Airgas Nation	National Welders - Charlotte Plant	Industrial Process & Commercial Wastewater Discharge	Minor	Mecklenburg	Mooresville	14,300
NC0085359	Union County Public Works	Twelve Mile Creek WWTP	Municipal Wastewater Discharge, Large	Major	Union	Mooresville	2,500,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors - Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 3E-2: Non-discharge Permits in the Catawba River Watershed

Permit #	Owner	Facility Name	Owner Type	Permit Type	Class	County	Region
WQ0004965	Linder Industrial Machinery Company	3535 N. Graham Street	Non-Government	Wastewater Recycling	Minor	Mecklenburg	Mooresville
WQ0012155	Metromont Corporation	Metromont Corporation	Non-Government	Wastewater Recycling	Minor	Mecklenburg	Mooresville
WQ0017321	Cargill Incorporated	Cargill Incorporated	Non-Government	Distribution of Residual Solids (503 exempt)	Minor	Mecklenburg	Mooresville

Table 3E-3: Wastewater Discharge Permits in the Catawba River Watershed

Permit #	Owner	Facility Name	Permit Type	Class	County	Region	Permit Flow (Gal./Day)
NC0024937*	Charlotte-Mecklenburg Utilities	Charlotte-Sugar Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	20,000,000
NC0024945*	Charlotte-Mechlenburg Utilities	Irwin Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	15,000,000
NC0024970*	Charlotte-Mechlenburg Utilities	McAlpine Creek WWTP	Municipal Wastewater Discharge, Large	Major	Mecklenburg	Mooresville	64,000,000
NC0029181	Carolina Water Service Inc. of North Carolina	Forest Ridge WWTP	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	150,000
NC0063789	Heater Utilities Inc.	Mint Hill Festival WWTP	Discharging 100% Domestic < 1MGD	Minor	Mecklenburg	Mooresville	35,000
NC0079758	National Welders DBA Airgas Nation	National Welders - Charlotte Plant	Industrial Process & Commercial Wastewater Discharge	Minor	Mecklenburg	Mooresville	14,300
NC0085359	Union County Public Works	Twelve Mile Creek WWTP	Municipal Wastewater Discharge, Large	Major	Union	Mooresville	2,500,000

* The asterisk indicates the NPDES permits with Pretreatment Programs. See the Point Source Contributors – Pretreatment section of the Subbasin Chapters for more details on Pretreatment Programs.

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG020045	Martin Marietta Materials Inc	Martin Marietta-Arrowwood	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG020049	Vulcan Construction Materials LP	Vulcan Construction Materials-Pineville	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG020051	Martin Marietta Materials Inc	Martin Marietta-Charlotte	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG020159	Vulcan Construction Materials LP	Vulcan Construction Materials-Elkin	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Surry	Winston-Salem
NCG020202	Martin Marietta Materials Inc	Martin Marietta-Matthews Q	Non-Government	Mining Activities Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030004	Duff-Norton	Duff-Norton	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030014	Imo Industries Inc	Imo Industries Inc-Mecklenburg	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030181	New South Fabricators LLC	New South Fabricators, LLC	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030208	McGee Corporation	McGee Corporation	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Union	Mooresville
NCG030234	Bendel Corporation	Bendel Corporation	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030254	Stork Prints America Inc	Stork Prints America, Inc.	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030276	Stowe Woodward LLC	DBA Mount Hope Machinery Company	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030284	Gerdau Ameristeel Corporation	Charlotte Rebar Division	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030302	Q C Manufacturing Inc	Q C Manufacturing, Inc.	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030385	Refabco Inc	Refabco Incorporated	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030391	Contech Construct Prod	Contech Construct Prod-Mecklennburg	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030397	Fuel Systems Inc	Fuel Systems Inc	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030444	Dental Equipment LLC DBA Pelton & Crane	Pelton & Crane	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG030486	A O Smith Water Systems	A. O. Smith Water Systems	Non-Government	Metal Fabrication Stormwater Discharge COC	Minor	Mecklenburg	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG050007	Keller Crescent Company	Keller Crescent- Charlotte Plant	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050087	Rutland Holdings LLC	Rutland Plastic Technologies, Inc.	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050129	Forbo Movement Systems	Forbo Movement Systems	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050139	Ipex USA LLC	IPEX USA LLC	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050147	Genpak LLC	Genpak LLC	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050149	Otto Industries	Otto Industries	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050150	Exopack Advanced Coatings	Exopack Advanced Coatings	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050253	Alpha Gary Corp	Alpha Gary Corp-Mecklenburg	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG050284	Aplix Inc	Aplix Incorporated	Non-Government	Apparel/Printing/Paper/Leather/ Rubber Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG060028	ADM Milling Company	ADM Milling Co	Non-Government	Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG060036	Cargill Incorporated	Cargill Incorporated	Non-Government	Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG060068	B & H Foods Inc	B & H Foods Incorporated	Non-Government	Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG060081	Ccbcc Operations LLC	Snyder Production Center	Non-Government	Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	Minor	Mecklenburg	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG060175	Frito Lay Inc	Frito Lay Incorporated	Non-Government	Food/Tobacco/Soaps/Cosmetics/ Public Warehousing Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG070010	Southern Concrete Materials Inc	Southern Concrete Materials, Inc.-Charlotte Block	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG070028	Metromont Corporation	Metromont Corporation	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG070082	Yates Wilbert Vault Company	Yates Wilbert Vault Company	Non-Government	Stone, Clay, Glass, and Concrete Products Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080035	Family Dollar Stores Inc	Family Dollar Stores Inc	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080109	Charlotte Partners	Charlotte Partners	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080178	United Parcel Service	United Parcel Service-Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080309	Ups Ground Freight Inc	UPS Ground Freight, Inc.-Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080332	Ezzell Trucking Inc	Ezzell Trucking-Mecklenburg	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080345	US Postal Service - Vmf	US Postal Service-Charlotte VMF	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080356	Fedex National Ltl Inc	FedEx National LTL, Inc.-Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG080367	Nationsway Transport Serv	Nationsway Transport Serv	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080583	Schneider National Carriers	Schneider National Carriers - SO43	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080591	Greyhound Lines Inc	Greyhound Lines Inc - Charlotte	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080607	NC Air National Guard	NC Air National Guard	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080619	Norfolk Southern Railway Company	Charlotte Intermodal	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080620	Norfolk Southern Railway Company	Norfolk Southern Railway Co - Liddell St	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG080826	Southern Steel Comapny LLC	Southern Steel Company, LLC-Wilkinson Blvd.	Non-Government	Transportation w/Vehicle Maintenance/Petroleum Bulk/ Oil Water Separator Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG100075	Hunter Auto & Wrecker Service	Hunter Auto & Wrecker Service	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG100076	DBA S&R Auto & Truck Salvage	DBA/S&R Auto & Truck Salvage	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG100082	City Salvage Inc	City Salvage Incorporated	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG100101	Lakeview Auto Parts Inc	Lakeview Auto Parts Incorporated	Non-Government	Used Motor Vehicle Parts Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG110012	Charlotte-Mecklenburg Utilities	Charlotte-Sugar Creek WWTP	Government - Municipal	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Mecklenburg	Mooresville
NCG110071	Union County Public Works	Twelve Mile Creek WWTP	Government - County	Municipal WWTP > 1MGD, Stormwater Discharge, COC	Minor	Union	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

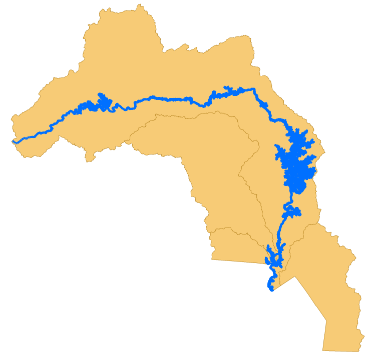
Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG120068	Mecklenburg County Solid Waste	Mecklenburg Co-Highway 521 Landfill	Government - Municipal	Landfill Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG130011	Sonoco Products Co	Sonoco Products Co-Charlotte	Non-Government	Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG130025	Safety-Kleen Systems Inc	Safety Kleen Corp-Mecklenburg	Non-Government	Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG130030	Safety-Kleen Systems Inc	Safety Kleen Systems	Non-Government	Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG130046	Fcr LLC	FCR-Mecklenburg	Non-Government	Wholesale Trade of Non-metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140041	Concrete Supply Co	Concrete Supply Co-N Plant	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140043	Concrete Supply Co	Concrete Supply Co-S Plant	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140054	Concrete Supply Co	Concrete Supply Co-W Plant	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140162	Southern Concrete Materials Inc	Southern Concrete Mat-Mecklenb	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140163	Southern Concrete Materials Inc	Southern Concrete Mat-Union	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Union	Mooresville
NCG140164	Southern Concrete Materials Inc	Southern Concrete Mat-Mecklen	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140187	Carolina Concrete	Carolina Concrete	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Union	Mooresville
NCG140198	Cemex Construction Materials Atlantic LLC	Cemex-Pineville-Kings Branch	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140202	Cemex Construction Materials Atlantic LLC	Cemex-N Charlotte	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140220	Utility Precast Inc	Utility Precast Incorporated	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140246	Concrete Supply Co	Concrete Supply Co-Arrowood	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville
NCG140308	Thomas Concrete Of Carolina Inc	Thomas Concrete Of Carolina Incorporated	Non-Government	Ready Mix Concrete Stormwater/ Wastewater Discharge COC	Minor	Mecklenburg	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCG160040	Blythe Construction Inc	Blythe Construction, Inc.-East Plant	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG160081	Rea Contracting A Division of the Lane Construction Corp	Rea Contracting-Arrowood 069	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG160083	Rea Contracting A Division of the Lane Construction Corp	Rea Contracting -Matthews 068	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG160115	Blythe Construction Inc	Blythe Construction Inc	Non-Government	Asphalt Paving Mixture Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG200347	Southern Metals Company	Southern Metals Company	Non-Government	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCG200351	Atlantic Scrap & Processing LLC-Charlot	Atlantic Scrap & Processing, LLC - Charlotte	Non-Government	Wholesale Trade of Metal Waste and Scrap Stormwater Discharge COC	Minor	Mecklenburg	Mooresville
NCGNE0056	Airborne Express	Airborne Express-CLT	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0111	ANI Holding LLC	ANI Holding LLC	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0113	Barnhardt Manufacturing Company	Barnhardt Mfg Company	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0120	BASF Corporation	BASF Corporation	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0143	Sonoco Carton	Sonoco Carton	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0147	Stronghaven Containers	Stronghaven Warehouse	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0169	Pennsylvania House	Pennsylvania House	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Union	Mooresville
NCGNE0230	Alcoa	Southern Graphic Systems	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0231	Atlantic Envelope Company	Atlantic Envelope Company	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0236	Green Fiber	Green Fiber	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0302	Southern Staircase	Southern Staircase-Charlotte	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0310	Hertron International LLC	Hertron International, LLC	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville

Table 3E-4: NPDES Stormwater Permits in the Catawba River Watershed

Permit #	Owner Name	Facility Name	Owner Type	Permit Type	Class	County	Region
NCGNE0440	Eaton Corporation-Clutch Division	Eaton Corporation-Clutch Division	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0524	Shaw Industries Inc	Shaw Industries Incorporated-Plt 25	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0581	CCL Label Inc	Ccl Label	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0593	Monarch Color Corporation	Monarch Color Corporation	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0616	Herff Jones Inc	Herff Jones Incorporated	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0630	American Circuits Inc	American Circuits Inc	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCGNE0660	Pepsi Bottling Group Charlotte	Pepsi Bottling Group-Charlotte	Non-Government	Stormwater Discharge, No Exposure Certificate	Minor	Mecklenburg	Mooresville
NCR001518	Edwards Construction Inc	Houston Ridge	Non-Government	Construction Stormwater	Minor	Union	Mooresville
NCS000040	Charlotte Pipe & Foundry Co	Charlotte Pipe & Foundry Company	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000045	National Welders DBA Airgas National Welders	National Welders-Charlotte Plant	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000049	Cognis Corporation	Cognis Corporation	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000183	Radiator Specialty Co	Radiator Specialty Co-Matthews	Non-Government	Stormwater Discharge, Individual	Minor	Union	Mooresville
NCS000213	Detrex Corporation	Detrex Corporation	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000240	City Of Charlotte Ms4	City Of Charlotte Ms4	Government - Municipal	Stormwater Discharge, Individual	Major	Mecklenburg	Mooresville
NCS000250	NC DOT - Environmental Operations	former NCDOT Division 10 Maintenance facility	Government - State	Stormwater Discharge, Individual	Major	Mecklenburg	Mooresville
NCS000312	Heritage Environmental Services LLC	Heritage Environmental Ser	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000313	Continental Tire North America Inc	Continental Tire North American Inc	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000315	Ashland Inc	Ashland Distribution Co	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000361	Caraustar Mill Group Inc	Caraustar Mill Group, Inc. - Charlotte Plant	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000382	Compost Central	Compost Central	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000386	Rohm And Haas Chemicals LLC	Rohm And Haas Chemicals LLC	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville
NCS000510	Sun Chemical Corporation	Sun Chemical Corporation	Non-Government	Stormwater Discharge, Individual	Minor	Mecklenburg	Mooresville



CHAPTER FOUR

Catawba River Chain of Lakes

Includes: Lake James, Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake & Lake Wylie

The Catawba Chain of Lakes

One of the most prominent hydrologic features of the Catawba River basin is the series of hydropower impoundments along the river's length that are widely referred to as the Catawba Chain of Lakes (Figure 4-1). This chain-like configuration presents a unique challenge to water quality management. The outflows from upstream reservoirs, as well as inputs from the surrounding watershed and direct discharges to the lakes themselves, influence the water quality in each impoundment. Therefore, water quality issues in a particular impoundment cannot be addressed without first considering the influence of watershed conditions, upstream water quality, and releases from upstream reservoirs. Downstream impacts must also be evaluated before any management decisions are implemented.

Impacts to water quality are magnified by the presence of a reservoir. Dams significantly slow the flow of water and create conditions not present in riverine systems. These conditions increase nutrient availability and give algae more time to grow. A reservoir may suffer the symptoms of excessive nutrient and sediment inputs, while a river receiving the same level of pollutants may not. In this case, the river may be moving pollutants quickly downstream, thus, preventing localized water quality problems. Similarly, two reservoirs receiving the same pollutant load may not exhibit the same symptoms. For example, one reservoir may have many small, isolated coves with little flow that allow algae to grow for extended periods of time, while another reservoir may simply act like a wide portion of a river with a continuous exchange of water and little algal growth.

All seven of the Catawba River Chain Lakes (Catawba-Wateree Project) are owned by Duke Energy Company and were created to generate electricity. The chain lakes were completed between 1904 and 1928 with the exception of Lake Norman, which was completed in 1963. These hydro projects provided much of the electrical power base needed to drive the industrial expansion (furniture, textile, etc.) seen in the first half of the 20th century. In some ways, the prosperity enjoyed by this area of North Carolina can be linked to the presence of these dams. In addition to renewable power generation, the lakes are popular recreational areas visited millions of times per year and provide drinking water to the local population. The lakes are also contributing to a recent economic expansion as new residents seek lakefront housing and commercial developments relocate near reliable water supplies. For statistics on the lakes, see Table 4-1.

Table 4-1: Statistics on Major Lakes in the Catawba River Basin (Upstream to downstream order)

Lake	Surface Area (ac)[1]	Mean Depth (ft)[1]	Max. Depth (ft)[1]	Shore Length (mi)[1]	Retent. Time (Days)[1]	Trophic Level[2]	Elev. MSL (ft)[1]	Cumulative Watershed Area (Sq. Mi.)[1]	Local Watershed Area (Sq. Mi.)[3]
Lake James	6,510	46	118	145	208	Oligo	1194	380	380
Lake Rhodhiss	3,515	20	52	90	21	Eutro	995	1,090	710
Lake Hickory	4,100	33	85	105	33	Meso	931	1,310	220
Lookout Shoals	1,270	30	69	39	7	Eutro	835	1,449	140
Lake Norman	32,510	33	118	520	239	Oligo	760	1,790	340
Mt. Island Lake	3,234	16	52	61	12	Oligo	648	1,859	70
Lake Wylie	12,450	23	69	327	39	Eutro	569	3,020	1160

1: Data from *1995 Catawba River Basinwide Water Quality Management Plan*; 2: Data from *2008 Lake and Reservoir Assessments Catawba River Basin*
3: Local Watershed Area: watershed area from the upstream dam to the dowmstream dam of that lake.

FIGURE 4-1: NC PORTION OF THE CATAWBA CHAIN OF LAKE

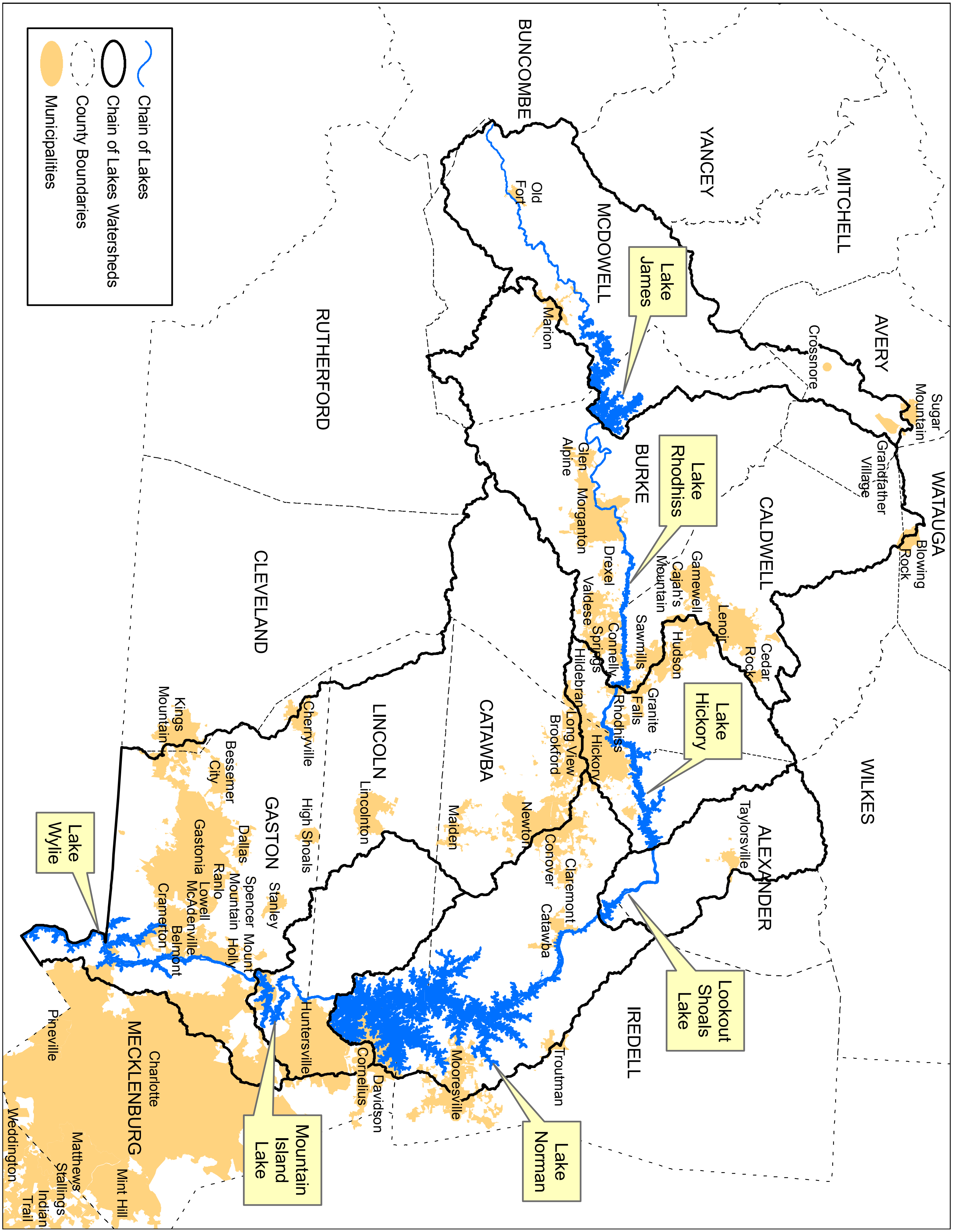


Figure 4-2: Entire Catawba Chain of Lakes

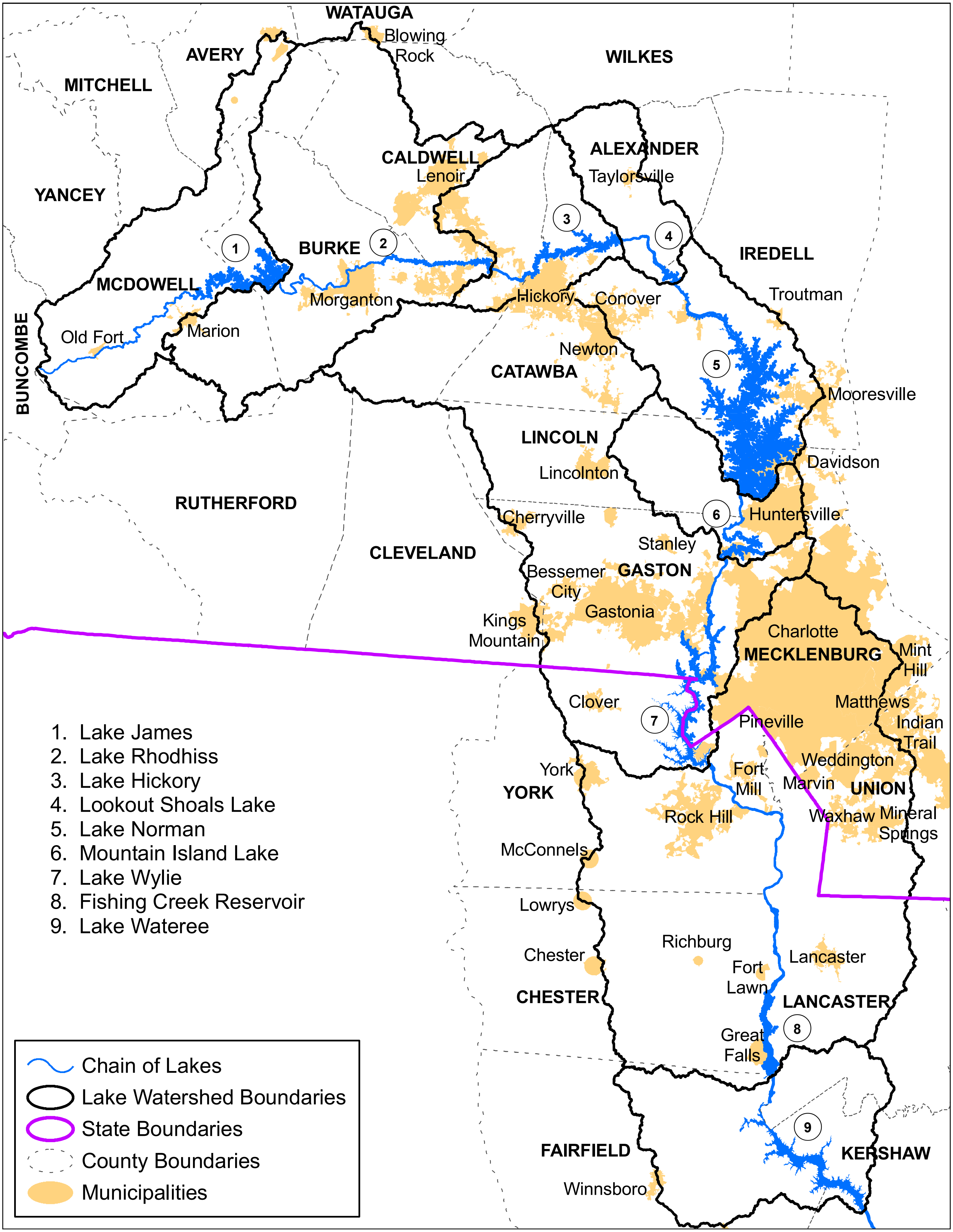


Table 4-2: Other Major Lakes Within the Catawba River Basin (Not on Catawba River)

Lake	Surface Area (Acres)	Trophic Level	Watershed Area (Sq. Mi.)	Major Uses
Lake Tahoma	161	Oligo	--	Rec (was Hydro)
Little River Dam	162	Eutro	25	Rec (was Hydro)
Bessemer City	15	Meso	0.4	WS
Newton City Lake	17	Oligo	--	WS

Off the mainstem of the Catawba River, there are four other lakes (greater than 14 acres) that have been sampled by DWQ in the past (Table 4-2) which include Little River Dam Lake, Lake Tahoma, Maiden Lake, Bessemer City Lake and Newton City Lake. Little River Dam is no longer used for hydropower purposes but has become a local fishing spot. It is located on a tributary to Lake Hickory. Lake Tahoma, located on Buck Creek, a tributary to the Catawba River upstream from Lake James, was originally created in the 1920s for hydropower purposes. It is now a recreational lake owned by Lake Tahoma Inc., a corporation of property owners living around the lake. The last three lakes are small water supply reservoirs that serve the municipalities of Maiden, Bessemer City and Newton.

General Information & Water Quality by Lake

Five lakes (James, Rhodhiss, Hickory, Norman and Wylie) were sampled by DWQ-ESS in 2007 as per the regular five year lake sampling cycle. The entire chain is located within the 03050101 Catawba River Headwater 8-digit HUC watershed. Each of the lakes hold a water supply designation of WS-IV and/or WS-V and have a secondary classification of B (primary recreation). Table 4-3 summarizes the data collected between April - September of 2007. The following section discusses each lake's water quality. Data were reported by DWQ-ESS in the *Catawba Lake and Reservoir Assessment* document.

Table 4-3: Chain of Lakes Description & Parameters of Concern from 2007 Data Summarized by Lake

Lake	AU#	Description	Classification	Parameters of Concern[1]
Lake James	11-(23)	From North Fork Catawba River to Bridgewater Dam	WS-V, B	None
Lake Rhodhiss	11-(37)	From Johns River to Rhodhiss Dam	WS-IV, B; CA	Chlorophyll *a*, **High pH**, TP, TN
Lake Hickory	11-(53)	From U.S. Highway 321 Bridge to N.C. Hwy. 127	WS-IV, B; CA	High Temperature
	11-(59.9)	From N.C. Hwy. 127 to Oxford Dam	WS-V, B	Chlorophyll *a*
Lake Norman	11-(75)	From Lyle Creek to Cowan's Ford Dam	WS-IV, B; CA	None
Lake Wylie	11-(117)	From Mountain Island Dam to Interstate Highway 85 Bridge at Belmont	WS-IV; CA	**Low pH**, Low DO
	11-(122)	From I-85 bridge to the upstream side of Paw Creek Arm of Lake Wylie, Catawba River	WS-IV, B; CA	Copper, Turbidity
	11-(123.5)a	From the upstream side of Paw Creek Arm of Lake Wylie to North Carolina-South Carolina State Line	WS-V, B	pH, Turbidity, Chlorophyll *a*
	11-(123.5)b	South Fork Catawba River Arm of Lake Wylie	WS-V, B	**Copper**, Turbidity, **High Temperature**

[1] Parameters of Concern: Physical or chemical data collected at lake monitoring sites which have elevated values. Parameters in **bold** indicate an impairment.

Understanding This Section

Use Support & Monitoring Box:

Figure 4-3: Example of a Use Support and Monitoring Box

Use Support: **Impaired** (1,849 ac)	
AU #	11-(37)
2010 IR Cat.	5
Lake Stations*	2007
(CTB034A)	High pH - 11% Chlorophyll a - 11%
*Stations in **bold** were sampled less than ten times.	

To reduce confusion and provide a quick reference, each lake discussed below has a corresponding Use Support and Monitoring Box (Figure 4-3). The top row indicates the Draft 2010 Use Support and the area of that lake. The second row displays the assessment number(s), as described below, to the corresponding data listed in that table, and the third row indicate the Integrated Report category which further defines the Draft 2010 Use Support. These first three rows are consistent for all boxes in this Chapter. The rows following are based on what type of monitoring stations are found on that lake and mostly include lake station monitoring data. The first of these rows indicated the type of data whether it's a lake or ambient monitoring station and the year the data was collected. The rows below list the station ID in parenthesis (e.g., CTB034A) and the station's data to the right. Only parameters exceeding the given standard are listed in the second column with the percent of exceedance listed beside each parameter. Stations listed in **bold** were sampled less than ten times during this sampling cycle and were not used for use support assessment.

Assessment Unit Numbers [AU#]:

Each waterbody throughout the state is given one or more assessment unit (AU) number(s). These identification numbers are assigned to a particular waterbody or portion of a waterbody for many reasons. One of those reasons is to reduce confusion when different waters have the same name. For example, there are five different streams in different parts of the Catawba River Basin named Big Branch. Another reason is to identify a particular segment of a stream or lake. A longer stream or lake may be split into multiple segments to provide more accurate assessments, classifications and reporting of a particular portion of that waterbody.

These AU numbers are indicated in the second row of each *Use Support and Monitoring Box* and are often displayed in [brackets]. If multiple segments of a lake are included in the box, each AU# will be listed. To reduce space, some AU numbers may be abbreviated. For example, the North Fork Catawba River is split into four segments, 11-24-(1), 11-24-(2.5)a, 11-24-(2.5)b, and 11-24-(13). This is then abbreviated to 11-24-(1), (2.5)a, (2.5)b & (13) where the common numbers are removed from the first part of the AU.

DWQ Lake Sampling & Assessment:

DWQ's Intensive Survey Unit samples lakes in each basin ever five years. Regular sampling events include physical (temperature, pH, dissolved oxygen, conductivity and secchi depth) and chemical (total phosphorus, total nitrogen, TKN, chlorophyll *a* and turbidity) parameters. Ten sampling events are needed at each station in a lake for use support assessment. In the case ten events are not collected, the data will not be used for use support purposes but can provide insight on current conditions within the lake. Stations listed in the *Use Support and Monitoring Box* in **bold** indicate those sampled less than ten times during this sampling cycle.

The methodology and procedures used by the Intensive Survey Unit to monitor lakes is explained in the *Standard Operating Procedures*.

Lake James

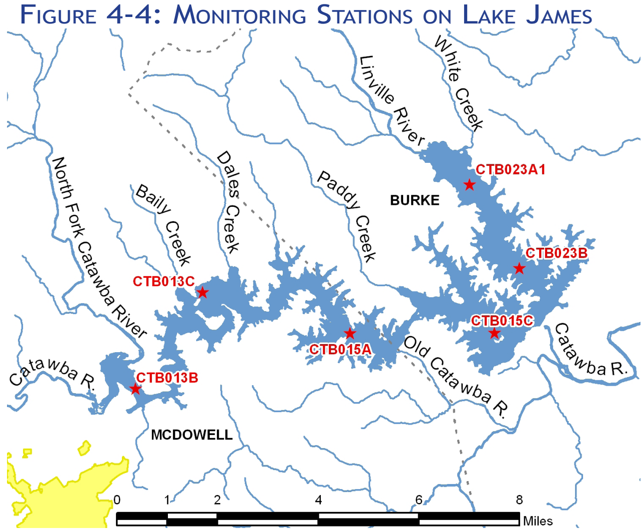
Use Support: Supporting (5,810 ac)	
AU #	11-(23)
2010 IR Cat.	2
Lake Stations	2007
(CTB013B)	High Temp - 27%
(CTB013C)	No Exceedances
(CTB015A)	High Temp - 17%
(CTB015C)	High Temp - 11%
(CTB023A1)	High Temp - 18%
(CTB023B)	High Temp - 10%

Formed by the impoundment of the Catawba River and the Linville River create Lake James, which is the most upstream reservoir in the Catawba Chain of Lakes and is operated by Duke Energy. The Catawba, the North Fork of the Catawba, and the Linville Rivers are the lake's major tributaries. The lake is used to generate electricity at the Bridgewater Hydroelectric Plant; public recreation is a secondary use.

Water Quality Assessment

The Catawba and Linville River portions of Lake James are joined by a small canal located at the Highway 126 Bridge. Water from the Catawba River portion of the lake flows through this canal into the Linville River portion. Due to the shallowness of the channel, warm, oxygenated surface water from the Catawba River portion flows into the Linville River section during the summer months, and the colder, less oxygenated water becomes trapped in the Catawba River side.

Figure 4-4: Monitoring Stations on Lake James



Lake James has undergone rapid shoreline development since last evaluated in 2002. In 1997, the shoreline was mostly forested but ten years later in 2007, the shoreline was 50% to 75% developed for residential use and is still being developed.

The water clarity during the 2007 sampling period was clearest right before the water left the lake near the reservoir dam. Decreased water clarity was noted at the first sampling station (CTB013B) of the Catawba arm (Figure 4-4). This is similar to what has been sampled in past cycles. Turbidity levels were well under the State's standard of 50 NTU. Low turbidity and high water clarity suggests the lake is acting as a catchment basin by slowing the flow enough to allow sediment and other materials to settle out of the water column before exiting the lake over the dam.

Temperature values were elevated due to high air temperatures during the summer months and severe drought. Even though all but one station exceeded the temperature standard, the lake will not be impaired for high temperature due to the severe drought in 2007 and result values were less than two degrees over the standard. The high water temperatures; therefore, extremely likely due to natural conditions.

On the Catawba River side of the lake, TKN (total Kjeldahl nitrogen) and TP (total phosphorus) levels were elevated as compared to previous years. TP levels measured were high for a mountain region lake. Nitrite and nitrate levels ranged from elevated to extremely elevated from April to June then decreased to normal levels by late July. In general, nutrient concentrations were greater in the Catawba River portion of the reservoir as compared to the Linville River portion. The lake was determined to be oligotrophic (low biological productivity) in 2007.

Even though excellent water clarity and elevated nutrients levels are favorable for algal growth, Lake James did not have nutrient levels sufficient to potentially produce nuisance algal blooms (Algal Growth Potential Test, 2007). However, a slight increase in algal growth did contribute to slightly higher chlorophyll *a* values. The State's standard for chlorophyll *a* is not to exceed 40 µg/L. Most stations recorded levels below 10 µg/L except for the most upstream station of the Catawba River arm (CTB013B) which consistently measured between 15 and 20 µg/L. Two other stations measured above 10 µg/L during the April sample (CTB013C & CTB015A). The Catawba River side of the lake may show more algal activity due to nutrient loading and reduced flow.

An Algal Growth Potential Test was conducted on samples from Lake James. This test is used to identify which, if any, nutrient might be limiting algal growth. The limiting nutrient (phosphorus or nitrogen) is the one that is used up first in the system decreasing continued growth of algae. The results of this test indicated that the lower portion of the Catawba River side was phosphorus limited and the lower portion of the Linville River side was nitrogen limited. However, the upper portion of the Linville River side was co-limited for nitrogen and phosphorus. Therefore, if a nutrient management strategy were developed for Lake James, some combination of nitrogen and phosphorus would probably be considered.

Point & Nonpoint Source Loading

Nonpoint Source Loading

Land use north of Lake James watershed consist mostly of forested land (Pisgah National Forest); however, south of Lake James the land use also includes agricultural and developed areas. Nutrients and sediment from these land uses have the most potential to cause water quality issues to Lake James. Nutrient loading from agricultural practices originate from the amount and timing of fertilizer application, livestock access to streams and general stormwater runoff from the land. Sediment from nonpoint sources in the Lake James watershed include agricultural practices, land development and other land disturbing activities. Implementation of agricultural and land development best management practices (BMPs) could help prevent large portions of these nutrients and sediment from reaching the streams and the lake. Runoff from lake front properties could also be impacting the water quality. It is suggested that local governments educate property owners and ensure implementation of the 50 foot buffers around the lake. Additional buffer information can be found in the *Buffers Chapter*.

Point Source Loading

There are 13 NPDES Discharger Permits within the Lake James watershed (Table 4-4). The City of Marion's Catawba River WWTP (NC0071200) is located about three and a half miles upstream of Lake James, discharges directly into the Catawba River, and has had difficulty meeting its permit requirements during 2004 through 2008. The monitoring station downstream of this facility, on average, had the highest measured levels of turbidity, suggesting that the Marion WWTP may contribute to the turbidity in the upper Catawba River arm of Lake James. The facility was granted a Special Order of Consent (SOC) to allow the city time to make necessary upgrades that would bring the facility back into compliance. However, after an extension of the SOC, the City came to the conclusion to shut the facility down and divert influent flow to the City's Corpening Creek WWTP (NC0031879) which was also recently under SOC. The City of Marion will be requesting Rescission of NPDES Permit NC0071200 in May 2010. For more information on these facility, see *Chapter 1 -* North Muddy Creek (030501010601).

Table 4-4: NPDES Discharger Permits within Lake James Watersheds

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	12-Digit HUC #	Receiving Stream
Coats American-Sevier Plant	NC0004243	Major; 2.0	030501010202	North Fork Catawba River
Old Fort WWTP	NC0021229	Major; 1.2	030501010101	Curtis Creek
Linville Land Harbor WWTP	NC0022756	Minor; 0.225	030501010301	Linville River
GGCC Utility WWTP	NC0023124	Minor; 0.07	030501010301	Linville River
Crossnore WWTP	NC0026654	Minor; 0.07	030501010301	Mill Timber Creek
Linville Resorts WWTP	NC0039446	Minor; 0.15	030501010301	Linville River
Corpening Forestry Training Center	NC0040339	Minor; 0.018	030501010301	Linville River
Jonas Ridge Adult Care Facility	NC0060224	Minor; 0.0075	030501010301	Camp Creek
Linville Ridge Country Club WWTP	NC0062413	Minor; 0.015	030501010301	Trib. to W. Fk Linville River
The Switzerland Inn	NC0030996	Minor; 0.01	030501010201	Buchanan Creek
City of Marion Catawba R WWTP	NC0071200	Minor; 0.25	030501010106	Catawba River
Blue Ridge Country Club WWTP	NC0080098	Minor; 0.202	030501010202	North Fork Catawba River

Figure 4-5: Exposed lake bed at upper end of Lake James

*Picture from Catawba RiverKeeper

Drought

Lake James was greatly impacted by the drought in 2007. By early October 2007, many areas of the lake were exposed as the water levels dropped by nine feet from normal full pool levels (Figure 4-5. Despite the drought that occurred during the monitoring period, the biological productivity, as indicated by algal density, had not significantly changed since the last cycle. However, the combination of low water levels and high air temperature caused water temperature exceedances in late summer at four out of the six lake monitoring stations as mentioned earlier. The lake will not be on the Impaired Waters list for these exceedances as the high temperatures and drought are considered natural causes. For more information on how high water temperatures can effect aquatic life, see Chapter 3, Section 3.3.6 of the *Supplemental Guide to North Carolina's Basinwide Planning.*

Aquatic Weed Infestation

Duke Energy discovered the nuisance aquatic plant, Hydrilla, in the Catawba River arm in 1999. This plant has the potential of spreading rapidly throughout the lake, reducing available boating and swimming areas, and decreasing the lake's aesthetic appearance. In 2002, 21,500 sterile grass carp were stocked by the NC Wildlife Resources Commission to control the spread of Hydrilla. During this sampling cycle, there were no observations of Hydrilla in the lake. However, the lack of reported observations should not be interpreted as an indication that this aquatic weed has been eradicated from the lake.

Recommendations for Lake James

Buffers

Due to the recent development pressures seen around the lake, local governments should work together to educate and ensure implementation of the Catawba River mainstem 50-foot riparian buffer rules adopted by the EMC in August of 2004. DWQ will also work with the Western Piedmont Council of Government (WPCOG) to find educational opportunities to assist in this effort. For more information about the Catawba River Buffer rules, see the *Buffers Chapter*.

Monitoring

During the next sampling cycle DWQ's Intensive Survey Unit will try to sample the six lake stations, at minimum, five times (monthly May - September). As resources become available, the six lake stations should be sampled and include all regularly sampled parameters ten or more times. This would assist in having a range of data to better assess for nutrients and other parameters that could impact aquatic health within Lake James.

Local Initiatives

The Lake James Environmental Association joined the efforts of the Environmental Quality Institute/University of North Carolina at Asheville to begin monitoring the lake in 2001. Through this Volunteer Water Information Network (VWIN), 13 sites in and around Lake James were sampled for pH, alkalinity, turbidity, TSS, conductivity, copper, lead, zinc, ortho P, ammonia-N and nitrate-N. For more information about the VWIN program, visit the *VWIN website*.

Lake Rhodhiss, Hickory & Lookout Shoals

Lakes Rhodhiss, Hickory and Lookout Shoals are perhaps the most closely linked in the lake chain and exhibit some of the most significant water quality trends in the basin. These are the first impoundments below the forested Blue Ridge and are heavily influenced by the urbanized corridor along Interstate 40. Although these lakes are relatively small in volume, compared to Lake James (upstream) and Lake Norman (downstream), the land area draining to them is large. In effect, most of the pollution generated by the urban centers (Morganton, Hickory, Lenoir, etc.) and agricultural operations makes its way to these reservoirs. The current result of this runoff is elevated inputs of nutrients and sediment. Each impoundment's response to this load is different and is discussed individually below.

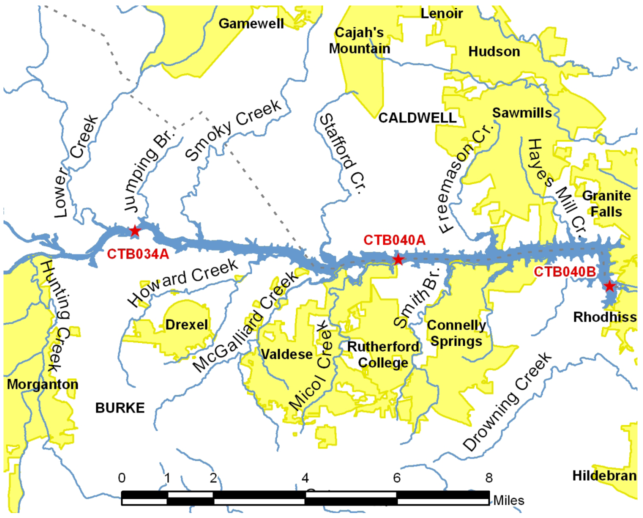
DWQ advocates a broad scale locally-driven management strategy be developed for these lakes collectively. At a minimum, this strategy should build upon the local efforts recently developed for Lake Rhodhiss discussed below and facilitate regional cooperation among local stakeholders.

Lake Rhodhiss

Use Support: Impaired (1,849 ac)	
AU #	11-(37)
2010 IR Cat.	5
Lake Stations*	2007
(CTB034A)	High pH - 11% Chlorophyll a - 11%
(CTB040A)	High pH - 11%
(CTB040B)	High pH - 22%
*Stations in **bold** were sampled less than ten times during this sampling cycle.	

Lake Rhodhiss is a run-of-the-river reservoir located on the Catawba River downstream of Lake James and upstream of Lake Hickory and has the largest drainage area (710 square miles) of all seven lakes. The 10-digit watersheds (HUCs 0305010104, 0305010105, 0305010106, 0305010107 and most of 0305010108) which drain to the lake are mostly forested in the upper headwaters and transition to urban and agricultural lands closer to the lake. Three major roads (US-321, US-70 and US-64) encompass the lake and drive much of the development in this area. There are 14 municipalities surrounding the lake along these corridors including Morganton, Lenoir, Gamewell, Sawmills, Drexel, Rhodhiss and Valdese. Along with the impacts from these land uses, there are also 11 minor and four major NPDES dischargers within these watersheds. Two of the major facilities (City of Morganton's WWTP and the Town of Valdese Lake Rhodhiss WWTP) discharge directly into the lake. These factors as well as the close relationship to downstream lakes make the health of Lake Rhodhiss significant to the health and water quality of the Chain of Lakes. By protecting the headwater lakes, such as Lake Rhodhiss, the accumulative impacts downstream can be minimized.

Figure 4-6: Monitoring Stations on Lake Rhodhiss



As seen in Figure 4-6, there are seven major streams which flow into the headwaters of the lake and include Lower Creek, Johns Creek, Warrior Fork, Canoe Creek, Catawba River, Silver Creek and Hunting Creek. Of these seven waterbodies, two appear on the 2008 Impaired Waters list (Lower & Hunting Creeks) along with seven other smaller streams within the lake's watersheds. Most of these impairments are due to poor biological integrity; however, some impairments are due to low pH and turbidity standard exceedances. Three Ambient Monitoring System (AMS) stations are located in the watershed on Wilson Creek, Lower Creek and the Catawba River. For more details about these sites, see *Chapter 1 - Catawba River Headwaters Subbasin*.

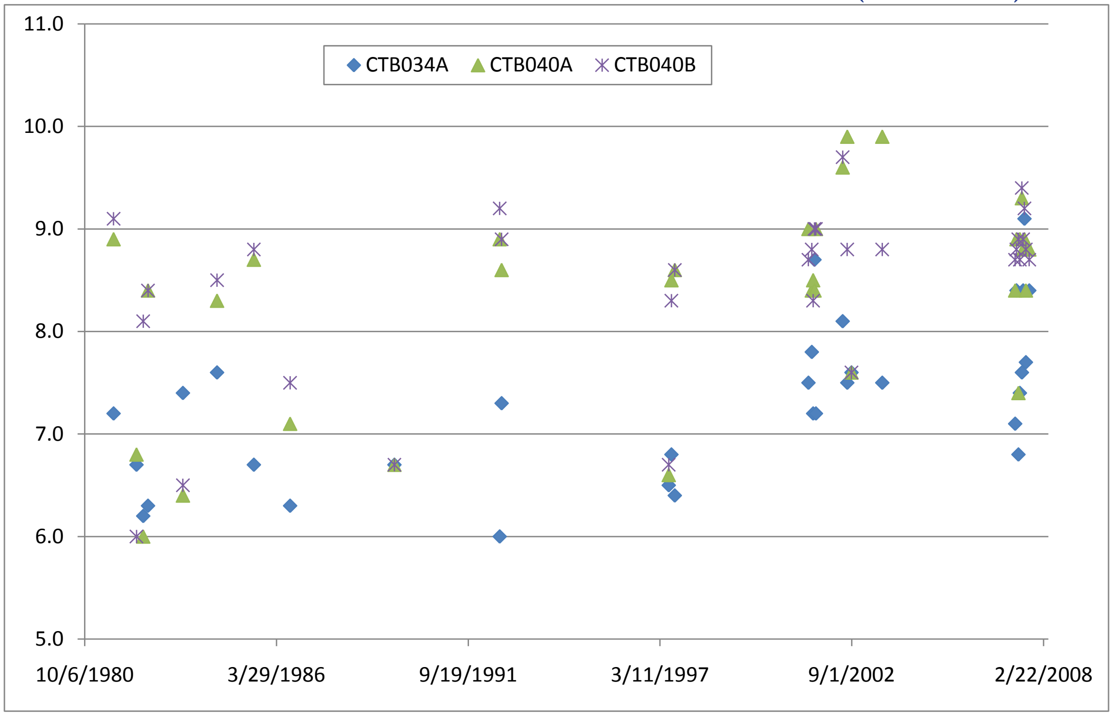
Water Quality Assessment

Lake Rhodhiss was first placed on the Impaired Waters list in 2006 for high pH based on data collected in 2002. During the 2007 monitoring cycle, the Intensive Survey Unit, within the Environmental Science Section (ESS) of DWQ, sampled the three ambient station in Lake Rhodhiss (CTB034A, CTB040A & CTB40B) (See Figure 4-6) nine times. Data from 2007 continue to support impairment due to exceedances of the pH standard and will remain on the 2010 Impaired Waters Report.

During this cycle, all three sites had elevated pH levels in more than 10% of the nine samples and one site (CTB034A) showed elevated chlorophyll *a* levels in September (70 µg/l). Conclusions which are consistent with previous monitoring cycles as well as current data collected from agencies or watershed groups outside of DWQ indicated that the lake was eutrophic (exhibited elevated biological productivity) during the summer sampling months of 2007.

In 2007, four out of the 27 total surface samples had pH values greater than the state standard of 9.0 su. Another ten surface samples were elevated above 8.7 su but did not exceed the state standard. This is not unlike what was observed during the 2002 sampling. Ambient stations located within the Lake Rhodhiss watershed and upstream of the lake stations, measured pH levels around 6.7 to 6.9 su; however, conditions in streams are not the same as those found in a lake due to water flow rates, water temperature, algal activity and loading rates. Figure 4-7 displays all pH samples for each of the three lake stations between 1981 and 2007. In the early 1980's, Lake Rhodhiss had a median pH of 7.0 su, which has increased over time. The median pH of samples taken in 2007 was 8.7 su.

Figure 4-7: pH History of the Three Lake Stations in Lake Rhodhiss (1982-2007)



Chlorophyll *a*, an indicator of algal productivity, was the only other parameter sampled that exceeded the state standard of 40 µg/l. A sample taken in September of 2007 (CTB34A) resulted in a value of 70 µg/l which was associated with a blue green algae bloom. Even though the state standard for chlorophyll *a* is set at 40 µg/l statewide, levels over 25 µg/l are considered elevated for mountain and upper piedmont regions lakes like Lake Rhodhiss. Twelve out of the 27 total samples were at or near 25 µg/l, indicating algal productivity. Algal blooms were observed during the sampling cycle at the upper end of the reservoir as well as near the dam.

During the previous sampling cycle in 2001 and 2002, reports of taste and odor problems in drinking water processed from the lake resulted in an in-depth special study at that time to investigate the extent and nature of the algal blooms which were causing the problems. Results of that special study found the existence of 15 well-established algae clusters or communities.

Analysis of data collected from lake monitoring efforts during the 2007 assessment indicated that excess nutrients and slow retention times contributed to blue-green algae blooms that occurred near the dam from mid-June through September. Based on an Algal Growth Potential Test conducted in 2007, Lake Rhodhiss was determined to be co-limited for nitrogen and phosphorus (i.e., neither nutrient, by itself, limited the growth of algae). *Cylindrospermopsis sp*, a blue-green alga associated with nutrient-rich water, was the dominate alga in the 2007 summer blooms. As seen in 2002, drought conditions in 2007 increased the retention time (amount of time that water traveled through the reservoir) allowing additional time for the nutrients from point and nonpoint source runoff to be utilized by the algae. As long as these conditions continue to reoccur, algae will remain an issue for Lake Rhodhiss.

Taste and odor problems in drinking water processed from the lake were being reported again in May 2010 to the public utility companies. The source of the taste and odor problems from these reports are not known at this time.

Point & Nonpoint Source Nutrient Loading

In July 2009, the Western Piedmont Council of Governments (WPCOG), published the results of a *Phosphorus and Nitrogen Loading and Export* study of Lake Rhodhiss (conducted by Carolina Land & Lakes RC&D, Inc.) to help better understand the origin of the nutrients within the watershed. This study was one of the first steps toward the development of a *Lake Rhodhiss Watershed Management Plan*, further discussed below. The study estimated nutrient and sediment loads from point and nonpoint sources for the Lake Rhodhiss watersheds. Please note that this study was conducted during a time of drought; therefore, nonpoint source estimates may typically be higher than the study shows.

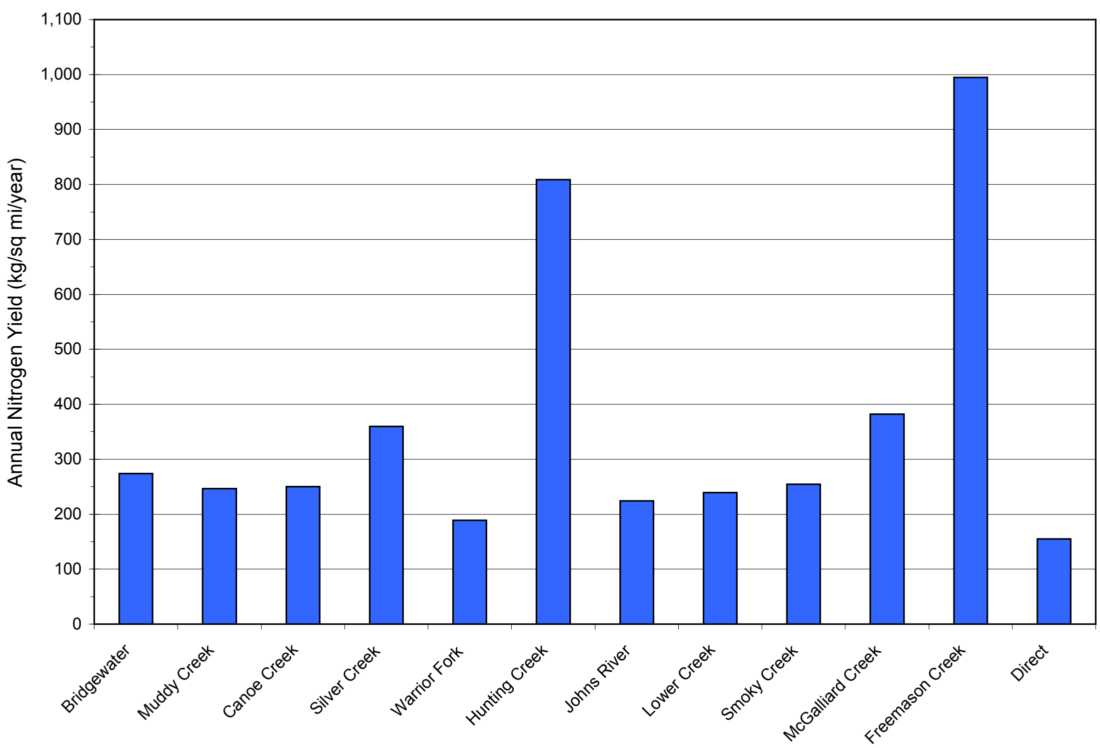
Nonpoint Source Loading

Figure 4-8 and Figure 4-9 show the nitrogen and phosphorus loadings from nonpoint sources for each watershed. These figures are based on information collected by Carolina Land & Lakes RC&D, Inc. between April 2007 and May 2008. Nutrient loads from point sources are not included in these graphs. The annual nitrogen and phosphorus yields are calculated by kilogram per square mile per year which eliminates the watershed size variable and provides a more accurate comparison of the watersheds.

As seen in Figure 4-8, the Hunting Creek and Freemason Creek watersheds produced the highest levels of nitrogen. The Hunting Creek watershed runs through the City of Morganton and is roughly 50 to 60% developed. Freemason Creek watershed; however, is mostly agricultural. In Figure 4-9, four watersheds appear to produce a higher phosphorus yield than other watersheds (Silver, Hunting, Lower Creeks and Johns River watersheds). Silver Creek watershed is mixed land use of developed and agricultural land with little forested area compared to the other three watersheds. The majority of Johns River watershed drains large tracks of forested land; however, about 12 miles upstream of the lake some agricultural lands line the river. The headwaters in the Lower Creek watershed flow through the City of Lenoir and the Town of Gamewell then flow through large agricultural lands further downstream. Construction and fertilizing activities which are likely sources of excess nutrient loading, are prominent in all five of these watershed. On these graphs, Bridgewater (the first bar) is referring to the last dam on Lake James.

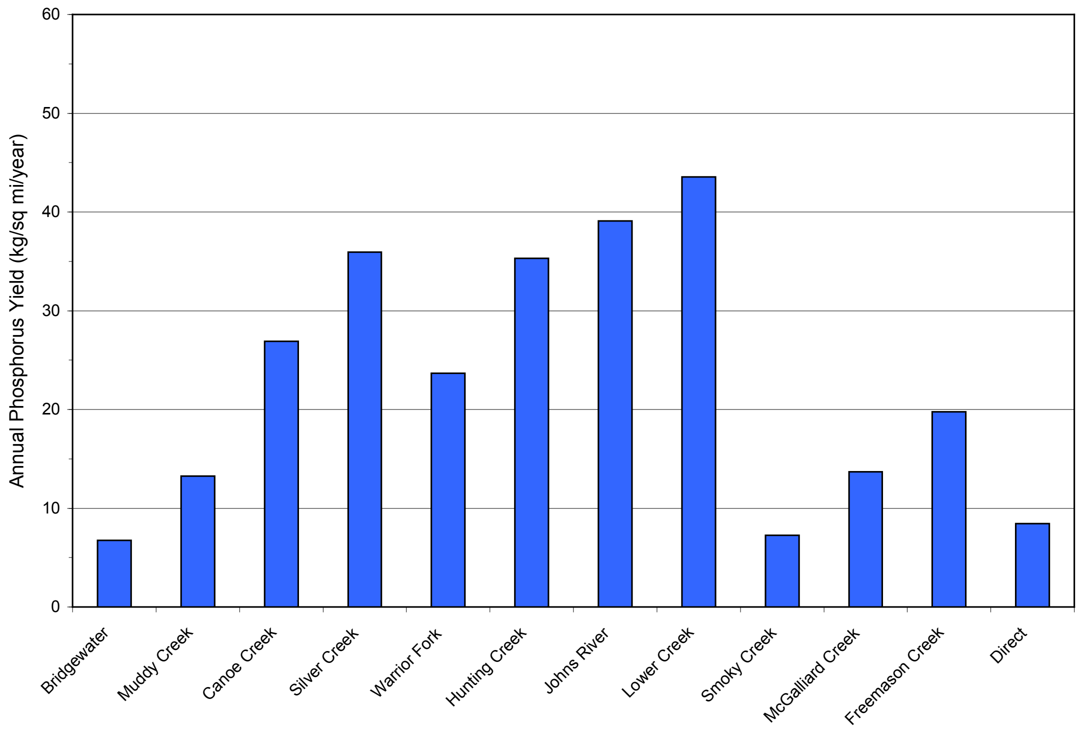
It was determined that total loading could not be linked to generalized land use patterns; however, activities such as construction and fertilizing agricultural and residential lands play a significant role. The study showed that the majority of phosphorus entering the streams is attached to suspended sediment that is being washed off the land.

Figure 4-8: Annual Nonpoint Source Nitrogen Yield by Watershed*



***Source**: Carolina Land & Lakes RC&D, Inc., *Phosphorus and Nitrogen Loading and Export From Rhodhiss Lake, North Carolina*

Figure 4-9: Annual Nonpoint Source Phosphorus Yield by Watershed*



Source: Carolina Land & Lakes RC&D, Inc., *Phosphorus and Nitrogen Loading and Export From Rhodhiss Lake, North Carolina*

Point Source Loading

There are four major NPDES Dischargers releasing effluent within these watersheds. The locations of these facilities are shown on the Permits map in *Chapter 11*. The City of Marion's WWTP (NC0031879) is the most upstream facility and is permitted to releases 3 MGD to Youngs Fork (Corpening Creek). The City of Lenoir's WWTP (NC0023981) is permitted to release 6 MGD of effluent to Lower Creek. The City of Morganton WWTP (NC0026573) and the Town of Valdese's WWTP (NC0041696) release directly into Lake Rhodhiss and are permitted for 13 MGD and 10.5 MGD, respectively.

Table 4-5: Annual Point Source Loading from WWTPs in Lake Rhodhiss*

Facility	TN (metric tons/yr)	TP (metric tons/yr)
Morganton WWTP	142.21	20.03
Valdese WWTP	23.23	10.27
Lenoir WWTP	18.76	4.08
Marion WWTP	7.39	1.65
Total	**191.59**	**36.04**

Source: Carolina Land & Lakes RC&D, Inc., *Phosphorus and Nitrogen Loading and Export From Rhodhiss Lake, North Carolina*

Nutrient loads within the effluent of both Marion and Lenoir's WWTPs are greatly reduced due to organic uptake, settling of sediment and the distance of the dischargers from the lake. Table 4-5 shows the nutrient loads within the effluent being released from each facility. It is clear that Morganton and Valdese have the largest input of both phosphorus and nitrogen in to the lake. The reduction of nutrients for these two facilities is especially critical to the overall loading because both facilities discharge directly into the lake. For additional information on how the loads for each facility was calculated, see the Carolina Land & Lakes RC&D, Inc., *Phosphorus and Nitrogen Loading and Export* document on the WPCOG website.

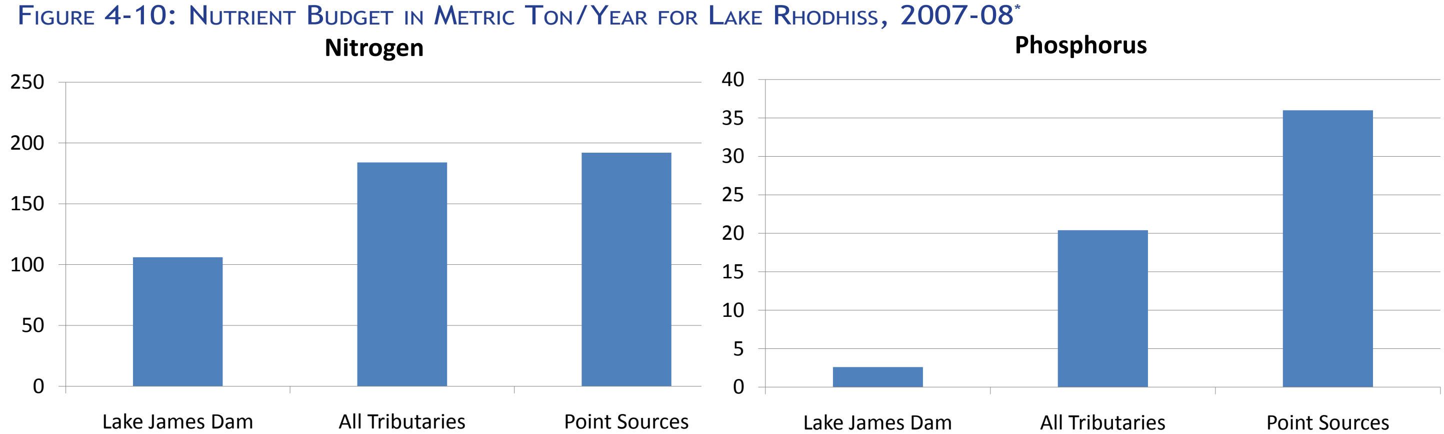
TABLE 4-6: NPDES DISCHARGER PERMITS WITHIN LAKE RHODHISS' WATERSHEDS

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	12-Digit HUC #	Receiving Stream
Lenoir Lower Creek WWTP	NC0023981	Major; 6.0	030501010702	Lower Creek
Morganton Catawba R. Pollution Control Facility	NC0026573	Major; 13.0	030501010608	Catawba River
Valdese Lake Rhodhiss WWTP	NC0041696	Major; 10.5	030501010801	Lake Rhodhiss
Marion Corpening Creek WWTP	NC0031879	Major; 3.0	030501010607	Corpening Creek
Collettsville Elementary School	NC0050075	Minor; 0.01	030501010505	Johns River
Sugar Hill Truck Stop	NC0029831	Minor; 0.005	030501010601	North Fork Muddy Creek
Ceadarbrook Residential Center	NC0035157	Minor; 0.003	030501010602	Long Branch
Days Inn - Marion	NC0040291	Minor; 0.02	030501010601	Hicks Branch
Jonas Ridge Adult Care Facility	NC0060224	Minor; 0.0075	030501010401	Cranberry Creek
Nebo Elementary School WWTP	NC0067148	Minor; 0.0075	030501010607	Shadrick Creek
McDowell Assisted Living WWTP	NC0075353	Minor; 0.01	030501010601	North Fork Muddy Creek
Harmony Estates WWTP	NC0079481	Minor; 0.04	030501010603	North Fork Muddy Creek
Baton Elementary School	NC0030783	Minor; 0.015	030501010801	Stafford Creek
NC Outward Bound School	NC0040754	Minor; 0.0075	030501010402	Roses Creek
Cedar Rock Country Clud	NC0043231	Minor; 0.009	030501010701	Tributary to Lower Cr.

Point vs. Nonpoint Source Loading

As seen in Figure 4-8, nitrogen loading from upstream (Bridgewater/Lake James Dam) accounts for about 20% of total nitrogen loading. Point and nonpoint sources about equally account for the remainder of the total nitrogen load. Phosphorus loading was dominated by the WWTP facilities within the watershed, accounting for 61% in which 85% was released from Morganton and Valdese. The remaining 39% of phosphorus was coming from nonpoint sources within the lake's watersheds, mainly Lower Creek. Conclusions from the study noted that majority of nonpoint source phosphorus was being carried by sediment washed off the land during rainstorm events. Of the nutrient and sediment loads entering the lake, 12% of sediment, 35% of nitrogen and 38% of phosphorus was retained by the lake. Most of the nutrients retained by the lake were likely utilized by algae or other biological organic matter or attached to sediment particles and settled before reaching the dam (Knight, 2009).

FIGURE 4-10: NUTRIENT BUDGET IN METRIC TON/YEAR FOR LAKE RHODHISS, 2007-08*



*** Source**: Carolina Land & Lakes RC&D, Inc., *Phosphorus and Nitrogen Loading and Export From Rhodhiss Lake, North Carolina*

* Data used for these graphs and data analysis for the Lake Rhodhiss Point & Nonpoint Source Nutrient Loading Section are summaries of information found in the Phosphorus and Nitrogen Loading and Export study conducted by Carolina Land & Lakes RC&D, Inc. DWQ's current and historical data as well as other watershed studies are congruent with much of the findings presented in this study.

Drought

The 2007 drought may have had an impact on Lake Rhodhiss; however, not to the magnitude of other lakes within the chain. The drought would have had the most impact on the lake through slowed retention time. Even though less nutrients and sediment were washed off the land via rainfall, the nutrients that did make it to the lake were present for a longer period of time, providing a greater chance of being utilized by algae. The lake was last monitored in 2002 which was also a drought year. The elevated nutrient levels during this monitoring cycle could be due to an increased intensity and duration of the drought but could also be due to increased loading. Further study is needed before that conclusion could be determined.

Lake Rhodhiss Nutrient Management Action Plan

Due to the high pH impairment of the lake, a Lake Rhodhiss Nutrient Management Action Plan was developed. Excessive nutrients within the lake have been shown to be originating from both point and nonpoint sources. The action plan below discusses how both sources will be addressed during the coming five year period.

Point Source Action Plan

Beginning in November 2008, an optimization study was conducted with three out of the four major NPDES dischargers into Lake Rhodhiss (Marion, Morganton and Valdese). The Lenoir facility was not included in this study because construction was completed to reduce phosphorus. The Asheville Regional Office is working closely with the other three facilities to ensure pilot studies and resulting implementation efforts are completed by end of summer 2011. These facilities are participating voluntarily with the goal of reducing effluent total phosphorus concentrations to 2 mg/L.

All four facilities (Marion, Morganton, Lenoir and Valdese WWTPs) will be required through their NPDES permit to monitor their effluent weekly for nitrogen and phosphorus. Permits will also include the requirement to conduct upstream/downstream monitoring for nutrients monthly during the period of the study for these facilities. This monitoring will provide clear nutrient contribution data from each facility by determining what the levels are in-stream above and below each facility's discharge pipe. Valdese discharges directly into Lake Rhodhiss and therefore upstream and downstream monitoring of nutrients is not required.

A TMDL for Lake Rhodhiss will be developed by the DWQ Modeling/TMDL Unit during this upcoming planning cycle for the pH impairment. Due to the fact the lake is co-limited for nutrients, the TMDL will specify total nitrogen and total phosphorus reductions from point and nonpoint sources.

Limits consistent with the TMDL will be incorporated into the 2014 permit renewals for the affected facilities. Any early reductions achieved through the pilot studies and implementation efforts will be taken into consideration when permit limits are established.

Nonpoint Source Action Plan

A Watershed Management Plan was developed by the Western Piedmont Council of Government (WPCOG) in 2009 to address point and nonpoint source nutrient loading for the entire Lake Rhodhiss watershed. This document includes recommendations that identify areas for implementing best management practices (BMPs) to reduce nutrient loading from both agricultural and non-agricultural nonpoint sources. DWQ will work with the WPCOG and other active watershed partners to ensure practices are implemented where they will be most effective during the upcoming planning cycle. Monitoring in these areas will be continued to evaluate the water quality benefits from these efforts. Continued monitoring will also assist in determining if nonpoint source BMPs need to be focused in additional locations.

Recommendations for Lake Rhodhiss

Buffers

Due to the recent development pressures seen around the lake, local governments should continue to work together to educate and ensure implementation of the Catawba River mainstem 50-foot riparian buffer rules adopted by the EMC in August of 2004. DWQ will also work with the WPCOG to find educational opportunities to assist in this effort. For more information about the Catawba River Buffer rules, see the *Buffers Chapter*.

Monitoring

During the next sampling cycle DWQ's Intensive Survey Unit will try to sample the three lake stations, at minimum, five times (monthly May - September). As resources become available, the three lake stations should be sampled and include all regularly sampled parameters ten or more times. This would assist in having a range of data to better assess for nutrients and other parameters that could impact aquatic health within Rhodhiss.

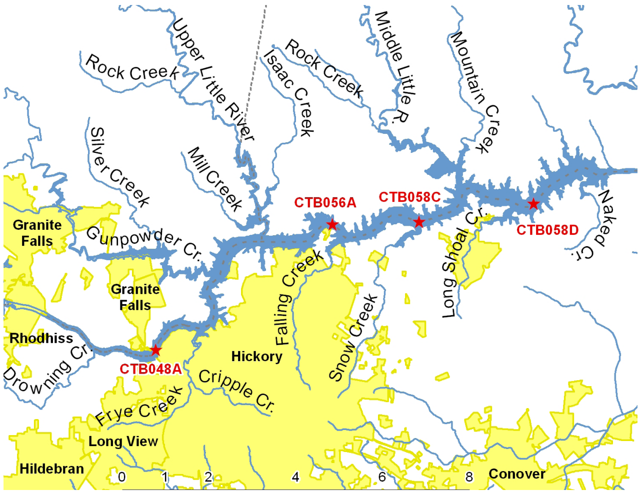
Lake Hickory

Use Support: Supporting (3,326 ac)	
AU #	11-(53) & (59.9)
2010 IR Cat.	2
Lake Stations*	2007
(CTB048A)	No Exceedances
(CTB056A)	No Exceedances
(CTB058C)	No Exceedances
(CTB058D)	No Exceedances

*Stations in **bold** were sampled less than ten times during this sampling cycle.

Lake Hickory is a run-of-the-river reservoir located between Lake Rhodhiss and Lookout Shoals Lake on the Catawba River. The lake was filled in 1928 and is operated by Duke Energy. It has the smallest drainage area of any other major lake in the chain. The 10-digit watersheds (HUCs 0305010109 and part of 0305010108 and 0305010110) which drain to the lake, are mostly forested in the upper headwaters, agricultural lands north of the lake, and urban areas south of the lake. The waters of the lake are used to generate hydroelectric power, for public water supply and for recreational purposes. Lake Hickory is classified from the Rhodhiss Dam to the US Highway 321 bridge on the Catawba River as WS-IV, B, CA, and from the US Highway 321 bridge to Oxford Dam as WS-V, B.

Figure 4-11: Monitoring Stations on Lake Hickory



As seen in Figure 4-11, there are five major streams draining into Lake Hickory as well as flow draining directly into the lake from Lake Rhodhiss. These two lakes have very similar water quality issues due to proximity as well as similar land use activities. For more information on water quality within Lake Rhodhiss, see the section above. The five streams include Gunpowder Creek, Drowning Creek, and Upper, Middle, and Lower Little Rivers. The upper segment of Lower Little River is the only one of these streams which appears on the 2008 Impaired Waters list (low pH). Gunpowder Creek, Lower Little River and Muddy Fork (a tributary to the Lower Little River) are expected to be on the 2010 Impaired Waters list for biological integrity and low pH. For further analysis of these streams impairments, see *Chapter 1 - Catawba River Headwaters Subbasin*.

Water Quality Assessment

In 2007, the Intensive Survey Unit sampled at each of the four lake stations, seen in Figure 4-11, approximately nine times. None of the lake stations showed any standard violations. However, there was one sample with elevated chlorophyll *a* and two with low DO values which occurred during September and may have been caused by cool weather mitigated turnover of the lake.

Chlorophyll *a* is an indicator of algal productivity. Even though the state standard for chlorophyll *a* is set at 40 µg/l statewide, levels over 25 µg/l are considered elevated for mountain and upper piedmont regions lakes like Lake Hickory. Nine out of the 32 total samples were near 25 µg/l, indicating early signs possible algal productivity. Overall, nutrient levels ranged from low to moderate. The consistent decline in dissolved oxygen levels, and increase in chlorophyll *a* and pH levels throughout the summer are similar to what was observed in Lake Rhodhiss.

An Algal Growth Potential Test was conducted on samples from Lake Hickory. This test is used to identify which, if any, nutrient might be limiting algal growth. The limiting nutrient (phosphorus or nitrogen) is the one that is used up first in the system decreasing continued growth of algae. The results of the Algal Growth Potential Test revealed nitrogen as the limiting nutrient for algal growth within the lake (Algal Growth Potential Test, 2007). The results were similar to values seen in 2002.

Algal blooms (*Euglenoid*) were seen at the lower end of the reservoir from late July through late September of 2007 which indicates elevated nutrient and organic loading. This suggests the excess nutrients are not solely from Lake Rhodhiss and, Lake Hickory is likely receiving nutrients from its own watersheds. Increased residence time due to the drought may have also contributed to the growth of the bloom. Taste and odor problems in drinking water processed from the lake were reported to the public utility companies in May of 2010.

Point & Nonpoint Source Nutrient Loading

Nonpoint Source Loading

On the north side of the lake, agricultural activities dominate the land use with exception of the very northern part of the drainage area which is mostly forested. Excess nutrient loads from agricultural practices can originate from the amount and/or timing of fertilization, the ability of cattle to have access to streams and general stormwater runoff from the land. Implementation of agricultural best management practices (BMPs) could help reduce nutrient delivery to these streams.

The City of Hickory is located just south of Lake Hickory and a majority of the city drains into the tributaries and lake. Urban stormwater runoff from the city can be toxic to aquatic life if not properly controlled or treated before reaching a waterbody. The City of Hickory began Phase II Stormwater implementation in July 2007 to reduce the impacts from urban runoff. Water quality improvements from these efforts will likely be evident during the next sampling cycle.

Point Source Loading

There are four major and eight minor NPDES Dischargers permitted in the lake's watersheds. Table 4-7 lists these facilities and respective receiving streams. Gunpowder Creek WWTP (NC0023736) received some major violations for elevated fecal coliform bacteria (FCB) and ammonia nitrogen values found within the plants effluent between 2004 and 2006. However, by the end of 2006, the issue had been corrected and the facility has not received violations for those two parameters since. None of these facilities are considered to be greatly affecting the water quality in the lake; however, during a drought year like 2007, the accumulative impacts can negatively affect aquatic life health.

Table 4-7: NPDES Discharger Permits within Lake Hickory's Watersheds

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	12-Digit HUC #	Receiving Stream
Rhodhiss WWTP	NC0025917	Minor; <0.01	030501010804	Lake Hickory
Huffman Fishing	NC0025135	Major; 0.25	030501010804	Trib. to Lake Hickory
Gunpowder Cr. WWTP	NC0023736	Major; 2.0	030501010803	Gunpowder Cr.
Granite Falls WWTP	NC0021890	Minor; 0.9	030501010803	Gunpowder Cr.
Oak Hill Elementary School	NC0041220	Minor; 0.003	030501010901	Mountain Run
Shuford Yarns LLC-Dudley Shoals Plant	NC0035211	Minor; 0.0054	030501010901	Upper Little River
Gateway Alternate School	NC0041157	Minor; 0.004	030501010901	Upper Little River
Northeast WWTP	NC0020401	Major; 6.0	030501010904	Lake Hickory
Schneider Mills WWTP	NC0034860	Major; 0.78	030501011003	Muddy Fork
Carolina Glove Company	NC0034967	Minor; 0.015	030501011003	Lower Little River
Taylorsville WWTP	NC0026271	Minor; 0.83	030501011003	Lower Little River

Point vs. Nonpoint Source Loading

Due to the amount of urban and agricultural land in these watersheds, nonpoint sources are likely having a greater impact on the lakes water quality than point sources during regular rainfall conditions. The local Soil & Water Conservation Districts (SWCD's) have recognized this fact and between 2003 and 2008, installed over 130 agricultural BMPs to reduce the effects of agricultural practices on aquatic life.

Drought

Figure 4-12: Exposed bridge pilings

*Picture from Catawba RiverKeeper

Lake Hickory was greatly impacted by the 2007 drought that caused water levels to drop to extreme lows. Figure 4-12 shows exposed structures normally several feet under water. These types of drought conditions can significantly reduce the amount and impacts of agricultural and urban nonpoint source runoff received by the lake; however, drought also increases the impacts of point sources. When there is less stream/lake volume, the percent of effluent within the receiving stream/lake is increased. Therefore, the normal effluent flow during an extended drought can have a greater impact on water quality than during normal rainfall.

Aquatic Weed Infestation

Approximately two to three acres of the invasive aquatic macrophyte, parrotfeather (*Myriophyllum aquaticum*) was discovered by Duke Energy aquatic plant biologists during the fall of 2001. By June 2002, this plant was found to infest 74 acres of the lake. In February 2004, the Aquatic Weed Control Council approved a work-plan for the State of NC's Weed Control Program that allocated $20,000 for the control of parrotfeather for Lake Hickory. These efforts along with high water flooding in 2004, homeowners action and herbicide treatment in 2006 and 2007 helped to eliminated the majority of the problem.

Recommendations for Lake Hickory

Restoration Efforts

A local watershed management plan, similar to the Lake Rhodhiss plan completed by the WPCOG, should be created and implemented for Lake Hickory. Due to the natural similarities between these two lakes and direct flow from Lake Rhodhiss, the nutrient issues currently identified within Rhodhiss are expected to occur within Hickory if action is not taken on a local scale. DWQ will work with local agencies as needed to begin development of such plan.

Buffers

Due to the recent development pressures seen around the lake, local governments should continue to work together to educate and ensure implementation the Catawba River mainstem 50-foot riparian buffer rules adopted by the EMC in August of 2004. For more information about the Catawba River Buffer rules, see the *Buffers Chapter*.

Monitoring

During the next sampling cycle DWQ's Intensive Survey Unit will try to sample the four lake stations, at minimum, five times (monthly May - September). As resources become available, the four lake stations should be sampled and include all regularly sampled parameters ten or more times. This would assist in having a range of data to better assess for nutrients and other parameters that could impact aquatic health within Lake Hickory.

Lake Norman

Use Support: Supporting (31,332 ac)	
AU #	11-(75)
2010 IR Cat.	2
Lake Stations*	2007
(CTB079A)	No Exceedances
(CTB082A)	No Exceedances
(CTB082AA)	No Exceedances
(CTB082B)	No Exceedances
(CTB082BB)	No Exceedances
(CTB082M)	No Exceedances
(CTB082Q)	No Exceedances
(CTB082R)	No Exceedances

*Stations in **bold** were sampled less than ten times during this sampling cycle.

Lake Norman is the largest man-made lake in NC and is located between Lookout Shoals Lake and Mountain Island Lake on the Catawba River. This lake is an important recreational lake for citizens of the State, providing opportunities for swimming, fishing and boating year round. It is owned and operated by Duke Energy for hydroelectric power generation. The lake has the third largest local watershed area (Table 4-1) compared to others within this river basin. The drainage basin of Lake Norman contains two 10-digit HUCs (0305010111 and 0305010112). In the upper HUC (0305010111), the land use consists of almost equal parts agricultural and forested lands; however, the lower HUC (0305010112) is dominated by dense residential neighborhoods and retail complexes. The lake is split into two segments [AU: 11-(74) & 11-(75)] which are both classified as WS-IV and critical area (CA) and the lower segment has an additional secondary B classification.

As seen in Figure 4-13, there are nine major streams draining into Lake Norman and include Catawba River (Lookout Shoals Lake), Lyle Creek, McLin Creek, Balls Creek, Mountain Creek, Reeds Creek, Norwood Creek, Reeder Creek and Buffalo Shoals Creek. None of these streams appeared on the 2008 Impaired Waters list; however, McLin Creek has been placed on the DRAFT 2010 Impaired Waters list for biological integrity. For more information about this creek and others within these watersheds, see *Chapter 1 - Catawba River Headwaters Subbasin*.

Water Quality Assessment

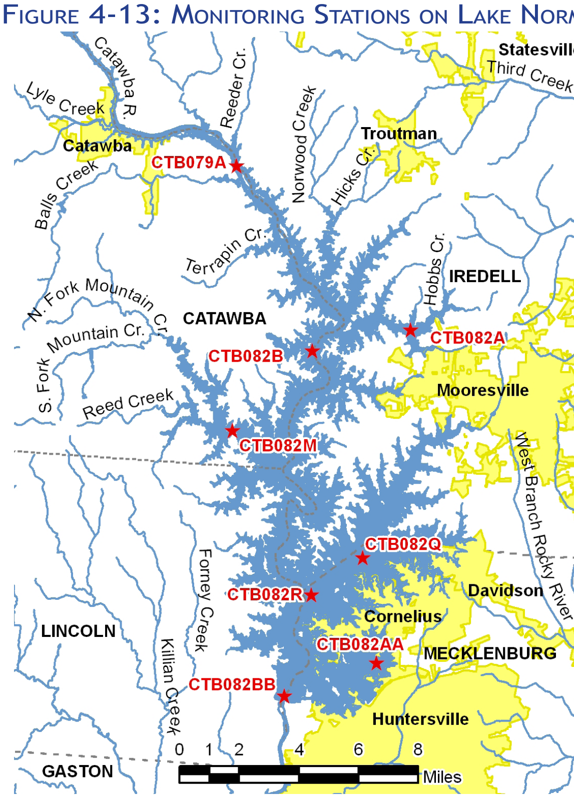
In 2007, the Intensive Survey Unit took nine samples at the eight stations within the lake. None of the eight monitoring stations within the lake violated any standards during 2007 sampling.

Overall, Lake Norman has some of the best water quality of the five lakes sampled within the chain. Nutrient monitoring at the eight stations determined the lake had low biological productivity (oligotrophic). Organic nitrogen was low; however, inorganic nitrogen was elevated which could be a result of impacts from severe drought conditions. Total phosphorous levels were generally below the DWQ laboratory detection level and all other lake station parameters were normal.

An ambient monitoring station was located on the upper reaches of the lake (same location as CTB079A). Samples collected between February 2004 and January 2007 indicate a decline in pH levels from past cycles. This is a common trend in streams across the basin.

Duke Energy routinely monitors the water quality of the lake as a requirement of the NPDES permit for the McGuire Nuclear Station. Monitoring in 2005 for water quality and fish communities showed similar results to the 2004 data. No obvious short-term or long-term impacts of the nuclear station operations were observed.

Figure 4-13: Monitoring Stations on Lake Norman



Point & Nonpoint Source Nutrient Loading

Nonpoint Source Loading

Dense residential neighborhoods dominate most of the shoreline surrounding Lake Norman with agricultural land seen more in the headwaters of the lake. Stormwater runoff from these residential areas have more of an impact on the lake than seen in other watersheds due to the compact nature of the neighborhoods, large amounts of impervious surfaces and the close vicinity of the houses to the lake. Agricultural properties are more spread out in this area as compared to residential properties and are located mostly in the headwaters of the watershed. This allows runoff longer time and travel before reaching the lake, so that nutrients can be utilized by aquatic organisms and adsorbed by sediments within the streams. Storm water runoff from impervious surfaces associated with lake-side residential development, along with runoff from lawns and landscapes treated improperly with fertilizers and pesticides, enter the lake with little to no biological and sediment uptake.

Point Source Loading

There are 22 minor and two major NPDES Dischargers located within Lake Norman's watersheds. Table 4-9 lists these facilities and the receiving streams of the permitted discharge. None of these facilities received any major violations nor are any considered to be impacting water quality within the lake.

Table 4-9: NPDES Discharger Permits within Lake Norman's watersheds

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	HUC	Receiving Stream
Marshall Steam Station	NC0004987	Major; 0	030501011202	Lake Norman
Cross Country Campground	NC0022497	Minor; 0.065	030501011201	Reed Creek
Conover Northeast WWTP	NC0024252	Major; 1.5	030501011102	Lyle Creek
Conover Southeast WWTP	NC0024279	Minor; 0.3	030501011101	McLin Creek
Claremont North WWTP	NC0032662	Minor; 0.1	030501011102	Mull Creek
Commscope WWTP	NC0034754	Minor; 0.02	030501011105	Trib to Terrapin Creek
Bunker Hill High School	NC0044059	Minor; 0.015	030501011102	Trib to Lyle Creek
Camp Dogwood	NC0044253	Minor; 0.01	030501011201	Lake Norman
Sherrills Ford Elem. School	NC0045438	Minor; 0.007	030501011201	Trib to Lake Norman
Bandys High School	NC0051608	Minor; 0.015	030501011201	Battle Run
Bridgeport WWTP	NC0056154	Minor; 0.1	030501011203	Lake Norman
Country Valley WWTP	NC0058742	Minor; 0.1	030501011101	Hagan Fork
Spinnaker Bay WWTP	NC0060593	Minor; 0.125	030501011201	Lake Norman
City of Hickory's Catawba WWTP	NC0025542	Minor; 0.225	030501011102	Lake Norman
Mill Creek Middle School	NC0086304	Minor; 0.065	030501011104	Balls Creek
Mallard Head WWTP	NC0062481	Minor; 0.02	030501011203	Lake Norman
Killians Crossroads WWTP	NC0063355	Minor; 0.075	030501011201	Lake Norman
Lake Norman Motel	NC0064599	Minor; 0.075	030501011201	Lake Norman
Murray's Mill Historical Site	NC0069345	Minor; 0.0125	030501011104	Balls Creek
Lake Norman Woods WWTP	NC0071528	Minor; 0.025	030501011105	Lake Norman
Diamond Head WWTP	NC0074772	Minor; 0.1	030501011203	Lake Norman
Alexander Island WWTP	NC0075205	Minor; 0.015	030501011203	Lake Norman
Windemere WWTP	NC0080691	Minor; 0.09	030501011105	Lake Norman
Claremont McLin Cr WWTP	NC0081370	Minor; 0.3	030501011104	McLin Creek

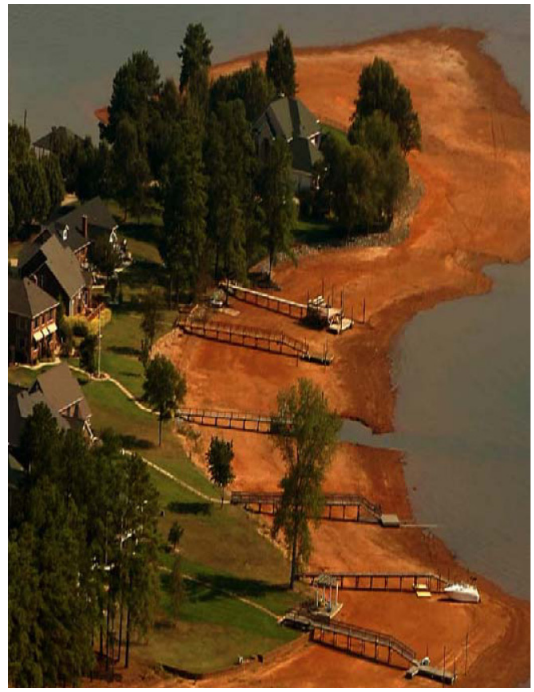
Point vs. Nonpoint Source Loading

Due to the high development density around Lake Norman, nonpoint source pollution is more likely to have a greater impact than the point sources. This increases the need for greater protection of riparian buffers and proper treatment of stormwater.

Aquatic Weed Infestation

The invasive aquatic plant, Hydrilla, has become established in Lake Norman. Control efforts currently underway are through the stocking of sterile grass carp. In 2006 and 2007, the lake was restocked with 400 grass carp through a joint effort of the Lake Norman Marine Commission, Duke Energy, and the NC Division of Water Resources. Another 1,200 grass carp are to be stocked in 2010.

FIGURE 4-14: EXPOSED SHORELINE OF NORMAN



*Picture from Charlotte Observer

Drought

Like most lakes within the chain, Lake Norman was also effected by the 2007 drought (Figure 4-14). Extreme low water levels which were a result of the drought caused several boat ramps to close in August of 2007 which greatly reduced public recreation use of the lake. No impacts were reported on the nuclear power station which uses the reservoir as a source of cooling water.

Recommendations for Lake Norman

Buffers

Due to the development pressures seen around the lake, local governments should continue to work together to educate and ensure implementation the Catawba River mainstem 50-foot riparian buffer rules adopted by the EMC in August of 2004. It is recommended that lake front property owners exempt from these buffer rules allow a 50-foot riparian zone to grow with minimal maintenance on a voluntarily basis. Trees, low growing shrubs or other ground cover plants will not only assist in filtering pollutants and excess nutrients from stormwater runoff, but also secure bank stability to prevent erosion which will inevitably reduce the size of the property. For more information about the Catawba River Buffer rules, see the *Buffers section* below.

Monitoring

During the next sampling cycle DWQ's Intensive Survey Unit will try to sample the eight lake stations, at minimum, five times (monthly May - September). As resources become available, the eight lake stations should be sampled and include all regularly sampled parameters ten or more times. This would assist in having a range of data to better assess for nutrients and other parameters that could impact aquatic health within Lake Norman.

MOUNTAIN ISLAND LAKE

USE SUPPORT: IMPAIRED (1,937 AC)	
AU #	11-(114)
2010 IR Cat.	5
AMS (C3699000)	Low pH - 12%

Mountain Island Lake is directly below Lake Norman, between the Cowan's Ford Dam and the Mountain Island Dam near the Town of Mount Holly water supply intake. The lake serves as the primary water supply for Charlotte-Mecklenburg, Gaston County and Mount Holly.

Lake monitoring was not conducted on Mountain Island Lake [AU: 11-(114)] during this sampling cycle; however, ambient monitoring station samples were collected during this cycle between February 2004 and January 2007. During that time, 12% of pH samples were below 6 su. The state standard for pH is between 6 and 9 su. Exceedances only occurred in the first three years during the months of March and April. The lake will appear on the Draft 2010 Impaired Waters list for the first time due to pH standard exceedances. The source of low pH is unknown at this time, but has been seen basinwide.

Aquatic Weed Infestation

The invasive aquatic plant, Hydrilla, was first noted in the lake in 2000. In 2002, it was observed in the upper portion of the lake and by 2004 it covered more than 625 acres. As soon as the nuisances aquatic plant was spotted in 2000, efforts began to rid the lake of the plant by stocking grass carp as a biological control. An additional 20,000 grass carp were restocked in the lake in 2002 and another 400 will be stocked in 2010.

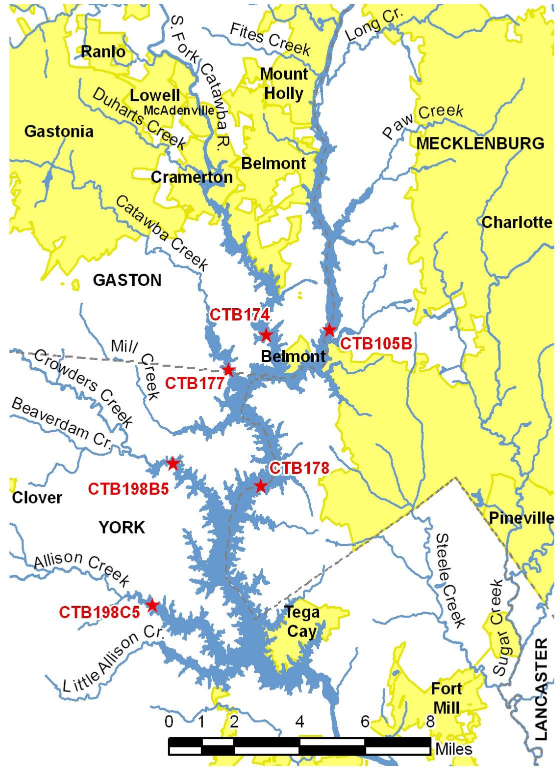
Recommendations for Mountain Island Lake

DWQ is currently in the planning stages of a special study to collect additional data that will assist in determining the severity of the low pH impairment. The lake's Use Support rating will be reassessed at the completion of that study.

Lake Wylie

Lake Wylie is a large reservoir on the Catawba River which is split between the North Carolina and South Carolina state border. The lake serves as a recreational area for boating, fishing and swimming as well as a water supply. All streams within subbasins 03050101 & 03050102 flow down into Lake Wylie. The lake itself is contained within 0305010114, 0305010115 and 0305010206. The land use surrounding the lake is mostly urban and forested with some agricultural lands. Lake Wylie is split into four separate segments [AUs: 11-(117), 11-(122), 11-(123.5)a and 11-(123.5)b] and is classified as WS-IV, CA; WS-IV, B, CA; and WS-V, B respectively. There are 21 minor and seven major NPDES Dischargers permitted on Lake Wylie or within its tributaries.

Figure 4-15: Monitoring Stations on Lake Wylie



As seen in Figure 4-15, there are eight major streams draining into Lake Wylie and include Paw Creek, Long Creek, Catawba River (Mountain Island Lake), Dutchmans Creek, Fites Creek, South Fork Catawba River, Duharts Creek and Catawba Creek. Crowders Creek feeds into the lake on the South Carolina side of the state line. Of these streams, South Fork Catawba River, Catawba Creek and Crowders Creek appeared on the 2008 303(d) Impaired Waters list due to ecological and biological integrity as well as low pH standard violations. Two segments of the lake were also on the 2008 list for low pH and elevated turbidity (discussed below). The three streams mentioned above are on the DRAFT 2010 Impaired Waters list and are likely to be joined by Dutchmans Creek and Long Creek. For more information about these creeks and others within these watersheds, see *Chapter 1* & *Chapter 2*.

Water Quality Assessment

Use Support: Impaired (375 ac)	
2008 IR Cat.	5
2010 IR Cat.	5
AMS (C3900000)	Low pH - 17%

Lake Wylie [AU: 11-(117)]: The upper most segment [AU: 11-(117)] mainstem of the lake flows from the Mountain Island Dam to the Interstate 85 bridge at Belmont. This segment was placed on the 2008 Impaired Waters list for low pH standard violations in 2006 and may remain listed in 2010. The percent of samples with this violation has increased from none in 2002, 14% in 2006 and 17% in 2008. The source of low pH is unknown; however, Mountain Island Lake was also listed for low pH in 2010 with 12% of samples below the pH standards. There are no lake monitoring stations within this segment of the lake due to the hydrologic characteristics. Nutrient samples taken at the AMS station (located at NC-27) indicated slightly elevated inorganic nitrogen levels. These values were higher than those taken in Mountain Island Lake and Dutchmans Creek, which flows into Lake Wylie just upstream of the AMS. The land use along this segment is dominated by residential neighborhoods with a few industrial facilities.

Use Support: Supporting (601 ac)	
2008 IR Cat.	2t
2010 IR Cat.	2t
AMS (C4220000)	No Exceedance

Lake Wylie [AU: 11-(122)]: This segment of Lake Wylie flows from the I-85 bridge to the upstream side of the Paw Creek's Arm of Lake Wylie. Currently, the segment is supporting its water supply, secondary recreation and critical area designated uses. There are no lake monitoring sites within this segment; however, an AMS site is located upstream of the Paw Creek confluence. Monitoring results showed no standard exceedances; however, copper (8.3%) and turbidity (8.6%) levels were elevated. The excess turbidity was running off a nearby construction site which corrected the problem through DWQ enforcement actions. Levels are expected to decrease in the near future. Excess copper is likely due to stormwater runoff from dense urban area lining either side of the segment.

Lake Wylie [AU: 11-(123.5)a]: The third segment of Lake Wylie encompasses the mainstem of the lake and includes Paw Creek cove and the Catawba Creek arm down to SC. In 2007, the Intensive Survey Unit sampled each parameter at least nine times at CTB105B and CTB177 lake stations. Some parameters for these stations were sampled ten times. Ten samples were taken for all parameters at CTB178. Three other lake stations were monitored on this segment in South Carolina (SC).

Use Support: Supporting (4,294 ac)	
2008 IR Cat.	2t
2010 IR Cat.	3a
AMS (C7400000) (C7500000)	 No Exceedance No Exceedance
Lake Stations*	2007
(CTB105B)	No Exceedances
(CTB177)	Low pH - 11%
(CTB178)	No Exceedances
(CTB198B5)	Chlor. *a* - 30%
(CTB198C5)	No Exceedances
(CTB198D)	No Exceedances

*Stations in **bold** were sampled less than ten times during this sampling cycle.

A comparison of the 2007 data collected on this segment at all three NC lake stations to data collected at these stations between 1997 to 2002 show an increase across the board in chlorophyll *a*, total nitrogen and pH levels. Total phosphorous decreased slightly at CTB105B and CTB177, but increased slightly at CTB178. Specific conductivity levels decreased at all three stations. The total phosphorous increase at CTB178 is likely originating from the South Fork Catawba River arm of the lake.

One of the three lake stations that DWQ monitors in SC is located about two miles south of the state line on the mainstem of the lake. The other two stations are located on the Crowders Creek arm and the Allison Creek arm of the lake. The Allison Creek watershed is completely in SC and does not receive flow from NC. Station CTB198B5 (Crowders Creek arm) experienced a significant decline in conductivity and nutrient levels and a slight decline in the average pH value between 1997 and 2007. Even though this station has a 30% standard exceedance for chlorophyll *a*, the average value of samples taken has dropped. This increase in water quality is likely the result of the closure of facilities that discharged to the NC portion of Crowders Creek and efforts to control nonpoint source pollutants through implementation of BMPs. Chlorophyll *a* values are also expected to further decline as benefits from these efforts are just beginning to be seen. For more information about Crowders Creek and the efforts made to improve water quality, see *Chapter 1 - Lake Wylie (0305010115)*.

The Allison Creek arm (CTB198C5) station exhibited an increase in all nutrient parameters and pH with a decrease in conductivity levels. The most southern mainstem station (CTB198D) increased in pH, total nitrogen and chlorophyll *a* values, but experienced a decline in conductivity and total phosphorous levels. This site is downstream of the Allison Creek confluence which may be contributing partly to the increase in pH, total nitrogen and chlorophyll *a* values. Increases in pH and chlorophyll *a* levels are more likely due to severe algal blooms in August of 2007 and moderate blooms in September.

Lake Wylie [AU: 11-(123.5)b]: The South Fork Catawba River segment of the lake begins at the line between the Town of Cramerton and the City of Belmont and flows to its confluence with the mainstem of the lake. In 2007, the Intensive Survey Unit sampled the physical parameters (temperature, dissolved oxygen (DO), pH, conductivity, and secchi depth) nine times at CTB174 during the summer months. The chemical parameters (phosphorus, nitrogen, chlorophyll *a* and turbidity) for these stations were sampled ten times. The segment also includes an AMS station co-located with the lake station at the NC-273 bridge.

Use Support: Impaired (1,291 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
AMS (C7000000)	Copper - 69% Temperature - 27%
Lake Stations*	2007
(CTB174)	No Exceedances

*Stations in **bold** were sampled less than ten times during this sampling cycle.

Data collected at the lake station in 2007 indicated an increase in nutrients and pH levels with a slight decline in specific conductivity values as compared to data collected between 1997 and 2002. The elevated nutrient levels are of concern due to the fact that this segment is included in a chlorophyll *a* TMDL. Further discussion about this topic can be found in the *Action Plan* section below.

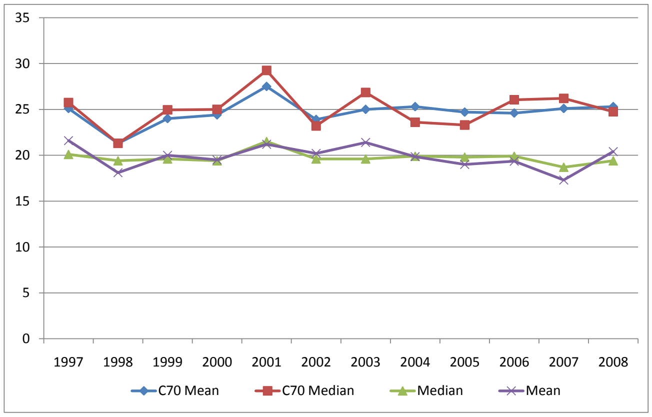


Figure 4-16: Summarized Temperature (cfs) Values for AMS C7000000 as Compared to the Average of the Other AMS Sites in this HUC

Out of the nine temperature surface samples taken during 2007, six exceeded the state temperature standard. The high temperatures were also recorded at the AMS station C7000000 in 27% of samples. These co-located monitoring sites are about two and a half miles downstream of the Duke Energy's Allen Steam Station discharge channel. Figure 4-16 shows the temperature mean and median of the AMS station C7000000 (blue and red lines, respectively) and the mean and median of five other AMS sites that are located on Lake Wylie (purple and green lines, respectively). As seen on the graph, C7000000's average water temperature is roughly 5°C higher than the other Wylie AMS station averages. DWQ is currently working with Duke Energy to review their water quality assessment study that is required to be conduct every five years. Duke received a temperature variance around the time the plant was constructed which requires a study to prove higher discharge temperatures are not harming aquatic life within the lake.

Copper levels in the South Fork arm are also elevated. Even though this will be the first time this segment of the lake will be placed on the Impaired Waters list for copper, this exceedance is not new. In fact, the percent of samples exceeding the standard has dropped from 81% (data years: 1997-2002) to the current 69% (data years: 2004-2008). The source of the excess copper is likely stormwater runoff from surrounding urban areas.

The Algal Growth Potential Test was completed on all segments of the lake and indicated the nutrient limiting algal growth was nitrogen (Algal Growth Potential Test, 2007). Chlorophyll *a* values in Lake Wylie were higher than any other lake in the chain with a lake-wide average for 2007 of 21.4 µg/L. In early June, a value of 41 µg/L (exceeding the state standard of 40 µg/L) was collected at CTB198B5 in SC. Of all samples collected in Lake Wylie for the 2007 cycle, 31% of chlorophyll *a* samples were above 25 µg/L indicating an emerging nutrient problem.

The algal blooms in the lower portion of the lake support the evidence of excess nutrients. Moderate to severe blooms were reported between June and August at three different stations (CTB198B5, CTB178 & CTB198D). The most severe bloom was located in Crowders Creek in August of 2007. No one alga dominated these blooms, but rather multiple taxa were present.

Point & Nonpoint Source Nutrient Loading

This topic is discussed in detail in the Action Plan section below. Table 4-10 lists seven major and 21 minor NPDES discharge facilities within the Lake Wylie watersheds and lists the respected receiving streams.

Table 4-10: NPDES Discharger Permits within Lake Wylie's watersheds

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	HUC	Receiving Stream
Pharr Yarns Industrial WWTP	NC0004812	Major; 1.0	030501020605	SFCR
Gastonia Long Creek WWTP	NC0020184	Major; 16.0	030501020603	Long Creek
Cramerton Eagle Road WWTP	NC0006033	Major; 4.0	030501020605	SFCR
Allen Steam Station	NC0004979	Major; 10.0	030501020605	SFCR
Mount Holly WWTP	NC0021156	Major; 4.0	030501011405	Main Stem Wylie
Clariant Mount Holly East WWTP	NC0004375	Major; 3.9	030501011405	Main Stem Wylie
Belmont WWTP	NC0021181	Major; 5.0	030501011405	Main Stem Wylie
Lola Street WWTP	NC0020036	Minor; 0.5	030501020601	Mauney Creek
Dallas WWTP	NC0068888	Minor; 0.6	030501020603	Dallas Branch
Spencer Mountain WWTP	NC0020966	Minor; 0.050	030501020605	SFCR
Gastonia WTP	NC0040070	Minor; 1.2	030501020603	Tributary to Long Cr.
Lowell WWTP	NC0025861	Minor; 0.6	030501020605	SFCR
College Park WWTP	NC0033421	Minor; 0.022	030501020603	Little Long Creek

Facility	Permit #	Major/Minor; Permitted Flow (MGD)	HUC	Receiving Stream
McAdenville WWTP	NC0020052	Minor; 0.13	030501020605	SFCR
Kings Grant WWTP	NC0032760	Minor; 0.07	030501020605	SFCR
Mount Holly WTP	NC0084689	Minor; 0.1	030501011402	Main Stem Wylie
Charlotte Terminal 2	NC0004839	Minor; 0.057	030501011403	Paw Creek
Charlotte II Terminal	NC0005185	Minor; 0.259	030501011403	Paw Creek
Refuel Terminal Operations	NC0046531	Minor; 0.0432	030501011403	Paw Creek
Belmont Textile Machinery WWTP	NC0023540	Minor; 0.005	030501011405	Fites Creek
Gough Econ WWTP	NC0058084	Minor; 0.0012	030501011405	Trib to Main Stem Wylie
Berryhill Elem. Sch. WWTP	NC0028711	Minor; 0.006	030501011404	Main Stem Wylie
Emerald Point WWTP	NC0059579	Minor; 0.06	030501011406	Main Stem Wylie
Queen Harbor WWTP	NC0062383	Minor; 0.1	030501011505	Main Stem Wylie
Harbor Estates WWTP	NC0063860	Minor; 0.075	030501011505	Main Stem Wylie
Riverpointe WWTP	NC0071242	Minor; 0.1	030501011505	Main Stem Wylie
The Hideaways WWTP	NC0057401	Minor; 0.2	030501011505	Main Stem Wylie
Mariners Watch WWTP	NC0068705	Minor; 0.0025	030501011505	Main Stem Wylie

Drought

Lake Wylie was effected by the 2007 drought as were all of the lakes in the Catawba chain. The lake hit a record low level of 92.9 feet in October, which beat the 2002 record of 93.8 feet (Figure 4-17). Prolonged drought conditions can significantly reduce impacts of agricultural and urban nonpoint source runoff received by the lakes; however, drought increases the impacts of point sources. When there is less stream/lake volume, the concentration of effluent within the receiving waterbody is increased. Therefore, the normal effluent flow during an extended drought can have a greater impact on water quality than during normal rainfall.

Figure 4-17: Lake Wylie shoreline during 2007 drought

*Picture from Pat Holman

Aquatic Weed Infestation

The invasive aquatic plants, Hydrilla and Alligatorweed, have been seen spotted in a few different locations throughout the lake. One patch of Hydrilla has been reported to be 90 acres in size. A long term plan has been developed by the Lake Wylie Marine Commission, Duke Energy, DENR, NC-WRC, and the SC Department of Natural Resources. In 2010, 500 grass carp will be stocked in the lake to help reduce the aquatic weeds. For more information about the long term plan, visit the *Lake Wylie Marine Commission* website.

Lake Wylie Action Plan & TMDL Evaluation

Eutrophic conditions in Lake Wylie and several of its major tributaries have been evident for many years. To address eutrophication in Lake Wylie, DWQ and South Carolina DHEC developed a nutrient control strategy for the Lake Wylie watershed. In 1996, EPA approved the Lake Wylie TMDL, including the point source allocation included in the Lake Wylie Nutrient Management Plan. The Lake Wylie Nutrient Management Area (Figure 4-18) is considered to be Lake Wylie and its tributaries including the Catawba River and its tributaries below Mountain Island Dam and the South Fork Catawba River below its confluence with Long Creek.

Current Conditions

Data from the most recent lake assessment period indicate that nutrient enrichment continues to be a major concern in (both) the North and South Carolina portions of the lake. Samples showed that total phosphorus levels were highest at the lake station on the South Fork arm. And, all four stations monitored within North Carolina had moderate nitrogen levels and elevated chlorophyll-a levels. Even though there were no chlorophyll *a* exceedances, except for Crowders Creek (SC), all arms of the lake had chlorophyll *a* concentrations greater than 25 µg/l in at least 40% of the samples (Table 4-11). This indicates that, although there are currently no exceedances of the chlorophyll *a* standard, there may be emerging localized eutrophication issues in the arms of the lake. The mainstem arm of the lake had lower nutrient levels comparatively, with no chlorophyll *a* concentrations greater than 25 µg/L. The Crowders Creek sample site (SC-CTB198B5) is located five miles downstream of the NC/SC state line, at which two chlorophyll *a* samples were over the North Carolina standard of 40 µg/l. Multiple samples at this site were over SC standards for chlorophyll *a* (40 ug/l), total phosphorus (0.06 mg/l) and total nitrogen (1.5 mg/l) as well.

Table 4-11: Chlorophyll *a* levels for 2007

Stream	% Over 25
South Fork	40%
Catawba Cr.	50%
Crowders Cr.	90%
Allison Cr.	40%

Chlorophyll *a* TMDL Evaluation

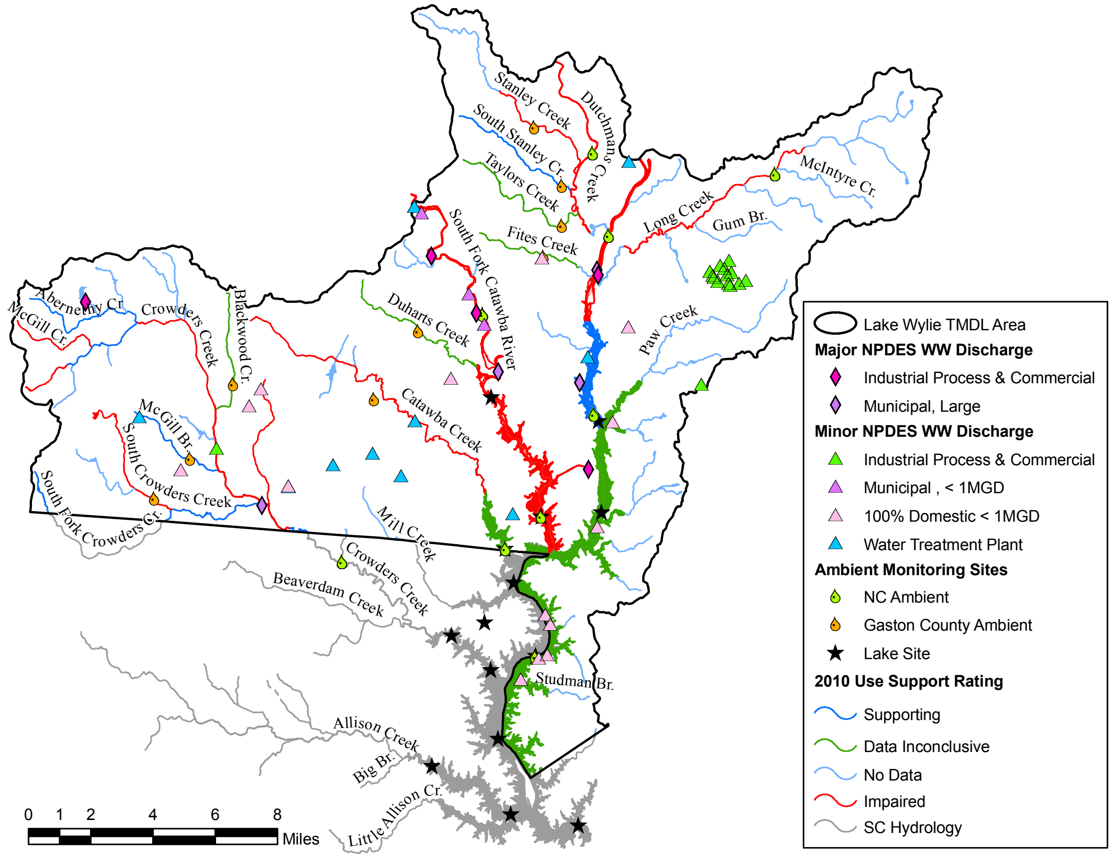
The Lake Wylie chlorophyll *a* TMDL was recently evaluated to determine if dischargers listed within the TMDL were in compliance with the individually assigned waste load allocations (see Table 4-12). According to the limited data collected during this planning cycle, facilities that have permitted nutrient limits are meeting given allocations. Those facilities include Gastonia's Long Creek WWTP and the Crowders Creek WWTP. Three other facilities in the original TMDL have closed. Mount Holly and Belmont WWTP's will both receive limits as per the TMDL during this permit cycle.

Table 4-12: TMDL Point Source Waste Load Allocations (Updated from Original)

Tributary	Discharger	Flow (MGD)	TN, mg/L (lb/day)	TP, mg/L (lb/day)	Notes
South Fork	Gastonia's Long Creek WWTP (NC0020184)	16.0	*6.0 (801)	1.0 (133)	
	JPS (NCG500169)	4.0	8.8 (293)	2.7 (90)	Inactive, Cramerton (NC0006033) took over the JPS allocations and limits went into effect in 2009.
Catawba River (mainstem)	Mt. Holly WWTP (NC0021156)	4.0	*9.0 (300)	1.5 (50)	These limits will be given during the 2010 permitting cycle.
	Belmont WWTP (NC0021181)	5.0	*8.4 (350)	1.4 (58)	These limits will be given during the 2010 permitting cycle.
Crowders Cr.	Gastonia Crowders Creek WWTP (NC0074268)	6.0	*6.0 (300)	1.0 (50)	
* April - October TN Limit					

The original 1996 TMDL and the 1995 nutrient management strategy are included in the Chain of Lakes *Appendix 4-B*.

Figure 4-18: Lake Wylie Chlorophyll *a* TMDL Management Area



2010 Recommendations

DWQ will appropriately place Lake Wylie in categories 1(t) and 3(t) of the Integrated Report to the EPA in order to reflect no criteria exceeded or not enough data for chlorophyll *a* and the presence of an approved TMDL. It is important to note that just because the lake is no longer impaired for chlorophyll *a*, the TMDL is still in effect. It appears that the existing strategy is currently sufficient to address nutrient loading into the lake as long as nutrient loading does not exceed the TMDL allocations. However, continued eutrophication concerns within the arms of Lake Wylie suggest that the nutrient management strategy may not be sufficient in the future to maintain the TMDL load allocations. For example, in the original strategy, discharges above Long Creek (a South Fork Catawba River tributary) were not given individual allocations.

Given the evidence of potential nutrient enrichment problems in the arms of the lake, DWQ is currently working on a monitoring plan to collect nutrient samples across the management area. This additional monitoring will assist in reevaluating nutrient loads during the upcoming planning cycle. It is also recommended that all Major NPDES Dischargers monitor their effluent weekly for total phosphorus and total nitrogen. And, all Minor NPDES Dischargers should monitor their effluent monthly (if not already required to monitor more frequently) for total phosphorus and total nitrogen. Due to the historic eutrophication issues in the lake and elevated chlorophyll *a* concentrations in the arms of the lake, this data is needed to ensure that the TMDL allocated loads are not exceeded. This will help prevent the lake from becoming impaired for chlorophyll *a* again in the future.

Over the next basinwide cycle, DWQ will consider the need to expand the management area to include Long Creek, which flows into the South Fork Catawba River. DWQ will also determine whether all other existing permits within the management area should be explicitly included in the nutrient management strategy as mentioned above. In the meantime, DWQ supports and encourages the continued efforts of municipalities and county governments to identify and implement local nonpoint source reduction plans and wastewater treatment plant upgrades.

Recommendations/Additional Information for the Chain of Lakes

Chain of Lakes Buffer Rules

On July 7, 2003, the Environmental Management Commission completed a stakeholder process to protect mainstem riparian habitat on the Catawba River by finalizing the "Catawba River Basin Buffer Rules" (§15A NCAC 02B.0243). The temporary rule became permanent in August 2004.

The Catawba River basin buffer rules require a 50-foot wide riparian buffer directly adjacent to surface waters along the Catawba River mainstem below Lake James and along mainstem lakes in the Catawba River basin. The rules create a two-zone protection area that allows for all existing uses that were in place on June 30, 2001. As long as the current land use was in place on that date, the Catawba River basin buffer rules do not apply. Otherwise, zone one is the 30-foot wide strip closest to the waterline that must remain generally undisturbed. Zone two constitutes the remaining 20 feet of buffers and allows for grading and revegetating as long as the health of zone one is not impacted. There are many exemptions and activities that are allowable with mitigation inside the buffer zone. Those include, but are not limited to, access roads, view corridors and timber harvesting. For a complete copy of the rule and the list of all exemptions, please refer to *§15A NCAC 02B.0243*. For more discussion on the process used to develop the rule, visit this *webpage*.

In addition to the rules discussed above, several other programs are implemented in the basin to protect riparian habitat. Protective zoning ordinances are in effect in all or part of Burke, McDowell and Mecklenburg counties. In addition, special protection is given to riparian habitat in water supply watersheds, high quality waters, outstanding resource waters, and trout waters throughout the basin. For additional information on all types of buffers within the Catawba River Basin, see the *Buffers Chapter*.

Adoption of a Catawba River Coalition

The Discharge Monitoring Coalition Program was developed by DWQ and permit-holders, to create an effective and efficient way to assess water quality within a watershed context. Participating permit holders voluntarily develop a monitoring program with the DWQ that is designed to evaluate coalition interests and watershed specific issues. In order to better utilize the resources spent by permittees, the monitoring locations are coordinated with the State's existing ambient and biological monitoring networks. This integrated management of monitoring resources reduces duplication and provides a more complete picture of watershed conditions. Coalition coordinators within DWQ are able to facilitate the collection of water quality data at 270 monitoring locations on a monthly basis. The Coalition Program substantially increases the data resources available to coalition members and the State for making basin-wide water quality management decisions.

During the last planning cycle DWQ has been actively promoting the formation of a Catawba River Basin Coalition for a number of reasons. There are many benefits to be gained by permitted facilities within the Catawba basin that take advantage of an organization such as a monitoring coalition, including potential cost savings, increased industry networking, more consistent and coordinated data, monitoring flexibility, reduction of in-stream permit requirements and an overall increase in environmental stewardship.

- Collaboration & Networking: Coalitions give members an outlet to discuss and address member-specific problems, watershed specific issues and potential watershed-based projects. It also provides the members with a collective voice to address issues in their river basin. The group gives smaller facilities the opportunity to hear about some of the larger concerns and all facilities the opportunity to discuss those concerns without the presence and influence of regulators or other stakeholders. In addition, it increases the opportunity for collaboration with DWQ through member's increased involvement in watershed management and increased exposure to DWQ staff and programs.

- Consistent, Reliable Data: Coalitions are able to evaluate and determine station locations throughout the basin with input from DWQ, which allows for a more evenly distributed pool of data to assess short and long term trends throughout the basin. The data is collected consistently from station to station giving the Coalition a more reliable and comparable dataset. This dataset is also more beneficial to DWQ when assessing a watershed for stressor sources.

- Monitoring Flexibility: One of the major benefits to forming a Coalition is that there are no set parameters to monitor or set number of stations which are required. These are negotiable factors as the members proceed through the coalition formation process. Members work with DWQ to come up with an agreed upon list of parameters that meets the needs of all parties involved. The number and placement of monitoring stations are also cooperatively developed by the members and DWQ. These decisions are then approved by both parties before an agreement between the Division and the Coalitions is signed.

- Permit Benefits: Members of a coalition enjoy the benefit of having in-stream monitoring requirements of their individual permits waived as long as they remain members of the Coalition Program. This frees up staff time and resources to be used elsewhere.

- Environmental Stewardship: Participation in the Coalition Program is voluntary. This type of monitoring is not only economical and efficient, but it is also a proactive way to provide critical data that gives members a better handle on what's happening with the water quality in their basin. This knowledge allows the Coalition to better manage decision-making processes about water quality issues.

- Potential Cost Savings: Monitoring stations are strategically placed to minimize overlap of sampling efforts between facilities and DWQ. As seen in other coalitions throughout the state, this may reduce the number of sample sites and in turn reduce overall cost to coalition members. Additionally, individual facilities may realize cost savings in the increased efficiency of staff no longer required to collect and analyze their own in-stream samples.

Coalitions empower members to make collectively well-informed decisions on how to handle water quality issues. The broad scale sampling and basin networking provides big picture knowledge to members about what's in the water, how it may or may not be effecting those downstream and what impacts to the basin are being caused by other sources. A Coalition is recommended in the Catawba River Basin to gather reliable and representative data that would aid in the decision making process as the basin faces increasing challenges from development and deteriorating conditions. Visit the following web link for more information about the *Discharge Monitoring Coalition Program*.

References

Knight, John. July 2009. *Phosphorus and Nitrogen Loading and Export from Rhodhiss Lake, North Carolina*. Carolina Land and Lakes RC&D, Inc. Newton, North Carolina.

North Carolina Department of Environment and Natural Resources (DENR). Division of Water Quality (DWQ). Environmental Science Section. June 23, 2008. *Lake and Reservoir Assessments Catawba River Basin*. Raleigh, NC. http://www.esb.enr.state.nc.us/documents/CATAWBA07Final.pdf.

_____. DWQ. Planning Section. September 2004. *Catawba River Basinwide Water Quality Plan*. Raleigh, NC. http://portal.ncdenr.org/web/wq/ps/bpu/basin/catawba.

_____. DWQ. February 1996. *Lake Wylie Total Maximum Daily Load/Nutrient Management Strategy.* Raleigh, NC.

Appendix 4-A

Lake Data Collected Between April & September 2007 by Intensive Survey Unit

TABLE 4-1: LAKE JAMES PHYSICAL PARAMETER DATA COLLECTED IN 2007

STATION	DATE	ZONE	TP (MG/L)	TKN (MG/L)	NH_3 (MG/L)	NO_x (MG/L)	CHLOROPHYLL *a*	TURBIDITY
CTB013B	09-Apr-07	Photic	0.03	0.20	0.01	0.12	7	6.1
CTB013B	23-Apr-07	Photic	0.03	0.10	0.06	0.11	8	8.0
CTB013B	01-May-07	Photic	0.03	0.30	0.01	0.13	12	5.8
CTB013B	15-May-07	Photic	0.03	0.28	0.01	0.10	12	4.9
CTB013B	06-Jun-07	Photic	0.04	0.39	0.01	0.01	20	6.5
CTB013B	19-Jun-07	Photic	0.04	0.35	0.01	0.01	15	4.6
CTB013B	10-Jul-07	Photic	0.03	0.37	0.01	0.01	13	4.8
CTB013B	23-Jul-07	Photic	0.04	0.36	0.01	0.01	20	4.6
CTB013B	08-Aug-07	Photic	0.04	0.40	0.01	0.01	14	4.6
CTB013B	21-Aug-07	Photic	0.04	0.35	0.01	0.01	15	4.6
CTB013C	09-Apr-07	Photic	0.02	0.10	0.02	0.16	4	2.1
CTB013C	23-Apr-07	Photic	0.02	0.10	0.01	0.12	13	5.9
CTB013C	01-May-07	Photic	0.02	0.20	0.01	0.08	1	2.5
CTB013C	15-May-07	Photic	0.01	0.10	0.01	0.07	4	2.2
CTB013C	06-Jun-07	Photic	0.01	0.10	0.01	0.01	8	2.6
CTB013C	19-Jun-07	Photic	0.02	0.26	0.04	0.04	---	4.6
CTB015A	09-Apr-07	Photic	0.01	0.10	0.01	0.14	3	2.9
CTB015A	23-Apr-07	Photic	0.01	0.10	0.01	0.12	18	2.2
CTB015A	01-May-07	Photic	0.01	0.26	0.01	0.09	6	1.6
CTB015A	15-May-07	Photic	0.01	0.10	0.01	0.07	1	1.2
CTB015A	06-Jun-07	Photic	0.01	0.10	0.03	0.10	1	<1.0
CTB015A	19-Jun-07	Photic	0.01	0.10	0.01	0.06	1	1.7
CTB015A	10-Jul-07	Photic	0.01	0.10	0.01	0.01	---	1.6
CTB015A	23-Jul-07	Photic	0.01	0.10	0.01	0.01	2	1
CTB015A	08-Aug-07	Photic	0.01	0.21	0.03	0.04	2	1.5
CTB015A	21-Aug-07	Photic	0.01	0.10	0.02	0.06	1	1.7
CTB015C	09-Apr-07	Photic	0.01	0.10	0.03	0.14	<1	2.3
CTB015C	01-May-07	Photic	0.01	0.10	0.01	0.09	9	1.4
CTB015C	15-May-07	Photic	0.01	0.10	0.01	0.11	1	<1.0
CTB015C	06-Jun-07	Photic	0.01	0.10	0.01	0.06	<1	1.4
CTB015C	19-Jun-07	Photic	0.01	0.10	0.01	0.05	---	<1
CTB015C	10-Jul-07	Photic	0.01	0.10	0.01	0.01	<1	1.3
CTB015C	23-Jul-07	Photic	0.01	0.10	0.01	0.01	2	1.1
CTB015C	08-Aug-07	Photic	0.01	0.10	0.01	0.02	1	1.2
CTB015C	21-Aug-07	Photic	0.01	0.10	0.01	0.05	1	<1.0
CTB023A1	09-Apr-07	Photic	0.01	0.10	0.02	0.15	<1	2.2
CTB023A1	23-Apr-07	Photic	0.01	0.10	0.01	0.16	1	1.1
CTB023A1	01-May-07	Photic	0.01	0.10	0.01	0.15	1	<1.0
CTB023A1	15-May-07	Photic	0.01	0.10	0.01	0.12	2	---
CTB023A1	06-Jun-07	Photic	0.01	0.10	0.01	0.08	2	1.0
CTB023A1	19-Jun-07	Photic	0.01	0.20	0.01	0.05	2	2.8
CTB023A1	10-Jul-07	Photic	0.01	0.22	0.01	0.01	3	2.1
CTB023A1	23-Jul-07	Photic	0.01	0.10	0.01	0.01	4	1.6

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB023A1	08-Aug-07	Photic	0.01	0.10	0.01	0.02	4	1.5
CTB023A1	21-Aug-07	Photic	0.01	0.20	0.01	0.05	2	2.8
CTB023B	09-Apr-07	Photic	0.01	0.10	0.03	0.15	<1	2.1
CTB023B	23-Apr-07	Photic	0.01	0.10	0.02	0.15	1	1.2
CTB023B	01-May-07	Photic	0.01	0.10	0.01	0.14	2	<1.0
CTB023B	15-May-07	Photic	0.01	0.10	0.01	0.10	1	1.1
CTB023B	06-Jun-07	Photic	0.01	0.10	0.01	0.07	<1	<1.0
CTB023B	19-Jun-07	Photic	0.01	0.10	0.01	0.05	2	2.2
CTB023B	10-Jul-07	Photic	0.01	0.21	0.01	0.04	<1	1.1
CTB023B	23-Jul-07	Photic	0.01	0.10	0.01	0.01	2	<1.0
CTB023B	08-Aug-07	Photic	0.01	0.10	0.01	0.03	2	1.1
CTB023B	21-Aug-07	Photic	0.01	0.10	0.01	0.05	2	2.2
CTBO13C	19-Jun-07	Photic	0.02	0.26	0.04	0.04	5	4.6
CTBO13C	10-Jul-07	Photic	0.01	0.24	0.01	0.01	5	2.2
CTBO13C	23-Jul-07	Photic	0.01	0.10	0.01	0.01	6	2.5
CTBO13C	08-Aug-07	Photic	0.01	0.22	0.01	0.01	6	1.7
CTBO13C	21-Aug-07	Photic	0.02	0.26	0.04	0.04	5	4.6

Table 4-2: Lake James Chemical Parameter Data Collected in 2007

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB013B	09-Apr-07	0.15	12.4	11.2	8.1	59	1.4
CTB013B	23-Apr-07	0.15	19.3	8.7	7.2	56	0.8
CTB013B	01-May-07	0.15	20.9	9.8	7.6	63	0.6
CTB013B	15-May-07	0.15	22.4	9.1	7.6	58	0.8
CTB013B	06-Jun-07	0.15	26.5	9.4	8.3	65	1.1
CTB013B	19-Jun-07	0.15	26.8	9.2	8.0	65	1.3
CTB013B	20-Jun-07	0.15	26.8	9.2	8.0	65	---
CTB013B	10-Jul-07	0.15	29.8	9.6	8.4	71	1.9
CTB013B	23-Jul-07	0.15	27.5	8.6	7.6	73	1.5
CTB013B	08-Aug-07	0.15	29.1	7.8	7.4	58	1.4
CTB013B	21-Aug-07	0.15	29.6	8.3	7.6	94	1.3
CTB013C	09-Apr-07	0.15	11.3	11.5	7.5	54	2.6
CTB013C	23-Apr-07	0.15	17.3	10.8	7.8	52	1.0
CTB013C	01-May-07	0.15	19.9	10.4	8.0	55	1.9
CTB013C	15-May-07	0.15	22.9	9.9	7.7	56	2.2
CTB013C	06-Jun-07	0.15	25.5	8.7	7.9	57	2.1
CTB013C	27-Jul-09	0.15	29.8	7.5	7.9	69	0.7
CTB013C	10-Sep-09	0.15	23.9	5.0	7.1	79	0.4
CTB015A	09-Apr-07	0.15	13.3	11.2	7.5	52	3.2
CTB015A	23-Apr-07	0.15	16.8	11.0	7.9	47	1.9
CTB015A	01-May-07	0.15	19.5	10.5	8.3	49	2.2
CTB015A	15-May-07	0.15	22.2	8.4	7.6	50	3.3

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB015A	06-Jun-07	0.15	25.2	8.1	7.2	52	4.1
CTB015A	19-Jun-07	0.15	26.8	8.3	7.5	53	3.9
CTB015A	20-Jun-07	0.15	26.8	8.3	7.5	53	---
CTB015A	10-Jul-07	0.15	28.6	7.4	7.5	55	4.0
CTB015A	23-Jul-07	0.15	27.1	7.9	7.2	55	4.2
CTB015A	08-Aug-07	0.15	28.8	8.9	7.8	70	4.2
CTB015A	08-Aug-07	0.15	29.1	7.9	7.3	50	4.2
CTB015A	21-Aug-07	0.15	29.9	7.7	7.5	60	3.9
CTB015C	09-Apr-07	0.15	13.6	9.8	7.5	51	5.7
CTB015C	01-May-07	0.15	19.4	10.7	8.3	46	1.9
CTB015C	15-May-07	0.15	21.9	8.9	7.6	46	5.1
CTB015C	06-Jun-07	0.15	25.3	8.0	7.6	48	6.0
CTB015C	19-Jun-07	0.15	26.8	8.1	7.4	49	3.7
CTB015C	19-Jun-07	0.15	26.8	8.1	7.4	49	---
CTB015C	20-Jun-07	0.15	26.8	8.1	7.4	49	---
CTB015C	10-Jul-07	0.15	28.8	7.8	7.6	50	5.0
CTB015C	23-Jul-07	0.15	27.6	8.6	7.4	50	3.5
CTB015C	21-Aug-07	0.15	30.0	7.7	7.4	51	3.7
CTB023A1	09-Apr-07	0.15	12.5	11.0	7.3	49	4.7
CTB023A1	23-Apr-07	0.15	16.3	10.3	7.1	44	4.7
CTB023A1	01-May-07	0.15	18.4	10.2	7.5	45	4.1
CTB023A1	15-May-07	0.15	22.3	8.6	7.3	46	3.2
CTB023A1	06-Jun-07	0.15	24.9	8.0	7.3	46	3.2
CTB023A1	19-Jun-07	0.15	27.3	8.2	7.4	46	3.1
CTB023A1	10-Jul-07	0.15	28.9	8.0	7.6	47	5.5
CTB023A1	23-Jul-07	0.15	27.1	8.1	7.3	47	3.0
CTB023A1	08-Aug-07	0.15	29.1	8.1	7.7	47	2.7
CTB023A1	21-Aug-07	0.15	29.8	7.8	7.5	48	3.1
CTB023B	09-Apr-07	0.15	14.1	9.5	7.5	49	5.4
CTB023B	01-May-07	0.15	19.2	10.6	7.8	46	3.9
CTB023B	15-May-07	0.15	21.7	9.4	7.6	46	3.2
CTB023B	06-Jun-07	0.15	25.3	8.0	7.4	46	5.1
CTB023B	19-Jun-07	0.15	26.7	7.9	7.3	48	5.5
CTB023B	19-Jun-07	0.15	26.7	7.9	7.3	48	---
CTB023B	10-Jul-07	0.15	28.7	7.8	7.5	48	5.6
CTB023B	23-Jul-07	0.15	27.3	8.1	7.4	48	4.0
CTB023B	08-Aug-07	0.15	27.9	8.5	7.1	48	4.0
CTB023B	21-Aug-07	0.15	30.0	7.7	7.4	50	5.5
CTBO13C	19-Jun-07	0.15	26.7	8.6	7.5	58	2.9
CTBO13C	10-Jul-07	0.15	28.8	8.1	7.5	61	3.3
CTBO13C	23-Jul-07	0.15	27.3	8.0	7.2	62	2.3
CTBO13C	08-Aug-07	0.15	28.8	8.5	7.9	58	2.9
CTBO13C	21-Aug-07	0.15	28.8	7.8	7.1	64	2.9

TABLE 4-3: LAKE RHODHISS CHEMICAL PARAMETER DATA COLLECTED IN 2007

STATION	DATE	ZONE	TP (MG/L)	TKN (MG/L)	NH_3 (MG/L)	NO_x (MG/L)	CHLOROPHYLL *a*	TURBIDITY
CTB034A	02-May-07	Photic	0.02	0.20	0.01	0.16	2	11.0
CTB034A	16-May-07	Photic	0.02	0.25	0.01	0.02	15	1.8
CTB034A	05-Jun-07	Photic	0.06	0.32	0.04	0.26	5	13.0
CTB034A	20-Jun-07	Photic	0.05	0.42	0.01	0.12	19	9.4
CTB034A	11-Jul-07	Photic	0.06	0.53	0.01	0.02	8	6.7
CTB034A	24-Jul-07	Photic	0.07	0.75	0.01	0.01	25	7.5
CTB034A	07-Aug-07	Photic	0.05	0.40	0.01	0.10	9	11.0
CTB034A	22-Aug-07	Photic	0.05	0.50	0.01	0.06	15	7.4
CTB034A	26-Sep-07	Photic	0.12	0.79	0.01	0.01	70	11.0
CTB040A	02-May-07	Photic	0.03	0.26	0.01	0.07	14	3.6
CTB040A	16-May-07	Photic	0.04	0.26	0.01	0.02	19	2.7
CTB040A	05-Jun-07	Photic	0.03	0.33	0.01	0.08	12	3.2
CTB040A	20-Jun-07	Photic	0.03	0.44	0.01	0.01	18	7.5
CTB040A	11-Jul-07	Photic	0.05	0.48	0.01	0.01	16	3.8
CTB040A	24-Jul-07	Photic	0.05	0.52	0.01	0.01	22	5.4
CTB040A	07-Aug-07	Photic	0.05	0.48	0.01	0.01	22	4.0
CTB040A	22-Aug-07	Photic	0.04	0.38	0.01	0.01	18	3.6
CTB040A	26-Sep-07	Photic	0.04	0.43	0.01	0.01	19	3.9
CTB040B	02-May-07	Photic	0.02	0.10	0.01	0.02	7	2.1
CTB040B	16-May-07	Photic	0.04	0.26	0.10	0.12	13	8.4
CTB040B	05-Jun-07	Photic	0.03	0.33	0.01	0.01	11	2.6
CTB040B	20-Jun-07	Photic	0.03	0.40	0.01	0.01	13	3.4
CTB040B	11-Jul-07	Photic	0.03	0.49	0.01	0.01	16	3.9
CTB040B	24-Jul-07	Photic	0.03	0.55	0.01	0.01	21	3.6
CTB040B	07-Aug-07	Photic	0.03	0.41	0.01	0.01	20	3.2
CTB040B	22-Aug-07	Photic	0.03	0.44	0.01	0.01	14	3.1
CTB040B	26-Sep-07	Photic	0.03	0.46	0.01	0.01	13	3.1

TABLE 4-4: LAKE RHODHISS PHYSICAL PARAMETER DATA COLLECTED IN 2007

STATION	DATE	DEPTH	TEMPERATURE	DO	pH	CONDUCTIVITY	SECCHI DEPTH
CTB034A	02-May-07	0.15	18.8	8.4	7.1	52	0.4
CTB034A	16-May-07	0.15	22.3	10.7	8.4	52	0.7
CTB034A	05-Jun-07	0.15	20.9	7.6	6.8	52	0.4
CTB034A	20-Jun-07	0.15	24.9	9.5	7.4	55	0.7
CTB034A	11-Jul-07	0.15	26.9	8.7	7.6	59	1.0
CTB034A	24-Jul-07	0.15	24.9	9.6	8.4	65	0.8
CTB034A	07-Aug-07	0.15	27.3	11.6	9.1	67	0.8
CTB034A	22-Aug-07	0.15	25.8	8.4	7.7	67	0.7
CTB034A	26-Sep-07	0.15	24.8	10.2	8.4	75	0.5
CTB040A	02-May-07	0.15	20.2	11.1	8.4	55	1.4
CTB040A	16-May-07	0.15	22.6	11.5	8.9	63	1.3
CTB040A	05-Jun-07	0.15	24.5	8.4	7.4	60	1.6

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB040A	20-Jun-07	0.15	26.4	10.4	8.9	63	1.4
CTB040A	11-Jul-07	0.15	28.1	10.5	9.3	69	1.3
CTB040A	24-Jul-07	0.15	25.7	9.0	8.8	69	0.9
CTB040A	07-Aug-07	0.15	29.1	10.7	8.9	77	1.2
CTB040A	22-Aug-07	0.15	27.6	8.8	8.4	78	0.8
CTB040A	26-Sep-07	0.15	23.6	10.6	8.8	90	1.1
CTB040B	02-May-07	0.15	21.0	10.7	8.7	51	1.8
CTB040B	16-May-07	0.15	21.5	11.7	8.8	58	1.9
CTB040B	05-Jun-07	0.15	25.5	10.3	8.9	63	1.8
CTB040B	20-Jun-07	0.15	27.5	9.6	8.7	64	1.1
CTB040B	11-Jul-07	0.15	28.6	10.0	9.4	71	1.2
CTB040B	24-Jul-07	0.15	25.7	9.1	8.9	64	1.1
CTB040B	07-Aug-07	0.15	30.1	10.6	9.2	75	1.2
CTB040B	22-Aug-07	0.15	28.5	8.8	8.8	58	1.0
CTB040B	26-Sep-07	0.15	25.2	9.7	8.7	78	1.3

Table 4-5: Lake Hickory Chemical Parameter Data Collected in 2007

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB048A	02-May-07	Photic	0.03	0.26	0.06	0.14	1	6.5
CTB048A	16-May-07	Photic	0.02	0.30	0.05	0.16	5	4.1
CTB048A	05-Jun-07	Photic	0.04	0.28	0.09	0.10	5	7.5
CTB048A	20-Jun-07	Photic	0.04	0.39	0.02	0.07	31	4.4
CTB048A	11-Jul-07	Photic	0.04	0.45	0.03	0.10	15	5.8
CTB048A	24-Jul-07	Photic	0.03	0.46	0.03	0.04	17	5.4
CTB048A	07-Aug-07	Photic	0.04	0.35	0.01	0.03	15	5.4
CTB048A	22-Aug-07	Photic	0.03	0.35	0.03	0.03	18	3.5
CTB048A	26-Sep-07	Photic	0.03	0.50	0.01	0.01	19	4.0
CTB056A	02-May-07	Photic	0.02	0.30	0.01	0.09	10	2.9
CTB056A	16-May-07	Photic	0.02	0.25	0.01	0.14	9	3.1
CTB056A	05-Jun-07	Photic	0.02	0.24	0.01	0.02	14	2.8
CTB056A	20-Jun-07	Photic	0.02	0.31	0.01	0.02	16	2.6
CTB056A	11-Jul-07	Photic	0.03	0.30	0.01	0.01	15	4.0
CTB056A	24-Jul-07	Photic	0.03	0.40	0.01	0.01	19	3.5
CTB056A	07-Aug-07	Photic	0.02	0.31	0.01	0.01	19	3.2
CTB056A	22-Aug-07	Photic	0.02	0.32	0.01	0.01	13	3.3
CTB056A	26-Sep-07	Photic	0.03	0.32	0.01	0.03	27	2.8
CTB058C	02-May-07	Photic	0.02	0.33	0.01	0.12	12	2.2
CTB058C	16-May-07	Photic	0.02	0.21	0.01	0.13	8	2.3
CTB058C	05-Jun-07	Photic	0.02	0.28	0.01	0.01	18	2.5
CTB058C	20-Jun-07	Photic	0.02	0.30	0.01	0.01	20	3.2
CTB058C	11-Jul-07	Photic	0.02	0.32	0.01	0.01	14	2.7
CTB058C	24-Jul-07	Photic	0.02	0.32	0.01	0.01	6	5.1
CTB058C	07-Aug-07	Photic	0.02	0.33	0.01	0.01	15	2.7

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB058C	22-Aug-07	Photic	0.02	0.28	0.01	0.01	12	2.0
CTB058C	26-Sep-07	Photic	0.02	0.30	0.01	0.04	20	2.4
CTB058D	02-May-07	Photic	0.02	0.32	0.01	0.12	9	2.2
CTB058D	16-May-07	Photic	0.02	0.23	0.01	0.12	6	2.1
CTB058D	05-Jun-07	Photic	0.02	0.26	0.01	0.01	13	2.8
CTB058D	20-Jun-07	Photic	0.02	0.30	0.01	0.01	13	2.2
CTB058D	11-Jul-07	Photic	0.02	0.29	0.01	0.01	4	2.1
CTB058D	24-Jul-07	Photic	0.02	0.34	0.01	0.01	8	2.1
CTB058D	07-Aug-07	Photic	0.01	0.33	0.01	0.01	6	2.5
CTB058D	22-Aug-07	Photic	0.02	0.28	0.01	0.01	10	1.9
CTB058D	26-Sep-07	Photic	0.01	0.27	0.06	0.03	16	1.8

Table 4-6: Lake Hickory Physical Parameter Data Collected in 2007

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB048A	02-May-07	0.15	18.7	8.1	6.8	50	1.1
CTB048A	16-May-07	0.15	19.8	8.0	6.9	54	1.4
CTB048A	05-Jun-07	0.15	23.6	7.5	7.0	60	1.0
CTB048A	20-Jun-07	0.15	25.6	8.8	7.1	57	0.9
CTB048A	11-Jul-07	0.15	25.7	6.9	7.2	59	1.0
CTB048A	24-Jul-07	0.15	26.3	8.2	7.1	59	1.1
CTB048A	07-Aug-07	0.15	28.0	8.1	7.4	60	1.1
CTB048A	22-Aug-07	0.15	28.0	7.4	7.0	64	1.2
CTB048A	26-Sep-07	0.15	27.7	8.4	8.2	65	1.2
CTB056A	02-May-07	0.15	20.7	11.3	8.2	50	1.8
CTB056A	16-May-07	0.15	21.5	9.6	7.4	50	1.8
CTB056A	05-Jun-07	0.15	25.3	9.1	7.7	52	1.6
CTB056A	20-Jun-07	0.15	27.0	9.7	8.3	54	1.5
CTB056A	11-Jul-07	0.15	28.1	8.5	7.7	55	1.4
CTB056A	24-Jul-07	0.15	26.6	7.7	7.1	57	1.2
CTB056A	07-Aug-07	0.15	29.2	9.4	8.2	58	1.4
CTB056A	22-Aug-07	0.15	28.9	8.0	7.5	61	1.8
CTB056A	26-Sep-07	0.15	27.9	5.9	8.3	65	1.7
CTB058C	02-May-07	0.15	20.8	10.6	8.1	50	2.0
CTB058C	16-May-07	0.15	21.8	10.0	7.6	49	1.7
CTB058C	05-Jun-07	0.15	25.2	9.5	8.3	52	1.8
CTB058C	20-Jun-07	0.15	26.6	9.7	8.4	53	1.5
CTB058C	11-Jul-07	0.15	28.2	9.1	8.1	55	1.6
CTB058C	24-Jul-07	0.15	26.7	8.1	7.2	56	1.4
CTB058C	07-Aug-07	0.15	29.3	9.2	8.1	58	2.0
CTB058C	22-Aug-07	0.15	29.0	7.8	7.3	60	1.4
CTB058C	26-Sep-07	0.15	27.7	4.6	7.9	65	1.8
CTB058D	02-May-07	0.15	22.2	10.1	7.9	49	2.1
CTB058D	16-May-07	0.15	21.7	10.6	7.6	48	2.2

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB058D	05-Jun-07	0.15	25.2	9.6	8.5	50	1.9
CTB058D	20-Jun-07	0.15	26.7	9.3	8.0	51	2.1
CTB058D	11-Jul-07	0.15	27.9	8.5	7.8	53	2.0
CTB058D	24-Jul-07	0.15	26.7	7.4	7.1	55	2.0
CTB058D	07-Aug-07	0.15	29.5	8.7	7.8	56	2.6
CTB058D	22-Aug-07	0.15	29.2	8.0	7.4	59	1.6
CTB058D	26-Sep-07	0.15	27.7	4.6	7.9	65	2.1

Table 4-7: Lake Norman Chemical Parameter Data Collected in 2007

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB079A	17-May-07	Photic	0.03	0.10	0.02	0.25	6	11.0
CTB079A	25-Jun-07	Photic	0.03	0.33	0.01	0.06	15	5.3
CTB079A	18-Jul-07	Photic	0.03	0.36	0.01	0.07	20	6.5
CTB079A	15-Aug-07	Photic	0.04	0.39	0.01	0.02	17	7.4
CTB079A	24-Sep-07	Photic	0.02	0.24	0.05	0.15	7.1	9.5
CTB082A	17-May-07	Photic	0.01	0.10	0.01	0.22	8	2.5
CTB082A	25-Jun-07	Photic	0.01	0.25	0.01	0.01	9	2.9
CTB082A	18-Jul-07	Photic	0.01	0.24	0.01	0.01	11	3.6
CTB082A	15-Aug-07	Photic	0.01	0.27	0.01	0.01	**9**	3.2
CTB082A	24-Sep-07	Photic	0.01	0.10	0.01	0.02	10	3.1
CTB082AA	17-May-07	Photic	0.01	0.10	0.01	0.17	3	3.2
CTB082AA	25-Jun-07	Photic	---	---	---	---	5	1.8
CTB082AA	18-Jul-07	Photic	0.01	0.20	0.01	0.09	8	1.9
CTB082AA	15-Aug-07	Photic	0.01	0.10	0.01	0.03	6	1.4
CTB082AA	24-Sep-07	Photic	0.01	0.10	0.01	0.02	6.5	3.8
CTB082B	17-May-07	Photic	0.01	0.10	0.01	0.23	8	2.8
CTB082B	25-Jun-07	Photic	0.02	0.26	0.01	0.17	11	2.8
CTB082B	18-Jul-07	Photic	0.01	0.28	0.01	0.15	6	2.5
CTB082B	15-Aug-07	Photic	0.01	0.25	0.01	0.04	12	2.3
CTB082B	24-Sep-07	Photic	0.01	0.10	0.01	0.08	5.8	2.1
CTB082BB	17-May-07	Photic	0.01	0.10	0.01	0.19	2	3.1
CTB082BB	25-Jun-07	Photic	0.01	0.10	0.01	0.11	4	2.2
CTB082BB	18-Jul-07	Photic	0.01	0.10	0.01	0.08	6	1.8
CTB082BB	15-Aug-07	Photic	0.01	0.20	0.01	0.03	6	1.5
CTB082BB	24-Sep-07	Photic	0.01	0.26	0.02	0.02	3	1.9
CTB082M	17-May-07	Photic	0.01	0.20	0.01	0.14	7	3.4
CTB082M	25-Jun-07	Photic	0.01	0.22	0.01	0.08	7	2.2
CTB082M	18-Jul-07	Photic	0.01	0.10	0.01	0.02	9	2.1
CTB082M	15-Aug-07	Photic	0.01	0.22	0.01	0.04	10	1.9
CTB082M	24-Sep-07	Photic	0.01	0.10	0.01	0.05	7	2.3
CTB082Q	17-May-07	Photic	0.02	0.10	0.01	0.18	3	3.0
CTB082Q	25-Jun-07	Photic	0.01	0.10	0.01	0.10	4	1.7
CTB082Q	18-Jul-07	Photic	0.01	0.10	0.01	0.06	6	1.9

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB082Q	15-Aug-07	Photic	0.01	0.20	0.01	0.01	6	2.2
CTB082Q	24-Sep-07	Photic	0.01	0.10	0.01	0.02	4.1	2.0
CTB082R	17-May-07	Photic	0.01	0.10	0.01	0.18	3	4.5
CTB082R	25-Jun-07	Photic	0.01	0.10	0.01	0.10	4	2.0
CTB082R	18-Jul-07	Photic	0.01	0.10	0.01	0.07	6	1.4
CTB082R	15-Aug-07	Photic	0.01	0.24	0.01	0.01	7	1.9
CTB082R	24-Sep-07	Photic	0.01	0.10	0.01	0.04	3.9	1.8

Table 4-8: Lake Norman Physical Parameter Data Collected in 2007

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB079A	17-May-07	0.15	21.1	7.9	7.1	50	0.9
CTB079A	25-Jun-07	0.15	28.2	9.4	8.2	54	1.2
CTB079A	18-Jul-07	0.15	28.6	7.2	7.3	55	0.9
CTB079A	15-Aug-07	0.15	29.3	8.1	7.2	61	0.9
CTB079A	24-Sep-07	0.15	27.0	8.1	7.3	63	0.9
CTB082A	17-May-07	0.15	22.4	8.8	7.6	58	2.2
CTB082A	25-Jun-07	0.15	28.4	8.9	8.5	61	1.9
CTB082A	18-Jul-07	0.15	29.0	8.0	7.9	62	1.7
CTB082A	15-Aug-07	0.15	30.6	7.7	7.4	66	1.4
CTB082A	24-Sep-07	0.15	27.1	8.6	7.9	70	1.8
CTB082AA	17-May-07	0.15	24.0	8.3	7.5	57	2.4
CTB082AA	25-Jun-07	0.15	31.0	8.3	7.5	58	2.5
CTB082AA	18-Jul-07	0.15	31.7	6.9	7.4	58	2.3
CTB082AA	15-Aug-07	0.15	33.8	7.5	7.5	63	2.2
CTB082AA	24-Sep-07	0.15	30.4	8.0	7.5	64	1.5
CTB082B	17-May-07	0.15	22.5	8.5	7.5	59	2.1
CTB082B	25-Jun-07	0.15	28.6	8.2	7.5	65	1.9
CTB082B	18-Jul-07	0.15	24.2	6.2	7.0	66	1.6
CTB082B	15-Aug-07	0.15	30.8	7.8	7.0	68	1.8
CTB082B	24-Sep-07	0.15	27.3	7.3	7.2	71	1.6
CTB082BB	17-May-07	0.15	23.1	8.6	7.4	56	3.4
CTB082BB	25-Jun-07	0.15	30.1	8.0	7.4	59	3.0
CTB082BB	18-Jul-07	0.15	31.1	6.7	7.2	58	3.0
CTB082BB	15-Aug-07	0.15	33.2	7.5	7.4	63	2.7
CTB082BB	24-Sep-07	0.15	30.5	6.8	7.2	66	1.7
CTB082M	17-May-07	0.15	23.4	9.0	7.6	58	2.6
CTB082M	25-Jun-07	0.15	28.5	8.8	7.9	62	2.0
CTB082M	18-Jul-07	0.15	28.0	7.8	7.8	63	2.1
CTB082M	15-Aug-07	0.15	30.9	8.3	7.6	68	2.0
CTB082M	24-Sep-07	0.15	28.6	8.4	7.9	72	2.0
CTB082Q	17-May-07	0.15	22.7	8.8	7.5	57	4.1
CTB082Q	25-Jun-07	0.15	29.0	8.5	7.8	59	3.0
CTB082Q	18-Jul-07	0.15	30.1	7.1	7.7	58	2.8

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB082Q	15-Aug-07	0.15	31.9	7.8	7.7	63	2.6
CTB082Q	24-Sep-07	0.15	28.8	7.9	7.5	65	2.6
CTB082R	17-May-07	0.15	21.4	8.9	7.6	57	3.0
CTB082R	25-Jun-07	0.15	29.9	8.3	7.4	59	3.0
CTB082R	18-Jul-07	0.15	29.9	7.0	7.4	59	2.3
CTB082R	15-Aug-07	0.15	32.1	7.7	7.4	63	2.5
CTB082R	24-Sep-07	0.15	28.5	7.4	7.4	65	2.2

Table 4-9: Lake Wylie Chemical Parameter Data Collected in 2007

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB105B	23-Jul-07	Photic	0.04	0.39	0.07	0.06	19	5.8
CTB105B	02-May-07	Photic	0.04	0.40	0.01	0.20	21	10.0
CTB105B	21-May-07	Photic	0.04	0.33	0.02	0.20	11	8.1
CTB105B	04-Jun-07	Photic	0.04	0.40	0.11	0.14	10	7.5
CTB105B	18-Jun-07	Photic	0.03	0.44	0.01	0.10	20	4.5
CTB105B	09-Jul-07	Photic	0.03	0.45	0.05	0.08	15	4.4
CTB105B	06-Aug-07	Photic	0.04	0.46	0.03	0.01	17	5.1
CTB105B	20-Aug-07	Photic	0.04	0.42	0.03	0.01	19	5.4
CTB105B	26-Sep-07	Photic	0.04	0.45	0.01	0.01	22	4.5
CTB174	02-May-07	Photic	0.06	0.41	0.01	0.24	19	10.0
CTB174	21-May-07	Photic	0.06	0.48	0.01	0.22	32	10.0
CTB174	04-Jun-07	Photic	0.04	0.40	0.06	0.18	14	9.3
CTB174	18-Jun-07	Photic	0.05	0.54	0.01	0.14	27	8.7
CTB174	09-Jul-07	Photic	0.04	0.46	0.01	0.11	26	6.2
CTB174	23-Jul-07	Photic	0.05	0.44	0.02	0.10	29	8.1
CTB174	06-Aug-07	Photic	0.07	0.45	0.02	0.04	18	6.4
CTB174	20-Aug-07	Photic	0.06	0.42	0.01	0.03	25	4.6
CTB174	12-Sep-07	Photic	0.05	0.37	0.02	0.03	15	5.4
CTB174	26-Sep-07	Photic	0.07	0.34	0.01	0.10	18	7.4
CTB177	02-May-07	Photic	0.04	0.50	0.01	0.17	32	7.7
CTB177	21-May-07	Photic	0.05	0.44	0.01	0.03	28	7.7
CTB177	04-Jun-07	Photic	0.04	0.40	0.04	0.07	13	4.8
CTB177	18-Jun-07	Photic	0.04	0.52	0.01	0.07	27	4.8
CTB177	09-Jul-07	Photic	0.04	0.55	0.01	0.02	34	4.9
CTB177	23-Jul-07	Photic	0.04	0.46	0.01	0.02	25	6.4
CTB177	06-Aug-07	Photic	0.05	0.53	0.01	0.01	21	6.2
CTB177	20-Aug-07	Photic	0.05	0.43	0.01	0.01	23	5.5
CTB177	12-Sep-07	Photic	0.05	0.50	0.05	0.01	14	9.9
CTB177	26-Sep-07	Photic	0.05	0.44	0.01	0.01	27	4.5
CTB178	02-May-07	Photic	0.02	0.32	0.01	0.21	12	2.6
CTB178	21-May-07	Photic	0.03	0.35	0.01	0.16	14	4.1
CTB178	04-Jun-07	Photic	0.03	0.36	0.03	0.12	16	4.9
CTB178	18-Jun-07	Photic	0.03	0.48	0.01	0.02	21	3.1

Station	Date	Zone	TP (mg/L)	TKN (mg/L)	NH_3 (mg/L)	NO_x (mg/L)	Chlorophyll *a*	Turbidity
CTB178	09-Jul-07	Photic	0.03	0.38	0.01	0.01	20	2.8
CTB178	23-Jul-07	Photic	0.03	0.38	0.01	0.03	21	3.2
CTB178	06-Aug-07	Photic	0.04	0.44	0.01	0.01	18	3.8
CTB178	20-Aug-07	Photic	0.03	0.39	0.01	0.01	20	3.7
CTB178	12-Sep-07	Photic	0.03	0.40	0.02	0.01	13	4.0
CTB178	26-Sep-07	Photic	0.03	0.41	0.01	0.01	18	2.5
CTB198B5	21-May-07	Photic	0.06	0.50	0.01	0.06	33	7.1
CTB198B5	04-Jun-07	Photic	0.07	0.62	0.03	0.03	41	10.0
CTB198B5	18-Jun-07	Photic	0.05	0.62	0.01	0.01	39	6.2
CTB198B5	09-Jul-07	Photic	0.04	0.51	0.01	0.01	32	7.1
CTB198B5	23-Jul-07	Photic	0.05	0.40	0.01	0.01	30	7.1
CTB198B5	06-Aug-07	Photic	0.06	0.58	0.01	0.01	34	8.8
CTB198B5	20-Aug-07	Photic	0.07	0.62	0.01	0.01	42	11.0
CTB198B5	12-Sep-07	Photic	0.06	0.43	0.01	0.01	35	8.5
CTB198B5	26-Sep-07	Photic	0.06	0.44	0.01	0.01	21	7.4
CTB198C5	02-May-07	Photic	0.04	0.36	0.01	0.16	14	8.8
CTB198C5	21-May-07	Photic	0.04	0.42	0.01	0.05	12	8.8
CTB198C5	04-Jun-07	Photic	0.04	0.39	0.01	0.01	18	7.1
CTB198C5	18-Jun-07	Photic	0.05	0.53	0.01	0.01	29	6.8
CTB198C5	09-Jul-07	Photic	0.05	0.55	0.01	0.01	27	7.2
CTB198C5	23-Jul-07	Photic	0.07	0.39	0.01	0.01	12	5.5
CTB198C5	06-Aug-07	Photic	0.05	0.60	0.01	0.01	28	9.6
CTB198C5	20-Aug-07	Photic	0.05	0.62	0.01	0.01	19	12.0
CTB198C5	12-Sep-07	Photic	0.04	0.48	0.01	0.01	21	11.0
CTB198C5	26-Sep-07	Photic	0.06	0.68	0.01	0.01	29	11.0
CTB198D	02-May-07	Photic	0.02	0.33	0.01	0.19	9	2.4
CTB198D	21-May-07	Photic	0.03	0.34	0.01	0.08	14	2.6
CTB198D	04-Jun-07	Photic	0.03	0.42	0.01	0.05	17	4.7
CTB198D	18-Jun-07	Photic	0.03	0.42	0.01	0.01	19	2.8
CTB198D	09-Jul-07	Photic	0.03	0.43	0.01	0.01	19	4.5
CTB198D	23-Jul-07	Photic	0.02	0.32	0.01	0.01	14	3.2
CTB198D	06-Aug-07	Photic	0.02	0.40	0.01	0.01	11	3.0
CTB198D	20-Aug-07	Photic	0.02	0.38	0.01	0.01	14	2.8
CTB198D	12-Sep-07	Photic	0.02	0.31	0.01	0.01	16	2.8
CTB198D	26-Sep-07	Photic	0.03	0.32	0.01	0.01	15	---

Table 4-10: Lake Wylie Physical Parameter Data Collected in 2007

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB105B	02-May-07	0.15	25.7	9.6	8.0	86	1.0
CTB105B	21-May-07	0.15	23.9	8.6	7.6	90	1.0
CTB105B	04-Jun-07	0.15	26.3	6.6	7.0	91	1.0
CTB105B	09-Jul-07	0.15	31.5	7.8	7.6	102	1.3
CTB105B	18-Jun-07	0.15	29.8	9.1	8.4	98	1.1

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB105B	23-Jul-07	0.15	29.3	7.3	7.4	98	1.2
CTB105B	06-Aug-07	0.15	33.0	8.5	8.3	113	1.2
CTB105B	20-Aug-07	0.15	31.5	7.4	7.7	100	1.1
CTB105B	12-Sep-07	0.15	29.5	6.1	7.3	102	1.0
CTB105B	26-Sep-07	0.15	28.3	9.1	8.8	115	1.0
CTB174	02-May-07	0.15	29.5	8.9	8.0	88	0.8
CTB174	21-May-07	0.15	27.5	10.4	8.5	96	0.6
CTB174	04-Jun-07	0.15	29.3	6.3	7.2	92	0.8
CTB174	18-Jun-07	0.15	33.6	9.7	8.5	100	0.7
CTB174	09-Jul-07	0.15	36.1	8.5	7.9	102	0.9
CTB174	23-Jul-07	0.15	32.4	8.4	7.7	102	0.9
CTB174	06-Aug-07	0.15	36.7	7.9	8.0	114	0.9
CTB174	12-Sep-07	0.15	34.1	5.6	7.1	101	1.0
CTB174	26-Sep-07	0.15	33.8	7.4	7.8	107	0.8
CTB177	02-May-07	0.15	25.2	10.4	8.5	87	1.0
CTB177	21-May-07	0.15	25.3	9.4	8.6	102	0.8
CTB177	04-Jun-07	0.15	27.9	7.5	8.1	91	1.2
CTB177	18-Jun-07	0.15	29.7	9.9	8.7	99	1.1
CTB177	09-Jul-07	0.15	31.4	9.4	8.5	103	1.2
CTB177	23-Jul-07	0.15	30.6	8.4	8.0	99	1.1
CTB177	06-Aug-07	0.15	33.0	8.3	8.4	112	1.0
CTB177	12-Sep-07	0.15	29.1	4.4	7.0	108	0.8
CTB177	26-Sep-07	0.15	29.4	10.2	9.1	114	1.2
CTB178	02-May-07	0.15	23.4	9.5	7.7	82	1.8
CTB178	21-May-07	0.15	25.3	9.2	8.3	92	1.4
CTB178	04-Jun-07	0.15	26.2	6.7	7.4	89	1.2
CTB178	18-Jun-07	0.15	29.1	9.7	8.5	97	1.5
CTB178	09-Jul-07	0.15	30.0	8.8	8.3	101	1.7
CTB178	23-Jul-07	0.15	30.2	7.7	7.6	99	1.6
CTB178	06-Aug-07	0.15	33.2	8.6	8.2	112	1.2
CTB178	20-Aug-07	0.15	30.8	7.2	7.7	108	0.8
CTB178	12-Sep-07	0.15	28.7	5.0	7.1	108	1.1
CTB178	26-Sep-07	0.15	27.8	9.4	8.8	111	1.5
CTB198B5	21-May-07	0.15	26.2	10.4	8.5	134	0.7
CTB198B5	04-Jun-07	0.15	27.3	9.1	8.2	118	0.5
CTB198B5	18-Jun-07	0.15	29.9	10.9	9.0	108	0.9
CTB198B5	09-Jul-07	0.15	30.2	9.2	8.5	112	0.9
CTB198B5	23-Jul-07	0.15	29.6	8.6	7.9	121	0.9
CTB198B5	06-Aug-07	0.15	32.6	10.7	8.7	151	0.6
CTB198B5	20-Aug-07	0.15	32.3	9.6	8.4	189	0.6
CTB198B5	26-Sep-07	0.15	28.7	9.6	8.7	140	1.1
CTB198C5	02-May-07	0.15	26.2	9.2	7.7	92	0.9
CTB198C5	21-May-07	0.15	25.9	9.5	8.5	100	0.9

Station	Date	Depth	Temperature	DO	pH	Conductivity	Secchi Depth
CTB198C5	04-Jun-07	0.15	26.9	8.1	8.5	103	0.9
CTB198C5	18-Jun-07	0.15	30.5	10.1	8.8	107	0.8
CTB198C5	09-Jul-07	0.15	31.1	9.8	8.8	116	0.9
CTB198C5	23-Jul-07	0.15	29.0	8.3	8.1	116	1.2
CTB198C5	06-Aug-07	0.15	33.0	9.5	8.7	128	0.6
CTB198C5	20-Aug-07	0.15	31.7	8.7	8.7	136	0.7
CTB198C5	12-Sep-07	0.15	28.3	7.3	7.4	154	0.7
CTB198C5	12-Sep-07	0.15	28.0	6.0	7.3	138	0.7
CTB198C5	26-Sep-07	0.15	28.6	9.5	8.8	134	1.0
CTB198D	02-May-07	0.15	25.1	9.1	7.8	81	1.9
CTB198D	21-May-07	0.15	25.6	9.6	8.7	90	1.6
CTB198D	04-Jun-07	0.15	25.0	8.5	7.9	89	1.4
CTB198D	18-Jun-07	0.15	29.4	9.5	8.7	97	1.7
CTB198D	09-Jul-07	0.15	30.0	8.8	8.6	101	1.3
CTB198D	23-Jul-07	0.15	29.9	8.3	8.1	106	1.8
CTB198D	06-Aug-07	0.15	31.6	9.2	8.7	112	1.6
CTB198D	20-Aug-07	0.15	31.0	8.2	8.7	115	1.9
CTB198D	12-Sep-07	0.15	28.5	6.8	7.5	115	1.6
CTB198D	26-Sep-07	0.15	28.0	9.2	8.8	117	1.3

Appendix 4-B

Lake Wylie TMDL
&
Original Management Strategies for Nutrients

(as seen in the 1995 *Catawba River Basinwide Water Quality Management Plan*)

FEB 05 1996

TMDL APPROVAL

Project:

Lake Wylie Nutrient Management Strategy

Location:

Mecklenburg and Gaston County, NC; York County, SC

Scope/Size:

The TMDL encompasses Lake Wylie and its tributaries including the Catawba River and its tributaries below Mountain Island Dam and the South Fork Catawba River below its confluence with Long Creek.

Water Quality Issue(s):

Eutrophication-related water quality standard violations.

Applicable Water Quality Standard(s):

The NC chlorophyll-a water quality standard for lakes is: not greater than 40 ug/l.

Water Quality Model:

The Walker Lake Model, an empirical, steady state model which relates eutrophication symptoms to external loadings, hydrology and reservoir morphometry, was calibrated for Lake Wylie.

Critical Conditions:

The model was used to predict the growing season (April-October) nutrient response of Lake Wylie during a low flow year.

TMDL Strategy:

NEW/EXPANDING DISCHARGES TO LAKE WYLIE*

>=1MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN-summer only).

<1MGD, but >0.05 MGD, all new and expanding facilities must meet a 2mg/l TP limit.

INDUSTRIAL DISCHARGES

All industrial discharges will be handled on a case-by-case basis because best available technology (BAT) is not clearly defined for them. The Division will require the industries in the management area to reduce TP and TN to BAT levels.

DISCHARGES TO CATAWBA CREEK (>0.05 MGD)

By 2001, all facilities must meet a 1 mg/l TP limit and 6 mg/l summertime TN limit. By 2006, all facilities must meet a 0.5 mg/l TP limit and TN limits of 4 mg/l summertime, 8 mg/l wintertime.

DISCHARGES TO CROWDERS CREEK (>1 MGD)

By 2001, all facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only).

DISCHARGES TO SOUTH FORK CATAWBA RIVER DOWNSTREAM OF LONG CREEK

>=1 MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only).

<1 MGD, but >0.05 MGD, all new and expanding facilities must meet a 2 mg/l TP limit.

*Defined as the Catawba River and its tributaries (unless otherwise noted) from the Mountain Island Lake dam to the Lake Wylie dam.

TMDL WASTELOAD ALLOCATION (WLA) STRATEGY

Tributary	Discharger	Flow MGD	TN, mg/l (lb/day)	TP, mg/l (lb/day)	Comments
S. Fork Catawba River	Gastonia NC0020184	16.0	*6.0 (801)	1.0 (133)	Plant not on line yet; these will be limits.
"	JPS NCG500169	4.0	8.8 (293)	2.7 (90)	Monitoring only; plant does not have limits.
Catawba River	Mt. Holley NC0021156	4.0	9.1 (304)	3.3 (110)	Currently discharges at these levels-no limits.
"	"	6.0	*6.0 (300)	1.0 (50)	After expansion, these will be permit limits.
"	Belmont NC0021181	5.0	15.0 (624)	8.3 (345)	Currently discharges at these levels-no limits.
"	"	7.0	*6.0 (350)	1.0 (58)	After expansion, these will be permit limits.
Catawba Creek	Gastonia NC0020192	9.0	*4.0 (300)	0.5 (38)	These will be permit limits by 2006.
Crowders Creek	Bessemer City NC0020826	1.5	*6.0 (75)	1.0 (13)	Permit limits by Jan. 01, 2000.
"	Gastonia NC0074268	6.0	*6.0 (300)	1.0 (50)	"

*April-October TN limit

The above WLAs which are scheduled to be implemented over the next several years are intended to prevent the average chlorophyll-a values from exceeding the 40 ug/l standard. The following table illustrates the improvement in the chlorophyll-a standard in the most impacted arms of Lake Wylie. These improvements (to meet the water quality standard) will be derived soley from permit limit modification.

Loading And Chlorophyll-a Levels Before TMDL Strategy

Tributary/Lake	TP, lbs/day	TN, (lbs/day)	Chlorophyll-a, (ug/l)
Catawba Creek	301	991	74
Crowders Creek	150	895	43
South Fork Catawba River	993	4760	-
Catawba River	801	7346	-
Lake Wylie	1195	9726	18.2

Loading And Chlorophyll-a Levels After TMDL Strategy

Tributary/Lake	TP, (lbs/day)	TN, (lbs/day)	Chlorophyll-a (ug/l)
Catawba Creek	56	337	35
Crowders Creek	82	520	33
South Fork Catawba River	718	4491	-
Catawba River	455	7068	-
Lake Wylie	825	8885	15.5

LOAD ALLOCATION (LA) BREAKDOWN

Nutrient budgets for point and non-point contributions were estimated for the South Fork, Catawba Creek and Crowders Creek watersheds based on average nutrient concentration, mean flow for each tributary, and NPDES compliance data. Estimated growing season background loadings were separated from estimated growing season loadings due to point sources.

The load allocations considered in the model for TMDL development are as follows:

Tributary	TP, (lbs/day)	TN, (lbs/day)
South Fork Catawba River	495	3398
Catawba Creek	19	36
Crowders Creek	20	144
Catawba River	346	6418

The LA for nonpoint source loading does not specify the percent reduction for TN and TP, because the previously identified WLAs will result in the average chlorophyll-a standard being met. However, the South Fork Catawba River has been identified as the highest priority for implementation of BMPs.

MARGIN OF SAFETY (MOS)

The water quality model was used to predict the nutrient response of Lake Wylie to a low flow year. Flow data from the 1986 growing season were selected for this run as it was the lowest flow in the past 10 years.

Availability for Public Comment:

Two public meetings were held to present the Catawba River Basin Plan in November, 1994. A number of comments were received about the Lake Wylie nutrient management strategy at these meetings. Based on the comments, NCDEM revised the strategy. The Catawba River Basin Plan was approved by the Environmental Management Commission in February, 1995.

Date Submitted:

NCDEM sent the final Catawba River Basin Plan containing the Lake Wylie Nutrient Management Strategy to EPA on December 14, 1995. Due to the furlough, EPA did not receive the Basin Plan until January 10, 1996.

Technical Approver John A. Kosche

Technical Reviewer [illegible]
R4 TMDL Coordinator

This TMDL strategy is hereby approved as meeting the requirements of Section 303(d) of the Clean Water Act.

Approved R F McGhee
Robert F. McGhee, Director
Water Management Division

Date 2/5/96

Lake Wylie TMDL 1995 Catawba River Basinwide Water Quality Management Plan

6.4 MANAGEMENT STRATEGIES FOR NUTRIENTS

Control of nutrients is necessary to limit algal growth potential, to assure protection of the instream chlorophyll *a* standard, and to avoid the development of nuisance conditions in the state's waterways. Point source controls are typically NPDES permit limitations on total phosphorus (TP) and total nitrogen (TN). Nonpoint controls of nutrients generally include best management practices (BMPs) to control nutrient loading from areas such as agricultural land and urban areas.

Assimilative capacity for nutrients vary greatly in the Catawba Basin as the waters flow from stream to lake to stream. A 1992 report by DEM and South Carolina Department of Health and Environmental Control (92-04) described the assimilative capacity of Lake Wylie as exhausted. Rhodhiss Lake and Lake Hickory are eutrophic lakes, but their short retention time mitigates the effect by somewhat controlling algal growth. Ongoing and planned studies will further detail the assimilative capacity for nutrients of Lake James, Rhodhiss Lake, Lake Hickory, Lookout Shoals Lake, and Mountain Island Lake.

6.4.1 Lake Wylie Management Strategy

The 1992 Lake Wylie Report (92-04) documented eutrophic conditions in Lake Wylie and several of its major tributaries. To address eutrophication in Lake Wylie, the state developed a point and non-point nutrient control strategy for the Lake Wylie watershed. For point sources, it required state-of-the-art nutrient removal for all new or expanding wastewater discharges in the vicinity of the lake. In addition, the nutrient management strategy required existing facilities on tributaries to the three most highly eutrophic arms of the lake (South Fork Catawba River, Catawba Creek and Crowders Creek) to meet stringent nutrient removal requirements. For nonpoint sources, this strategy included targeting of funds from the state's Agricultural Cost Share Program for the Reduction of Nonpoint Source Pollution for implementation of best management practices on agricultural lands to highly impacted watersheds of Lake Wylie.

In conjunction with the Catawba River basinwide planning effort, the existing Lake Wylie management strategy was reexamined using current water quality data to assess the strategy's consistency with the State's stated goal of managing problem pollutants while accommodating reasonable economic growth. The Lake Wylie nutrient management strategy presented below is designed to reduce and eventually prevent the occurrence of eutrophication-related water quality standard violations in Lake Wylie and is consistent with the general results and conclusions of the 1992 Lake Wylie report.

The Lake Wylie Nutrient Management Area

In order to control nutrient loading in Lake Wylie and its major tributaries, both point and non-point source controls need to be implemented. For the purposes of this document, the Lake Wylie Nutrient Management Area is considered to be Lake Wylie and its tributaries including the Catawba River and its tributaries below Mountain Island Dam and the South Fork Catawba River below its confluence with Long Creek. The upper watersheds of the Catawba River, above Mountain Island Lake Dam, and the South Fork Catawba River, above Long Creek, are not included in the management area due to both the distance of these waters from Lake Wylie and the presence of impoundments which trap some nutrients. Because distance from the lake and the presence of impoundments may somewhat mitigate the effects of nutrients released into the upper Lake Wylie watersheds, nutrient management will be focused within the study area as defined above.

Future study will be conducted to reevaluate the extent of the defined management area. Point and non-point sources on the South Fork Catawba River upstream of Long Creek will be further assessed to determine what effect additional control of nutrients in the upper South Fork Catawba River basin may have upon eutrophication in Lake Wylie. Results of this study will be considered during the development of the next Catawba River Basin Plan.

Recommended Point Source Nutrient Reduction Strategies

To reduce nutrient enrichment of Lake Wylie, the following recommendations are made for point source discharges within the Lake Wylie Nutrient Management Area. These recommendations are summarized and compared with those from the 1992 Lake Wylie Report in Table 6.2, below.

Reference is also made to Figures 6.1 and 6.2, below, and Figure 3.4 in Chapter 3. Figures 6.1 and 6.2 depict the average daily nutrient loading and predicted chlorophyll *a* concentrations in the four major tributary arms and the mainstem of Lake Wylie based on the nutrient management strategy described below. The key differences between Figures 6.1 and 6.2 pertain to nutrient loadings in the Catawba River arm and the lake mainstem resulting from possible future expansions and upgrading of the Mt. Holly and Belmont municipal wastewater treatment plants (WWTPs). In Figure 6.1, the nutrient loadings to the lake mainstem area, which are shown enclosed by a dashed box in the figure, would be 1077 lbs/day for total phosphorus (TP) and 9289 lbs/day for total nitrogen (TN). The predicted average chlorophyll *a* concentration would be 17.2

ug/l (compared to the state standard of 40 ug/l). Figure 6.2 shows conditions in which the Mt. Holly and Belmont WWTPs are enlarged. Even though their respective flows would increase by 2.0 MGD, their actual nutrient loadings are reduced because nutrient limits would apply to the plants upon expansion. As a result, the TP and TN loads and the predicted chlorophyll *a* concentrations in the mainstem of the lake are lower in Figure 6.2 than in 6.1.

Finally, a comparison can be made between present and permitted nutrient loadings and chlorophyll *a* concentrations by comparing Figures 6.1 and 6.2 with Figure 3.4 in Chapter 3. Major nutrient loading reductions and predicted chlorophyll *a* concentrations can be seen in the Catawba Creek and Crowders Creeks arms when comparing existing conditions (Figure 3.4) and the recommended permitting strategies contained herein. The reductions in nutrient loadings and chlorophyll *a* in the two other lake arms and the lake mainstem are less dramatic but significant.

New Discharges
It is recommended that no new discharges should be allowed to the lake mainstem or its tributaries, unless an evaluation of engineering alternatives shows that it is the most environmentally sound alternative. For any new discharges that meet this requirement it is recommended that advanced treatment technology be required. It is further recommended that any new facility with a permitted design flow of greater than or equal to 1 MGD should be required to meet monthly average limits of 1.0 mg/l total phosphorus (TP) and 6.0 mg/l total nitrogen (TN), (nitrogen limits to apply for the months April through October only). For new facilities with a permitted design flow of less than 1 MGD but greater than 0.05 MGD (50,000 gallons per day) it is recommended that they meet a total phosphorus limit of 2.0 mg/l.

All industrial discharges will be handled on a case-by-case basis because attainable advanced removal technology cannot be clearly defined for them as a group. The Division will require the industries in the management area to control TP and TN to best available technology levels applicable to their industrial type.

Existing Discharges
Existing discharges to the lake mainstem and tributaries should be encouraged to be removed when alternatives become available. Programs such as the Charlotte-Mecklenburg Utility Department (CMUD) sewer line extension project should continue to be supported.

Upon expansion or major modification, it is recommended that all existing discharges should be required to apply advanced nutrient removal technology. For all expanding facilities with a permitted design flow greater than or equal to 1 MGD, recommended monthly average limits are as follows: 1.0 mg/l TP and 6.0 mg/l TN, (nitrogen limits to apply for the months of April through October only). For expanding facilities with a permitted design flow less than 1 MGD but greater than or equal to 0.05 MGD, the recommended TP limit is 2.0 mg/l. No expansion should be allowed that increases the total nutrient load from the facility unless an evaluation of engineering alternatives shows that it is the most environmentally sound alternative.

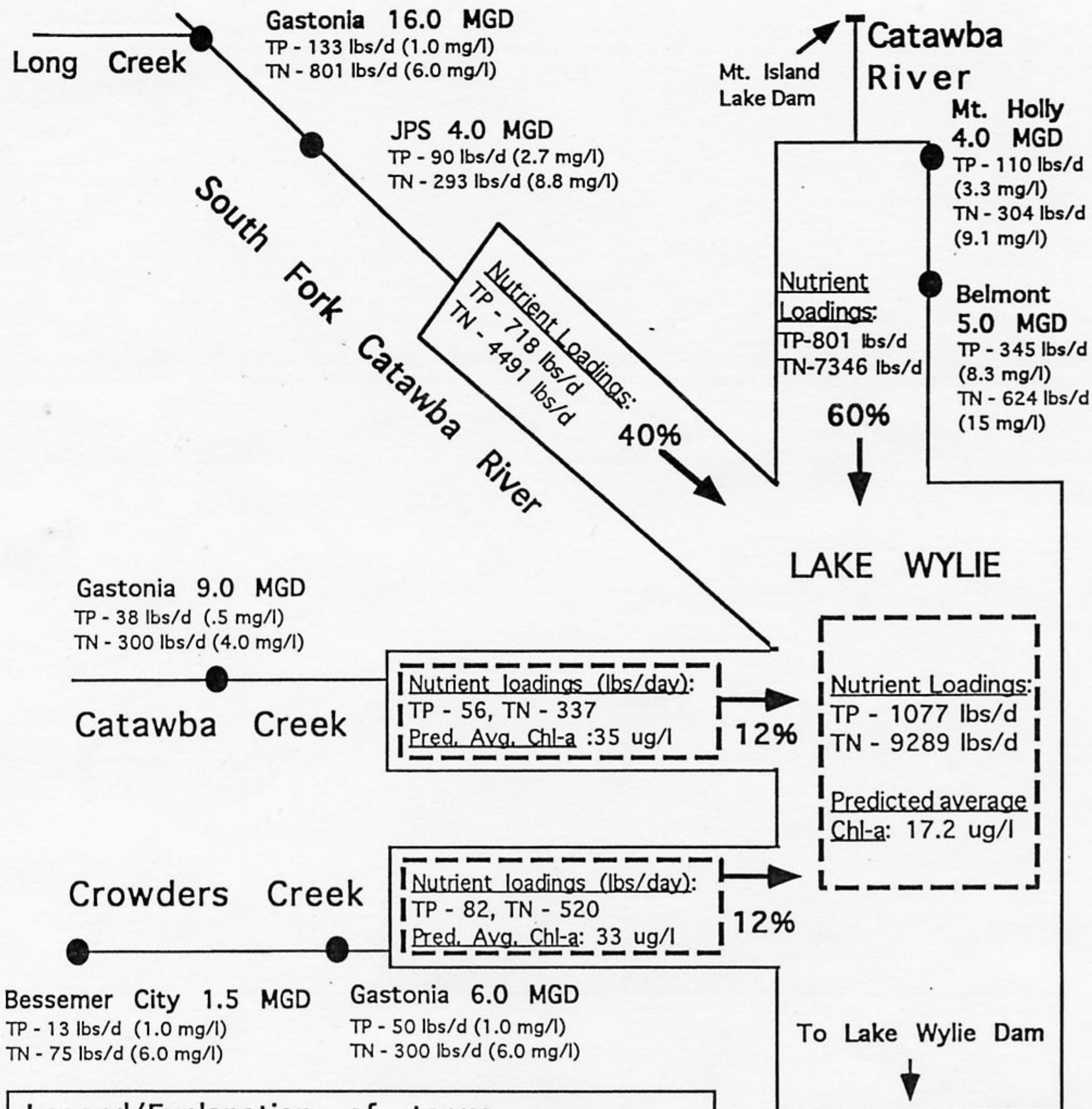
All existing industrial discharges will be handled on a case-by-case basis because attainable advanced removal technology can not be clearly defined for them as a group. DEM will require the industries in the management area to reduce TP and TN to best available technology levels.

To reduce nutrient enrichment in the two most eutrophic arms of Lake Wylie, additional recommendations are made for point source discharges to the Catawba Creek and Crowders Creek watersheds. In both watersheds, incentives should be established to encourage the privately owned facilities to tie on to larger municipal WWTPs which have a greater resource base to draw on in order to consistently operate the state-of-art treatment facilities required to protect water quality in the above listed sensitive areas. In addition, specific nutrient management recommendations are presented below.

Table 6.2 Comparison of 1992 and 1995 Point Source Phosphorus Reduction Strategies for Lake Wylie

1992 STRATEGY	1995 STRATEGY
NEW/EXPANDING DISCHARGES TO LAKE WYLIE*	NEW/EXPANDING DISCHARGES TO LAKE WYLIE*
Upon expansion, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	≥ 1 MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only). <1 MGD, but >0.05 MGD, all new and expanding facilities must meet a 2 mg/l TP limit.
INDUSTRIAL DISCHARGES	INDUSTRIAL DISCHARGES
All industrial discharges will be handled on a case-by-case basis because best available technology (BAT) is not clearly defined for them. The Division will require the industries in the management area to reduce TP and TN to BAT levels.	No change
DISCHARGES TO CATAWBA CREEK (>0.05 MGD)	DISCHARGES TO CATAWBA CREEK (>0.05 MGD)
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	By 2001, all facilities must meet a 1 mg/l TP limit and 6 mg/l summertime TN limit. By 2006, all facilities must meet a 0.5 mg/l TP limit and TN limits of 4 mg/l in the summertime and 8 mg/l in the wintertime.
DISCHARGES TO CROWDERS CREEK (>1 MGD)	DISCHARGES TO CROWDERS CREEK (>1 MGD)
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	By 2001, all facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only).
DISCHARGES TO SOUTH FORK CATAWBA RIVER DOWNSTREAM OF LONG CREEK	DISCHARGES TO SOUTH FORK CATAWBA RIVER DOWNSTREAM OF LONG CREEK
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	≥ 1 MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only). <1 MGD, but >0.05 MGD, all new and expanding facilities must meet a 2 mg/l TP limit.

*Defined as the Catawba River and its tributaries (unless otherwise noted) from the Mountain Island Lake dam to the Lake Wylie dam.



Legend/Explanation of terms

● Major NPDES Discharger locations with facility name and predicted avg. daily nutrient loads for total nitrogen (TN) and phosphorus (TP) based on permitted flow and recommended nutrient concentrations.

Nutrient sensitive lake areas.

Note: Daily nutrient loadings in the 4 lake arms are based on 89-90 measured background levels plus actual average 93-94 loadings from dischargers. Nutrient loading in the main lake is based on percentages of the lake arm loadings that are thought to reach the lake based on a field-calibrated in-lake nutient transport model.

Figure 6.1 Schematic Diagram of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy

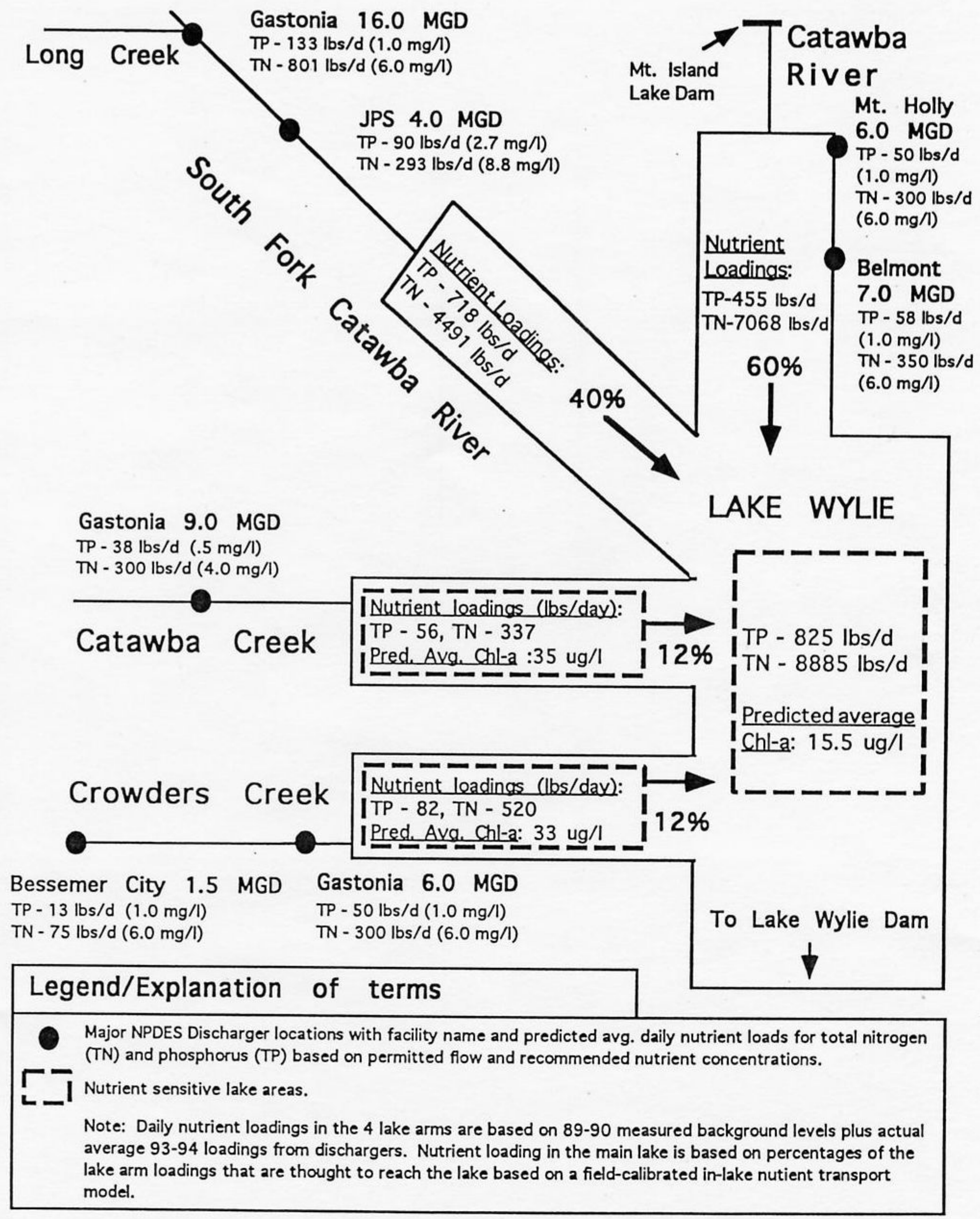


Figure 6.2 Schematic of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy with Mt. Holly and Belmont Expanded by 2.0 MGD

Catawba Creek

All existing surface water discharges in these watersheds with a permitted design flow of greater than or equal to 0.05 MGD should be required to apply state-of-art nutrient removal technology. Existing facilities have been notified of this strategy and will be required to meet permit limits of 0.5 mg/l TP and TN limits of 4 mg/l in the summer and 8 mg/l in the winter by 2006. Interim limits of 1.0 mg/l TP and 6.0 mg/l TN (summer) will become effective January 1, 2001. Based on a comparison between Figure 3.4, in Chapter 3, and Figure 6.1, it can be seen that these recommendations would result in reducing the predicted chlorophyll *a* concentration in Catawba creek from 74 ug/l (Figure 3.4) to 35 ug/l (Figure 6.1).

Crowders Creek

By January 1, 2000, it is recommended that all facilities with a permitted design flow of greater than or equal to 1 MGD will be required to meet limits of 1.0 mg/l TP and 6.0 mg/l TN. The nitrogen limits would apply for the months of April through October only. Based on a comparison between Figure 3.4, in Chapter 3, and Figure 6.1, it can be seen that these recommendations would result in reducing the predicted chlorophyll *a* concentration in the creek from 43 ug/l to 33 ug/l.

Non point sources

All tributaries to Lake Wylie should be targeted by the NC Division of Soil and Water Conservation for cost share funds for use in implementation of best management practices (BMPs). When possible, resources should be targeted toward implementation of BMPs in the Catawba Creek, Crowders Creek, and the South Fork Catawba River watersheds since a significant amount of the nutrients reaching these streams is from non-point sources. Since the South Fork Catawba River provides by far the largest nutrient load of any tributary to Lake Wylie, the South Fork should be considered the highest priority for implementation of BMPs.

Chapter Topics

CHAPTER FIVE

Agriculture

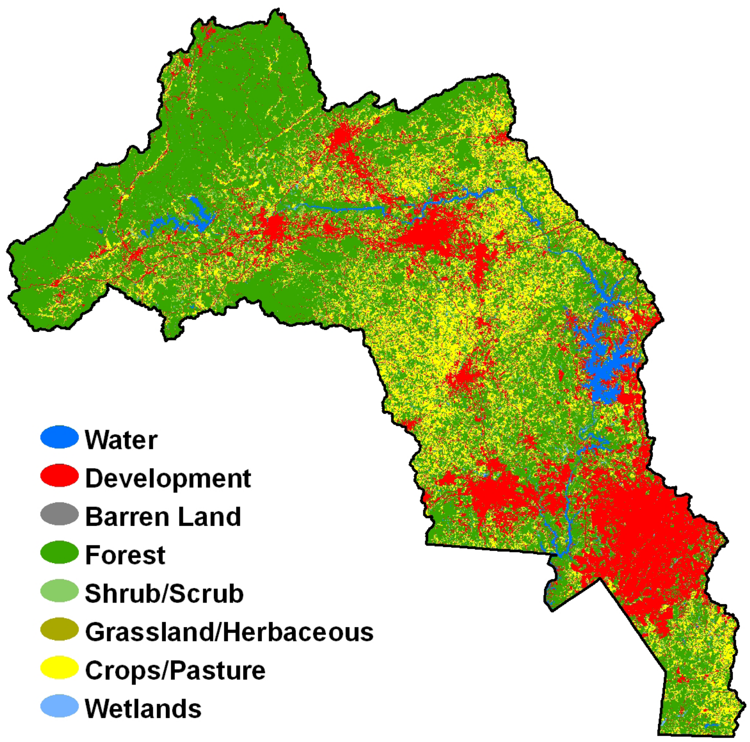
In the Catawba River Basin

Agriculture in the Catawba

Agriculture has been an important part of the economic success and health of North Carolina for decades and provides countless benefits. Recently, much emphasis has been placed on the value of local farming in which DWQ supports. However, like many beneficial human activities, agriculture can have a large impact on water quality. Over the past decades, agricultural agencies and farmers have joined efforts to greatly reduce these impacts. This Chapter is focused on remaining impacts as well as activities to restore water quality or prevent habitat degradation during this cycle.

Many national, state, and local agencies are focused on these efforts. Specific restoration and preservation projects which were planned or implemented during this plan cycle are discussed in the respective 10-digit watershed write ups within the Subbasin Chapters.

Figure 5-1: Land Cover in the Catawba River Basin (2001)



* Homer, 2004

Agricultural practices in the Catawba River Basin accounts for 18.9% of the land use activities; of that, 18.5% are estimated as pasture/hay land (Figure 5-1). This includes areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

Confined animal operations, grazing, plowing, stream access, pesticide spraying, fertilizing, planting and harvesting are all agricultural activities that may impact water quality. The major agricultural nonpoint source pollutants that result from these activities are sediment, nutrients, pathogens (i.e., bacteria), pesticide and salts. Agricultural activities can also damage habitat and stream channels.

Soil & Water Conservation Districts

Agricultural Cost Share Program (ACSP)

During the six-year, six-month period (January 2003 – June 2009), 547 Best Management Practices (BMPs) were installed with just over $2 million dollars of NCACSP funds equaling total project costs of $2.65 million. This equates to approximately 84 BMPs installed with just over $310,000 of NCACSP funds per year, averaging $3,691 per BMP. Total project costs would equal 84 BMPs installed at a total cost of >$408,000/year averaging $4,861 per BMP.

Of the 547 BMPs installed, 251 were implemented within water-supply watersheds (46%). Of the 547 BMPs installed, 178, or 33%, were installed within the 14 digit HUC's of 303(d) listed streams (the 14 digit HUCs were chosen to "scale-down" the watersheds of the 303d listed streams). Of the 547 BMPs installed, 342 were in either water-supply watersheds and/or 303(d) listed streams (63% of the practices). Funds expended in either water supply watersheds and/or 303(d) listed streams equaled 71% of the total funds expended (and the total project costs). Effective targeting of NC Agricultural Cost-Share Program funds was accomplished with 71% of the allocations being implemented in these important watersheds.

Tables 5-1 through 5-4 and Figure 5-2 provide additional information on practices installed, costs, locations and benefits. The following is a breakdown of the amounts and percentages of the totals of the practices installed:

Table 5-1: Breakdown of the Amounts & Percentages of Total Practices Installed

Practice	$ Amount	% of Total Practices Installed
Stream Protection	$794,258	39%
Waste Management	$518,294	26%
Erosion/Nutrient Reduction	$404,252	20%
*Community Conservation	$104,810	5%
Sediment/Nutrient Reduction	$67,508	3%
Agri-Chemical Pollution Prevention	$65,179	3%
*Drought Response	$61,134	3%
*Community Conservation is a new program and the Drought Response was a special one-time legislated program		

The Catawba Basin has three eight digit hydrologic units within the entire Basin Watershed, 03050101, 03050102, and 03050103. The breakdown regarding NCACSP funds expended based on these HUC's follows:

Table 5-2: Breakdown of NCACSP Funds Expended Based on 8-Digit HUC's

8-Digit Hydro Unit	Funds Expended	% of Total Funds Expended	Drainage Area	% of Total Drainage Area
03050101	$1,297,781	64.4%	2218.68 square mile DA	67.5%
03050102	$ 608,517	30.2%	660.74 square mile DA	20.1%
03050103	$25,107	1.2%	405.99 square mile DA	12.4%

The total "Funds Expended" for these HUC's equals 96%, the remainder coming from anomalies within the dataset (data points that lie outside the watershed boundaries). The Watershed drainage areas equal 100%.

Table 5-3: NCACSP BMP Implementation Data (January 2003 - June 2009) by 8-Digit HUCs

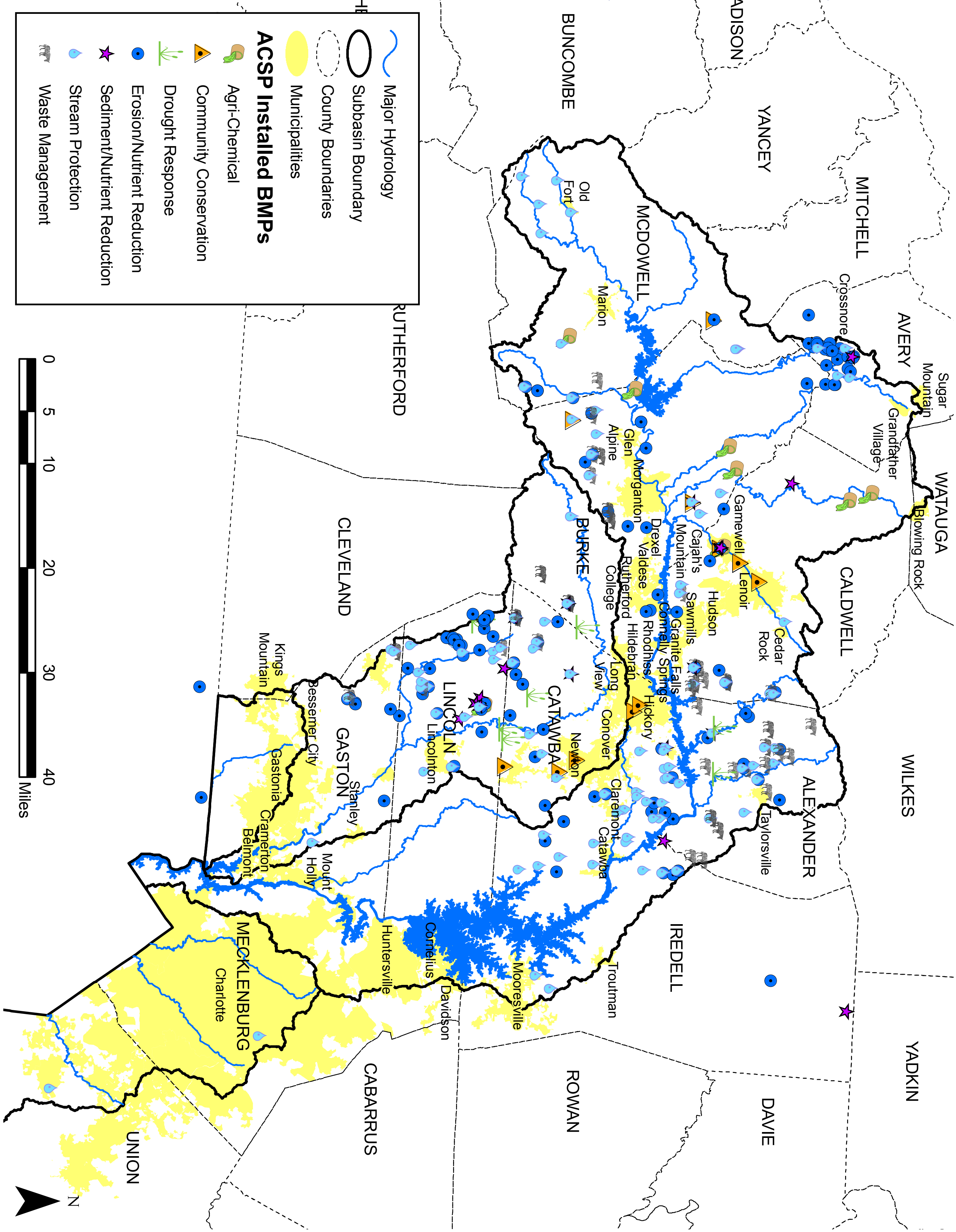
Purpose of BMP	Hydrologic Unit 03050101			Hydrologic Unit 03050102			Hydrologic Unit 03050103		
	Total Implemented	Cost-Shared Funded	Total Project Costs	Total Implemented	Cost-Shared Funded	Total Project Costs	Total Implemented	Cost-Shared Funded	Total Project Costs
Agri-Chemical Pollution Prevention	--	$47,106	$62,808	--	$18,073	$24,097	--	--	--
Number of Facilities	7	--	--	1	--	--	--	--	--
Drought Response	--	$27,449	$36,599		$33,685	$44,913	--	--	--
Well-Confined Supply	2	--	--	1	--	--	--	--	--
Irrigation Well	--	--	--	3	--	--	--	--	--
Conservation Irrigation	--	--	--	1600 ft	--	--	--	--	--
Erosion/Nutrient Loss Reduction from Fields	--	$27,449	$268,601	--	$179,345	$239,127	--	--	--
Acres Treated	3,848 ac	--	--	4,476 ac	--	--	--	--	--
Sediment/Nutrient Delivery Reduction from Fields	--	$24,845	$33,127	--	$27,503	$36,671	--	--	--
Stream Protection	--	$541,211	$721,615	--	$182,526	$243,368		$25,107	$33,476
Linear Feet Treated	87,009 ft	--	--	29,722 ft	--	--	11,875 ft	--	--
Waste Management	--	$355,017	$473,356	--	$163,277	$217,703	--	--	--
Number of Units Installed	47	--	--	14	--	--	--	--	--
Grand Total	--	$1,297,781	$1,730,375	--	$608,517	$811,356	--	25,107	$33,476

Table 5-4: NCACSP BMP Implementation Benefits Data (January 2003- June 2009) by 8-Digit HUCs

Benefits	03050101	03050102	03050103
Acres Affected	15,347	7,809	478
Nitrogen Saved (lb.)	27,797	177,361	--
Phosphorus Saved (lb.)	13,284	41,403	--
Soil Saved (lb.)	45,973	39,069	--
Waste-N Pounds Managed	709,923	444,523	--
Waste-P Pounds Managed	846,475	372,342	--

A474

FIGURE 5-2: NCACSP BMPs IMPLEMENTED WITHIN THE CATAWBA RIVER BASIN (JANUARY 2003- JUNE 2009)



Animal Operations & Recommendations

In 1992, the Environmental Management Commission (EMC) adopted a rule modification (15A NCAC 2H.0217) establishing procedures for managing and reusing animal wastes from intensive livestock operations. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following size: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system. For key animal operation legislation between 1995 and 2003, see Chapter 6 of the *Supplemental Guide to North Carolina's Basinwide Planning*.

Even though the rules adopted by the EMC are focused on managing and reusing animal waste in an environmentally and economically feasible manner, animal operation facilities can have many other impacts on local and downstream water quality. Some of the major impacts on water quality are:

- **Streambank Erosion & Sedimentation:** Livestock grazing with unlimited access to the stream channel and banks can also cause severe streambank erosion resulting in sedimentation and degraded water quality. Although they often make up a small percentage of grazing areas by surface area, riparian zones (vegetated stream corridors) are particularly attractive to cattle that prefer the cooler environment and lush vegetation found beside rivers and streams. This concentration of livestock can result in increased sedimentation of streams due to "hoof shear", trampling of bank vegetation, and entrenchment by the destabilized stream. Despite livestock's preference for frequent water access, farm veterinarians have reported that cows are healthier when stream access is limited (EPA, 1999).
- **Loss of Riparian Vegetation:** As livestock gather near streams, the riparian zone becomes trampled and thinned out. The more frequent access livestock has to the stream, the less of a chance the vegetation has to grow back. Establishing, conserving and managing streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs.
- **Excessive nutrients:** Elevated nutrients levels from animal operations are not only from livestock within the stream excreting waste, but also from stormwater runoff which washes the waste deposited in the pasture into the stream. When these streams have healthy riparian zones or buffers, instream nutrients are greatly reduced. Once the storm flow reaches the buffer, it has a chance to filter into the soil and excess nutrients is taken up by the vegetation.

More specific information about these agricultural impacts can be found in *Chapter 6* of the *Supplemental Guide to North Carolina's Basinwide Planning*.

Table 5-5: Permitted Animal Operations in 03050101

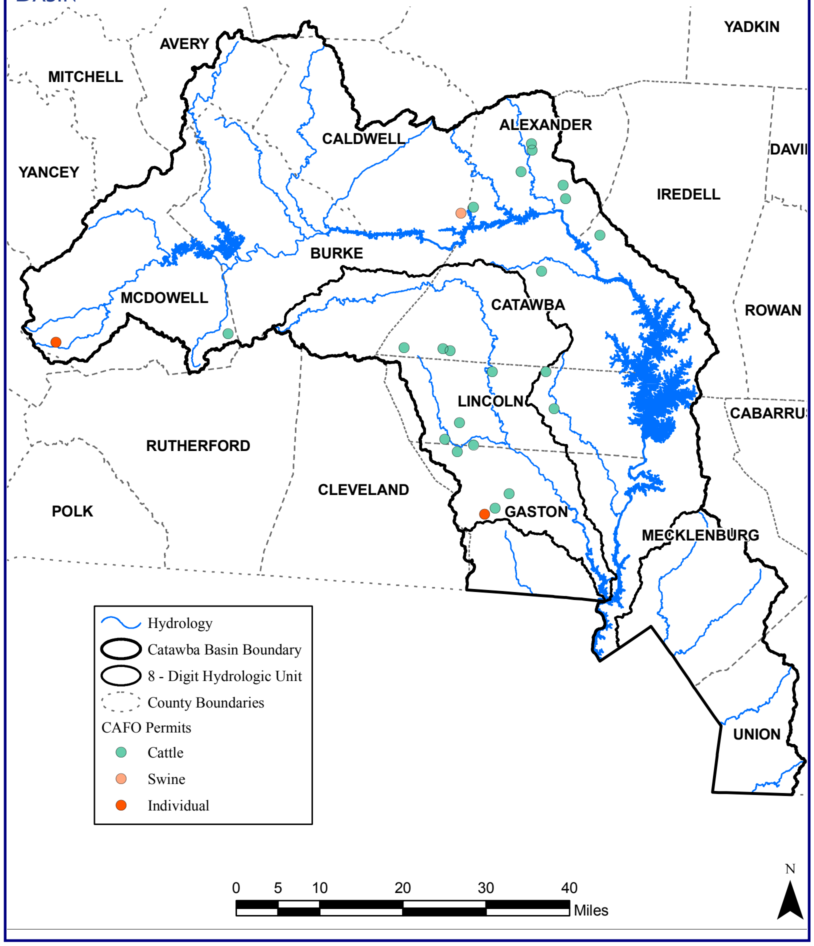
	03050101			03050102		
Type	# of Facilities	# of Animals	SSLW	# of Facilities	# of Animals	SSLW
Cattle	12	4,713	5,714,950	11	5,115	6,746,350
Swine	1	260	368,420	0	0	0

*Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service (NRCS) guidelines. Since the amount of waste produced varies by hog size, this is the best way to compare the sizes of the farms.

Water Quality Impacts in the Catawba River Basin

Between 2004 and 2009, the majority of habitat degradation and other impacts from animal operations were observed in the upper half of the basin. Even though almost all of the permitted operations are within the South Fork subbasin (03050102) and just northeast of Lake Hickory Figure 5-3), there are many smaller farms scattered throughout the basin. As mentioned above, only facilities with animal populations of 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system must obtain a permit from the state.

FIGURE 5-3: PERMITTED ANIMAL OPERATIONS IN THE CATAWBA RIVER BASIN



There are a variety of programs available to and used by agricultural facilities throughout North Carolina. Many give incentives for protecting water quality including a variety of programs supported by the Federal Farm Bill. For more information on these programs see *Chapter 6* of the *Supplemental Guide to North Carolina's Basinwide Planning*. For additional information about the 2008 Farm Bill, see the *Conservation Practices brochure* on the National Resources Conservation Services website.

As seen in *Section A: Chapter 2* of the 2004 *Catawba River Basinwide Water Quality Plan*, there has been a shift in animal operations from cattle to poultry within the basin since the mid 1990's. Impacts being seen by biologist, environmental professionals and local citizens from this shift to poultry farms is sediment filling in nearby streams. Agricultural practices are exempt from having to complete a sediment and erosion control plan which is a state requirement for any land disturbing activity over an acre; however, if the operation participates in any federal farm government program, they may be required to meet soil erosion control goals or lose their program benefits. Poultry houses that are not participating in federal farm programs are not required to implement sediment and erosion controls and some are being constructed without proper controls in place to trap sediment on the property before it reaches the stream. Many of these poultry houses are located in the headwaters of the Catawba River Basin where high quality waters (HQW), outstanding resource waters (ORW) and trout waters (Tr) are also found. These water are usually very sensitive to the impacts of sedimentation.

At the urging of the NC Agriculture Task Force and NC Soil & Water Conservation Commission, the NC Poultry Federation is establishing operating guidelines and standards to address setbacks, site stabilization and other environmental concerns related to the construction of new poultry production facilities. It is recommended that poultry farmers voluntarily install sediment and erosion controls on the property during construction activities to reduce impacts from sedimentation.

REFERENCES

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. *www.mrlc.gov*.

U.S. Environmental Protection Agency (EPA). 1999. Watershed Academy Website: *http://epa.gov/owow/watershed/wacademy/* (accessed 2004).

Chapter Topics

- Using Riparian Buffers
- Trout Buffers (Tr)
- Water Supply Buffers
- HQW/ORW Buffers
- Chain of Lakes

CHAPTER SIX

Buffer Rules

In the Catawba River Basin

Using Riparian Buffers to Protect Stream Quality and Integrity

A stream and its riparian area function as one. The condition of a riparian area plays a pivotal role in the integrity of a stream channel and instream water quality. While any type of streamside vegetation is desirable, forests provide the greatest amount of benefit and the highest potential for meeting both water quality and habitat restoration objectives. Riparian forest buffers are managed to protect water quality through the control of nonpoint source pollution and the maintenance of the stream environment.

Riparian forest buffer systems are typically comprised of an area of trees, usually accompanied by shrubs and other vegetation, adjacent to a waterbody and managed as three integrated streamside zones that are designed to intercept surface runoff and subsurface flow.

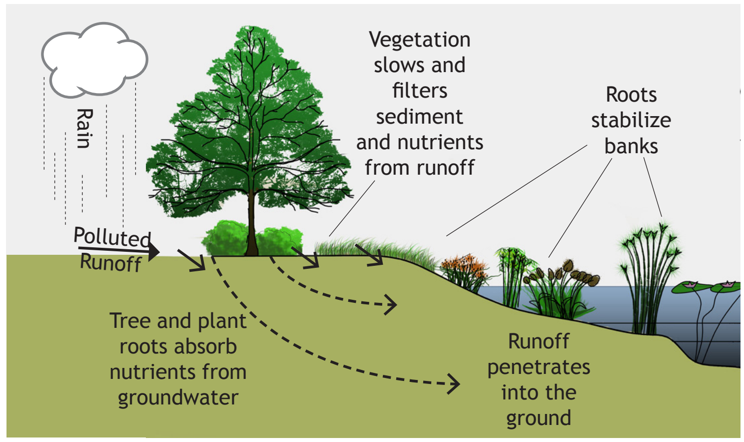
A sound scientific foundation exists to support the sediment reduction, nutrient reduction and ecological values and functions of riparian forest buffers. The use of riparian buffers as a management tool should be promoted.

There are many different types of buffers within the Catawba River Basin, but they all have the same purpose, to reduce the amount of pollutants and excess nutrients running off the land and into surface waters. The types of buffers include trout, water supply, HQW, ORW and the Chain of Lakes buffers. The first four are based off of primary and secondary use classification. The Chain of Lakes buffers were initiated by the Environmental Management Commission to help protect the lakes against sedimentation and excess nutrients. Each buffer type may vary in width and have differing rules and regulations. These differences are described below in their respective sections along with a map indicating locations within the basin.

Need For & Benefits of the Chain of Lakes Buffers

The presence of intact riparian buffers and/or wetlands in urban areas can reduce urban impacts. Establishment and protection of buffers should be considered where feasible, and the amount of impervious cover should be limited as much as possible. Wide streets, large cul-de-sac, and long driveways and sidewalks lining both sides of the street are all features of urban development that create excess impervious cover and consume natural areas. Certain sections of the chain (Lake Rhodhiss and Lake Wylie) are already impaired due to the impacts from the accumulation of excessive nutrients. Riparian buffers are one way to help protect the Catawba River and its lakes from runoff pollution, particularly from new development. Some of these benefits include:

Figure 6-1: How Riparian Buffers Work



- Filtering runoff: Rain that runs off the land can be slowed and infiltrated in the buffer, which helps capture nutrients, sediment and other pollutants before they reach the lakes (Figure 6-1). Slowing the velocity of the runoff is critical in areas with large slopes or unstable soils. Runoff with high velocity has the force to transport sediment and other pollutants in its path to the receiving waterbody, and can quickly cause gullies and slope failures.

- Nutrient Removal: Phosphorus and nitrogen from lawn and crop fertilizers and animal waste are taken up by tree roots where they are then stored in leaves, limbs and roots instead of reaching the water. Some groundwater nitrogen is also converted to nitrogen gas by bacteria that live around the roots.

- Provides Canopy and Shade: Shading by buffer vegetation can moderate water temperature along the shorelines, providing some relief for aquatic life in the hot summer months.

- Provides food and habitat for wildlife: Leaves fall into a lake or river where they provide food to the aquatic food chain. The riparian buffer itself also offers habitat for many animals including songbirds, turtles and amphibians.

Trout Buffers

Trout Waters (Tr) Classification

Trout waters are defined in the Environmental Management Commission Rule (15A NCAC 2B .0202) as "waters which have conditions which shall sustain and allow for trout propagation and survival of stocked trout on a year-round basis". All named and unnamed tributaries to trout waters usually carry the trout waters classification. This classification does not and is not intended to provide public access to streams for fishing on private and public lands and does not regulate, in any way, fishing activities (seasons, size limits, creel limits, and bait and lure restrictions) handled by the NC Wildlife Resources Commission.

Trout Buffer Law

The Sedimentation Pollution Control Act of 1973 requires buffer zones along trout waters.

G.S. 113A-57(1) of this Act states:

> *"Waters that have been classified as trout waters by the Environmental Management Commission shall have an undisturbed buffer zone 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent (25%) of the buffer zone nearest the land-disturbing activity, whichever is greater. Provided, however, that the Sedimentation Control Commission may approve plans which include land-disturbing activity along trout waters when the duration of said disturbance is temporary and the extent of said disturbance would be minimal."*

Trout Buffer Requirements

Division of Land Resources ("DLR") Rule 15A NCAC 04B .0125 specifies the following requirements for buffer zones for trout waters that must be met:

- The (minimum) 25-foot buffer must be measured horizontally from the top of the bank.
- A land-disturbing activity in the buffer zone adjacent to trout water can be permitted if the duration of the disturbance is temporary and the extent of the disturbance is minimal. Permission must be received from DLR (contact on back).
- To be considered minimal, a land-disturbing activity must meet two conditions. (1) The land-disturbance must be limited to a maximum of ten percent of the total length of the buffer zone on your property. (2) There must not be more than 100 linear feet of disturbance in each 1000 linear feet of buffer zone. For example, if there is 750 linear feet of buffer zone on your property, up to 75 linear feet of that buffer can be disturbed. If there is 1500 linear feet of buffer zone on your property, you are still limited to 100 linear feet of disturbance in any 1000 linear foot section along the stream. Please check with the appropriate Regional Office (contact information on back) to verify that the proposed activity is minimal.
- If the disturbance will exceed 10 percent or 100 linear feet in every 1000 linear feet, approval for the disturbance must be obtained from the Director of the DLR. Please submit your trout buffer variance request through the *DLR Central Office*.
- A land-disturbing activity within a buffer zone adjacent to trout water that will cause adverse stream temperature fluctuations, as set forth in 15A NCAC 2B .0211, is prohibited.

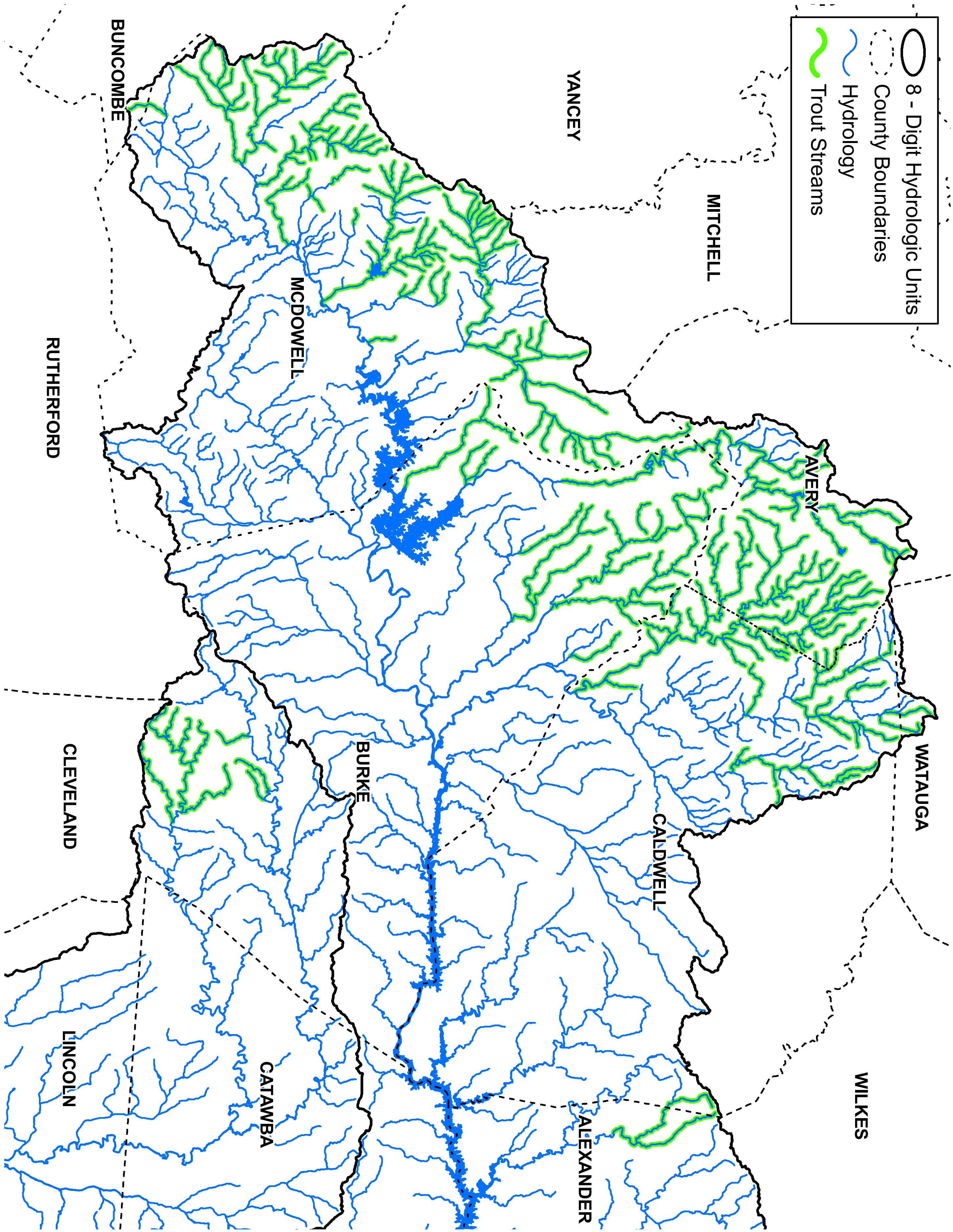
Trout Waters in the Catawba River Basin

Almost all trout waters in the Catawba River basin are located in the upper portion of the headwaters subbasin (03050101), with a few stream miles in the headwaters of the South Fork subbasin (03050102). Figure 6-2 indicates where these waters are with a thick green line.

For more information on trout buffers:

- *Frequently Asked Questions About Trout Buffers* Fact Sheet;
- Contact the *Division of Land Resources*: (919) 733-3833;
- Contact the Division of Water Quality: (919) 807-6300;
- Or, contact your Regional Office: Asheville (828) 296-4500 | Mooresville (704) 663-1699

Figure 6-2: Trout Waters in the Catawba River Basin



Water Supply Buffers

Water Supply (WS) Classification

Water Supply I (WS-I):

Waters protected for all Class C uses plus waters used as sources of water supply for drinking, culinary, or food processing purposes for those users desiring maximum protection for their water supplies. WS-I waters are those within natural and undeveloped watersheds in public ownership. All WS-I waters are HQW by supplemental classification.

Water Supply II (WS-II):

Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I classification is not feasible. These waters are also protected for Class C uses. WS-II waters are generally in predominantly undeveloped watersheds. All WS-II waters are HQW by supplemental classification.

Water Supply III (WS-III):

Waters used as sources of water supply for drinking, culinary, or food processing purposes where a more protective WS-I or II classification is not feasible. These waters are also protected for Class C uses. WS-III waters are generally in low to moderately developed watersheds.

Water Supply IV (WS-IV):

Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas. More information: *Water Supply Watershed Protection Program* Homepage

Water Supply Buffer Law

Water Supply - I (WS-I):

- Entire water supply watershed: Agricultural activities must maintain a 10-foot vegetated buffer from perennial surface waters or equivalent control as determined by the Soil and Water Conservation Commission (Administrative Code 15A NCAC 02B .0104 (p), (1) in the *Redbook*).

Table 6-1: Defining Low & High Density Development For Water Supplies (DENR-DWQ, 2009)

Water Supply Level	Area Affected	Low Density Option (DU=Dwelling Unit; AC=Acres)	High Density Option[1]
WS-I	Entire water supply watershed	Undeveloped	Undeveloped
WS-II	½ mile critical area[2]	1 du / 2 ac or 6% built upon area	6-24% built upon area
	Rest of watershed	1 du / 1 ac or 12% built upon area	12-30% built upon area
WS-III	½ mile critical area[2]	1 du / 1 ac or 12% built upon area	12-30% built upon area
	Rest of watershed	1 du / ½ ac or 24% built upon area	24-50% built upon area
WS-IV	½ mile critical area[2]	1 du / ½ ac or 24% built upon area[4]	24-50% built upon area[4]
	Protected area[3]	1 du / ½ ac or 24% built upon area[4,5]	24-70% built upon area[4,5]

1 - High Density Option requires control of runoff from the first 1 inch of rainfall through use of engineered stormwater controls. **2** - Critical Area is ½ mile and draining to water supplies as measured from the normal pool elevation of reservoir, or ½ mile and draining to a river intake. **3** - Protected Area is five miles and draining to water supplies as measured form the normal pool elevation of reservoirs, or 10 miles upstream of and draining to a river intake. **4** - These rules apply only to project requiring a Sedimentation and Erosion Control Plan. **5** - ⅓ acre lot or 36% built upon surface area is allowed for projects without a curb and gutter streat system

Water Supplies - II, III & IV:

- Critical Area: (which is a ½ mile and draining to water supplies as measured from the normal pool elevation of reservoirs, or ½ mile and draining to a river intake.)
- Agricultural activities must maintain a 10-foot vegetated buffer from perennial surface waters or equivalent control as determined by the Soil and Water Conservation Commission;
- A 30-foot buffer is required on all low density developments;
- And, a 100-foot buffer is required on all high density developments.
- Rest of Watershed:
- A 30-foot buffer is required on all low density developments;
- And, a 100-foot buffer is required on all high density developments.

Table 6-1 defines what low and high density development means for Water Supplies I-IV. For additional information about water supplies and development density see Administrative Code 15A NCAC 02B .0212 in the *Redbook*.

Water Supplies in the Catawba River Basin

Most of water supply waters in the Catawba River basin are located along the Chain of Lakes and the South Fork Catawba River. Figure 6-3 indicates the locations of these waters and respective levels, which are intended to protect downstream water supplies.

High Quality & Outstanding Resource Water Buffers

HQW & ORW Classifications

High Quality Waters (HQW):

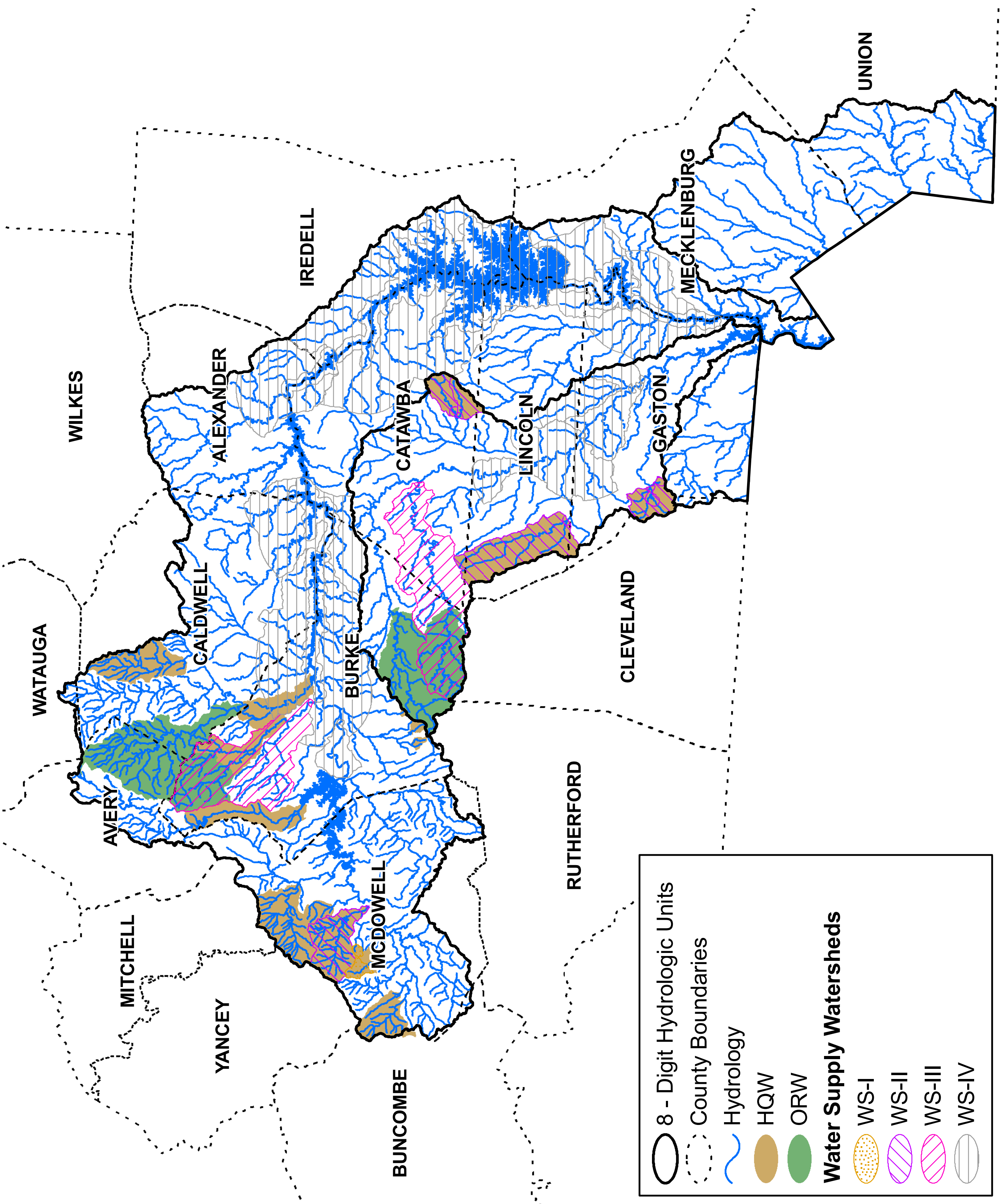
Supplemental classification intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through Division monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission.

Outstanding Resource Waters (ORW):

All outstanding resource waters are a subset of High Quality Waters. This supplemental classification is intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance. To qualify, waters must be rated Excellent by DWQ and have one of the following outstanding resource values:

- Outstanding fish habitat and fisheries,
- Unusually high level of waterbased recreation or potential for such kind of recreation,
- Some special designation such as North Carolina Natural and Scenic River or National Wildlife Refuge,
- Important component of state or national park or forest, or
- Special ecological or scientific significance (rare or endangered species habitat, research or educational areas).

Figure 6-3: Water Supply, HQW & ORW Areas in the Catawba River Basin



HQW & ORW Buffer Law

HQW:

- The affected area for HQW buffers include within one mile from and draining to the HQW waterbody.
- If a Sedimentation and Erosion Control Plan is required then low density developments (1 dwelling unit per acre or 12% built upon) is required to have a 30-foot buffer.
- Statewide rules administered by DWQ require certain size animal feedlots to have permit coverage and approved animal waste management plans as well as to implement buffer zones between newly constructed waste facilities/waste application areas and perennial surface waters.

ORW:

- The affected area for ORW buffers normally include the entire watershed/drainage area.
- If a Sedimentation and Erosion Control Plan is required then low density developments (1 dwelling unit per acre or 12% built upon) is required to have a 30-foot buffer.
- Statewide rules administered by DWQ require certain size animal feedlots to have permit coverage and approved animal waste management plans as well as to implement buffer zones between newly constructed waste facilities/waste application areas and perennial surface waters.

HQW & ORW in the Catawba River Basin

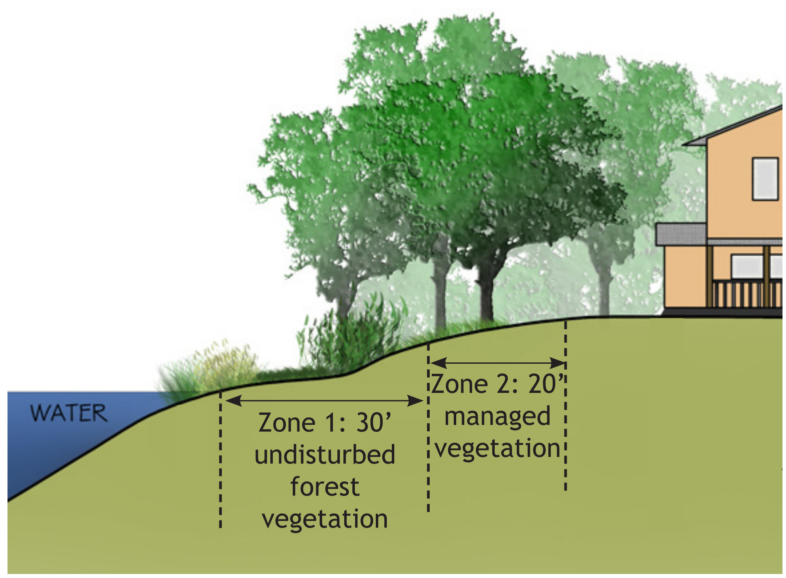
Almost all HQW & ORW designations in the Catawba River basin are located in the upper portion of the headwaters subbasin (03050101), with a few stream miles in the headwaters of the South Fork subbasin (03050102). Figure 6-3 indicates where these waters are located.

Chain of Lakes Buffers

The Chain of Lakes Buffer Rules

On July 7, 2003, the Environmental Management Commission completed a stakeholder process to protect mainstem riparian habitat on the Catawba River by finalizing the "Catawba River Basin Buffer Rules" (§15A NCAC 02B.0243). The temporary rule became permanent in August 2004.

Figure 6-4: 2-Zone Buffer Design



The Catawba River basin buffer rules apply to a 50-foot wide riparian buffer directly adjacent to surface waters along the Catawba River mainstem below Lake James and along mainstem lakes in the Catawba River basin. The rules create a two-zone protection area that allows for all existing uses that were in place on June 30, 2001 (Figure 6-4). As long as the current land use was in place on that date, the Catawba River basin buffer rules do not apply. Otherwise, Zone One is the 30- foot wide strip closest to the waterline that must remain generally undisturbed. Zone Two constitutes the remaining 20 feet of buffers and allows for grading and revegetating as long as the health of zone one is not impacted. There are many exemptions and activities that are allowable with mitigation inside the buffer zone. Those include, but are not limited to, access roads, view corridors and timber harvesting. For a complete copy of the rule and the list of all exemptions, please refer to §15A NCAC 02B.0243 in the *Redbook*. For more discussion on the process used to develop the rule, visit the *Nonpoint Source Management Program* website.

Chain of Lakes Buffer Recommendations

The Chain of Lakes double zoned 50-foot buffer does provide some protections to the lakes. However, as populations in the surrounding watersheds increase and land uses change, so will the amount of impervious surface. These changes will put the lakes at a greater risk for eutrophication. Local governments have the opportunity to adopt a local riparian buffer ordinance to further protect water quality past that of what these buffers can do. A local ordinance can set more stringent rules, like expanding to 100-foot buffers along certain shorelines, require additional stormwater controls on areas with excessive nutrient runoff or reduce acceptable activities within both zones. DWQ recommends local governments take some voluntary action to increase buffer requirements as appropriate for that area. Local requirements should be assessed with the long term plans of the community. As a community grows and the demand on water increases, whether for recreation, drinking or aesthetic purposes, the quality of the water will become more critical. By reducing the pollutants and nutrients entering the lake, municipalities will be able to spend less on filtering drinking water and keeping aquatic weeds from clogging intake pipes. This will also reduce the chances of algal blooms which can prevent adequate recreation use and discourage return visits.

An essential element of implementing successful buffers is public education. DWQ highly recommends educational efforts by local watershed groups, governments and agencies, and support will be provided were possible for these efforts. Public outreach and education is a critical since the majority of land use around the immediate shorelines are residential. If a residence has a better understanding of the buffers purpose and that his or her actions can effect the appearance and quality of the lake, that residence is more likely to take voluntary steps. Residence who are new to the area, especially in the lower half of the chain where populations are increasing quickly, may be unaware of the buffer rules all together. Educational emphasis should be placed on the purpose of the buffers and enhancing local water quality not necessarily what can and can't be done within the zones. The buffers are not in place to impede what an individual can do on their own property, but are designed to enhance the use and enjoyment of the lake for that individual as well as other. Clean lakes are not only beneficial to property values but economically beneficial to the local community and its tourist industry.

It is up to the local population of each lake to take water quality into their own hands. Local voluntary actions are much more effective in the long term and creates ownership amongst citizens. State level action is necessary in certain cases; however, it can cause some to become more concerned with additional regulations and in turn lose site of the real issue. DWQ will assist and support all local efforts that encourage the expansion of lake buffers and/or buffer requirements/guidelines and all educational efforts where possible.

Local Buffer Rules

Some local governments have developed additional riparian buffer rules to provide more protection to the headwaters of the Chain of Lakes.

Lincoln County

Lincoln County adopted a Streamside Buffer Ordinance in 2007 that was modeled after the State's Catawba River Buffer regulations. The County regulations require a minimum 50-foot two-zone buffer on both sides of intermittent and perennial streams. The first 30 feet from streams edge is a 'no touch' zone and the remaining 20 feet is to have managed vegetation or other ground cover. No development or impervious surfaces are allowed anywhere within the 50-foot buffer.

Gaston County

Gaston County buffer regulations require a minimum 30-foot vegetative buffer for low-density development along perennial water and a 100-foot buffer for high-density development.

Mecklenburg County

Mecklenburg County developed an approach in the late 1990's called Surface Water Improvement & Management or SWIM with the objective to "*prevent further degradation, preserve the best waters, improving the good and remediating the worst waters*" (Mecklenburg County, 2000). This approach includes buffer requirements as listed below. The table and graphics were pulled from the *Charlotte-Mecklenburg SWIM Stream Buffer Implementation Guidelines* document found on their website.

Table 6-2: Summary of Mecklenburg County SWIM Stream Buffer Requirements

Jurisdiction	Date Ordinance Adopted	Total Buffer Widths			
		≥ 640 acres	≥ 300 acres	≥ 100 acres	≥ 50 acres
Mecklenburg County(1) unincorporated	11/9/99	total = 100 ft + 50% of area of floodfringe beyond 100 ft stream side=30ft. managed use=45ft. upland=25ft +50% of area of floodfringe beyond 100 ft	total = 50 ft stream side=20ft managed use =20ft. upland=10ft	total = 35 ft stream side=20ft managed use =none upland=15ft	No Buffer Requirements
Charlotte(1)	11/15/99	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County
Pineville(1)	4/11/2000	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County
Cornelius(2)	12/6/99	total = entire floodplain but no less than 100 feet	total = 50 feet no zones	total = 35 ft no zones	
Huntersville(1)	10/19/99	total = floodway + 100% of floodfringe but no less than 100 ft stream side=30ft managed use=45 ft upland=remainder	total = 50 feet stream side=20ft managed use =20ft. upland=10ft	total = 35 ft stream side=20ft managed=none upland=15ft	
Matthews(1)	2/14/2000	same as Huntersville	same as Huntersville	same as Huntersville	
Mint Hill(1)	7/20/2000	same as Huntersville	same as Huntersville	same as Huntersville	
Davidson(1)	10/99 "PLAN" and not Ordinance	Total buffer width = a minimum of 100 feet for all streams within Davidson's jurisdiction. For all FEMA regulated streams the width is 100 feet + 50% of the area of the floodfringe beyond 100 feet - stream side zone = 30 feet, managed use = 45 feet and upland = 25 feet + 50% of area of floodfringe			

All buffers are measure horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream.
(1): Function, vegetative targets and uses for each of the buffer zones correspond to the buffer plan developed by the S.W.I.M. Panel dated April 20, 1999 (as summarized on the following page).
(2): No buffer zones have been designated. The entire buffer area is designated in the Ordinance as "UNDISTURBED."

Figure 6-5: Buffer Zones Diagram

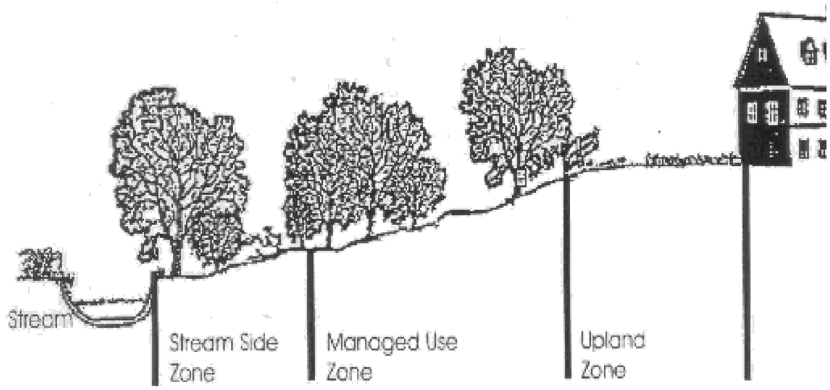


Table 6-3: Description of Buffer Function, Vegetative Targets & Use Which Vary According to the Different Buffer Zones

Characteristics	Stream Side Zone	Managed Use Zone	Upland Zone
Function	Protect the integrity of the ecosystems	Provide distance between upland development and the stream side zone	Prevent encroachment and filter runoff
Vegetative Targets (1)	**Undisturbed (no cutting or clearing allowed)** - If existing tree density is inadequate, reforestation is encouraged	**Limited clearing** - Existing tree density must be retained to a minimum of 8 healthy trees of a minimum 6 inch caliper per 1000 square feet - If existing tree density is inadequate, re-forestation is encouraged	**Grass** or other herbaceous ground cover allowed - Forest is encouraged
Uses (2)	**Very restricted** - Permitted uses limited to: flood control structures and bank stabilization as well as installation of utilities and road crossings with stabilization of disturbed areas as specified in "III E" above.	**Restricted** - Permitted uses limited to: all uses allowed in the Stream Side Zone, as well as storm water best management practices (BMPs), bike paths, and greenway trails (not to exceed 10 feet in width).	**Restricted** - Permitted uses limited to: all uses allowed in the Stream Side and Managed Use Zones, as well as grading for lawns, gardens, and gazebos and storage buildings (non-commercial and not to exceed 150 sf).

(1): Re-vegetation of disturbed buffers is required when such disturbances result in the failure of the buffer system to comply with the vegetative targets specified above.
(2): Fill material can not be brought into the buffer. Grading is allowed only in the Upland Zone. Commercial buildings or occupied structures are not allowed in the buffer. Permitted uses within the buffer zones should be coordinated to ensure minimal disturbance of the buffer system. For example, if it is necessary to install utilities within the buffer, every attempt should be made to build greenway trails so they follow the cleared areas instead of requiring additional clearing.

REFERENCES

North Carolina Department of Environment and Natural Resources (DENR). Division of Land Resources (DLR). 2007. *Sedimentation Pollution Control Act of 1973*. North Carolina General Statutes Chapter 113A Article 4 §113A-57(1) Raleigh, NC. *http://www.dlr.enr.state.nc.us/images/Sedimentation%20Pollution%20Control%20Act%20of%201973,%202007%20amendments.pdf*.

____. DLR. February 1992. *Buffer Zone Requirements*. North Carolina Administrative Code: 15A NCAC 4B .0125. Raleigh, NC.

North Carolina Department of Environment and Natural Resources (DENR). Division of Water Quality (DWQ). May 2007. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCAC 2B .0202. Raleigh, NC.

____. DWQ. May 2007. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCAC 2B .0104. Raleigh, NC.

____. DWQ. May 2007. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCAC 2B .0212. Raleigh, NC.

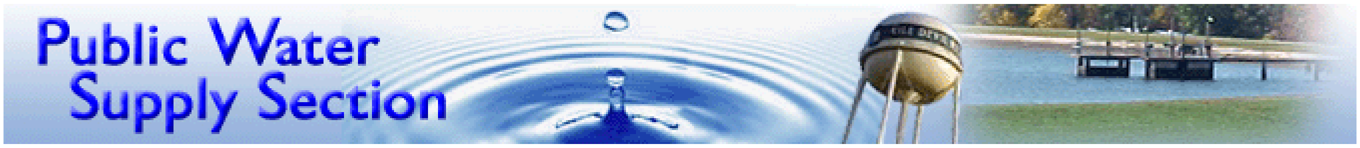
____. DWQ. May 2007. *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina*. North Carolina Administrative Code: 15A NCAC 2B .0243. Raleigh, NC.

____. DWQ. 2009. *A Guide to Surface Freshwater Classifications in North Carolina*. Central Office, Raleigh, NC. *http://portal.ncdenr.org/c/document_library/get_file?p_l_id=38446&folderId=125637&name=DLFE-8307.pdf*

CHAPTER SEVEN

Source Water Assessment & Protection

In the Catawba River Basin



Source Water Assessment of Public Water Supplies

Introduction

The Federal Safe Drinking Water Act (SDWA) Amendments of 1996 emphasize pollution prevention as an important strategy for the protection of ground and surface water resources. This new focus promotes the prevention of drinking water contamination as a cost-effective means to provide reliable, long-term and safe drinking water sources for public water supply (PWS) systems. In order to determine the susceptibility of public water supply sources to contamination, the amendments also required that all states establish a Source Water Assessment Program (SWAP). Specifically, Section 1453 of the SDWA Amendments require that states develop and implement a SWAP to:

- Delineate source water assessment areas;
- Inventory potential contaminants in these areas; and
- Determine the susceptibility of each public water supply to contamination.

In North Carolina, the agency responsible for the SWAP is the Public Water Supply (PWS) Section of the DENR Division of Environmental Health (DEH). The PWS Section received approval from the EPA for their SWAP Plan in November 1999. The SWAP Plan, entitled North Carolina's Source Water Assessment Program Plan, fully describes the methods and procedures used to delineate and assess the susceptibility of more than 9,000 wells and approximately 207 surface water intakes. To review the SWAP Plan, visit the PWS website at *http://swap.deh.enr.state.nc.us/swap/*.

Delineation of Source Water Assessment Areas

The SWAP Plan builds upon existing protection programs for ground and surface water resources. These include the state's Wellhead Protection Program and the Water Supply Watershed Protection Program.

Wellhead Protection (WHP) Program

North Carolinians withdraw more than 88 million gallons of groundwater per day from more than 9,000 water supply wells across the state. In 1986, Congress passed Amendments to the SDWA requiring states to develop wellhead protection programs that reduce the threat to the quality of groundwater used for drinking water by identifying and managing recharge areas to specific wells or wellfields.

Defining a wellhead protection area (WHPA) is one of the most critical components of wellhead protection. A WHPA is defined as "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The SWAP uses the methods described in the state's approved WHP Program to delineate source water assessment areas for all public water supply wells. More information related to North Carolina's WHP Program can be found at http://swap.deh.enr.state.nc.us/swap/.

Water Supply Watershed Protection (WSWP) Program

DWQ is responsible for managing the standards and classifications of all water supply watersheds. In 1992, the WSWP Rules were adopted by the EMC and require all local governments that have land use jurisdiction within water supply watersheds adopt and implement water supply watershed protection ordinances, maps and management plans. SWAP uses the established water supply watershed boundaries and methods established by the WSWP program as a basis to delineate source water assessment areas for all public water surface water intakes. Additional information regarding the WSWP Program can be found at http://h2o.enr.state.nc.us/wswp/index.html.

Susceptibility Determination - NC's Overall Approach

The SWAP Plan contains a detailed description of the methods used to assess the susceptibility of each PWS intake in North Carolina. The following is a brief summary of the susceptibility determination approach.

Overall Susceptibility Rating

The overall susceptibility determination rates the potential for a drinking water source to become contaminated. The overall susceptibility rating for each PWS intake is based on two key components: a contaminant rating and an inherent vulnerability rating. For a PWS to be determined "susceptible", a potential contaminant source must be present and the existing conditions of the PWS intake location must be such that a water supply could become contaminated. The determination of susceptibility for each PWS intake is based on combining the results of the inherent vulnerability rating and the contaminant rating for each intake. Once combined, a PWS is given a susceptibility rating of higher, moderate or lower (H, M or L).

Inherent Vulnerability Rating

Inherent vulnerability refers to the physical characteristics and existing conditions of the watershed or aquifer. The inherent vulnerability rating of groundwater intakes is determined based on an evaluation of aquifer characteristics, unsaturated zone characteristics and well integrity and construction characteristics. The inherent vulnerability rating of surface water intakes is determined based on an evaluation of the watershed classification (WSWP Rules), intake location, raw water quality data (i.e., turbidity and total coliform) and watershed characteristics (i.e., average annual precipitation, land slope, land use, land cover, groundwater contribution).

Contaminant Rating

The contaminant rating is based on an evaluation of the density of potential contaminant sources (PCSs), their relative risk potential to cause contamination, and their proximity to the water supply intake within the delineated assessment area.

Inventory of Potential Contaminant Sources (PCSs)

In order to inventory PCSs, the SWAP conducted a review of relevant, available sources of existing data at federal, state and local levels. The SWAP selected sixteen statewide databases that were attainable and contained usable geographic information related to PCSs.

Source Water Protection

The PWS Section believes that the information from the source water assessments will become the basis for future initiatives and priorities for public drinking water source water protection (SWP) activities. The PWS Section encourages all PWS system owners to implement efforts to manage identified sources of contamination and to reduce or eliminate the potential threat to drinking water supplies through locally implemented programs

To encourage and support local SWP, the state offers PWS system owners assistance with local SWP as well as materials such as:

- Fact sheets outlining sources of funding and other resources for local SWP efforts.
- Success stories describing local SWP efforts in North Carolina.

- Guidance about how to incorporate SWAP and SWP information in Consumer Confidence Reports (CCRs).

Information related to SWP can be found at *http://swap.deh.enr.state.nc.us/swap*.

Public Water Supply Susceptibility Determinations in the Catawba River Basin

In April 2004, the PWS Section completed source water assessments for all drinking water sources and generated reports for the PWS systems using these sources. The assessments are updated regularly; the most recent updates were published in May 2007. The results of the assessments can be viewed in two different ways, either through the interactive ArcIMS mapping tool or compiled in a written report for each PWS system. To access the ArcIMS mapping tool, simply click on the "NC SWAP Info" icon on the web page: *http://swap.deh.enr.state.nc.us/swap/*. To view a report, select the PWS System of interest by clicking on the "SWAP Reports" icon.

In the Catawba River Basin, 1289 public water supply sources were identified. Twenty-four are surface water sources and 1265 are groundwater sources. Of the 1265 groundwater sources, 40 of them have a Higher, 1221 have a Moderate and 4 have a Lower susceptibility rating. Table 19 identifies the surface water sources and their overall susceptibility ratings. It is important to note that a susceptibility rating of Higher does not imply poor water quality. Susceptibility is an indication of a water supply's potential to become contaminated by the identified PCSs within the assessment area.

Table 7-1: SWAP Results for Surface Water Sources in the Catawba River Basin

PWS ID Number	Inherent Vulnerability Rating	Contaminant Rating	Overall Susceptibility Rating	Name of Surface Water Source	PWS System Name
0114010	H	H	H	LAKE RHODHISS	LENOIR, CITY OF
0114030	H	H	H	LAKE RHODHISS	GRANITE FALLS, TOWN OF
0136010	H	M	H	MTN ISLAND LAKE	GASTONIA, CITY OF
0136015	H	H	H	CATAWBA RIV-LAKE WYLIE	BELMONT, CITY OF
0136020	M	M	M	MOUNTAIN ISLAND LAKE	MOUNT HOLLY, CITY OF
0136025	M	L	M	ARROWWOOD LAKE	BESSEMER CITY, TOWN OF
0136025	H	L	M	LONG CREEK	BESSEMER CITY, TOWN OF
0136030	H	L	M	LICK CREEK	CHERRYVILLE, CITY OF
0136030	M	L	M	INDIAN CREEK	CHERRYVILLE, CITY OF
0136065	H	M	H	S FORK CATAWBA RIVER	DALLAS, TOWN OF
0160010	M	M	M	MT ISLAND LAKE	CHARLOTTE-MECKLENBURG UTILITY
0160010	H	H	H	LAKE NORMAN	CHARLOTTE-MECKLENBURG UTILITY
0155010	H	L	M	S FORK CATAWBA	LINCOLNTON, CITY OF
0155035	M	H	H	LAKE NORMAN	LINCOLN COUNTY WTP
0112010	H	H	H	LAKE RHODHISS	VALDESE, TOWN OF
0112015	H	M	H	CATAWBA RIVER	MORGANTON, CITY OF
0118010	H	H	H	LAKE HICKORY	HICKORY, CITY OF
0118015	M	L	M	CATAWBA RIVER	NEWTON, CITY OF
0118015	M	L	M	CITY LAKE	NEWTON, CITY OF
0118025	H	H	H	LAKE HICKORY	LONGVIEW, TOWN OF
0149015	M	H	H	LAKE NORMAN	MOORESVILLE CITY OF
0156010	M	L	M	MACKEY CREEK	MARION, CITY OF
0156010	M	L	M	BUCK CREEK	MARION, CITY OF
0156010	M	L	M	CLEAR CREEK	MARION, CITY OF

Chapter Topics

- Forestland Ownership
- Forest Water Quality Regulations
- Catawba River Basin Riparian Buffer Rule
- Other Water Quality Regulations
- Water Quality Foresters
- Forestry Best Management Practices
- Protecting Stream Crossings with Bridgemats
- Forest Management
- Education & Outreach
- DFR - Catawba Basin Contacts

CHAPTER EIGHT

Forestry

In the Catawba River Basin

Division of Forest Resources

Forestland Ownership*

Approximately 85% of the forestland in the basin is privately-owned, while the remaining 15% is almost entirely comprised of publically-owned lands. The North Carolina Division of Forest Resources (NC-DFR) manages two Educational State Forests (ESF) in the basin for the purposes of education, forest management demonstration, and working-lands conservation. Tuttle ESF protects in excess of 300 acres in Caldwell County along Celia Creek (sub basin 0305010107). Mountain Island ESF protects approximately 1,600 acres along the western shoreline of Mountain Island Lake (sub basin 0305010114) which serves as a primary water supply for the city of Charlotte.

** The ownership estimates come from the most recent data published by the USDA-Forest Service ("Forest Statistics for North Carolina, 2002." Brown, Mark J. Southern Research Station Resource Bulletin SRS-88. January 2004).*

Forest Water Quality Regulations

Forestry operations in North Carolina are subject to regulation under the Sedimentation Pollution Control Act of 1973 (Article 4-GS113A, referred to as "SPCA"). However, forestry operations may be exempted from specific requirements of the SPCA if the operations meet the compliance performance standards outlined in the Forest Practices Guidelines Related to Water Quality (15A NCAC 1I .0100 - .0209, referred to as "FPGs") and General Statutes regarding stream and ditch obstructions (GS 77-13 and GS 77-14).

The FPG performance standard rule-codes and topics include:
- .0201: Streamside Management Zone (SMZ)
- .0202: Prohibition of Debris Entering Streams and Waterbodies
- .0203: Access Road and Skid Trail Stream Crossings
- .0204: Access Road Entrances
- .0205: Prohibition of Waste Entering Streams, Waterbodies, and Groundwater
- .0206: Pesticide Application
- .0207: Fertilizer Application
- .0208: Stream Temperature
- .0209: Rehabilitation of Project Site

The NC-DFR is delegated the authority to monitor and evaluate forestry operations for compliance with these aforementioned laws and/or rules. In addition, the NC-DFR works to resolve identified FPG compliance questions brought to its attention through citizen complaints. Violations of the FPG performance standards that cannot be resolved by the NC-DFR are referred to the appropriate State agency for enforcement action. During the period January 1, 2005 through December 31, 2009 there were 1,421 FPG inspections conducted on forestry-related sites in the basin; 94% of the sites were in compliance upon the initial site inspection.

Catawba River Basin Riparian Buffer Rule

The Catawba River Basin is subject to riparian buffer protection rule 15A NCAC 02B .0243. Forestry activities must comply with this buffer rule in addition to the requirements for SMZ establishment as defined within the FPG rules. The NC-DFR monitors forestry activities for compliance with the buffer rule and notifies the NC-DWQ if violations are observed. During the last 5 year period, there was 1 water quality referral for enforcement recorded. To assist loggers, landowners and foresters with the implementation of the buffer rule, the NC-DFR has developed a 2-page Forestry Leaflet that is available at local NC-DFR offices and can be downloaded from the *website*.

Other Water Quality Regulations

In addition to the multiple State regulations noted above, NC-DFR monitors the implementation of the following Federal rules relating to water quality and forestry operations:

- The Section 404 silviculture exemption under the Clean Water Act for activities in wetlands;
- The federally-mandated 15 best management practices (BMPs) related to road construction in wetlands;
- The federally-mandated BMPs for mechanical site preparation activities for the establishment of pine plantations in wetlands of the southeastern U.S.

Water Quality Foresters

Nearly the entire river basin falls within the coverage area of a Water Quality Forester. Statewide, there is a Water Quality Forester position in 9 of NC-DFR's 13 operating districts. Water Quality Foresters conduct FPG inspections, survey BMP implementation, develop pre-harvest plans, and provide training opportunities for landowners, loggers and the public regarding water quality issues related to forestry. These foresters also assist County Rangers on follow-up site inspections and provide enhanced technical assistance to local agency staff. Water Quality Foresters are the primary point of contact in their districts for responding to water quality or timber harvesting questions or concerns that are suspected to be related to forestry activities.

Forestry Best Management Practices

Implementing forestry Best Management Practices (BMPs) is strongly encouraged to efficiently and effectively protect the water resources of North Carolina. In 2006, the first ever revision to the North Carolina forestry BMP manual was completed. This comprehensive update to the forestry BMP manual is the result of nearly four years of effort by the NC-DFR and a DENR-appointed Technical Advisory Committee consisting of multiple sector stakeholders, supported by two technical peer-reviews. The forestry BMP manual describes measures that may be implemented to help comply with the forestry regulations while protecting water quality. Copies of the forestry BMP manual can be obtained at a County Ranger or District Forester office, or *online*.

In the basin during this period, the NC-DFR assisted with or observed 2,575 forestry activities in which BMPs were either implemented or recommended, encompassing a total area greater than 86,160 acres.

From March 2000 through March 2003, the DFR conducted a statewide BMP Implementation Survey on 565 active forest harvest operations to evaluate the usage of forestry BMPs. This survey evaluated 49 sites in this river basin, with a resulting BMP implementation rate of 76%. The problems most often cited in this survey across the state relate to stream crossings, skid trails and site rehabilitation. A copy of this report is available from the DFR Raleigh Central Office or can be downloaded from the *water quality webpage*. A second round of BMP Implementation Surveys was conducted on additional logging sites statewide from 2006 to 2008; at this time, the data is being compiled and a report of the findings will be available in 2010. These periodic, recurring BMP surveys serve as a basis for focused efforts in the forestry community to address water quality concerns through better and more effective BMP development, implementation and training.

Protecting Stream Crossings with Bridgemats

The NC-DFR provides bridgemats on loan to loggers for establishing temporary stream crossings during harvest activities in an effort to educate loggers about the benefits of installing crossings in this manner. Temporary bridges can be a very effective solution for stream crossings, since the equipment and logs stay completely clear of the water channel. Since 2005 all District Offices in the basin have had bridgemats available for loan-out. Periodic status reports, a list of bridgemat suppliers, and additional information are available on the *DFR bridgemat webpage*.

Forest Management

Forest management is a valued and prevalent land-use across much of the river basin. This area of North Carolina consistently ranks high in the number of acres in which sustainable forestry is being practiced. As a testament to this, more than 13,000 acres of land were established or regenerated with forest trees across the basin from January 1, 2005 through December 31, 2009. During this same time period the NC-DFR produced 2,220 individual forest plans for landowners that encompassed an estimated 105,600 acres of forestland in the basin.

Education & Outreach

The two Educational State Forests located in the basin are primary outlets for reaching school-aged children through structured, hands-on teaching. Tuttle ESF hosts on average approximately 4,000 students annually. While Mountain Island ESF is not yet open to the public, the personnel assigned to this ESF routinely instruct students at their schools or via specially-guided field tours at the ESF. More information about all of the ESFs is available on the *ESF website*.

Each year since 2004 the NC-DFR summarizes its BMP, water quality, and nonpoint source accomplishments in a color brochure entitled “Year In Review”. This report is available on the *DFR Year in Review webpage*.

The North Carolina Forestry Association, in cooperation with forest industry, NC-DFR, and NCSU, conducts educational programs annually at different locations in the North Carolina. The first program is called the Forestry and Environmental Camp, and is for middle and high school aged children. These 3-day long camps introduce children to the basic science and math skills needed when practicing forestry. The second program is the Sustainable Forestry Teachers Academy/ Tour, and educates school teachers about forestry practices and how forest products are manufactured. For more information about these programs visit the *North Carolina Forestry Association website*.

North Carolina DFR Contacts for the Catawba River Basin

Office Location	Contact Person	Phone	Address
Asheville District: D1	Asst. District Forester	(828) 667-5211	220 Sardis Road Asheville, NC 28806-8504
Lenoir District: D2	Water Quality Forester	(828) 757-5611	1543 Wilkesboro Blvd., NE Lenoir, NC 28645-8215
Mount Holly District: D12	Water Quality Forester	(704) 827-7576	1933 Mountain Island Highway Mt. Holly, NC 28120
Regional Office: Region III	Asst. Regional Forester	(828) 665-8688	14 Gaston Mountain Road Asheville, NC 28806-9101
Raleigh Central Office	Nonpoint Source Branch - Forest Hydrologist	(919) 857-4856	1616 Mail Service Center Raleigh, NC 27699
Griffiths Forestry Center	Water Quality & Wetlands Staff Forester	(919) 553-6178 Ext. 230	2411 Old US Hwy 70-West Clayton, NC 27520

Chapter Topics

- The Importance
- Catawba RiverKeeper
- Conservation Easement Fund
- Charlotte-Mecklenburg
- Lincoln County
- Gaston County
- Other

CHAPTER NINE

Local Initiatives

In the Catawba River Basin

Local Initiatives

The focus of this Chapter is to highlight some of the local initiatives that have been planned or implemented throughout this planning cycle. This Chapter also includes a list of watershed groups and natural resource agencies focused on improving water quality across the basin. There may be more of these groups and agencies active within the basin and as DWQ becomes aware of water quality improvement or protection activities, they will be updated within this Chapter. Please contact the *Catawba Basin Planner* to have your program/projects listed here.

The Importance of Local Initiatives

Local initiatives to protect water quality are essential to any community because local citizens make decisions that affect change in their own communities. There are a variety of limitations local initiatives can overcome including limited state government budgets and staff resources, minimal regulations for land use management, rulemaking processes and many others. Local organizations and agencies are able to combine professional expertise in a watershed, thus allowing groups to holistically understand the challenges and opportunities of different water quality efforts. Involving a wide array of people in water quality projects also brings together a wide range of knowledge and interests and encourages others to become involved and invested in these projects.

By working in coordination across jurisdictions and agency lines, more funding opportunities may be available. This will potentially allow local entities to do more work and be involved in more activities because their funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of local efforts are key to water quality improvements. There are good examples of local agencies and groups using these cooperative strategies throughout the basin and specific groups and projects are discussed within each of the 10-digit watershed write ups in the three Subbasin Chapters. Some of these groups are listed below. DWQ applauds the foresight and proactive response of local watershed groups and local governments to address any number of water quality problems.

Catawba RiverKeeper Foundation, Inc (CRF)

The Catawba RiverKeeper Foundation advocates for and secures protection and enhancement of the Catawba River, its lakes, tributaries and watershed so that it will always sustain the human and wildlife populations that depend on it for life.

Catawba RiverKeeper Foundation advocates for and secures protection and enhancement of the Catawba River, its lakes, tributaries and watershed so that it will always sustain the human and wildlife populations that depend on it for life.

Accomplishments since 2004:

- Received the dubious distinction in 2008 as America's "Most Endangered River"
- Leading public awareness campaign on 4 EPA listed "High Hazard Potential" coal ash ponds along the Catawba River
- Trained new groups of Covekeeper volunteers on Lakes Hickory, Norman, and Wylie
- Launched and trained over 200 Catawba basin residents in Muddy Water Watch, a citizen program to stop sediment-laden construction stormwater runoff
- Coordinated our Annual Riversweep on Lake Wylie, which has removed over 100 tons of waste from Wylie in the past 4 years
- Unified basin governments in opposition to an IBT request from Concord and Kannapolis
- Partnered on efforts to protect 116 acres surrounding East Lincoln County's water intake
- Many more found here *http://www.catawbariverkeeper.org/aboutus/accomplishments*

Conservation Easement Fund

The Conservation Easement Fund, as discussed in the 2004 basin plan, administered by the UNCC Urban Institute and Clemson University and funded by Crescent Resources, Inc., was successful in preserving and protecting 1,311 acres in NC and 146 acres in SC of riparian and wetland habitats along perennial streams and rivers in the Catawba River basin. The fund reimbursed land trusts and landowners for their costs in establishing conservation easements on these properties in the sum of $81,021. These efforts have significantly improved water quality and habitat throughout the Johns River watershed, as seen in the Excellent biological ratings it received during the 2007 sampling. For more information about this grant, please see the *Strom Thurmond Institute website*.

** Submitted by UNC Charlotte Urban Institute April 27, 2010.*

Charlotte-Mecklenburg

Post-Construction Controls Ordinance

In 2007 & 2008, the City of Charlotte, the Towns of Huntersville, Cornelius, Davidson, Mint Hill, Matthews, Pineville and Mecklenburg County implemented a Post-Construction Controls Ordinance that exceeds the State's minimum standards. The Ordinance contains provisions for open space, detention, stream buffers and pollution control for both new development and redevelopment. The Ordinance goes beyond the State's minimums by:

- Strengthening detention measures to protect streams from erosion and alleviate street & house flooding,
- Requiring undisturbed open space,
- Mandating wider stream buffers,

- Providing guidance for nutrient controls in sensitive areas, and
- Including requirements for redevelopment.

Water Quality Education campaign

Charlotte-Mecklenburg Storm Water Services (CMSWS) is making a difference with a public information program that is comprehensive, clear and creative. The multi-faceted program helps citizens of Charlotte and Mecklenburg County choose behaviors that protect our water quality. Rather than use a "one size fits all" mentality, CMSWS' public information program presents clear messages through a kaleidoscope of media such as print, radio, television, student programs, public events, volunteer programs, social media and partnerships with local universities, just to name a few. Volunteer programs include an Adopt a Stream Program, Storm Drain Stenciling Program, and a Volunteer Monitoring Program. Public surveys indicate these broad campaigns have made a definite impact. Awareness of storm water issues is at an all-time high of 62%, up nearly 20% in the past five years.

Regional Stormwater Partnership

In 2007, member municipalities of the Centralina Council of Governments formed a Regional Stormwater Partnership to address regional stormwater issues. The group meets quarterly to discuss regulations and issues. They also work cooperatively to educate the region about storm water issues, provide public involvement programs and train the staff of the member municipalities. The group leverages dues with grants to accomplish common goals.

Stream Monitoring Program

Charlotte-Mecklenburg manages an extensive stream monitoring program, which encompasses the entire county and includes sites in Charlotte and all six towns. The program is multifaceted and includes a variety of methods to assess stream health and identify pollution sources. Types of sampling conducted include chemical/physical, biological, macroinvertebrate, fish, habitat, quantitative monitoring and automated/ continuous.

Industrial/Municipal Inspection Program

Over 200 private and municipal facilities are inspected per year throughout the county. Facilities are evaluated regarding pollution prevention, spill response, storage practices and good housekeeping measures. Records and permits are reviewed and local and state water quality ordinances are enforced as necessary. Select facilities are monitored during storm events to evaluate facility BMPs.

Citizen Requests / Emergency Response

Over 800 citizen requests and emergencies are responded to every year. Investigations include discolored streams, unusual smells, illicit discharges and various other pollution issues. Emergencies include fuel and chemical spills and sewage discharges.

Erosion Control Program

Mecklenburg County and the City of Charlotte have local erosion control programs and ordinances. These programs are aimed at keeping sediment out of surface waters by proactively enforcing the erosion ordinances through the review of erosion control plans, site inspections and educating the development industry and the public. A local erosion control certification program is required for site contractors that work in Mecklenburg County and Charlotte. The Charlotte-Mecklenburg Certified Site Inspector (CMCSI) training and certification classes are typically offered quarterly to the public.

City of Charlotte

Pilot Best Management Practices (BMP) Program

The City of Charlotte has an aggressive Pilot BMP program. The City installs structural BMPs with a goal of determining the best use, costs, and effectiveness. Stormwater flowing into and out of the BMPs is tested regularly to show which BMPs are most effective at removing pollutants under various conditions. The City's Pilot BMP program is focused on determining the cost benefit, pollutant removal efficiency, and maintenance costs or requirements of various types of BMPs. Knowledge gained from evaluating these Pilot BMPs is part of an overall water quality management strategy for Charlotte watersheds.

Stream and Wetland Mitigation Bank

In 2004, Charlotte-Mecklenburg Storm Water Services successfully completed negotiations with State and Federal authorities to establish the City of Charlotte Stream and Wetland Mitigation Bank with the goal of restoration, enhancement, and preservation of stream and wetland systems. Restoration projects constructed by Storm Water Services generate credits that can be used to offset impacts to streams and wetlands authorized by Clean Water Act permits. These credits are 'banked' for use later on City and County public projects that impact those resources. Prior to the establishment of the Mitigation Bank, mitigation requirements were satisfied by purchasing credits from the State without regard for where the money will be spent. The Mitigation Bank allows mitigation dollars to remain local, so that the benefits of restoration projects are realized in Charlotte's watersheds. The Mitigation Bank also allows Charlotte to build restoration projects well in advance of impacts so public infrastructure project schedules are not affected by delays related to mitigation needs.

Stream & Pond Capital Projects

Using an extensive list of criteria, dozens of streams and ponds have been ranked in order to prioritize funding of the Water Quality Capital Project Program. Streams and ponds are restored and rehabilitated to enhance the water quality benefit of the City's urban watersheds. Currently, the City initiates 2-3 pond rehabilitation projects a year and approximately 4,000 linear feet of stream restoration projects a year. There is an annual budget of $4.4 million dedicated to these projects.

Mecklenburg County

Lake Management Program (SWIM Phase I)

Three large Catawba River reservoirs, Lake Norman, Mtn. Island Lake and Lake Wylie pass through Mecklenburg County, which all together encompass the entire western border of the County. Mecklenburg County has monitored the water quality of the lakes since 1978. Today, the County monitors all lakes routinely at twenty eight sites, six times a year for a suite of chemical parameters. Sample results are put into a locally produced Lake Use Support Index (LUSI) and made available to the public for review. Additional bacteria monitoring occurs during the summer months at known swimming areas in order to assess the water for safe swimming conditions. Specific pollutants of concern and known areas of impairment are targeted for additional monitoring and investigation through the Pollution Abatement Monitoring (PAM) program which is aimed at identifying and eliminating specific pollution sources.

McDowell Creek Watershed Restoration (SWIM Phase II)

In 2006 Mecklenburg County in cooperation with the Towns of Cornelius and Huntersville developed the McDowell Creek Watershed Management Plan. The purpose of the plan was to restore the watershed to its designated use, which had been compromised due to past agricultural and more recent development practices. The watershed was initially included as a Category 5, 303(d) listing for biological impairment, however after review of the plan state and federal officials re-categorized the watershed to Category 4b, which indicates that a plan is in place to restore the watershed. Mecklenburg County, the Towns of Cornelius and Huntersville and various federal and state programs have invested more than $6,000,000 on projects to restore McDowell Creek, with 3 more projects currently in the planning stage and many more with high priority for implementation. These projects include retrofitting existing development with BMPs to treat storm water runoff, and miles and miles of stream restoration aimed at reducing sediment load from stream banks and restoring biological habitat in the stream.

Creek ReLeaf Program (SWIM Phase II)

The Creek Releaf program is a volunteer effort aimed at restoring stream buffer and floodplains to a natural forested state. Thus far, the program has planted more than 7,500 trees and restored more than 12 acres of floodplain. In 2009 the program attracted more than 400 volunteers during a week-long planting event. Efforts planned for 2010 include the restoration of 3 acres of urban floodplain along with in-stream planting and invasive vegetation removal. The program receives assistance from local grants and sponsorships.

Capital Improvement Program

Mecklenburg County administers the major system Capital Improvement Program (CIP) that is funded from a portion of storm water fees charged to landowners in Mecklenburg County. The program's current budget is $3,374,313 and it focuses upon improvements to the larger, FEMA regulated streams in Mecklenburg County. The CIP funds are broadly allocated to two main pots of money: 1) $1,621,984 is designated for improvements to the stream channel itself through funding of stream restoration, enhancement and preservation efforts; and, 2) $1,752,329 is allocated to Flood Mitigation for the reduction of risk from flooding in the Major System through targeted buy-outs of flood prone properties and other techniques to reduce the impacts of flooding.

** Submitted by Charlotte-Mecklenburg Stormwater Services June 17, 2010.*

Lincoln County

Environmental Planning in Lincoln County focuses on the protection of natural resources, including water and air quality. Watershed planning and planning related to reducing the cumulative impacts of development across the county is the primary focus of *Lincoln County's Environmental Planning Division*. The county has recently implemented 50 foot buffers on all streams in county. The floodplain ordinance has also been revised to include floodplain buffers which should be at least the size of the flood plain.

Gaston County

Sediment & Erosion Control Local Program

Gaston County's Sediment & Erosion Control Program was adopted in April 2003 and is administered by the Natural Resources Department (or Soil and Water Conservation District). Since the program was taken over in 2003, Gaston Natural Resources has reviewed 1835 plans (14738.24 acres impacted) and collected $267,720 in violations. Between the first year (April 2003 to April 2004) and this past year (April 2009 to April 2010) there has been a significant difference in the amount of fines levied (i.e. nearly 90% of all plans submitted between 2009-2010 had no recorded violations). This shows the County's successful ability to work and educate the building community on the import relationship between erosion control and reducing off site sedimentation.

The Program was modeled after other proven local programs in both administration and enforcement. Other communities looking to adopt a Local Program should look to Gaston County as an example.

Stormwater Phase II Local Program

Along with Gaston County's Sediment & Erosion Control Program, the Natural Resources Department is also responsible for the Stormwater Phase II Local Program, as of 2007. Their goal is not only to reduce sedimentation in the Catawba River, but also reduce the contaminants from stromwater in a post construction environment. To date, the program has reviewed and enforced the EPA Phase II rules on plans that will impact the future of water quality in Gaston County.

For more information about *Gaston County's Natural Resources Department*, click the link to visit their website.

** Submitted by Gaston County July 15, 2010.*

Other Local Initiatives

Blue Ridge Forever Coalition

In Western North Carolina, the *Blue Ridge Forever Coalition*, a group of 10 land trusts in the region, was awarded a $375,000 grant to protect headwater streams through conservation easements and purchases and conveyances to the state parks system. This grant will fund six projects covering almost 3,000 acres in Avery, Alleghany, Caldwell, Henderson and McDowell and counties in the French Broad, Yadkin Pee-Dee and Catawba River Basins. Collectively, the land trusts of the Blue Ridge Forever Coalition has conserved more than 180,000 acres in Western North Carolina.

This grant is a result of a lawsuit agreement reached with Smithfields Foods, the world's largest pork producer, which designated two million dollars in grants that will go to improving water quality, protect North Carolina rivers and wildlife habitat, and help farmers clean up animal waste lagoons.

** Source: Asheville Citizen-Times, June 23, 2010.*

Out of the six projects planned, two will be located in the Catawba River Basin. Both projects will be led by the Foothills Conservancy of NC and will conserve 1,022 acres. One will be located on Wilson Creek in Caldwell County and includes 4.2 stream miles and 332 acres with public access. The second will also be located in the headwaters, McDowell County, and includes 690 acres and 2.8 stream miles with public access.

** Information provided by Campaign Director for the Blue Ridge Forever Coalition.*

Other Organizations Active in the Catawba River Basin

NC Stream Watch, SCDHEC, Bi-State Commission, Catawba River Corridor Project, Lake James Task Force, Catawba County, Burke County, Voices and Choices, Catawba River Women's Group, Sustainable Environment for Quality of Life, Catawba Land Conservancy, Foothills Conservancy, Catawba River Foundation, Trout Unlimited, American Rivers Catawba-Wateree Relicensing, NC Wildlife Foundation, VWIN and The Trust for Public Land.

CHAPTER 10

2008/2010
USE SUPPORT METHODOLOGY

North Carolina Division of Water Quality

2008
Use Assessment Methodology

Table of Contents

Purpose

Section 303(d) of the federal Clean Water Act (CWA) which Congress enacted in 1972 requires States, Territories and authorized Tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the list of impaired waterbodies and TMDLs to the U.S. Environmental Protection Agency (EPA). Current federal rules require states to submit 303(d) lists biennially, by April 1st of every even numbered year. The "303(d) list" is technically considered the impaired waters listed as Category 5, requiring a TMDL. EPA is required to approve or disapprove the state-developed §303(d) list within 30 days. For each water quality limited segment impaired by a pollutant and identified in the §303(d) list, a Total Maximum Daily Load (TMDL) must be developed.

Assessment Units and Water Quality Classifications

Water quality assessments are based on water quality classifications as well as data availability. Water quality classifications are associated with a stream reach or area that is described in the schedule of classifications. Reaches vary in length or area and are sometimes split into smaller units to represent application of water quality data. Classifications are represented by a series of numbers called index numbers, 27-33-43-(1), as an example. Water quality assessments are applied to assessment units or AUs. AUs are, for the most part, the same as index numbers. When an AU is subdivided because of data applicability a letter is added to indicate this smaller unit. For example, if Index number 27-33-43-(1) (12 miles in length) is divided into three different segments because of three different available data types the new segments would be 27-33-43-(1)a, 27-33-43-(1)b and 27-33-43-(1)c. The combined mileage of the AUs would be 12 miles.

Decisions on the length or area to apply data to are based on the data type, waterbody characteristics, stations indicating similar water quality, watershed information and landmarks on which to base descriptions. The AUs where water quality concerns are evident are used as markers. Solutions to water quality concerns, including TMDLs, typically encompass entire watersheds.

Data Window/Assessment Period

The data window for the 2008 Water Quality Use Assessment (305(b) and 303(d) Integrated Reporting) includes data collected in calendar years 2002 through 2006 (five years). Some AUs may have biological data collected earlier for waters that have not been resampled during this data window or where the current impairment is based on that sample. The data collection year is noted for each AU.

Data Availability and Quality

Data are collected by various state and federal agencies. NC Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) collects most of the data used for water quality assessments. There are significant data sets collected by NCDENR Division of Environmental Health (DEH) for use in coastal water quality assessment. The United States Geological Survey (USGS) also provides data in several AUs. Local governments and environmental groups as well as industry, municipal and university coalitions also provide data. Submitted data sets must include an approved Quality Assurance Project Plan (QAPP) or other documentation to assure that the data were collected in a manner consistent with agency data. A standing solicitation for data is maintained on the DWQ website. DWQ evaluates all data and information submitted.

Use Support Categories and Water Quality Standards

There are numerical and narrative water quality standards that are in place to protect the various best uses of North Carolina waters. Best uses include aquatic life or biological integrity, recreation or swimming, fish consumption, shellfish harvesting and water supply. Water quality assessments are based on the standards and data availability for the applicable use support category- aquatic life, recreation etc. Dissolved oxygen standards are used to assess aquatic life and pathogen indicators are used to assess recreation for example. Standards assessment criteria have been developed for each parameter assessed. The standards assessment criteria are used to make water quality assessments- not the standards themselves. While the standards assessment criteria are based on the standards they are different in that a frequency term is included. The details of how each standard is assessed are discussed in the following sections.

Aquatic Life Assessment Methodology

Numerical Water Quality Standards

The aquatic life numerical water quality standards are assessed using a 10% exceedance of the standard criterion. These assessments use ambient monitoring data from the five year assessment period (2002-2006). If no aquatic life numerical water quality standards exceed the 10% criterion then the AU is Supporting aquatic life water quality standards. This AU/multiple-parameters assessment is a Category 1 listing not requiring a TMDL. If greater than 10% of the samples exceed the numerical standard and there are at least 10 samples, then the AU is Impaired for that parameter. The AU/parameter assessment is listed in Category 5, requiring a TMDL. If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL. The NC DWQ "Redbook" contains the complete descriptions of water quality standards and surface water classifications [15a NCAC 02B .0200 - .0300]

Dissolved Oxygen (DO) Standards

Freshwater dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions.

Salt water dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions.

Freshwater Dissolved Oxygen (DO) Assessment (Class C, B, WS)

A fresh non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 4 mg/l for instantaneous samples (monthly) or when greater than 10% of samples are below a daily average of 5mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Saltwater Dissolved Oxygen (DO) Assessment (Class SC, SB, SA)

A saline/estuarine non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 5 mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Trout Water Dissolved Oxygen (DO) Assessment (Supplemental Class Tr)

A supplemental classified Trout water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below 6 mg/l. A minimum of 10 samples was needed to rate the water as Impaired.

Swamp Water Dissolved Oxygen (DO) Assessment (Supplemental Class Sw)

A supplemental classified swamp (Sw) AU was Not Rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 mg/l for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5 mg/l (freshwater only). There is not a numerical standard for these waterbodies and natural background conditions cannot be determined. This is a category 3a listing not requiring a TMDL.

A swamp like AU (not classified Sw) was Not Rated for aquatic life when greater than 10% of samples were below 4 mg/l (5 mg/l for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5mg/l (freshwater only) and when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater. Geographic location, biological data, tributary classifications, discharges and land use were considered when assigning use support ratings to waters considered to be swamp like or receiving significant swamp water input.

pH

pH Standards

Freshwater pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

Saltwater pH: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;

Low pH Assessment (Class C, SC, B, SB, SA, WS)

A non-swamp water AU was assessed as Impaired for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater.

A swamp like AU (not classified Sw) was Not Rated for aquatic life when greater than 10% of samples were below a pH of 6.0 (SU) for freshwater or 6.8 (SU) for saltwater or when greater than 10% of samples were below a dissolved oxygen of 4 mg/l (5 mg/l for salt) for instantaneous samples (monthly) or when greater than 10% of samples were below a daily average of 5mg/l (freshwater only) Geographic location, biological data, tributary classifications, discharges and land use were considered when making use support determinations on waters considered to be swamp like or receiving significant swamp water input.

High pH Assessment (Class C, SC, B, SB, SA, WS)

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than a pH of 9 (SU) for freshwater or 8.5 (SU) for saltwater. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Swamp Water Low pH Assessment (Supplemental Class Sw)

A supplemental classified swamp (Sw) AU was assessed as Impaired when greater than 10% of samples were below 4.3 (SU). A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Temperature Use Assessment

Temperature Standards

For freshwaters- Temperature: not to exceed 2.8°C (5.04°F) above the natural water temperature, and in no case to exceed 29°C (84.2°F) for mountain and upper piedmont waters and 32°C (89.6°F) for lower piedmont and coastal plain waters. The temperature for trout waters shall not be increased by more than 0.5°C (0.9°F) due to the discharge of heated liquids, but in no case to exceed 20°C (68°F).

Lower piedmont and coastal plain waters mean those waters of the Catawba River Basin below Lookout Shoals Dam; the Yadkin River Basin below the junction of the Forsyth, Yadkin, and Davie County lines; and all of the waters of Cape Fear, Lumber, Roanoke, Neuse, Tar-Pamlico, Chowan, Pasquotank, and White Oak River Basins; except tidal salt waters which are assigned S classifications.

Mountain and upper piedmont waters mean all of the waters of the Hiwassee; Little Tennessee, including the Savannah River drainage area; French Broad; Broad; New; and Watauga River Basins; and those portions of the Catawba River Basin above Lookout Shoals Dam and the Yadkin River Basin above the junction of the Forsyth, Yadkin, and Davie County lines.

For saltwaters- Temperature: shall not be increased above the natural water temperature by more than 0.8°C (1.44°F) during the months of June, July, and August nor more than 2.2°C (3.96°F) during other months and in no cases to exceed 32°C (89.6°F) due to the discharge of heated liquids.

Temperature Assessment

A mountain or upper piedmont water AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 29°C. A minimum of 10 samples was needed to rate the water as Impaired.

A lower piedmont or coastal plain stream AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 32°C. A minimum of 10 samples was needed to rate the water as Impaired.

If the 10% criterion was exceeded and fewer than 10 samples were collected the water was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Temperature Screening Criteria for Trout Waters (Supplemental Class Tr)

A supplemental classified trout water (Tr) AU was Not Rated for aquatic life when greater than 10% of samples were greater than 20°C. The presence of heated discharges was not determined. This is a Category 3a listing not requiring a TMDL.

Assessment of Extreme Temperature Conditions

A waterbody that exceeds the above criteria may be Not Rated for aquatic life because of meteorological conditions that occur on a regular basis. These conditions must be documented and reassessment will occur after more normal conditions return. This is a Category 3a listing not requiring a TMDL. Examples of extreme conditions may include extreme drought, reservoir drawdown, hurricane impacts and flooding, dam failure, and saltwater encroachment. Other extreme conditions may be documented as needed for future assessments

Chlorophyll *a*

Chlorophyll *a* Standard

Chlorophyll *a* (corrected): not greater than 40 μg/l in sounds, estuaries, and other waters subject to growths of macroscopic or microscopic vegetation.

Other waters subject to growths are interpreted by DWQ to include dam backwaters, lakes and reservoirs.

Chlorophyll *a* Standards Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 40 μg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. Some reservoirs in North Carolina are sampled fewer than 10 times during the assessment period. These data are used to document eutrophication issues. Reservoirs are targeted for increased monitoring to determine if there are standards violations using the above methodology. This is a Category 3a listing not requiring a TMDL.

Toxic Substances and Action Levels Metals

Toxic Substances Numerical Standards

Refer to the NC DWQ “Redbook” for complete text of standards:
Arsenic: 50 ug/l
Beryllium: 6.5 ug/l;
Cadmium: 0.4 ug/l for trout waters and 2.0 ug/l for non-trout waters;
Chlorine, total residual: 17 ug/l;
Chromium, total recoverable: 50 ug/l;
Cyanide: 5.0 ug/l
Fluorides: 1.8 mg/l;
Lead, total recoverable: 25 ug/l;
Mercury (assessed in fish consumption category)

Nickel: 88 ug/l; 8.3 ug/l
Chlorides: 230mg/l; (note this is an action level standard)

Metals Action Level Standards

Action Level Copper: 7 ug/l FW or 3 ug/l SW
Action Level Silver: 0.06 ug/l;
Action Level Zinc: 50 ug/l;

Toxic Substances and Action Level Metals Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than the above standards or action level standards. A minimum of 10 samples was needed to rate the water as Impaired. These are Category 5 listings requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

The action level standard for Iron was not assessed during this assessment period because the standard is being reevaluated and the Iron exceedances of the Action Level have been shown to be a natural condition.

Action levels are used for permitting purposes and are not used as the only information to assess aquatic life uses. Copper and Zinc may be indicators of potential impacts to aquatic life. DWQ will review Copper and Zinc assessments that result in Category 5 listings. The review will be used to determine if the Category 5 listing is appropriate. The following criteria will be used to determine if a review is warranted.

1. A collocated Good, Excellent, Natural or Not Impaired biological rating or
2. A collocated Good-Fair, Moderate or Not Rated biological rating and less than 25% of Copper or Zinc samples exceed the evaluation level.
3. There are no biological data available and less than 25% of Copper or Zinc samples exceed the evaluation level.

The Water Quality Assessment Team will evaluate and integrate the following lines of watershed information to determine if a Category 5 listing for Copper and/or Zinc is warranted.

1- Analysis of duration, frequency and magnitude of exceedances.
2- Historical data and trends for the parameter of interest.
3- Detailed assessment of all available biological data.
4- Qualitative aquatic habitat information.

5- Natural or background conditions assessment including current imagery.
6- Sample quality (note that Zinc samples can be easily contaminated)
7- Waterbody classifications and other designated uses.
8- Exceedances of other likely associated metals.
9- Biological data in nearby Assessment Units.
10- Potential sources of metals
11- Site specific hardness

After review, the Assessment team will determine if the AU/parameter assessment is more appropriately listed in a Category other than 5. Each reviewed assessment will require documented justification for a final Integrate Report category other than Category 5.

Turbidity

Turbidity Standards

Turbidity: the turbidity in the receiving water shall not exceed 50 Nephelometric Turbidity Units (NTU) in streams not designated as trout waters and 10 NTU in streams, lakes or reservoirs designated as trout waters; for lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTU; if turbidity exceeds these levels due to natural background conditions, the existing turbidity level cannot be increased.

Turbidity Assessment

An AU was assessed as Impaired for aquatic life when greater than 10% of samples were greater than 50 NTU or 10 NTU for Tr waters or 25 NTU for lakes, reservoirs and estuarine waters. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Ecological/Biological Integrity

Aquatic Life Narrative Standards

The aquatic life narrative water quality standard is assessed using a biological integrity index criterion (or bioclassification). Biological integrity means the ability of an aquatic ecosystem to support and maintain a balanced and indigenous community of organisms having species composition, diversity, population densities and functional organization similar to that of reference conditions. Waters shall be suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and agriculture. Sources of water pollution which preclude any of these uses on either a short-term or long-term basis shall be considered to be violating a water quality standard.

Aquatic Life Assessment

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and there were no other Aquatic Life standards violations. This is a Category 5 listing requiring a TMDL.

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and there were other Aquatic Life numeric standards violations. This is a Category 4s listing requiring a TMDL for the identified aquatic life numerical standards violation (Category 5 or 4a listing) impairing the ecological/biological integrity of the waterbody.

An AU was assessed as Impaired for aquatic life when a fish or benthic macroinvertebrate community sample received a bioclassification of Severe, Poor or Fair and an approved TMDL for an aquatic life numerical water quality standard has been completely implemented. This is a Category 5s listing requiring a TMDL.

Recreation Assessment Methodology

Recreation standards were assessed using fecal coliform bacteria data collected at DWQ ambient stations and special study sites and enterrococci data collected at DEH Recreational Monitoring sites in coastal waters. Screening criteria were used to assess areas for potential standards violations. DEH advisory postings were also used for recreation assessments as well. The following criteria were used to assess waters for recreation.

Pathogen Indicator Standards

Organisms of coliform group: fecal coliforms not to exceed geometric mean of 200/100 ml (MF count) based on at least five consecutive samples examined during any 30-day period and not to exceed 400/100 ml in more than 20 percent of the samples examined during such period.

Enterococcus, including *Enterococcus faecalis, Enterococcus faecium, Enterococcus avium* and *Enterococcus gallinarium*: not to exceed a geometric mean of 35 enterococci per 100 ml based upon a minimum of five samples within any consecutive 30 days.

Fecal Coliform Bacteria Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a Category 5 listing requiring a TMDL.

Fecal Coliform Bacteria Screening Assessment

An AU was Not Rated when the geometric mean was greater than 200 colonies/100ml or greater than 20% of the samples were higher than 400 colonies/100ml. Samples were not collected in the same 30-day period. This is a Category 3a listing not requiring a TMDL. These AUs are prioritized for resampling 5 times in 30 days based on classification and available resources. Data are reviewed yearly for prioritization.

Enterrococci Assessment Criteria

An AU was assessed as Impaired when the geometric mean was greater than 35 colonies/100ml. At least 5 samples must have been collected within the same 30-day period. This is a Category 5 listing requiring a TMDL.

Enterrococcus Screening Assessment

An AU was Not Rated when the geometric mean was greater than 35 colonies/100ml. Samples were not collected in the same 30-day period. This is a Category 3a listing not requiring a TMDL.

Advisory Posting Assessment

An AU was assessed as Impaired when a swimming advisory was posted for greater than 61 days in any 5 year period (includes permanent postings). This is a Category 4cr listing not requiring a TMDL.

Shellfish Harvesting Assessment Methodology

Shellfish Harvesting standards were assessed using fecal coliform bacteria data collected at DEH monitoring stations in Class SA waters. DEH growing area classifications were also used for use assessments. The following criteria were used to assess waters for shellfish harvesting.

Shellfish Harvesting Standards

Organisms of coliform group: fecal coliform group not to exceed a median MF of 14/100 ml and not more than 10% of the samples shall exceed an MF count of 43/100 ml in those areas most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

Fecal Coliform Bacteria Assessment Criteria

DEH fecal coliform data were not assessed to determine standards violations. Category 5 impairments were based on Growing Area Classifications alone.

DEH Shellfish Sanitation Growing Area Classification Assessment

An AU was assessed as Impaired when the DEH growing area classification was Prohibited or conditionally approved. This is a Category 5 listing requiring a TMDL.

Water Supply Assessment Methodology

Water Supply standards were assessed using data collected at DWQ ambient stations located in Class WSI-WSV waters. The following criteria were used to Impair waters for water supply. Category 5 listings were only made when Standards Assessment Criteria (SAC) were exceeded.

Water Supply Standards

Refer to Water Quality "Redbook" for complete text of standards
Barium: 1.0 mg/l;
Chloride: 250 mg/l;
Manganese: 200 ug/l; (not human health or aquatic life- not assessed)
Nickel: 25 ug/l;
Nitrate nitrogen: 10.0 mg/l;
2,4-D: 100 ug/l;
2,4,5-TP (Silvex): 10 ug/l;
Sulfates: 250 mg/l;

Water Supply Assessment

An AU was assessed as Impaired for water supply when greater than 10% of samples were greater than the above standards except for manganese. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Fish Consumption Assessment Methodology

Fish Consumption was assessed based on site-specific fish consumption advisories. The advisories were based on the NC Department of Health and Human Services (DHHS) consumption advisories developed using fish tissue data that exceed standards. The following criteria were used to Impair waters for fish consumption. Because of the statewide Mercury advice there were no use cases for Supporting fish consumption and therefore no overall Category 1 waters.

Polychlorinated biphenyls (PCBs) Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for PCBs. This is a Category 5 listing requiring a TMDL.

Dioxin Assessment Criteria

An AU was assessed as Impaired when a site-specific advisory was posted for dioxins. This is a Category 5 listing requiring a TMDL.

Mercury Assessment Criteria

An AU was assessed as Impaired for fish consumption when greater than 10% of samples were greater than 0.012 μg/l. A minimum of 10 samples was needed to rate the water as Impaired. This is a Category 5 listing requiring a TMDL.

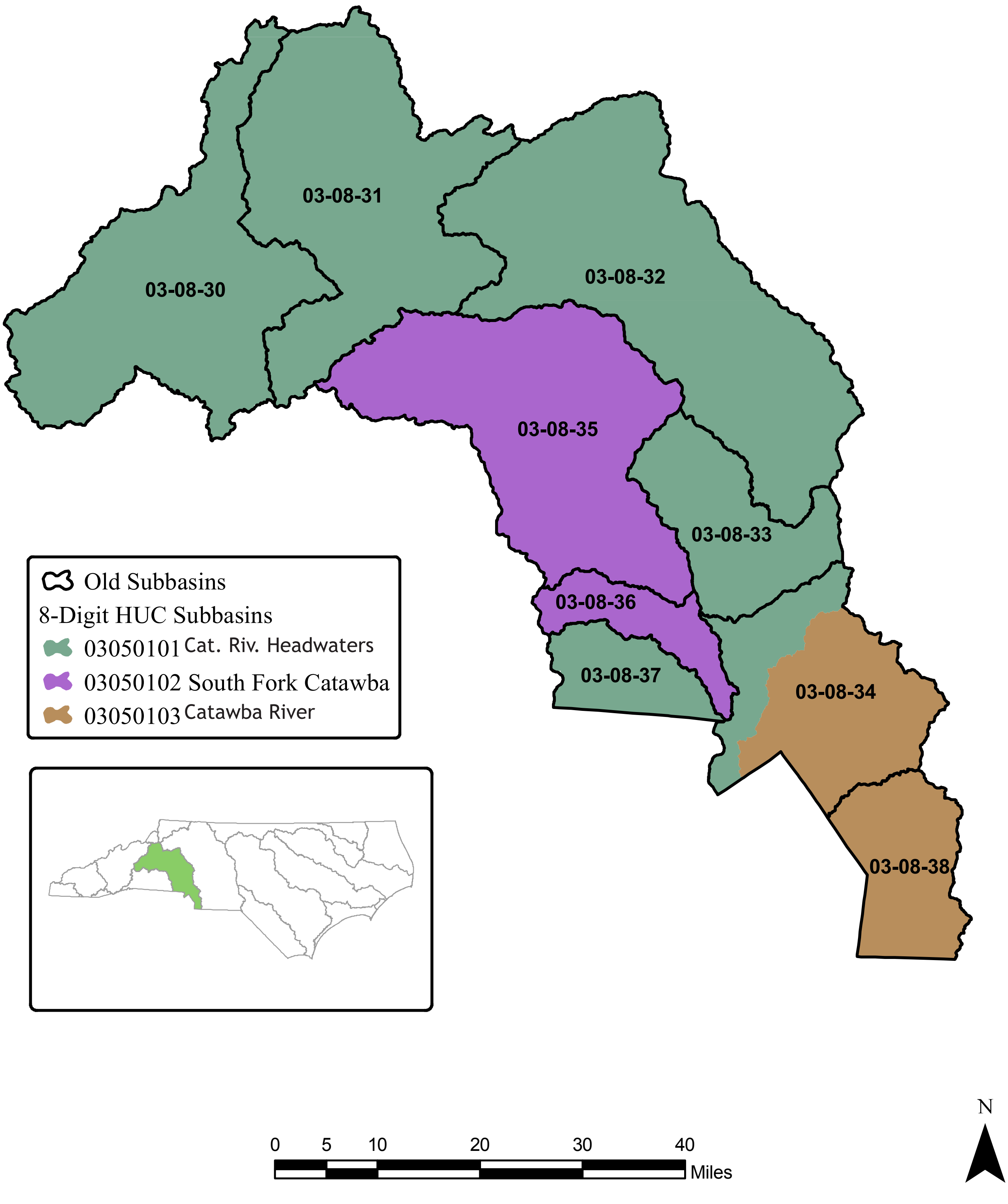
If the 10% criterion was exceeded and fewer than 10 samples were collected the AU was Not Rated and targeted for further sampling. This is a Category 3a listing not requiring a TMDL.

Statewide advice for Mercury in fish tissue was not assessed because it was not associated with a specific AU but was applied to all waters of the state. All AUs are considered Impaired and in Category 5 for the statewide Mercury fish consumption advice. Previous site specific listings for Mercury will no longer be listed in Category 5. DWQ continues to monitor mercury in fish tissue, and has identified specific locations where Mercury levels exceed 0.4mg/kg of fish tissue.

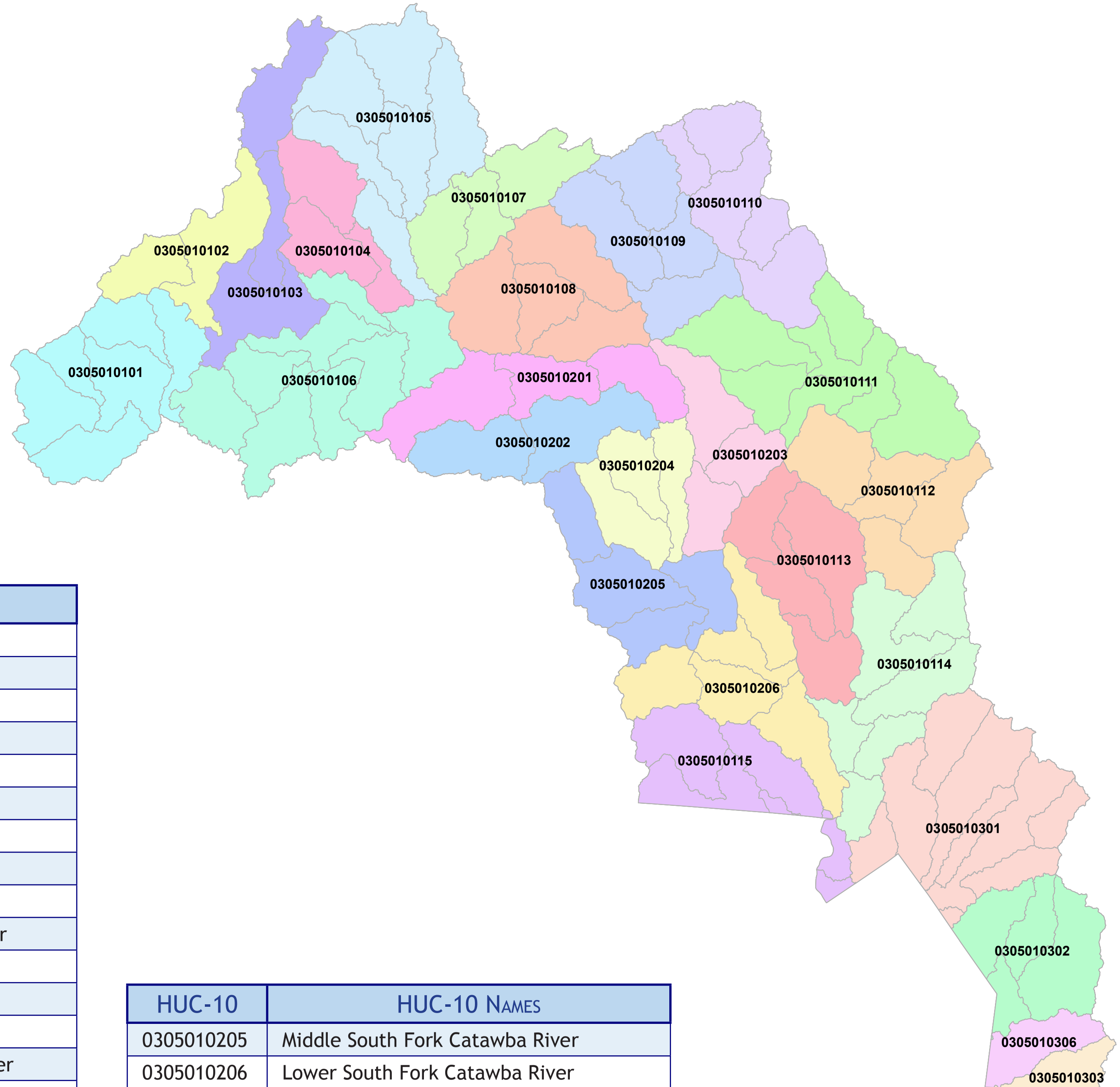
CHAPTER 11

CATAWBA RIVER BASINWIDE MAPS

Catawba Basin
Conversion from Old DWQ Subbasins
to 8-Digit HUC Subbasins



Catawba River Basin
10 and 12 Digit HUCs

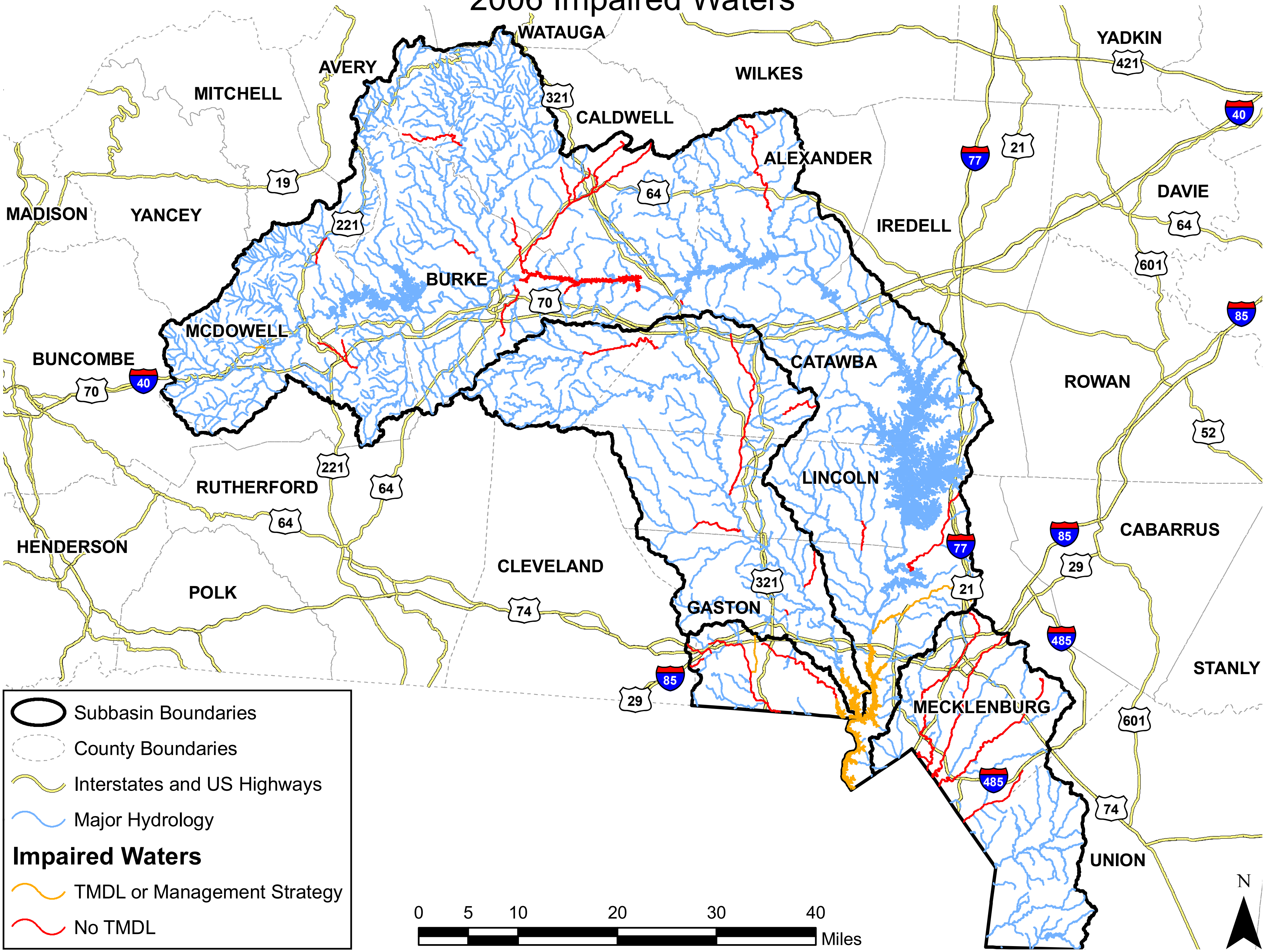


HUC-10	HUC-10 Names
0305010101	Headwaters Catawba River
0305010102	North Fork Catawba River
0305010103	Linville River-Lake James
0305010104	Warrior Fork-Catawba River
0305010105	Johns River
0305010106	Silver Creek-Catawba River
0305010107	Lower Creek
0305010108	Rhodhiss Lake-Catawba River
0305010109	Lake Hickory-Catawba River
0305010110	Lookout Shoals Lake-Catawba River
0305010111	Upper Lake Norman
0305010112	Lower Lake Norman
0305010113	Dutchmans Creek
0305010114	Mountain Island Lake-Catawba River
0305010115	Lake Wylie-Catawba River
0305010201	Henry Fork
0305010202	Jacob Fork
0305010203	Clark Creek
0305010204	Upper South Fork Catawba River

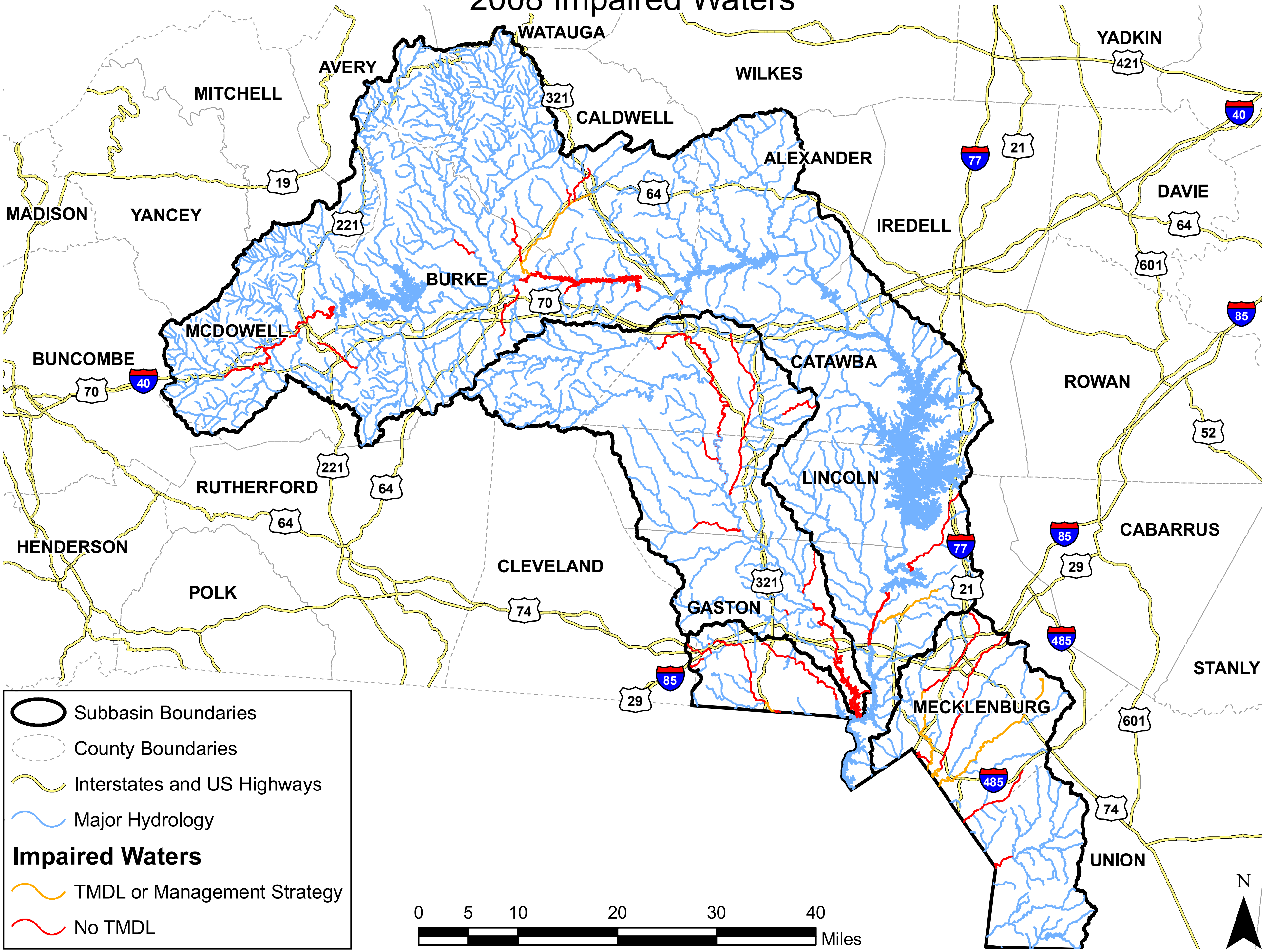
HUC-10	HUC-10 Names
0305010205	Middle South Fork Catawba River
0305010206	Lower South Fork Catawba River
0305010301	Sugar Creek
0305010302	Twelvemile Creek
0305010303	Cane Creek
0305010306	Fishing Creek Reservoir-Catawba River

2004 IR Map
Coming Soon

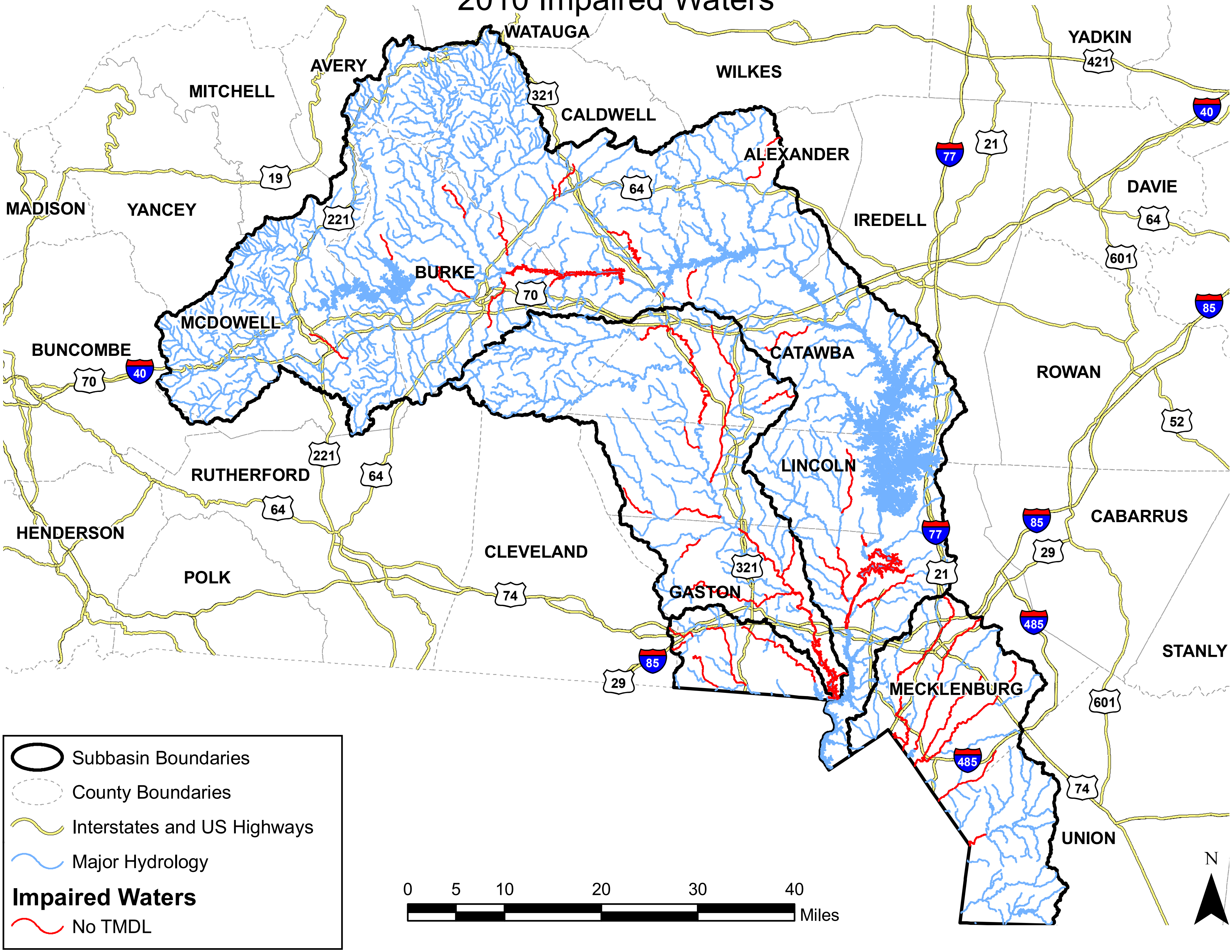
2006 Impaired Waters



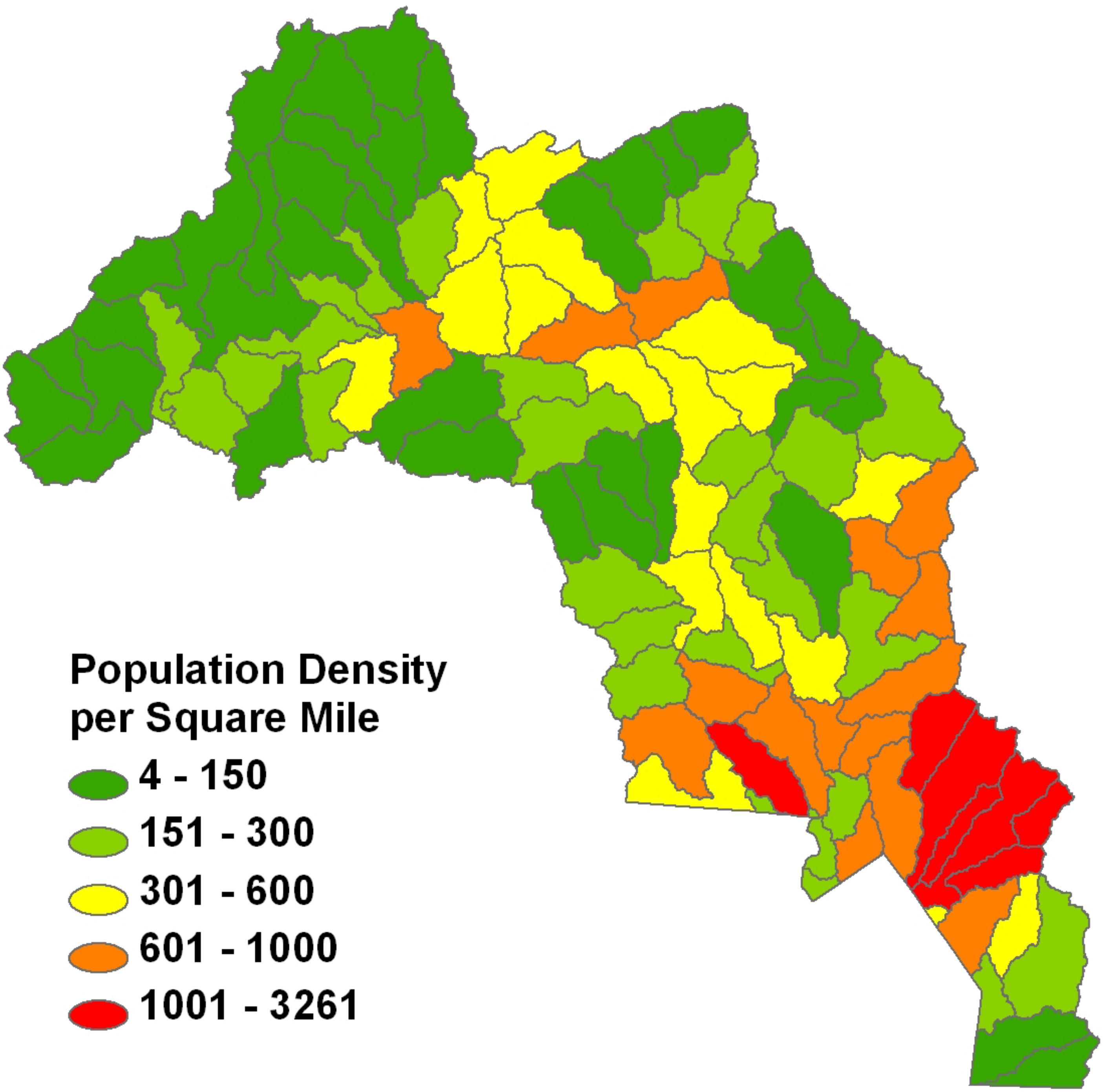
2008 Impaired Waters



2010 Impaired Waters



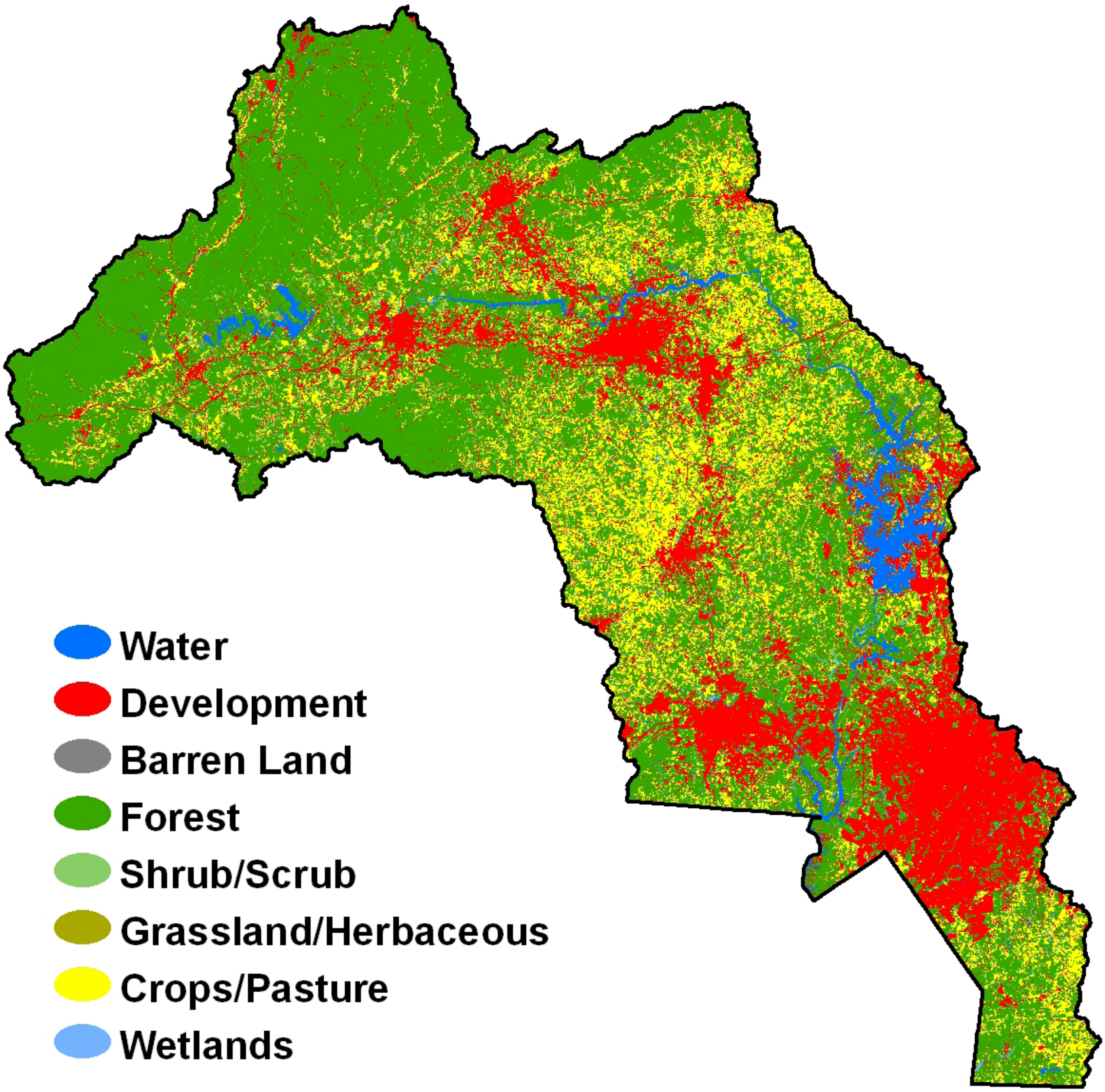
Population Density for the Catawba River Basin Based on 2000 US Census



Data Reference:

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.

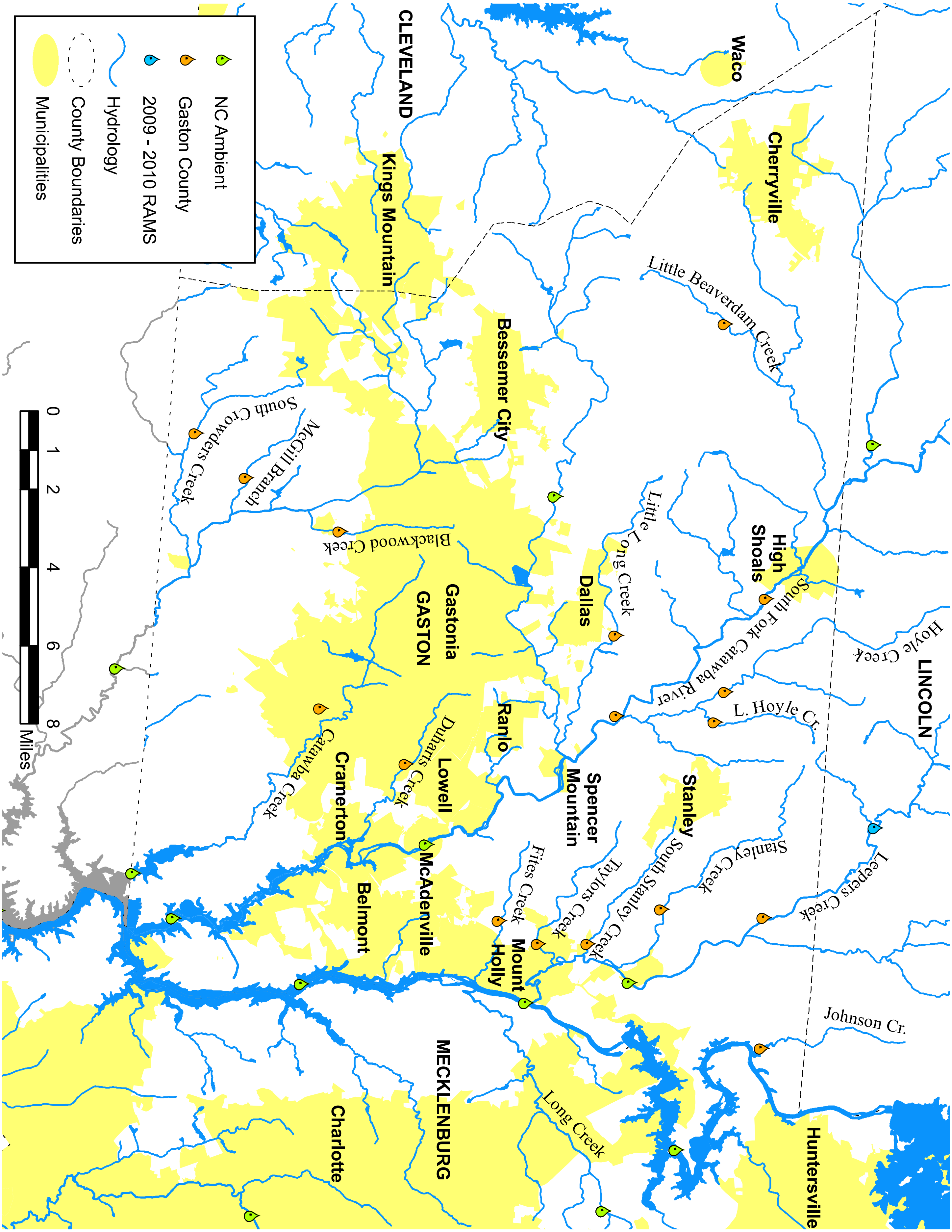
Land Cover for the Catawba River Basin Based on 2001 Data



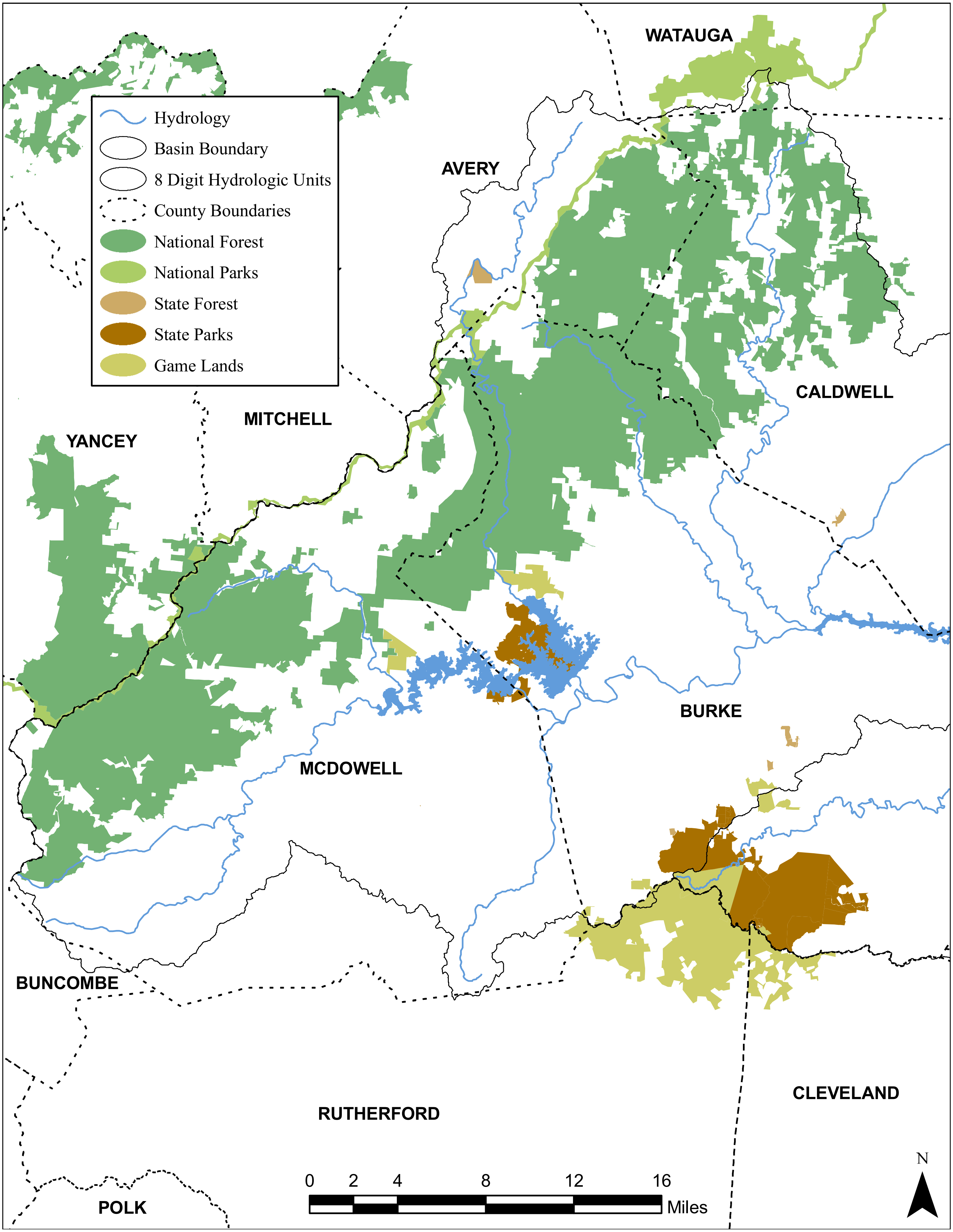
Data Reference:

Homer, C., C. Huang, L. Yang, B. Wylie and M. Coan, 2004. *Development of a 2001 National Land Cover Database for the United States*. Photogrammetric Engineering and Remote Sensing Vol.70, No.7, pp 829-840. www.mrlc.gov.

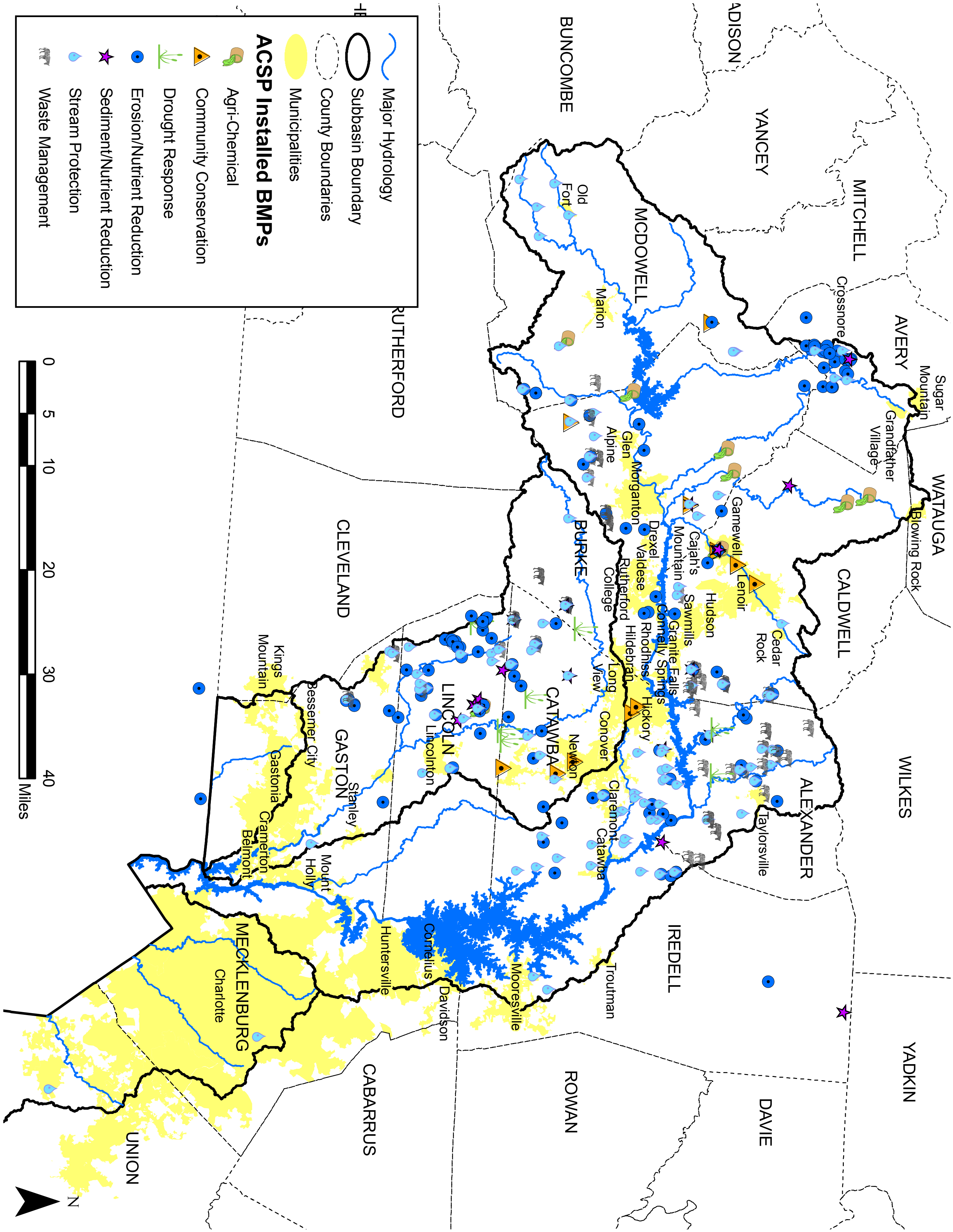
Gaston County Ambient Monitoring Sampling Locations



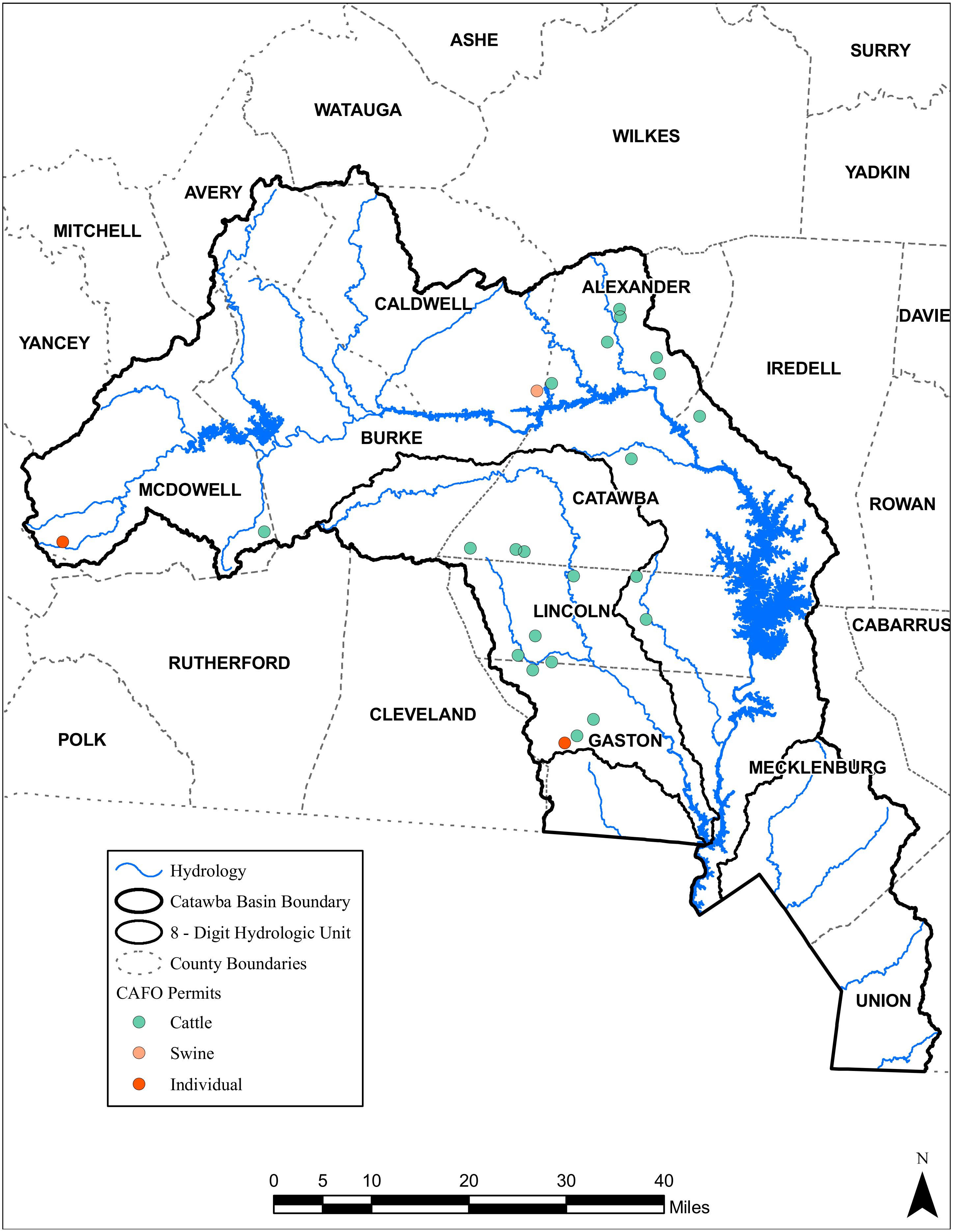
National & State Parks/Forests & Game Land Located within the Catawba River Basin



Agricultural Cost Share Program BMPs Installed in the Catawba River Basin Between 2003-2009



Permitted Animal Operations Located in the Catawba River Basin as of 2008



Non-Discharge Permits by Type in the Catawba River Basin Between 2003-2009