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

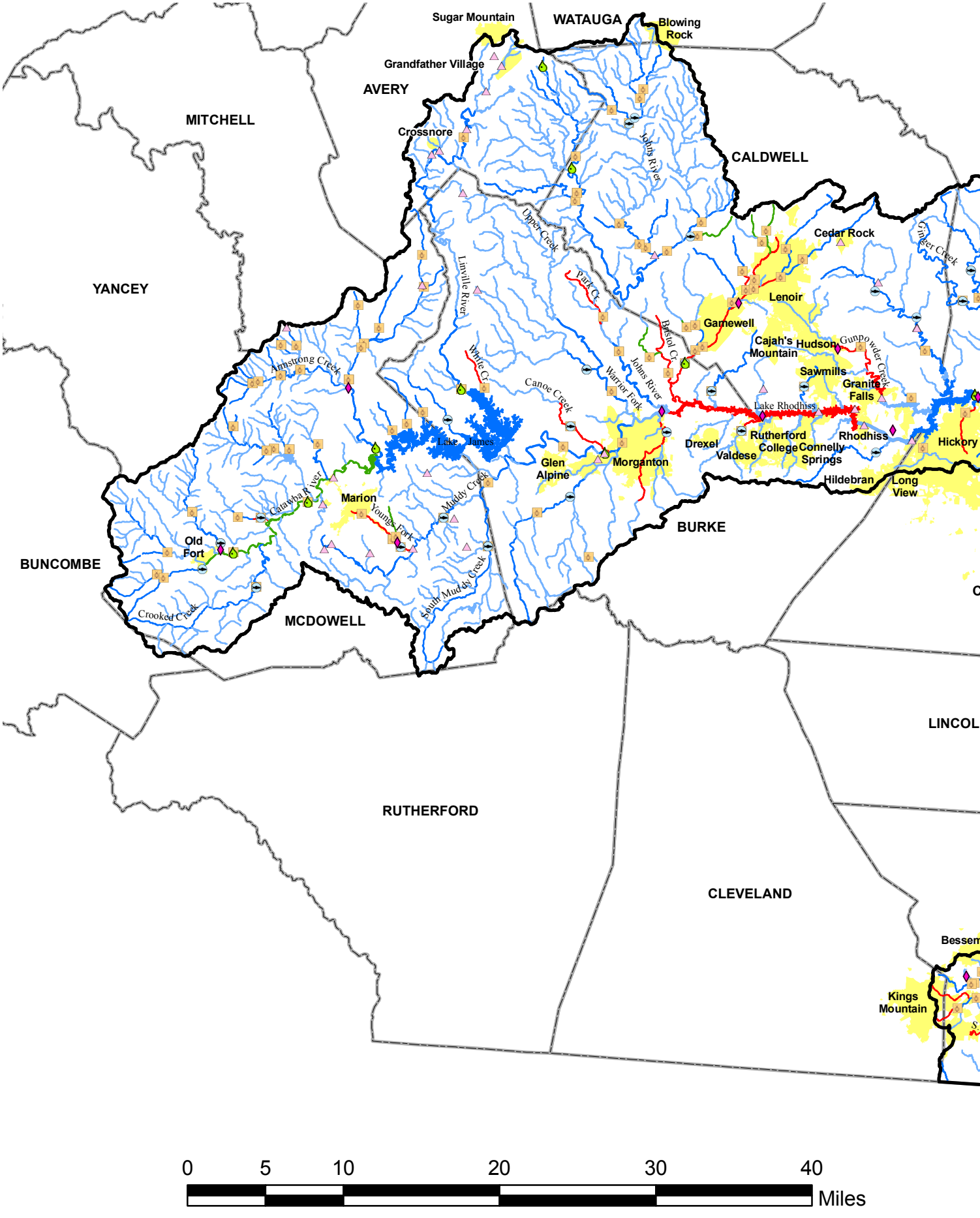
NPDES NonDischarge: 35
Stormwater: 343
- General 297
- Individual 46

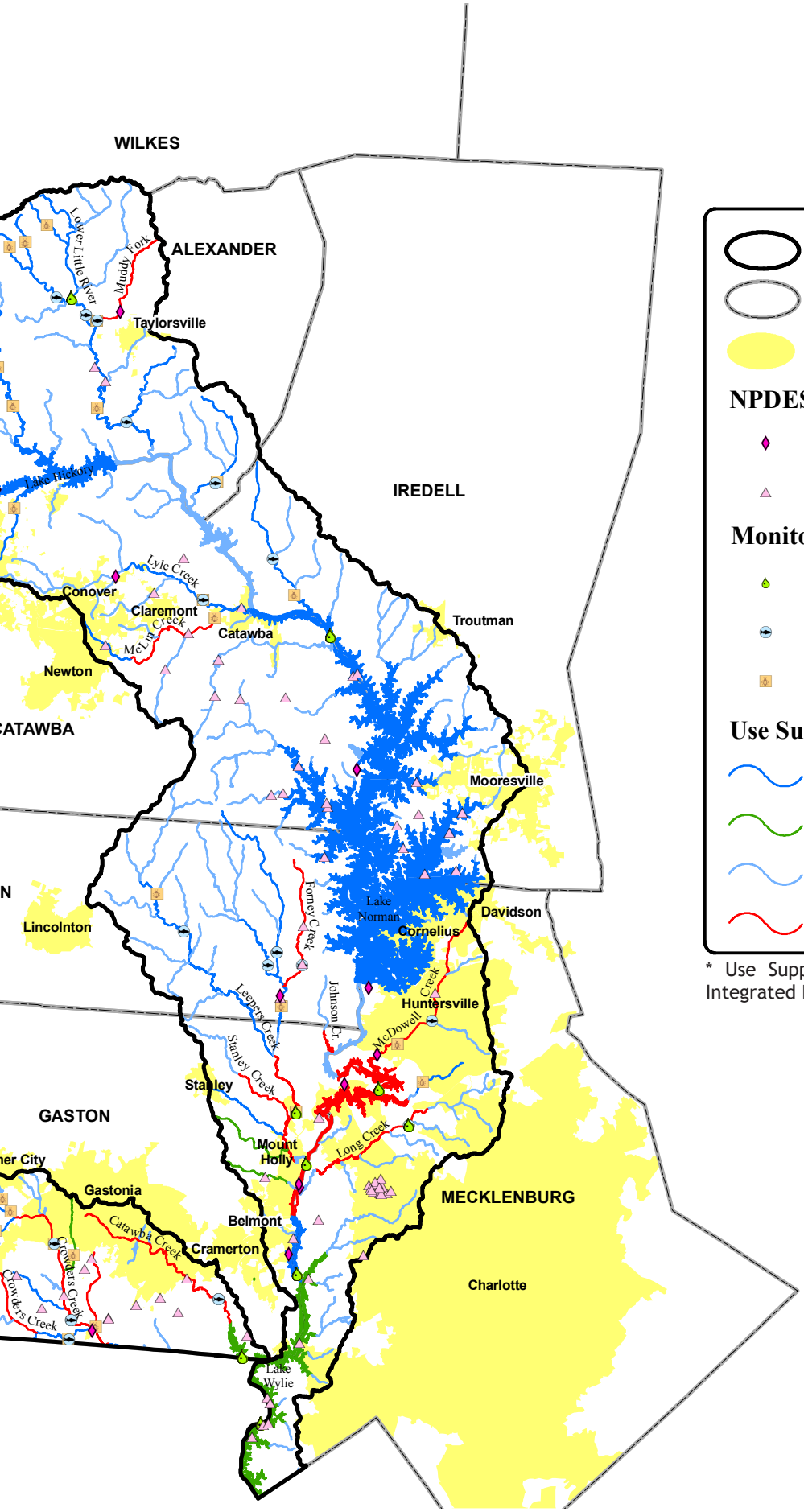
Animal Operations: 13

Population: 555,543

% of Impervious Surface: 3.1%

Figure 1-1: Catawba River Headwaters Subbasin - 03050101





- Subbasin Boundary
- County Boundaries
- Municipalities

NPDES WW Discharge

- Major
- Minor

Monitoring Sites

- Ambient
- Fish Community
- Benthic Macroinvertebrate

Use Support Ratings

- Supporting
- Data Inconclusive
- No Data
- Impaired

* Use Support ratings based on Draft 2010 Integrated Report.

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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.

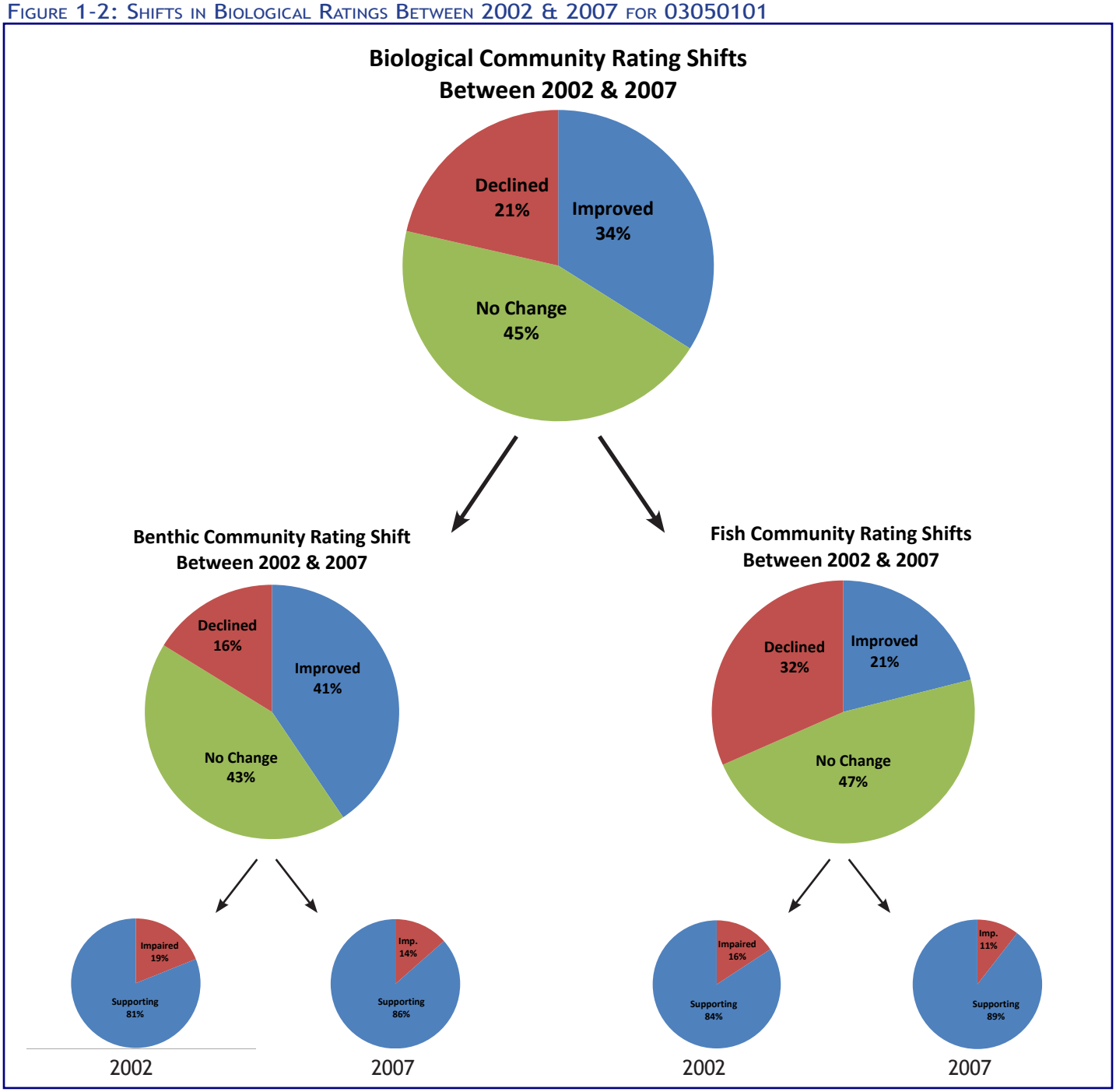
Biological Data

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

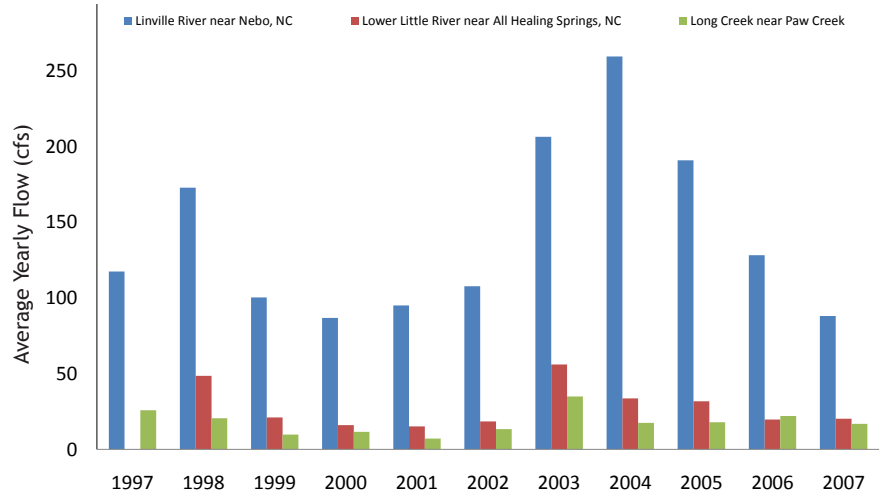


Figure 1-3 shows the yearly averages for three different USGS gage stations spread through the 03050101 HUC between 1997 and 2007. The figure also shows the drought that impacted the basin between 1999 and 2002 as well as the impact from heavy rain events in 2003 and the three hurricanes that occurred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

The water quality standard for pH in surface freshwater is 6.0 to 9.0 su. 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: SUMMARIZED PH VALUES FOR ALL DATA COLLECTED AT AMBIENT SAMPLING STATIONS IN HUC 03050101

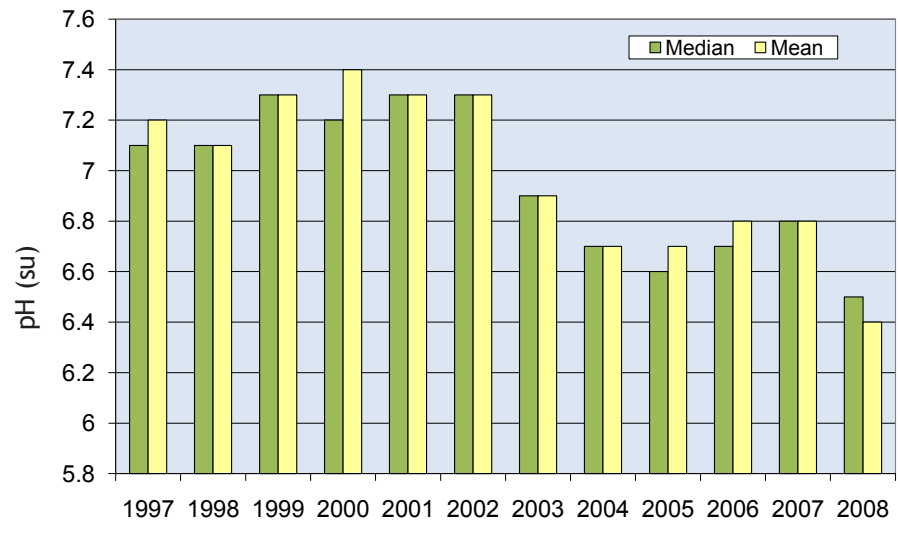


Figure 1-4 shows the mean and median of pH levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The lowest pH yearly average recorded and the year with the most standard violations was 2008. The overall basin trend during this 12 year period is a significant 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*.

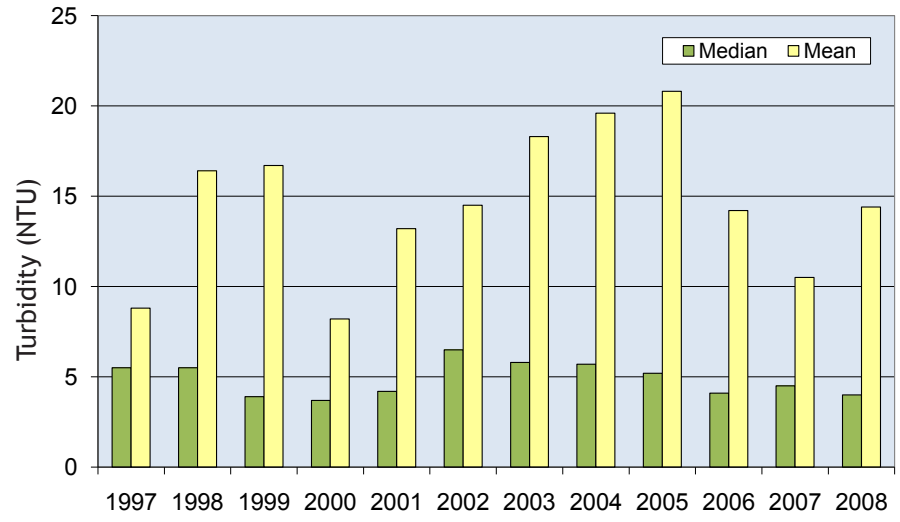
Turbidity

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*.

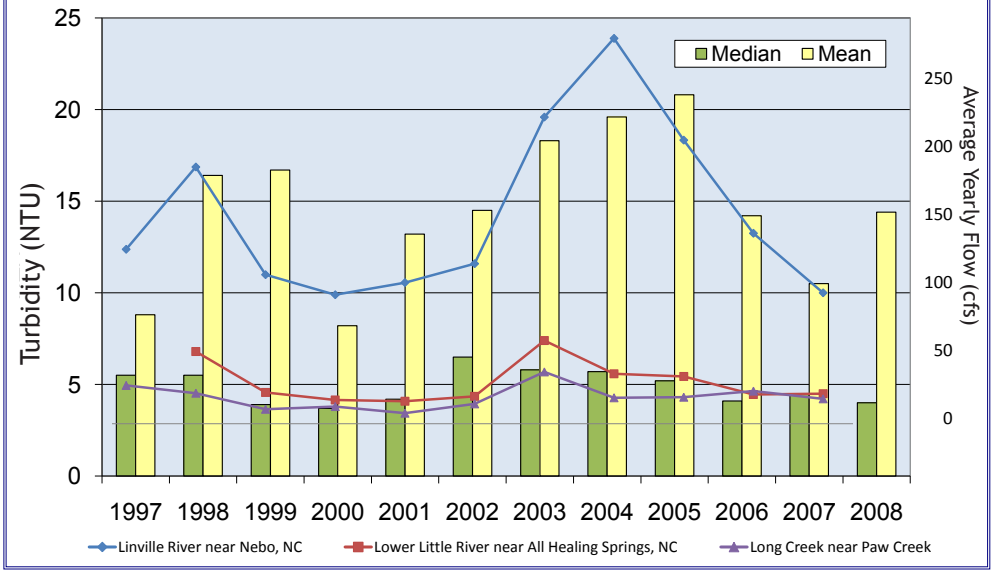
Figure 1-5 shows the mean and median of turbidity levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The highest yearly averages for turbidity were recorded between 2003 and 2005 which were also the three years with the most turbidity standard violations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

Figure 1-5: Summarized Turbidity Values for All Data Collected at Ambient Sampling Stations in HUC 03050101



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 4 mg/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

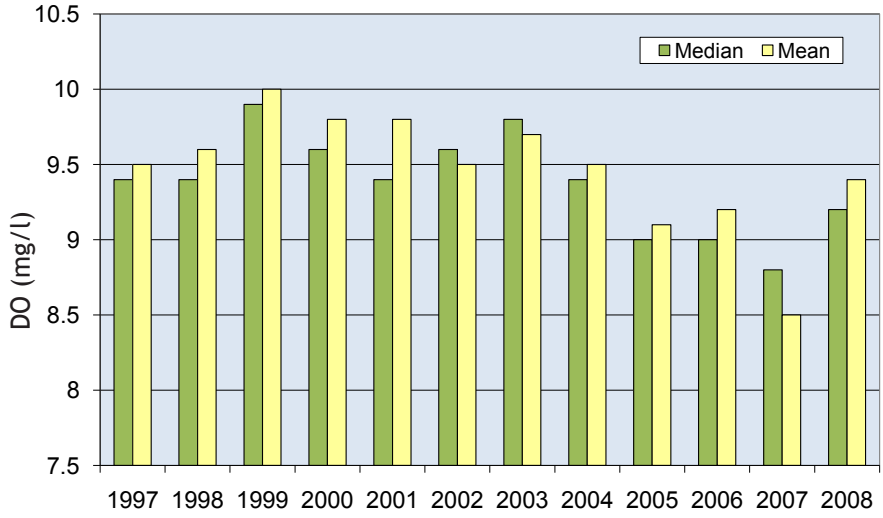


Figure 1-7 shows the mean and median of DO levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The lowest yearly average for DO was recorded in 2007 which was the same year with the most DO standard violations (7%). Dissolved Oxygen can be strongly influenced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

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

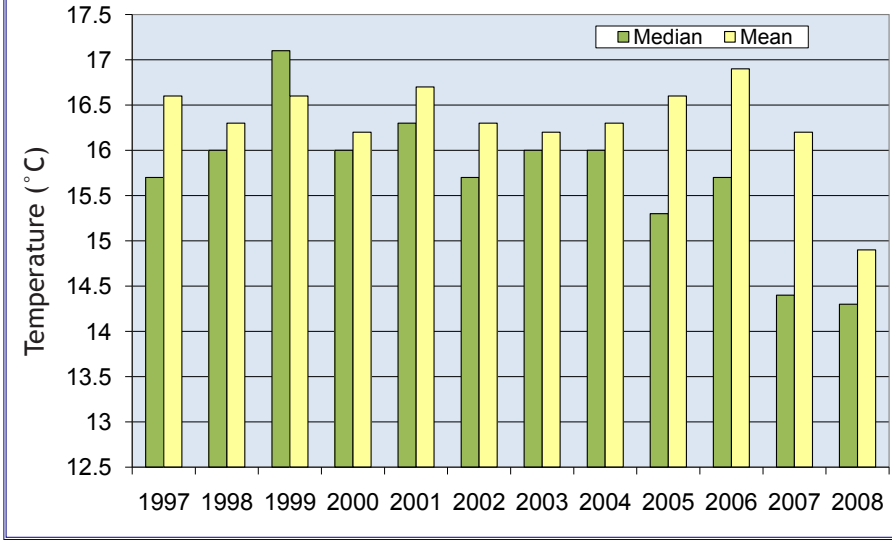


Figure 1-8 shows the mean and median of temperature levels for all samples taken over the course of 12 years in the Catawba River Headwaters subbasin. The highest yearly average for temperature was recorded in 2006. However, the year with the most temperature standard violations occurred in 2005 (3%).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

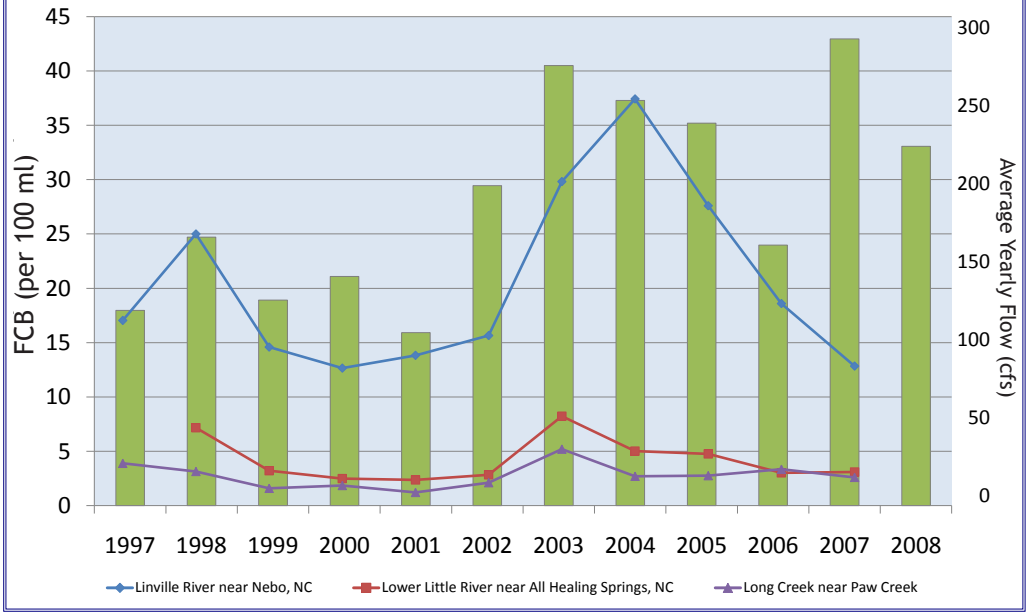
Table 1-3: Waters with Elevated FCB Levels & Without 5-in-30 Studies.

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*.

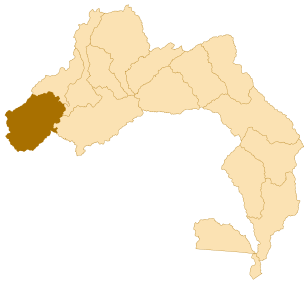
Table 1-4: HUC Quick Reference

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:

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.

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%

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

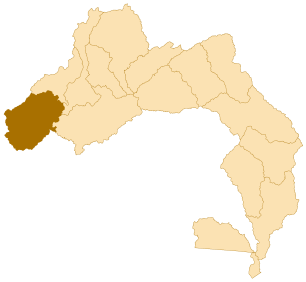
Stream Name	AU#	10-Digit HUC	IR Category[1]	Restoration/ Protection/Success[2]
Catawba R	11-(8)	0305010101	3a	Protection/Success
Crooked Cr	11-12	0305010101	2	Protection
Left Prong Catawba R	11-6	0305010101	2	Success
Mackey Cr	11-15-(3.5)b	0305010101	2	Success
Catawba R	11-(1)	0305010101	2	Success
N 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.

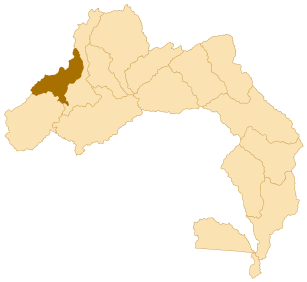
Mackey Creek [AU: 11-15-(3.5)b]:
Mackey Creek was placed on the Impaired Waters list for toxic impacts in 2000 based on a benthic sample taken in 1998 resulting in a Fair bioclassification. In July of 2002, a small industrial metals facility ceased its 0.01MGD discharge just up stream of the benthic 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

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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.

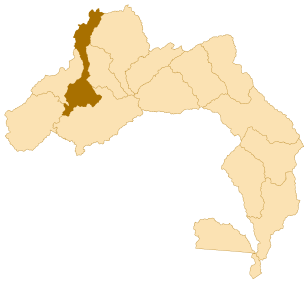
Pepper Creek [AU: 11-24-10] & Honeycutt Creek [AU: 11-24-8]:
Pepper Creek (4 mi) and Honeycutt Creek (5 mi) flow into the North Fork Catawba River within the 030501010202 subwatershed. Both creeks were sampled in 2007 as part of a HQW/ORW Reclassification Study[1]. Neither creek qualified for the more 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) Honeycutt Cr. (CB316)	 Good-Fair (2007) 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]:

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.

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

Upper Linville River (030501010301)

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

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).

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 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.

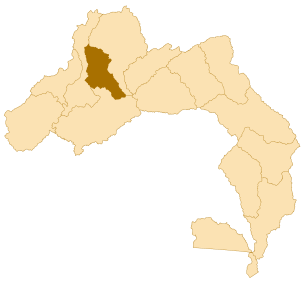
Watershed Recommendations

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.

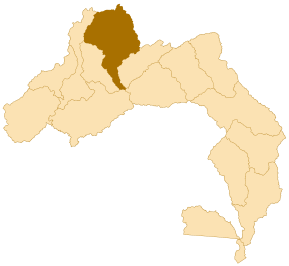
The Western Piedmont Council of Government (WPCOG) completed a *Watershed Management Plan* in 2009 for the Lake Rhodhiss watershed and surrounding watersheds. The Warrior Fork watershed is included in that management plan. The main purpose of the plan is to identify the most critical restoration areas 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]:

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.

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

Protection Priorities

Upper & Lower Wilson Creek (030501010502 & 030501010504)

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

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

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

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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]:

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*.

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

Middle Johns River (030501010505)

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

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.

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

Water Quality Improvements & Success Stories

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

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

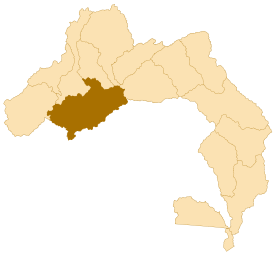
Johns River is 42.5 miles long from its source in Blowing Rock to where it flows into Lake Rhodhiss near the City of Morganton. Johns River drains this entire 10-digit watershed which is mostly forested and mostly contained within the Pisgah National Forest. The river has historically received Excellent 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)

Youngs Fork (Corpening Creek) [AU: 11-32-1-4a & b]:
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)]:

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.

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

Hunting Creek-Catawba River (030501010608)

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

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*.

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)

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)

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.

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

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.

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*.

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

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)

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.

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

Hunting Creek-Catawba River (030501010608)

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*.

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

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)

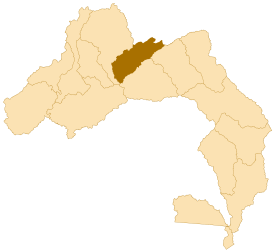
South Muddy Creek [AU: 11-32-2]:
South Muddy Creek has been rated Good-Fair for its benthic community since 1992; however, during this sampling cycle it received a Good rating. This may be due to a reduction in runoff from surrounding farms as an effect of drought; however, the local SWCD has installed 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.

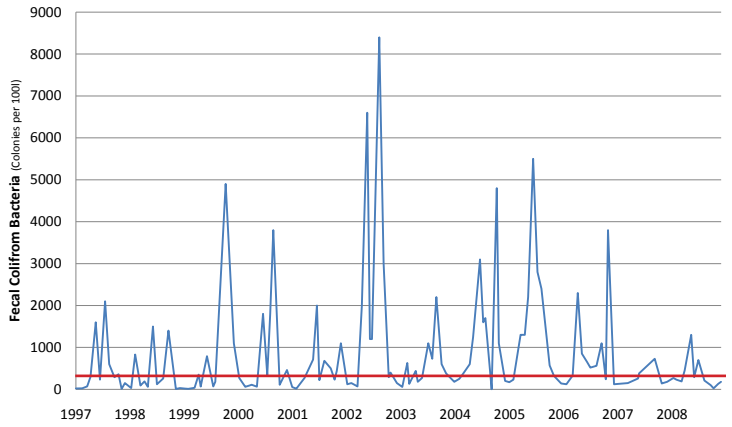
Urban and commercial land uses in the headwaters could be the source of high volume stormwater which can easily erode streambanks and fill in critical aquatic habitat during large rainfall events. This is a common source of excess turbidity and sedimentation throughout the creek and the main reason for 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*.

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.

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 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]:

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)

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.

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]:

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)

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*).

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]:

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)

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.

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]:
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.

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

Protection Priorities

Upper Lower Creek (030501010701)

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

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

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]:
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.

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)

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)

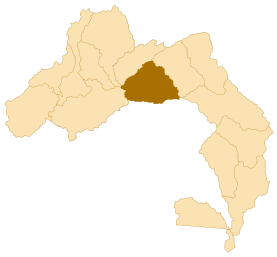
Unnamed Tributary to Zacks Fork:
A Notice of Violation (NOV) was issued by Division of Land Resources (DLR) in March of 2008 to the property owner of a development under construction in Caldwell County NC for sediment and erosion control violations. DLR notified DWQ of the violations and noted the failure 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)]:

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

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.

Protection Priorities

McGalliard Creek-Lake Rhodhiss (030501010801)

Smoky Creek [AU: 11-41-(1)]:

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

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.

Gunpowder Creek (030501010803)

Silver Creek [AU: 11-56-(2)]:

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

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.

Drowning Creek-Catawba River (030501010804)

Drowning Creek [AU: 11-52-(1)]:

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

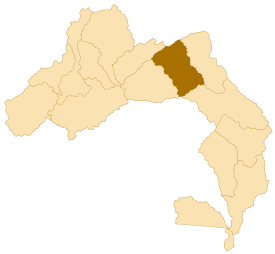
Drowning Creek drains mostly residential and agricultural lands before flowing into the western portion of Lake Hickory. This creek was sampled for the first time in 2007 and received a Good-Fair fish community rating. This moderate rating is likely a result urban stormwater runoff and sedimentation 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.

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]:

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.

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

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)]:

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.

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

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

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

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.

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)

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)]:
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.

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

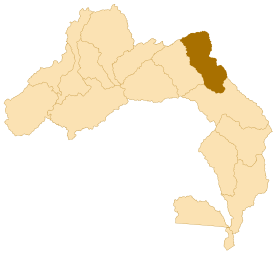
Even though the creek appears to be returning to more natural conditions, it is still considered a protection priority by DWQ. The monitoring site at NC-90 had notably more sand and gravel in the stream than in 2002. Sediment runoff from the construction of poultry buildings in the headwater are a likely 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.

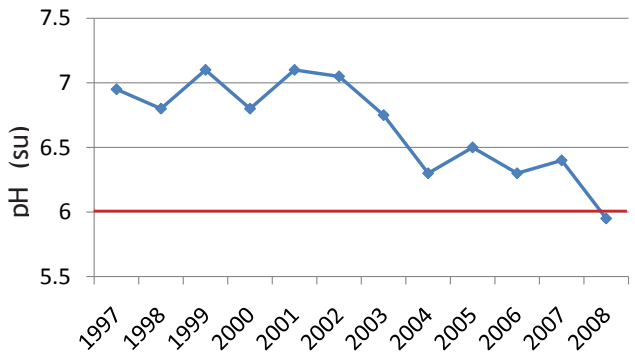
Restoration Opportunities

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

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

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%

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)

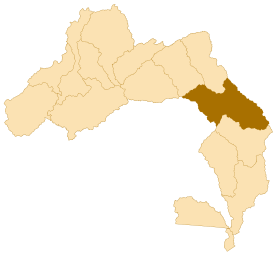
Lookout Shoals Lake (030501011005)

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 (03050101 11)



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)]:

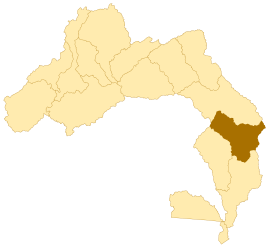
Use Support: Supporting (6 mi)	
2008 IR Cat.	2
2010 IR Cat.	2
Benthos (CB122)	Good-Fair (2007)
Fish Com (CF35)	Excellent (2004)

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.

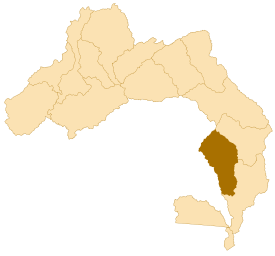
The health of the waterbodies listed above is critical to the protection of the lakes they drain into. The pollutants collected in the upper portion of the Chain of Lakes often continue downstream. The accumulative impacts are already being seen in Lake Wylie. The more protection given to the headwaters, 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 (03050101 12)



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)

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.

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

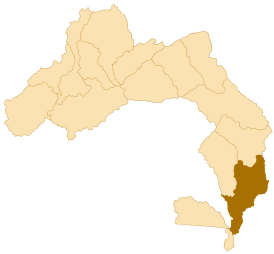
Upper Dutchmans Creek (030501011303)

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.

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

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)

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.

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

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)

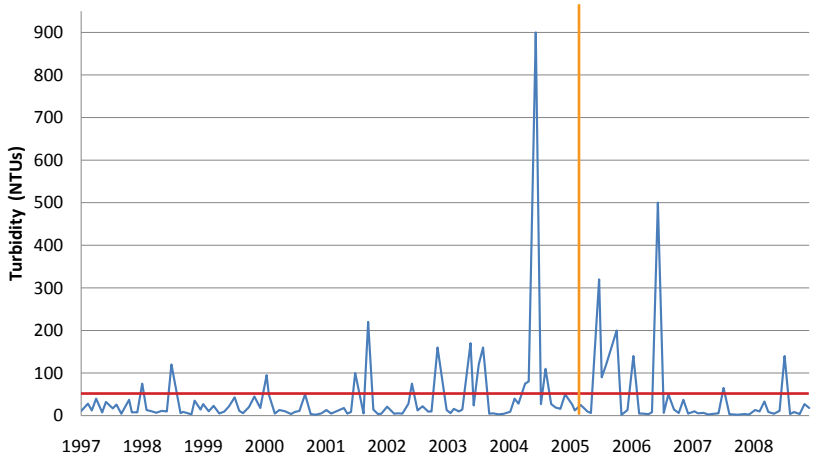
Use Support: Impaired (11 mi)	
2008 IR Cat.	5
2010 IR Cat.	5
Fish Com (CF30)	Good (2004)
AMS (C4040000)	Copper - 23% Turbidity - 20% FCB - 25%

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)]:

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.

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

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:

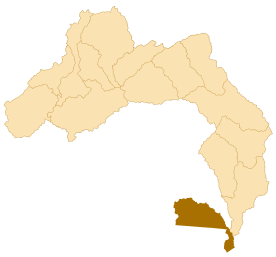
Turbidity Management Strategy:

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 watersheds 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*.

Nutrient Management Strategy:

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

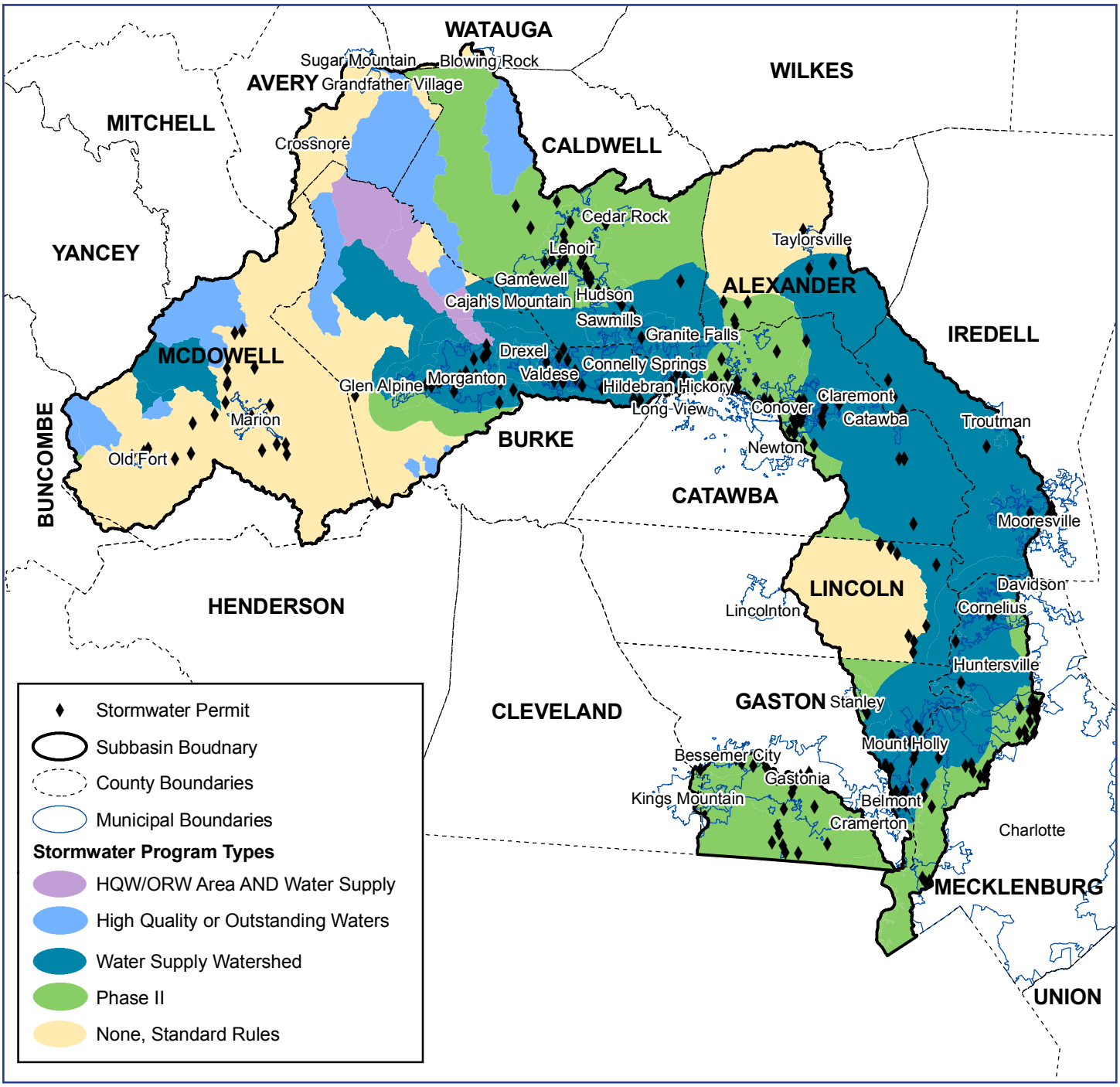
There are many different stormwater programs administered by DWQ. One or more of these affects many communities in the Catawba River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. 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.

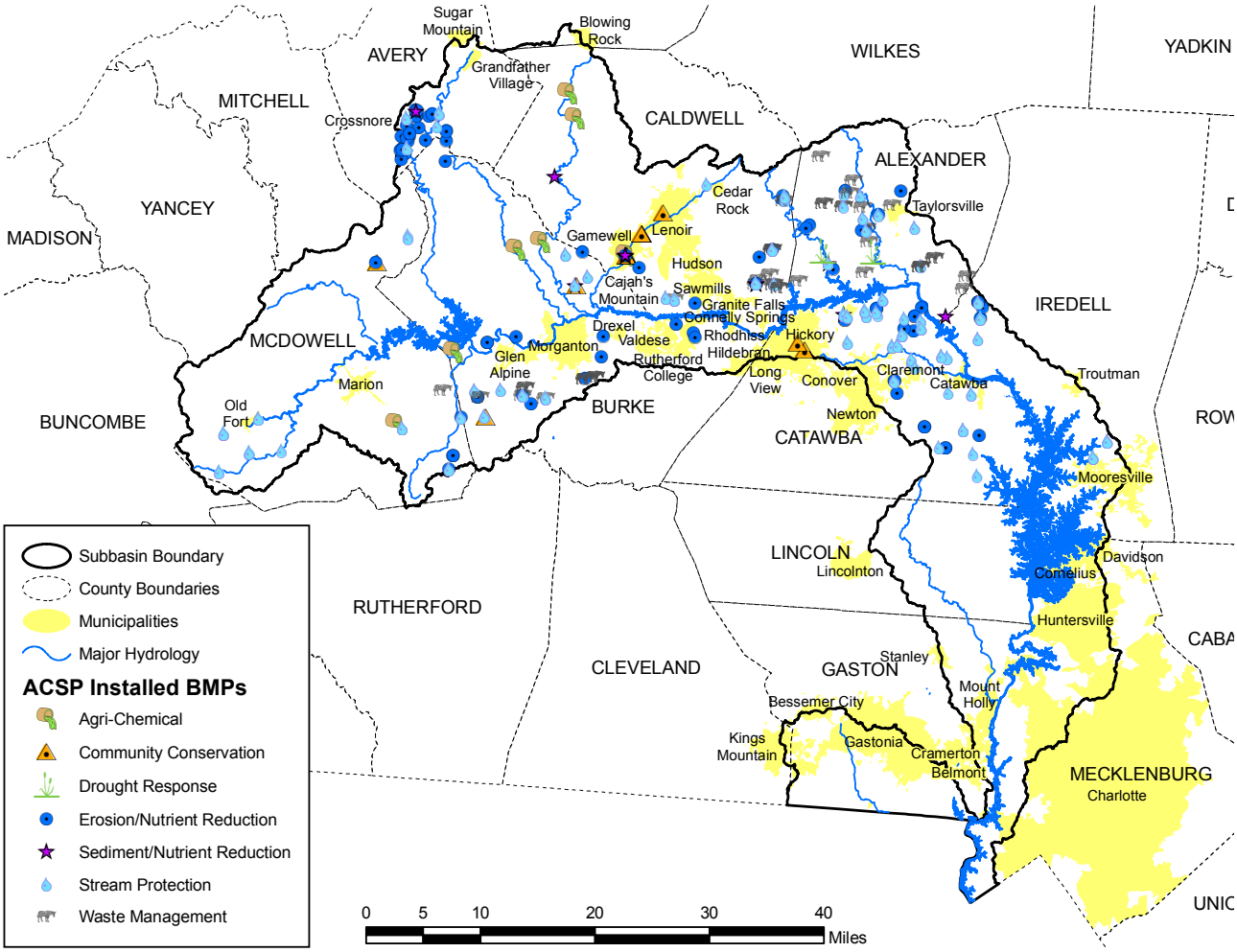
Table 1-8: List of BMPs Implemented by ACSP Between January 2003 to June 2009 in HUC 03050101

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: Watershed Planning

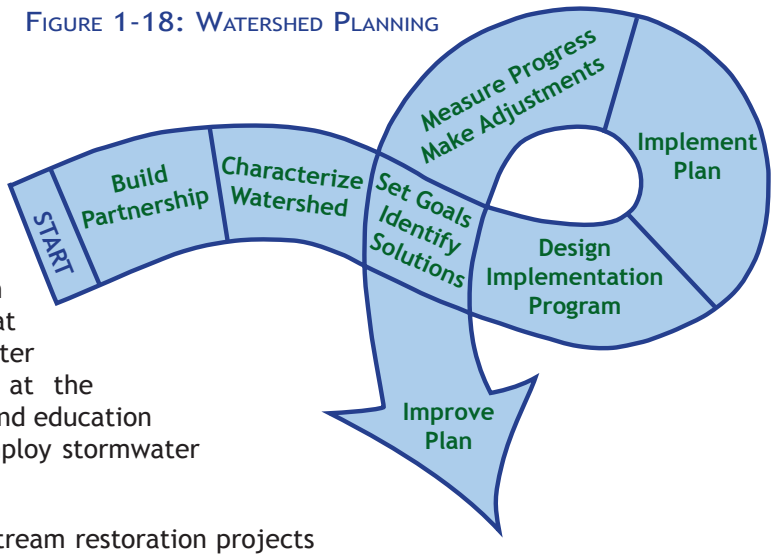


Figure 1-18 illustrates a general process for developing watershed restoration plans. This process can and should be applied to streams suffering from habitat degradation and pollution. Interested parties should contact the Basinwide Planning Program to discuss opportunities to begin the planning and 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.

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*.

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