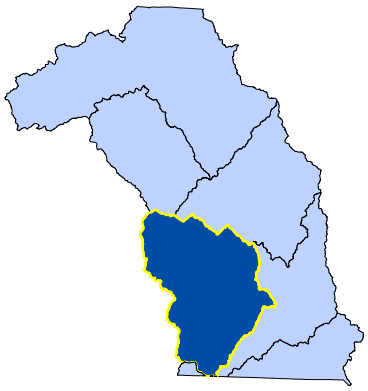


Rocky River Watershed

Subbasin HUC 03040105

Water Quality Overview

This subbasin is located adjacent to the City of Charlotte where rapid development along with limited stream waste assimilation capacity is having a major impact on water quality. Of the monitored waters, 29 percent are supporting and 65 percent are impaired. New impairments corresponded with an increase in number of sample sites, indicating as more monitoring is done more water quality problems will likely be detected. The network of ambient monitoring sites in the Rocky River watershed indicate that turbidity and nutrients (nitrogen and phosphorus) are notably higher in this area than in other parts of the Yadkin – Pee Dee River basin. Fecal coliform bacteria, iron, and copper are also pollutants of concern in this watershed. Iron and copper occur naturally in the soils of this region and further investigation is needed to determine the groundwater contribution of these metals to surface waters. Other possible sources include nonpoint source runoff from urban areas and waste land-application sites. Goose Creek is the home to the endangered Carolina Heelsplitter Mussel which requires special land use management strategies to protect and restore its habitat.

Watershed at a Glance

Counties

Anson, Cabarrus, Iredell, Mecklenburg, Rowan, Stanley, Union

Municipalities

Albemarle, Charlotte, China Grove, Concord, Cornelius, Davidson, Gold Hill, Harrisburg, Huntersville, Indian Trail, Kannapolis, Lake Park, Landis, Locust, Marshville, Matthews, Mint Hill, Mooresville, Mount Pleasant, New London, Norwood, Oakboro, Peachland, Richfield, Stallings, Stanfield, Wingate

Permitted Facilities

NPDES WWTP:	
Major	8
Minor	45
NPDES Nondischarge:	24
NPDES Stormwater:	
General	141
Individual	9
Phase II	10
Animal Operations:	75

Stream Summary

Total Streams:.....1,158.3mi
Total Monitored:.....605.8mi
Total Supporting:.....175.3mi
Total Impaired:.....392.9mi
Total Not Rated:.....37.6 mi
Total No Data:.....552.5 mi

General Description

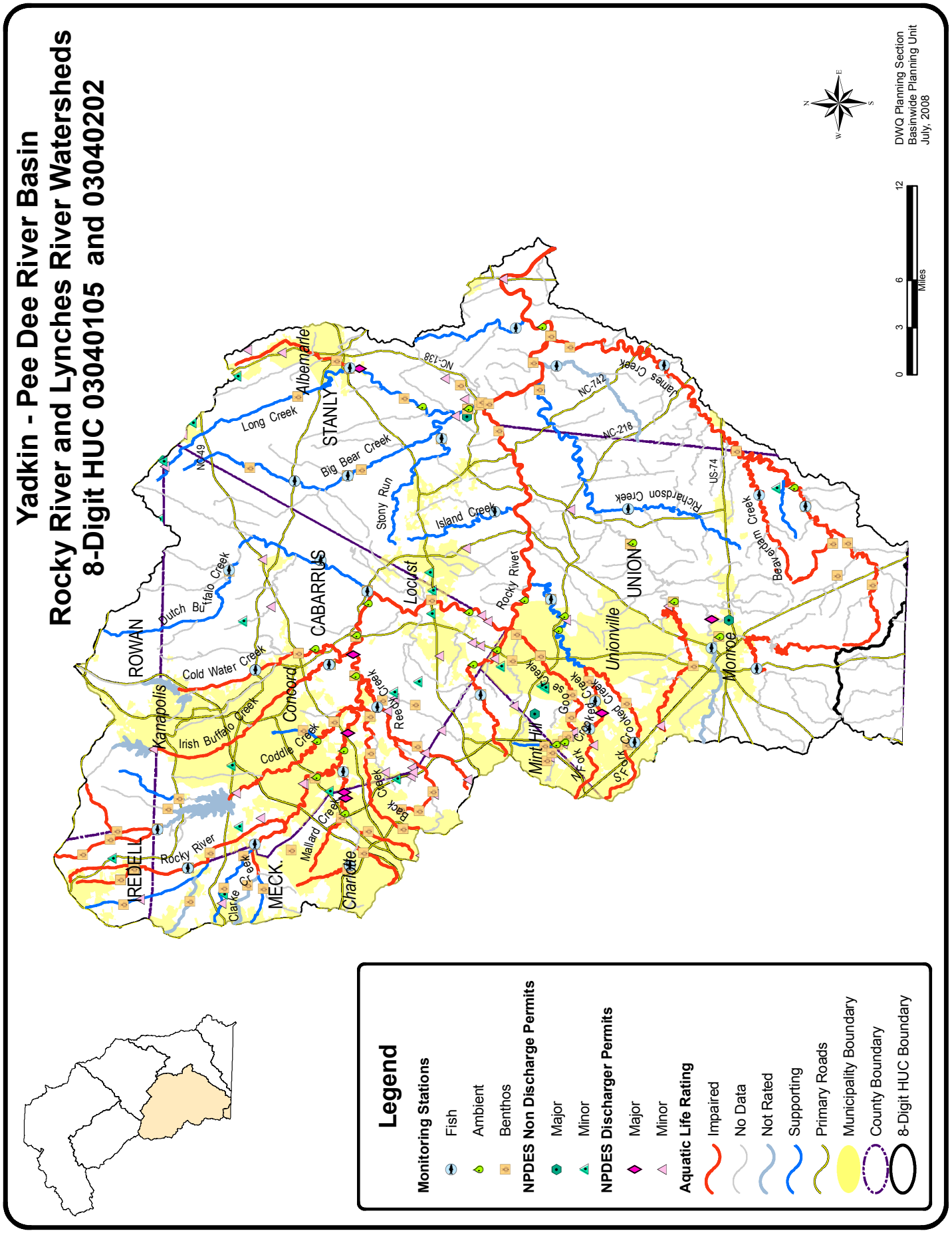
The Rocky River is the largest tributary of the Yadkin - Pee Dee River and flows for almost 100 miles from its headwaters near Mooresville in Iredell County to its confluence with the Pee Dee River. Coddle Creek is a major tributary in the northwestern part of the watershed, while Irish Buffalo Creek, Goose Creek, and Crooked Creek drain central portion of the watershed.

This region contains many rapidly growing urban areas including Mooresville, Concord, Cornelius, Davidson, Huntersville, eastern Mecklenburg County, Concord, and Kannapolis. Pressure from urban expansion is rapidly shifting agricultural land towards residential and commercial uses. Stream degradation due to impacts from this shift is the greatest threat to water quality in the area.

Going downstream, stream type shifts from those characterized by sandy substrates and generally consistent summer flow regimes to those characterized by low summer flows, extensive bedrock formations, and the prevalence of boulder and cobble substrate. These are considered Carolina Slate Belt streams and are found primarily in eastern Cabarrus and Union Counties.

Big Bear, Long, Richardson, and Lanes Creeks form the major tributaries in the southeastern portion of the Rocky River watershed. These are all considered Slate Belt Streams. The Albemarle WWTP and the Town of Oakboro's WWTP both discharge to Long Creek. The Towns of Marshville, Wingate, and Monroe (along the US 74 corridor) are the large urban areas area. The Monroe WWTP is a major discharge to Richardson Creek. Land use in this area is mostly comprised of hay fields and pasture, although there are large numbers of swine and poultry operations. Moreover, numerous confined animal operations (CAFOs) are found in the Richardson and Lanes Creeks catchments. Many of these operations land apply their manure or litter. The effect of long-term land application programs on water quality is unknown.

Figure 5-1. Rocky River Watershed HUC 03040105



Current Status and Significant Issues

Impaired streams are those streams not meeting their associated water quality standards in more than 10 percent of the samples taken within the assessment period (January 1, 2002 through December 31, 2006) and impacted streams are those not meeting water quality standards in 7 to 9 percent of the samples. The ***Use Support*** report provides information on how and why water quality ratings are determined and DWQ's "***Redbook***" describes in detail water quality standards for each waterbody ***classification***. For a general discussion of water quality parameters, potential issues, and rules please see "***Supplemental Guide to North Carolina's Basinwide Planning***: Support Document for Basinwide Water Quality Plans"

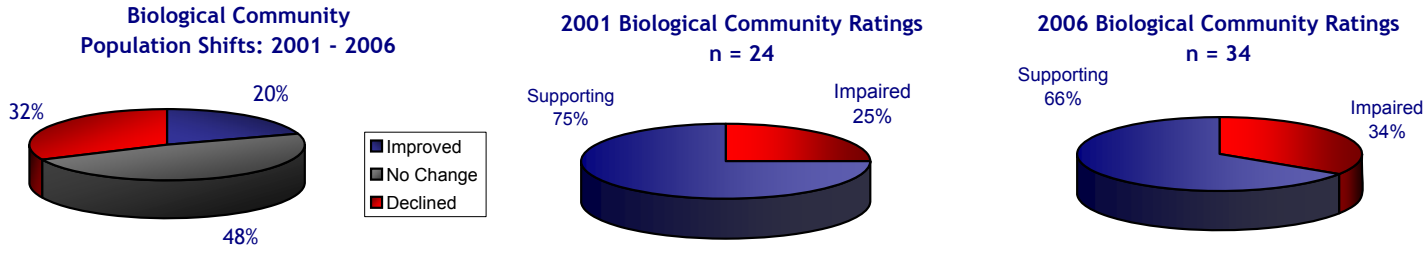
Figure 5-1. shows monitoring station locations and impaired streams for the Rocky River subbasin.
Appendix A provides descriptions of all monitored waterbodies in the subbasin.
Appendix B. provides a summary of each ambient data monitoring station.
Appendix C provides summaries of biological and fish assessment monitoring sites.

General Biological Health

Thirteen benthic and twenty-one fish sites were sampled as part of the five-year basinwide sampling program. Additionally, several special studies were conducted during the assessment period including TMDL stressor studies of McKee and Coddle Creeks, a detailed assessment of benthic communities in the upper Rocky River watershed, and a survey to assess urban fish populations.

Of the sites that were sampled in both 2001 and 2006, over thirty percent declined in bioclassification while just twenty percent showed an improvement. Further, the total number of samples increased by 41 percent and corresponded to a 37 percent increase in the number of impaired sites. This suggests that as further investigations are performed, more water quality problems are uncovered. (Figure 5-2)

Figure 5-2. Biological Health Summary



Wetlands Restoration Program Rocky River Study

In response to existing impacts from agricultural land uses and anticipated residential growth, the ***Ecosystem Enhancement Program*** (EEP, formerly the Wetlands Restoration Program) targeted the Rocky River Watershed for water quality and habitat quality improvements. DWQ sampled twenty stream sites in southern Iredell County, southern Rowan County, eastern Mecklenburg County, and most of western Cabarrus County in July 2003 to help EEP prioritize streams for restoration.

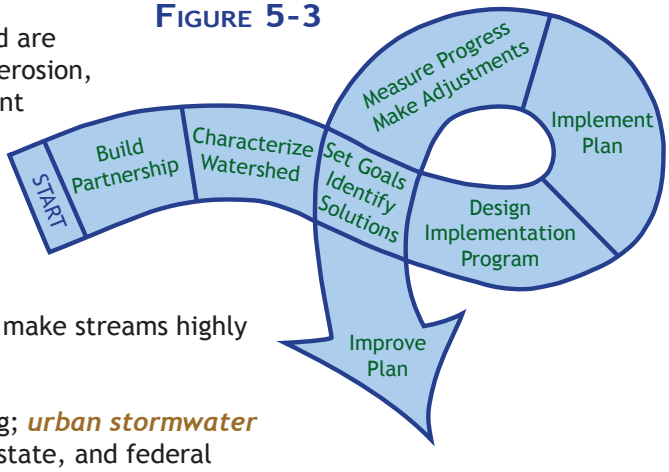
Nearly all of the streams sampled in the Rocky River drainage had highly impervious catchments as a result of their proximity to urban and suburban areas of Charlotte. This highly impervious environment is reflected by the fact that 12 of 14 sites in the Rocky River catchment received Fair bioclassifications, while only 2 out of 6 sites in the less developed Coddle Creek catchment received bioclassifications of Fair or worse.

Habitat degradation was a chronic problem in all the sites within this study. Streams with agricultural watersheds and no NPDES discharges were in slightly better condition overall. Streams in urbanized watersheds were in the worst condition. As this area continues to develop, urban stormwater is becoming the primary cause of water quality degradation. Local commitment from town and county leaders to require ***low impact development*** for all new construction is necessary to prevent further degradation in this watershed. ***State and federal funding*** can be used to match this commitment with restoration projects to address existing degradation.

Habitat Degradation

As mentioned above, many streams in the Rocky River Watershed are impaired or impacted by habitat degradation. The severe bank erosion, shifting sandy substrates, channelization, and sedimentation point to an overall pattern of habitat degradation in the watershed. In most cases habitat is degraded by the cumulative effect of several stressors acting in concert. These stressors often originate in the upland portions of the watershed and may include impervious surfaces, sedimentation and erosion from construction, general agriculture, and other land disturbing activities. Naturally erodible soils in the Rocky River watershed make streams highly vulnerable to these stressors.

Figure 5-3



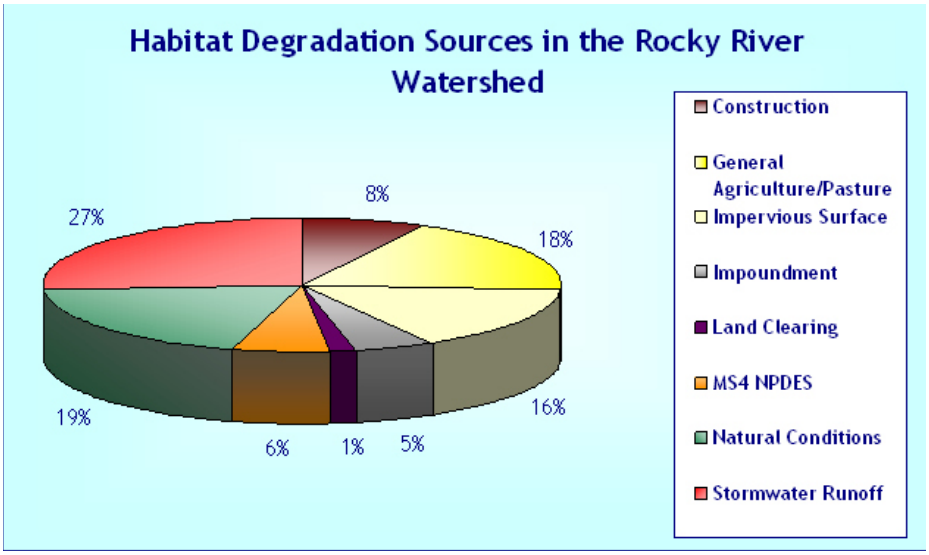
Many tools are available to address habitat degradation including; ***urban stormwater BMPs***, ***agricultural BMPs***, ordinance/rule changes at the local, state, and federal levels, volunteer activism, and education programs. New and existing development should employ ***stormwater BMPs*** wherever practical. Figure 5-3 illustrates a general process for developing ***watershed restoration plans***. This process can and should be applied to streams suffering from habitat degradation. Interested parties should contact the ***Basinwide Planning Program*** to discuss opportunities to begin the planning and restoration process.

Table 5-1. Stream Impaired and Impacted by Habitat Degradation

Assessment Unit	Name	Subbasin	Class.	Impaired	Impacted	Source	Miles
13-17-11-(1)	Dutch Buffalo Creek	03-07-12	WS-II; HQW		X	Natural Conditions	12.6
						Agriculture/Pasture	
13-17-11-(5)	Dutch Buffalo Creek	03-07-12	C		X	Agriculture/Pasture	11.3
						Natural Conditions	
13-17-17	Clear Creek	03-07-11	C	X		Stormwater Runoff	13.1
13-17-18a	Goose Creek	03-07-12	C		X	Construction	3.2
						Land Clearing	
13-17-18b	Goose Creek	03-07-12	C	X		Construction	13.1
						Impervious Surface	
						MS4 NPDES	
13-17-2	Dye Creek (Branch)	03-07-11	C	X		MS4 NPDES	4.4
						Impervious Surface	
13-17-20-1	North Fork Crooked Creek	03-07-12	C	X		Stormwater Runoff	12.0
						Construction	
13-17-20-2a	South Fork Crooked Creek	03-07-12	C	X		Construction	5.6
						Stormwater Runoff	
13-17-20-2b	South Fork Crooked Creek	03-07-12	C	X		Stormwater Runoff	8.8
				X		Construction	
13-17-31	Long Creek	03-07-13	C		X	Stormwater Runoff	26.7
13-17-3-1	South Prong West Branch Rocky River	03-07-11	C		X	Impervious Surface	4.6
						Land Clearing	
13-17-31-1	Little Long Creek	03-07-13	C	X		Impervious Surface	8.5
13-17-31-5	Big Bear Creek	03-07-13	C		X	Natural Conditions	19.9
13-17-31-5-5	Stony Run	03-07-11	C		X	Natural Conditions	11.9
13-17-36-15	Negro Head Creek	03-07-14	C		X	Agriculture/Pasture	13.0
						Impervious Surface	
13-17-36-9-(1)	Stewarts Creek	03-07-14	WS-III	X		Agriculture/Pasture	8.3
						Impervious Surface	
13-17-4	Clarke Creek	03-07-11	C	X		Stormwater Runoff	5.5
13-17-40-(12)	Lanes Creek	03-07-14	C	X		Impoundment	27.1
						Agriculture/Pasture	
						Natural Conditions	
13-17-5-2	Clarks Creek	03-07-11	C	X		Stormwater Runoff	4.4
						Impervious Surface	

Assessment Unit	Name	Subbasin	Class.	Impaired	Impacted	Source	Miles
13-17-5-3	Doby Creek	03-07-11	C	X		Impervious Surface	4.1
						Stormwater Runoff	
13-17-5-5	Stony Creek	03-07-11	C	X		Stormwater Runoff	5.1
						Impervious Surface	
13-17-5b	Mallard Creek	13-17-5b	C	X		Stormwater Runoff	4.8
						Impervious Surface	
13-17-6-(0.5)	Coddle Creek	03-07-11	WS-II; HQW	X		Agriculture/Pasture	7.6
13-17-6-1	East Fork Coddle Creek	03-07-11	WS-II; HQW	X		Natural Conditions	6.4
						Agriculture/Pasture	
13-17-6-5-(1)	Mill Creek	03-07-11	WS-II; HQW		X	Natural Conditions	5.1
					X	Agriculture/Pasture	
13-17-7	Back Creek	03-07-11	C	X		Stormwater Runoff	12.5
13-17-8	Reedy Creek	03-07-11	C	X		Impervious Surface	15.2
						Stormwater Runoff	
13-17-8-4	McKee Creek	03-07-11	C	X		Agriculture/Pasture	6.9
						Stormwater Runoff	
13-17-9-(2)	Irish Buffalo Creek	03-07-12	C	X		Stormwater Runoff	16.7
						Total	298.3

Figure 5-4. Habitat Degradation Sources

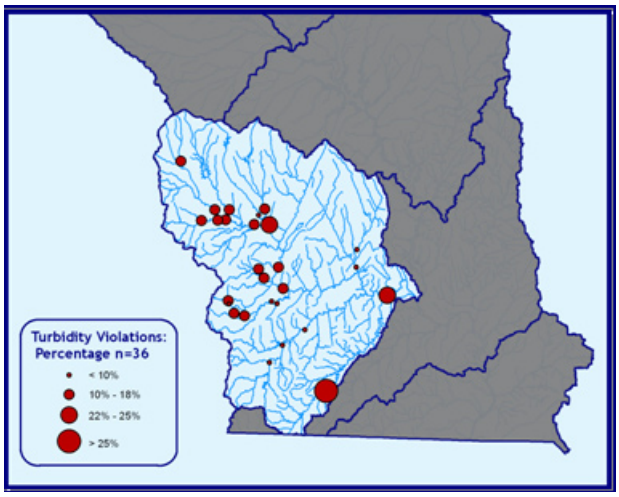


Ambient Water Quality

Turbidity

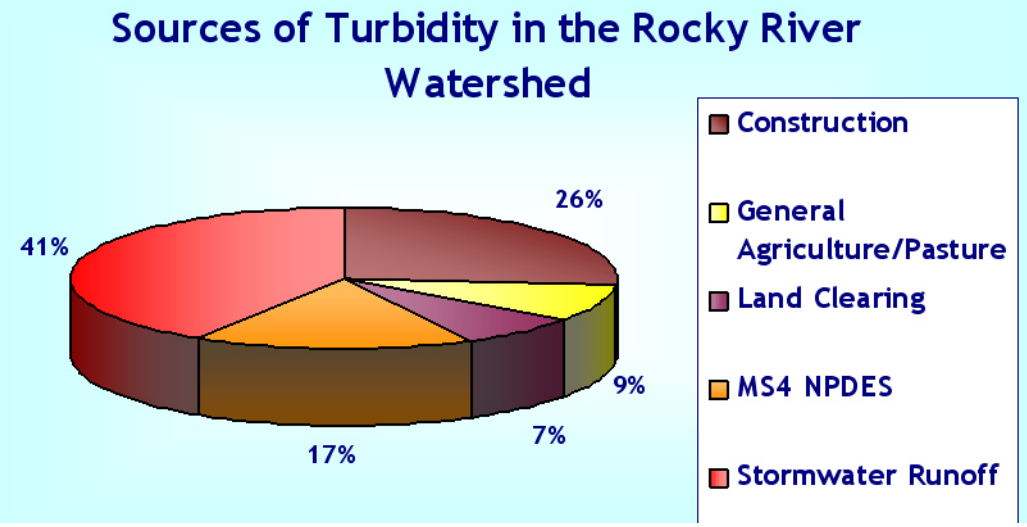
Turbidity violations are common throughout the Rocky River watershed, and their frequency and intensity are concerning. In fact, violations are more common here than in any other area in the Yadkin - Pee Dee River Basin. Turbidity is a measure of cloudiness in water and is often accompanied with excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning gravels (reducing fish survival and growth rates), impair fish food sources, fill in rearing pools (reducing cover from prey and thermal 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

Figure 5-5. Turbidity Violations



and odor problems, block water supply intakes, foul treatment systems, and fill reservoirs. (USEPA, 1999 and Waters, 1995). Sand and silt were noted in the stream substrate at most of the biological sample sites in the Rocky River watershed.

Figure 5-6. Turbidity Sources



Soil erosion is the most common source of turbidity and sedimentation and while some erosion is a natural phenomenon, human land use practices can 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 Rocky River watershed.

It is likely that a combination of human caused land disturbances and natural erosion are causing the majority of turbidity violations in this watershed, with human causes being the leading contributor. For example, the Lanes Creek monitoring station, in a primarily agricultural watershed, violated the state turbidity standard in almost 70 percent of the measurements. Ambient stations in the northern and eastern portion of the watershed, where urban construction is accelerating and large areas of impervious surfaces are common, consistently violated the standard in 10 to 20 percent of the measurements (Figure 5-5). To appropriately address turbidity and sediment problems in the Rocky River watershed, an assessment to determine the contribution of human accelerated erosion sources relative to natural processes should be undertaken. All reasonable efforts to reduce or eliminate human source of erosion should be implemented immediately. Local commitment from town and county leaders to require ***low impact development*** for all new construction will also help to prevent further degradation in this watershed.

Table 5-2. Stream Impaired and Impacted by Turbidity in Hydrologic Unit 03040105

Assessment Unit	Name	Subbasin	Class.	Impaired	Impacted	Source	Miles
13-17-17	Clear Creek	03-07-12	C	X		Construction	13.1
				X		MS4 NPDES	
				X		Impervious Surface	
13-17-18a	Goose Creek	03-07-12	C		X	Construction	3.2
						MS4 NPDES	
						Impervious Surface	
13-17-20	Crooked Creek	03-07-12	C		X	Stormwater Runoff	12.9
						Construction	
13-17-20-1	North Fork Crooked Creek	03-07-12	C	X		Stormwater Runoff	12.0
						Construction	
13-17-36-(5)a2	Richardson Creek	03-07-14	C	X		Agriculture/Pasture	7.3
13-17-36-(5)a1a	Richardson Creek	03-07-14	C	X		Unknown	8.2
13-17-40-(1)	Lanes Creek	03-07-14	WS-V		X	Agriculture/Pasture	27.4
13-17-5b	Mallard Creek	03-07-11	C	X		Stormwater Runoff	4.8
13-17-6-(5.5)	Coddle Creek	03-07-11	C	X		Stormwater Runoff	14.5
13-17-9-(2)	Irish Buffalo Creek	03-07-12	C		X	Impervious Surface	16.7
						MS4 NPDES	
13-17-9-4-(1.5)	Cold Water Creek	03-07-12	C	X		Stormwater Runoff	12.5
13-17a	Rocky River	03-07-11	C	X		Construction	34.1
						Stormwater Runoff	
						MS4 NPDES	

Assessment Unit	Name	Subbasin	Class.	Impaired	Impacted	Source	Miles
13-17b	Rocky River	03-07-12	C	X		Stormwater Runoff	8.5
						Construction	
13-17c	Rocky River	03-07-12	C	X		Stormwater Runoff	21.6
						Construction	
13-17d	Rocky River	03-07-14	C	X		Land Clearing	29.3
						Stormwater Runoff	
						Total	226.1

Fecal Coliform

Fecal Coliform concentrations did exceed the standard of 400 colonies/100ml in the Rocky River subbasin. The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the fecal material of humans or other warm-blooded animals. At the time this occurred, the source water might have been contaminated by pathogens or disease producing bacteria or viruses that can also exist in fecal material. Some waterborne pathogenic diseases include typhoid fever, viral and bacterial gastroenteritis and hepatitis A. 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 or nonpoint sources of human and animal waste.

Figure 5-7. Fecal Coliform Bacteria Sources

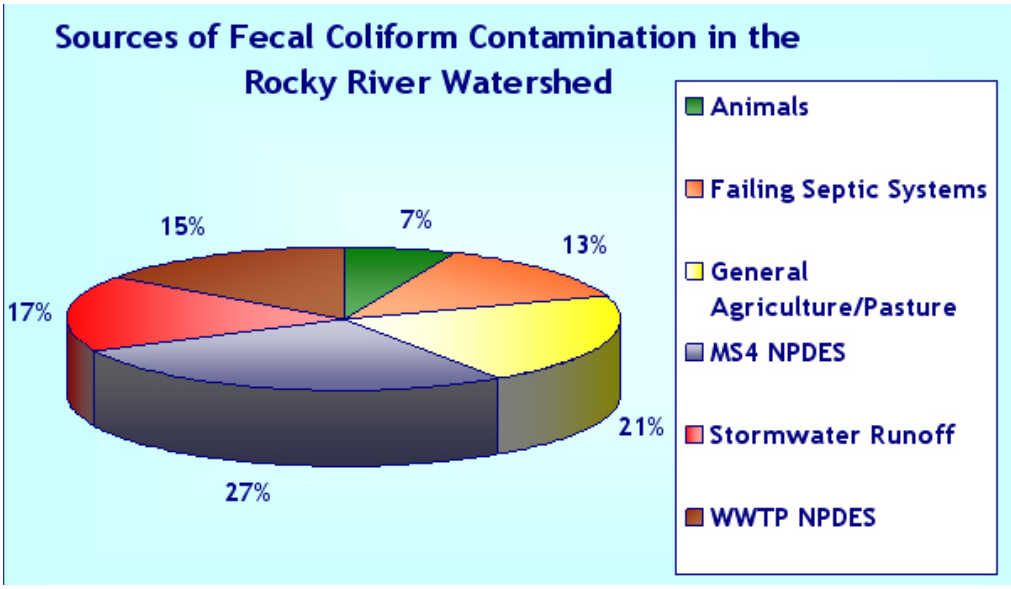


Table 5-3. Stream Impaired and Impacted by Fecal Coliform Bacteria in 03040105

Assessment Unit	Name	Subbasin	Class.	Impaired	Impacted	Source	Miles
13-17-18a	Goose Creek	03-07-12	C	X		WWTP NPDES	3.2
						Animals	
						Failing Septic Systems	
						MS4 NPDES	
13-17-18b	Goose Creek	03-07-12	C	X		WWTP NPDES	13.1
						Failing Septic Systems	
						MS4 NPDES	
						Animals	
13-17-20-1	North Fork Crooked Creek	03-07-12	C		X	Stormwater Runoff	12.0
13-17-40-(1)	Lanes Creek	03-07-14	WS-V		X	Agriculture/Pasture	27.4
13-17-40-10	Barkers Branch	03-07-14	WS-V		X	Agriculture/Pasture	4.6
13-17-40-11	Beaverdam Creek	03-07-14	WS-V		X	Agriculture/Pasture	12.1
13-17-8-4	McKee Creek	03-07-11	C	X		Agriculture/Pasture	6.9
13-17-9-(2)	Irish Buffalo Creek	03-07-12	C		X	MS4 NPDES	16.7
						Failing Septic Systems	
13-17a	Rocky River	03-07-11	C	X		MS4 NPDES	34.1
13-17c	Rocky River	03-07-12	C		X	WWTP NPDES	21.6
13-17d	Rocky River	03-07-14	C		X	Stormwater Runoff	29.3
						Total	180.9

Nutrient Impacts

Compounds of nitrogen and phosphorus are major components of living organisms and thus are essential to maintain life. These compounds are collectively referred to as "nutrients." Nitrogen compounds include ammonia-nitrogen (NH3-N), total Kjeldahl nitrogen (TKN) and nitrite+nitrate nitrogen (NO2+NO3-N). Phosphorus is measured as total phosphorus. When nutrients are introduced to an aquatic ecosystem from municipal and industrial treatment processes, or runoff from urban or agricultural land, the excessive growth of algae (algal blooms) and other plants may be accelerated. In addition to the possibility of causing algal blooms, ammonia-nitrogen may combine with high pH water to form NH4OH, a form toxic to fish and other aquatic organisms. The waterbodies that are impaired or impacted by nutrient enrichment are listed in Table 5-4 below.

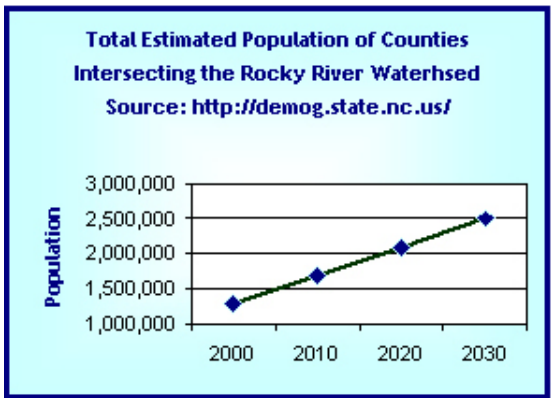
Table 5-4. Stream Impaired and Impacted by Nutrient Impacts in 03040105

Assessment Unit	Name	Subbasin	Class.	Stressor	Impaired	Impacted	Source	Miles
13-17-18b	Goose Creek	03-07-12	C	Low Dissolved Oxygen	X		Stormwater Runoff	13.1
13-17-2	Dye Creek (Branch)	03-07-11	C	Low Dissolved Oxygen	X		WWTP NPDES	4.4
				Nutrient Impacts				
13-17-20	Crooked Creek	03-07-12	C	Low Dissolved Oxygen		X	Natural Conditions	12.9
							WWTP NPDES	
13-17-31	Long Creek	03-07-13	C	Low Dissolved Oxygen		X	Natural Conditions	26.7
							WWTP NPDES	
13-17-31-5	Big Bear Creek	03-07-13	C	Nutrient Impacts		X	Agriculture/Pasture	19.9
13-17-31-5-5	Stony Run	03-07-13	C	Nutrient Impacts		X	Agriculture/Pasture	11.9
13-17-36-(3.5)	Richardson Creek (Lake Lee)	03-07-14	WS-IV; CA	Nutrient Impacts	X		Agriculture/Pasture	2.5
13-17-36-4-(0.5)	Little Richardson Creek (Lake Monroe)	03-07-14	WS-IV	High pH		X	Agriculture/Pasture	78.9 ac
13-17-36-4-(2)	Little Richardson Creek (Lake Monroe)	03-07-14	WS-IV; CA	High pH, Chlorophyll a	X		Unknown	39.2 ac
13-17-4	Clarke Creek	03-07-11	C	Low Dissolved Oxygen	X		Stormwater Runoff	5.5
13-17-40-(1)	Lanes Creek	03-07-14	C	Low Dissolved Oxygen		X	Natural Conditions	27.4
				Nutrient Impacts			Agriculture/Pasture	
13-17-40-10	Barkers Branch	03-07-14	WS-V	Low Dissolved Oxygen		X	Natural Conditions	4.6
13-17-40-11	Beaverdam Creek	03-07-14	WS-V	Low Dissolved Oxygen	X		Natural Conditions	12.1
13-17-5b	Mallard Creek	03-07-11	C	Nutrient Impacts	X		Stormwater Runoff	4.8
13-17-8-4	McKee Creek	03-07-11	C	Nutrient Impacts	X		WWTP NPDES	6.9
							Agriculture/Pasture	
13-17-9-(2)	Irish Buffalo Creek	03-07-12	C	Nutrient Impacts	X		Stormwater Runoff	16.7
13-17-9-4-(1)	Cold Water Creek (Lake Fisher)	03-07-12	WS-IV; CA	Nutrient Impacts		X	Stormwater Runoff	0.6
13-17-9-4-2-(2)	Unnamed Tributary to Cold Water Creek (Lake Concord)	03-07-12	WS-IV; CA	Nutrient Impacts		X	Stormwater Runoff	0.5

Population and Land Use

Human activity impacts water quality. The many types of pollution generated by human activities may seem insignificant when viewed separately, but when taken as a whole, can be very stressful to aquatic ecosystems. Population growth results in dramatic impacts on the natural landscape. The most obvious impact is the expansion of urban and suburban areas and the associated impervious surfaces. Impervious surfaces are materials that prevent infiltration of water into the soil and include roads, rooftops and parking lots. Impervious surfaces alter the natural hydrology, prevent the infiltration of water into the ground, and concentrate the flow of stormwater over the landscape. In general, impervious surface coverage increases at twice the rate of population growth (USDA-NRCS, 2001; U.S. Census Bureau, 2000).

Figure 5-8. Population Growth



Studies over the past decade converge on a central point, when more than 10 percent of the acreage in a watershed is covered in roads, parking lots, rooftops, and other impervious surfaces, the rivers and streams within the watershed become seriously degrade (Center for Watershed Protection, 2003). Studies show that if urbanized areas cover more than 25 percent of a watershed, there is a point where the decline in the health of the ecosystem is irreversible (Beach, 2002; Galli, 1991). The growth rate of municipalities that lie at least partly within the Rocky River Watershed was almost 30 percent between 2000 and 2005 (Table 5-5). At that rate, one would expect to see a 60 percent increase in impervious surface over the same time period. Unfortunately, the land cover data necessary to test this hypothesis is unavailable. However, DWQ's biological and ambient data indicate streams in urbanizing areas of the Rocky River Watershed are demonstrating negative water quality impacts.

Reversing the existing water quality impairments and preventing new impairments will depend on programs that control stormwater runoff from new and existing development, restore stream and ***riparian*** habitat, and educate the public about ***personal choices*** they can make to improve water quality. Most of these ***programs*** must be implemented at the local government level and will require protective ordinances and adequate enforcement staff. State and federal programs can provide guidance and limited financial support.

Figure 5-9. Population Density

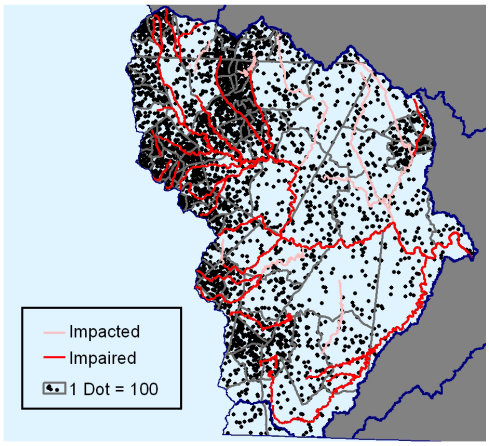
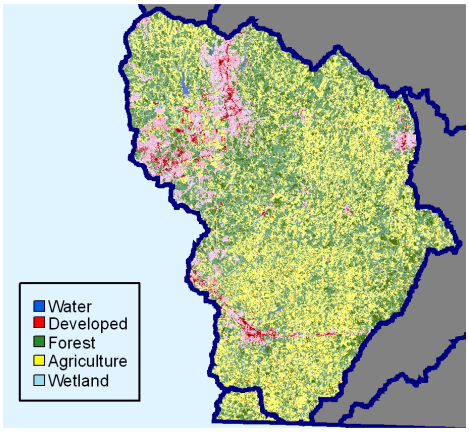


Figure 5-10. Land Cover



Source: http;//demog.state.nc.us/

Table 5-5. Population of Towns in the Rocky River Watershed

Municipality	Apr-00	Jul-05	% Change	Municipality	Apr-00	Jul-05	% Change
ALBEMARLE	15,680	15,645	-0.2	MARSHVILLE	2,360	2,762	17.0
CHARLOTTE	540,167	640,270	18.5	MATTHEWS	22,125	25,442	15.0
CHINA GROVE	3,616	4,219	16.7	MINT HILL	15,609	18,804	20.5
CONCORD	55,977	63,429	13.3	MOORESVILLE	18,823	23,125	22.9
CORNELIUS	11,969	16,856	40.8	MOUNT PLEASANT	1,259	1,417	12.5
DAVIDSON	7,139	8,162	14.3	NEW LONDON	326	604	85.3
HARRISBURG	4,493	5,451	21.3	NORWOOD	2,216	2,858	29.0
HUNTERSVILLE	24,960	31,646	26.8	OAKBORO	1,198	1,153	-3.8
INDIAN TRAIL	11,749	22,030	87.5	PEACHLAND	554	578	4.3
KANNAPOLIS	36,910	40,139	8.7	RICHFIELD	515	512	-0.6
LAKE PARK	2,093	2,840	35.7	STALLINGS	3,171	9,508	199.8
LANDIS	2,996	3,036	1.3	STANFIELD	1,113	1,277	14.7
LOCUST	2,416	2,790	15.5	WINGATE	2,406	3,706	54.0
Average Growth Rate: 29.7 percent							

TMDLs

A TMDL or ***Total Maximum Daily Load*** is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

A TMDL provides a detailed water quality assessment that provides the scientific foundation for an implementation plan. An implementation plan outlines the steps necessary to reduce pollutant loads in a certain body of water to restore and maintain human uses or aquatic life. Plan implementation is usually voluntary. The development of TMDL implementation plans is often the best method to improve water quality. The following TMDLs have been completed in the Rocky River watershed and should be adopted by all residents and local governments within the watershed.

Table 5-6. Finalized TMDLs in the Rocky River Watershed

Waterbody	Pollutant	Final TMDL Date	Link
McKee and Clear Creeks	Fecal Coliform	August 1, 2003	*Final TMDL*
Rocky River	Fecal Coliform	September 19, 2002	*Final TMDL*
Goose Creek	Fecal Coliform	July 8, 2005	*Final TMDL*

Threatened & Endangered Species

The Goose Creek tributary is home to the Federally Endangered Carolina Heelsplitter Mussel. DWQ has been required by Rule 15A NCAC 2B .0110 to develop site-specific management strategies for waters providing habitat for federally-listed threatened and endangered aquatic animal species. In order to meet the requirement to maintain and restore the water quality of the Goose Creek watershed for the Carolina Heelsplitter freshwater mussel, DWQ has drafted rule language to meet this goal. Several state and federal agencies prepared written draft technical recommendations for DWQ to consider in its final recommendations.

DWQ has written an explanation of its proposed rule language in the report entitled "Report on Water Quality Recommendations in the Site-Specific Management Strategy for the Goose Creek Watershed". The proposed rule language is included in that report. See ***http://h2o.enr.state.nc.us/csu/GooseCreek.html*** for more information.

Inter-Basin Transfers

The rapid population growth discussed above has also led to an urgent need to identify and develop new water sources for the communities in the Rocky River watershed. One option for increasing the local water supply is to transfer water from neighboring basins. In 1993, the Legislature adopted the Regulation of Surface Water Transfers Act (G.S. 143-215.22I). The intention of the law is to regulate large surface water transfers between river basins by requiring a certificate from the Environmental Management Commission (EMC). In general, a transfer certificate is required for a new transfer of 2 million gallons per day (MGD) or more and for an increase in an existing transfer by 25 percent or more, if the total including the increase is 2 MGD or more. However, if a transfer facility existed or was under construction on July 1, 1993, a certificate is not required up to the full capacity of that facility to transfer water, regardless of the transfer amount.

The following links lead to specific details about the two inter-basin transfer certificates currently issued for the Rocky River watershed. Charlotte-Mecklenburg Utilities is currently pursuing a revised certificate that could allow additional water transfers into the Goose Creek portion of the Rocky River watershed. Additional transfer certificates are likely in the future as the region continues to grow and the demand for water increases.

- ***Charlotte-Mecklenburg Utilities (CMUD)***
  - A 33 MGD transfer from the Catawba River basin to the Rocky River basin.
- ***Cities of Concord and Kannapolis***
  - A transfer to the Rocky River basin of 10 MGD from the Catawba River basin and 10 MGD from the Yadkin River basin.

Issues surrounding inter-basin transfers to the Rocky River watershed are complex and controversial. At a minimum, the natural flow of water through the landscape is altered and impacts aquatic communities. Depending on the size of the transfer, the impacts can be significant on both the source and receiving streams. At the regional level, inter-basin transfers facilitate higher density development and support a larger human population. As discussed in the population section above, this urban expansion can bring a suite of additional water quality concerns including habitat

degradation, impervious surfaces, and expanding waste water discharges. Collectively, these are considered Secondary and Cumulative impacts.

Because these concerns are highly complex and address issues far beyond the simple transfer of water, inter-basin transfers should be evaluated in terms of a comprehensive regional water use strategy that includes long term plans to address the change in hydrology, secondary and cumulative impacts, and wastewater discharge/assimilative capacity. Due to the rapid urban expansion and anticipated population growth in this region, secondary and cumulative impacts should receive a review equal to or exceeding that which is currently dedicated to primary impacts. Inter-basin transfer certificates should not be issued without assurance that strong and permanent measures to mitigate secondary and cumulative impacts are in place.

Local Initiatives

Watershed Improvement Commission

This 3-member commission works closely with the Cabarrus County Soil and Water Conservation Office and seeks to improve the County's water resources. Activities include efforts to reduce flooding, improve water quality and quantity and to reduce future problems through erosion control, water storage, cover protection, and education. Appointments are for terms of six years.

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 significant investment in the Rocky River Watershed. Table 5-7 includes a list of projects and their cost. These projects include land acquisitions, capital improvements to wastewater and stormwater infrastructure, and stream restorations. The CWMTF often partners with conservation groups and clusters projects into specific watersheds in order to leverage additional funds and increase the benefits to water quality and conservation.

Table 5-7. CWMTF Funded Projects (9/1/2001-8/31/2006).

Project Number	Application Name	Proposed Project Description	Amount Funded
2001A-003	Cabarrus Co W&S Authority-Lake Don T. Howell Land Acq	Acquire 104 acres of land, through fee simple purchase, along Park Creek.	$361,000
2002B-005	Catawba Lands Conservancy - Acq./Wilson Farm, S. Fork Catawba R.	Acquire through conservation easements 135 acres along the Rocky River. CWMTF funds to acquire a permanent conservation easement on 49 riparian acres.	$245,000
2005B-502	Concord, City of - WW/ WWTP Discharge Elimination, Rocky River	Eliminate the discharge of raw sewage from an abandoned 5,600 gpd WWTP to Rocky River. Install 3,100 linear feet of new collection line and associated manholes to route waste from 14 residences to the Rocky River WWTP.	$175,000
2006A-536	Wingate, Town of- WW/ Sewer Repair, Rays Branch	Design and permit rehabilitation project on 29,000 linear feet of sewer line along Rays Fork, a 303(d)-listed stream.	$100,000

North Carolina Agriculture Cost Share Program

Nonpoint source pollution is a significant source of stream degradation in the Rocky River Watershed. 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.

Financial incentives are provided through ***North Carolina's Agriculture Cost Share Program***. The ***Division of Soil and Water Conservation*** in the Department of Environment and Natural Resources administers this program. It has been applauded by the U.S. Environmental Protection Agency and has received wide support from the general public as well as the state's agricultural community. Table 5-8 shows the number of projects implemented and in the Yadkin River Headwaters and the dollar amount invested. Table 5-9 shows the water quality benefits realized from that investment.

Table 5-8. ACSP Project Expenditures In the Rocky River Watershed

	Erosion Reduction/Nutrient Loss Reduction in Fields		Stream Protection from Animals		Proper Animal Waste Management	
12-digit HUC	Total Implemented	Cost	Total Implemented	Cost	Total Implemented	Cost
030401050100	61.7 ac.	$7,416	6 units	$46,543	1 unit	$7,000
030401050200	113 ac.	$12,048	73 units	$33,515	9 units	$91,318
030401050300	20.62 ac.	$1,547			1 unit	$14,361
030401050400					5 units	$69,049
030401050500	40.2 ac.	$4,565	1 unit	$1,022	6 units	$38,162
030401050600	317.96 ac.	$42,183	21 units	$35,819	19 units	$233,277
030401050700					15 units	$165,463
030401050800			2 units	$2,055	10 units	$64,234
Total		$67,759		$118,954		$682,864

Table 5-9. NC ASCP Water Quality Benefits - Rocky River Watershed

	Water Quality Benefits				
12-digit HUC	Soil Saved (tons)	Nitrogen Saved (lbs)	Phosphorus Saved (lbs)	Waste-N Managed (lbs)	Waste-P Managed (lbs)
030401050100	307	7,114	35	17,473	17,354
030401050200	1,017	13,809	101	136,368	163,001
030401050300	32	1,373	3	12,750	24,750
030401050400				43,510	76,069
030401050500	314	694	16	63,700	135,643
030401050600	2,220	9,932	379	371,777	636,881
030401050700				156,336	234,631
030401050800	3			93,763	136,585
Total	3,893	32,923	535	895,677	1,424,914

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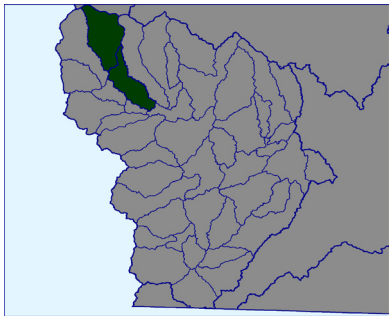


Coddle Creek

Part of the Rocky River Watershed: HUC 03040105

This document is a working draft and will be updated as information and resources become available

The 12 digit HUCs forming the Coddle Creek Watershed include:

12 Digit HUC	Name	Sq. Mi.
030401050105	Coddle Creek Headwaters	47.47
030401050106	Coddle Creek	31.4

Watershed at a Glance

Counties

Cabarrus, Iredell, Rowan

Municipalities

Concord, Kannapolis, Moorseville

Permitted Facilities

NPDES WWTP:	0
NPDES Nondischarge:	1
NPDES Stormwater:	21
Registered Animal Operations:	5

Monitored Stream Summary - Aquatic Life

Total Streams:	60.2 mi
Total Supporting:	23.1 mi
Total Impaired:	37.0 mi

Overview

The upper third of the Coddle Creek watershed is located in southern Iredell and Rowan Counties. The remainder of the watershed is located entirely within Cabarrus County and drains a large portion of the Town of Concord.

Land use in the upper portion of the watershed is primarily fallow fields and pasture, but urban development is encroaching from all directions as Concord, Kannapolis, and Mooresville expand. The southern portion of the watershed is substantially more urban. Coddle Creek in this area has consistently rated Fair since 1996.

Coddle Creek was dammed north of Concord in 1993 to form the Coddle Creek Reservoir (Lake Howell). The entire watershed upstream of the dam is classified as a ***WS-II Water Supply Watershed*** and is subject to special rules developed to protect the drinking water supply. Lake Howell is not violating any drinking water standards, but unfortunately, the rules do not appear to effectively protect the reservoir's tributaries as indicated by new stream impairments and widespread stream habitat impacts throughout the water supply watershed. It should be noted that by rule, streams classified WS-II or better also receive ***High Quality Water (HQW)*** designation. None of the streams sampled in this watershed meet the requirements for HQW designation based on water quality merits alone. Protection from ongoing urbanization is a primary concern for all streams in this watershed.

Current Status

In addition to regular sampling for the Basinwide Assessment Program, three special studies included sample sites in the Coddle Creek drainage. The studies included a survey to support the Watershed Restoration Program (Now the ***Ecosystem Enhancement Program***), a ***TMDL*** Stressor Study, and a Fish Urbanization Study. These studies indicated the most common problem among streams in this watershed was severe bank erosion and habitat degradation. Most streams show some level of degradation, but overall, upstream sites have better water quality and worse habitat. Conversely, habitat is generally better but water quality is worse downstream. This is likely due to the differences in land use between the upper and lower watershed. The large areas of pasture in the upper watershed probably contribute to the habitat degradation, but contribute less toxic stormwater pollution compared to the urban, downstream portion of the watershed.

Table 1. Monitored Stream Segments In The Coddle Creek Watershed

AU Number	AU Name	Impaired 2008	Impacted 2008
13-17-6-(0.5)	Coddle Creek	YES	No
12-17-6-(1.5)	Coddle Creek Reservoir (Lake Howell)	No	No
13-17-6-(5.5)	Coddle Creek	YES	No
13-17-6-1	East Fork Coddle Creek	YES	No
13-17-6-5-(1)	Mill Creek	No	YES
13-17-6-3-(2)	Park Creek	No	YES
13-17-6-7	Wolf Meadow Branch	No	No

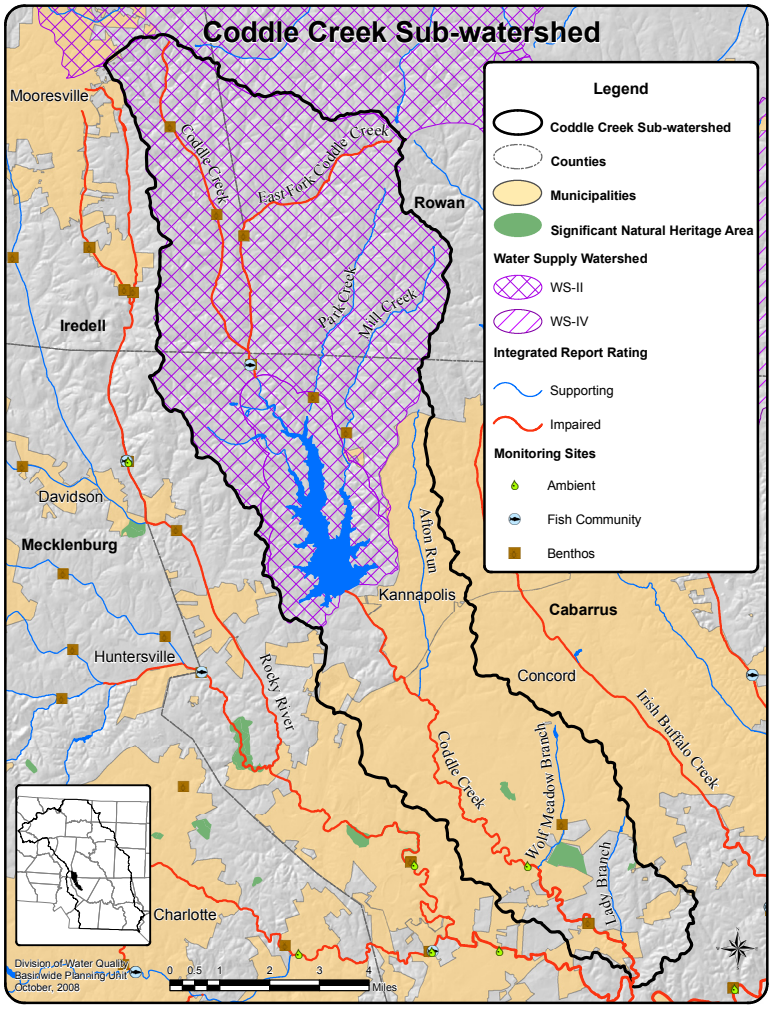
For a complete list of monitored waterbodies in the Yadkin- Pee Dee Basin see: *http://h2o.enr.state.nc.us/basinwide/Neuse/2008/documents/YAD_Use_Support_Table.pdf*

Impaired Streams

Coddle Creek [AU# 13-17-6-(0.5), 13-17-6-(5.5)]

Four benthic sites (QB310, QB311, QB312, & QB313), one fish site (QF93) and one ambient station (Q7700000) were sampled on Coddle Creek. All of the fish and benthic sites suffered from severe bank erosion and the riparian zones were disturbed at most locations. Fish site QF93 at SR1612 received a poor bioclassification and benthic site QB310 at NC49 received a Fair rating. Turbidity measurements at the ambient station exceeded the water quality standard in 16.7 percent of the measurements. This data indicate the stream above and below the Coddle Creek Reservoir (Lake Howell) is impaired for aquatic life. Impacts from agricultural stressors are more likely in the upper watershed, while urban stressors are most likely in the lower watershed. ***Stormwater best management practices (BMPs)*** and stream bank restoration should be implemented in this creek.

Figure 1. Coddle Creek Subwatershed



East Fork Coddle Creek [AU# 13-17-6-1]

East Fork Coddle Creek is in the agricultural portion of the watershed. Extreme bank erosion and habitat degradation are the primary problems in this creek. During sampling at site QB317 (rated Poor), biologists noted an abundance of worms and snails that indicate nutrient enrichment is also a concern. Potential nutrient sources should be identified and corrected. ***Stormwater best management practices (BMPs)*** and stream bank restoration should be implemented in this creek.

Streams with Notable Impacts

Mill Creek [AU# 13-17-6-5-(1)]

Like the streams listed above, Mill Creek suffers from severe bank erosion and a poor riparian zone that contribute to overall habitat degradation. Biologists noted cattle have direct access to the stream near benthic site QB321 and

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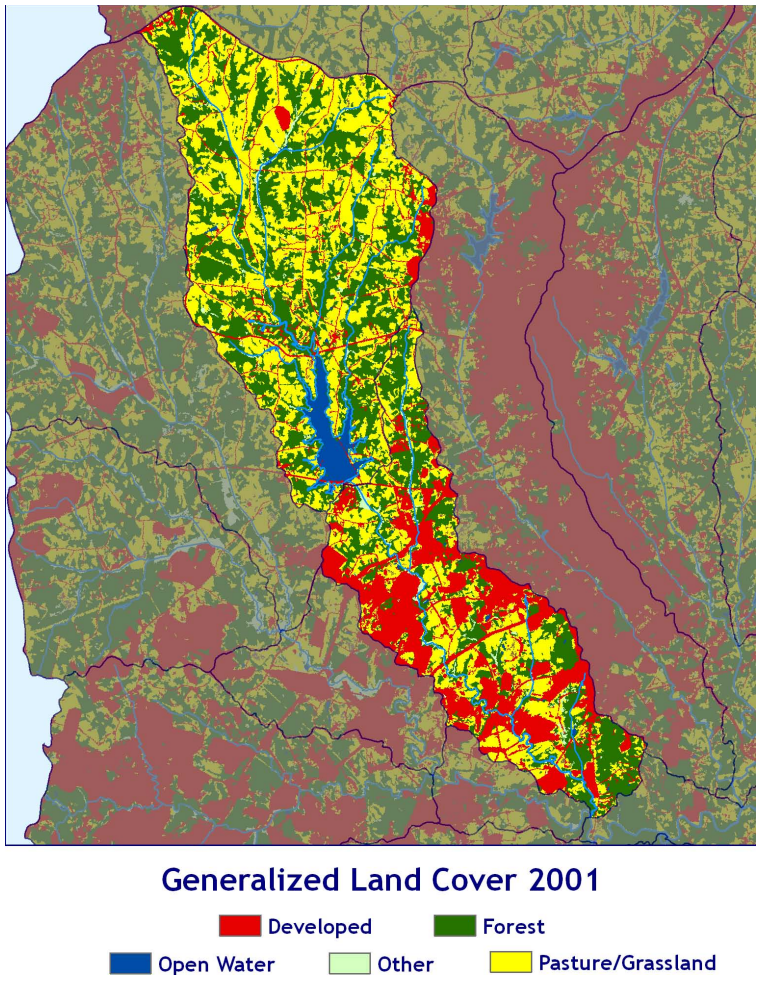
are contributing to the erosion problem. In its headwaters, urbanization may be contributing to excessive stormwater flows. Livestock access to the stream should be restricted. ***Stormwater best management practices (BMPs)*** and stream bank restoration should be implemented in this creek.

Park Creek [AU# 13-17-6-3-(2)]

Park Creek suffers from severe bank erosion and a poor riparian zone that contribute to overall habitat degradation. Stressors are likely agriculture related and, to a lesser extent, urbanization and land development. Bank stabilization projects should be undertaken.

Figure 2. Coddle Creek Subwatershed Lanc Cover



Local Initiatives

CWMTF/319 Projects in the Watershed

Project Number	Applicant	Purpose	Funding Amount
2001A-003	Cabarrus Co W&S Authority-Lake Don T. Howell Land Acq	Acquire 104 acres of land, through fee simple purchase, along Park Creek.	$361,000