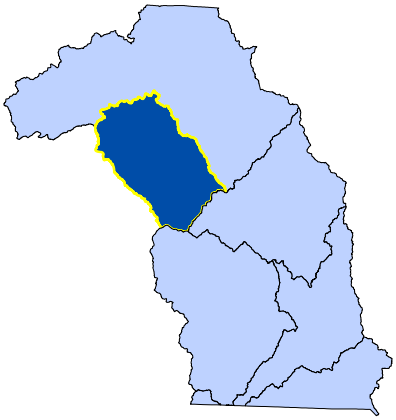


South Yadkin River

Subbasin HUC 03040102

Includes the South Yadkin River and Tributaries

Water Quality Overview

Of the monitored streams in the South Yadkin River subbasin, 47 percent are supporting for their designated uses; however, 53 percent are impaired. Of the monitored waters habitat degradation is the largest stressor to meeting Aquatic Life standards, with 51 percent of the streams impacted or impaired because of habitat degradation. Overall, benthic macroinvertebrate samples indicate an improvement in bioclassification since the 2001 samples. Turbidity violations also contribute to impairments in the Aquatic Life category, with 39 percent of monitored streams listed as impaired. Fecal coliform is the parameter of interest in the Recreation Use Support category, this bacteria accounts for 37 miles of impaired streams.

Watershed at a Glance

Counties

Alexander, Davie, Iredell, Rowan

Municipalities

Taylorsville, Harmony, Mocksville, Statesville, Troutman, Cleveland, Mooresville

Permitted Facilities

NPDES WWTP:	
Major	5
Minor	24
NPDES Nondischarge:	8
NPDES Stormwater:	
General	791
Individual	3
Phase II	0
Animal Operations:	94

Stream Summary

Total Streams:.....686 mi

Total Monitored:.....296 mi

Total Supporting:.....139 mi
Total Impaired:.....157 mi
Total Not Rated:.....0 mi
Total No Data.....390 mi

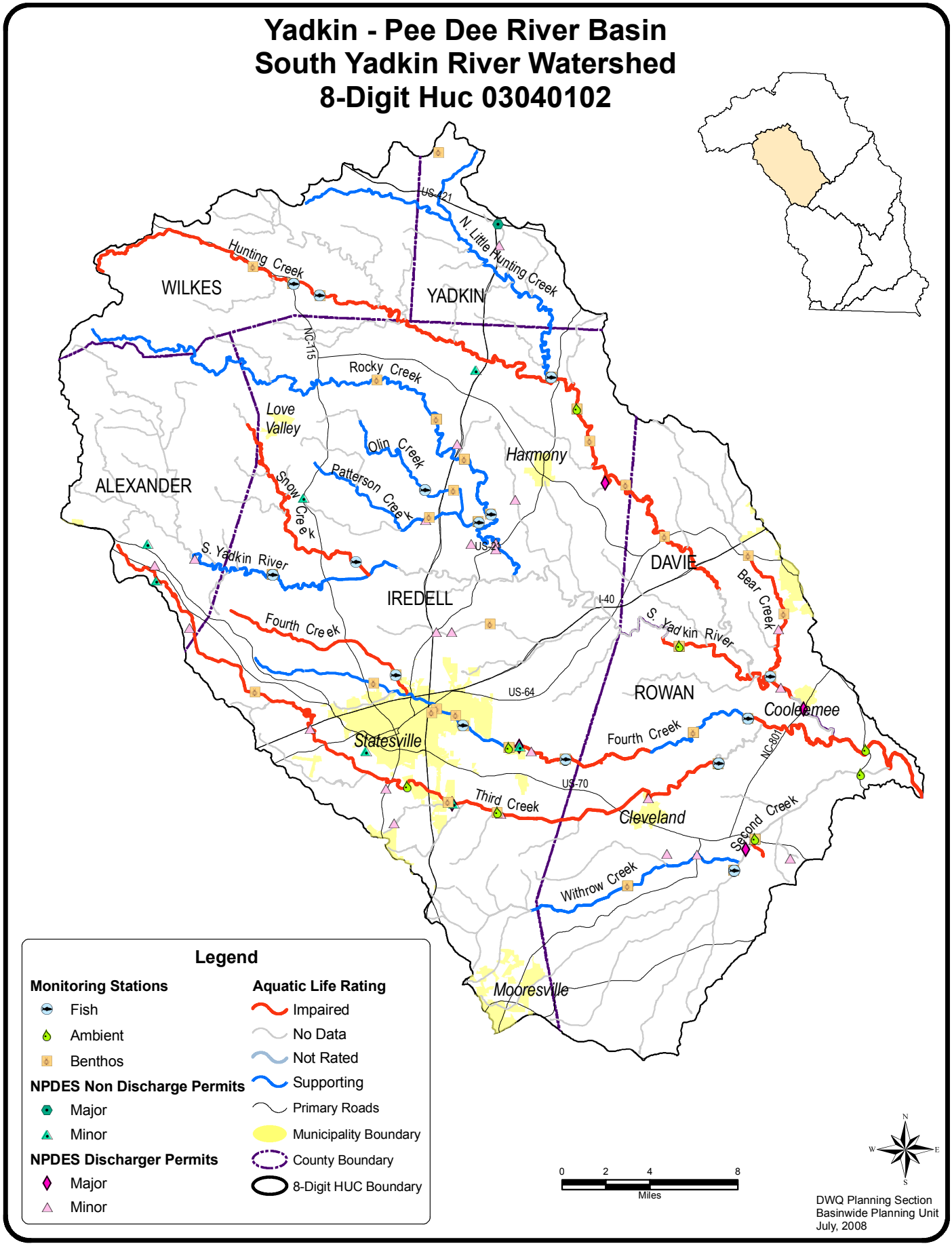
General Description

The South Yadkin River, hydrologic unit 03040102, consists of the South Yadkin River watershed and its major tributaries: Hunting, Rocky, Fourth, Third, and Second Creeks. The tributary streams constitute large watersheds in Iredell, Davie, and Rowan counties. Except for a very small portion of the headwater sections of Rocky, Hunting and North Hunting Creeks (in Wilkes and Yadkin counties), which are located in the Eastern Blue Ridge Foothills ecoregion, the majority of the subbasin is located in the Southern Outer Piedmont and Northern Inner Piedmont ecoregions. The watershed includes the I-40 and US 70 corridors from Salisbury westward. The largest metropolitan area in this subbasin is Statesville. Land use is mainly forest and agriculture.

Third Creek and Fourth Creek are two of the largest streams in the watershed and originate upstream of Statesville, in an area of agricultural land use. The streams flow east southeastward across Iredell County through the city and receive urban runoff from several small tributaries. Downstream of the city, the catchment is a combination of forest, agricultural and residential land use. The city of Statesville is permitted to discharge treated wastewater up to 6.0 MGD in Fourth Creek and 4.0 MGD in Third Creek.

There are over 25 major and minor dischargers in this hydrologic unit. Several have permitted flows greater than one million gallons per day (MGD). Most facilities with permitted flows greater than 1 MGD discharge to the South Yadkin River, Hunting, Second, Third, and Fourth Creeks. All streams in the South Yadkin River hydrologic unit flow into High Rock Lake.

Figure 2-1. South Yadkin River HUC 03040102



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 2-1. shows monitoring station locations and impaired streams for the South Yadkin River subbasin.
Appendix 2-A provides descriptions of Use Support ratings for all monitored waterbodies in the subbasin
Appendix 2-B. provides a summary of each ambient data monitoring station.
Appendix 2-C provides summaries of biological and fish assessment monitoring sites.

General Biological Health

Many of the streams in this subbasin have moderate to severe bank erosion and are suffering from shifting sandy substrates, channelization, and sedimentation. During benthos sampling most of the streams were turbid to slightly turbid.

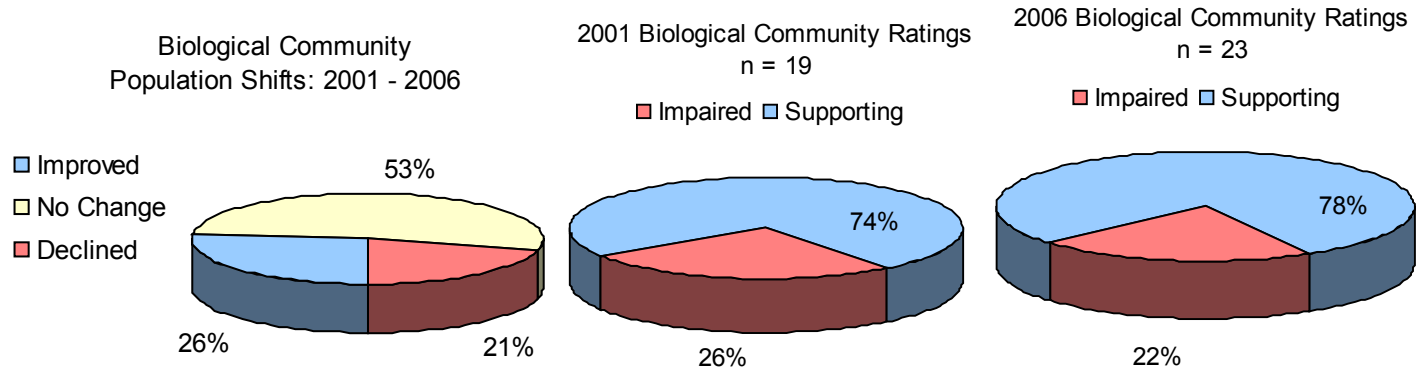
Twelve sites were sampled for benthic macroinvertebrates 2006. All the streams sampled for benthos were classified using Piedmont criteria, except for Hunting Creek at NC 115 (mountain ecoregion). Among these, four sites (Patterson Creek, Fourth Creek, North Second Creek at SR 1526, and North Second Creek at US 70) showed improved bioclassifications compared with 2001 sampling, six sites retained the same bioclassification as 2001, and two sites (Hunting Creek at SR 2115 and North Little Hunting Creek) showed degraded bioclassifications compared to 2001. None of the sites improved or degraded more than one level of bioclassification.

Eleven sites were sampled to evaluate fish populations. One site, Olin Creek, showed an improved bioclassification, four sites retained their 2001 classification, and two sites (Hunting Creek at NC 115 and North Little Hunting Creek) showed degraded classification compared to 2001. Four additional fish sites were added as basinwide sites: Snow Creek, Rocky Creek, Patterson Creek, and Bear Creek.

The watersheds in the northern half of the watershed (north of Statesville) all have Good or Excellent water quality based on benthic macroinvertebrates. The fish communities generally supported the benthos findings with the exception of South Yadkin River and North Little Hunting Creek. The number of fish and the number of fish species collected at these two sites decreased and the number of tolerant fish species collected increased. Conversely, the benthos data showed an increase in the number of intolerant macroinvertebrate species.

The watersheds in the southern half of the watershed (Third Creek, Fourth Creek, North Second Creek, and Withrow Creek) support more degraded benthic and fish communities than the upper South Yadkin River watershed. The fish community reflected less species diversity than the benthic community, especially in Fourth and Third Creeks, which were rated Poor by the fish but Good or Excellent by the benthos. This may be explained by the lack of good instream habitats in these very sandy streams.

Figure 2-2. Biological Health Summary

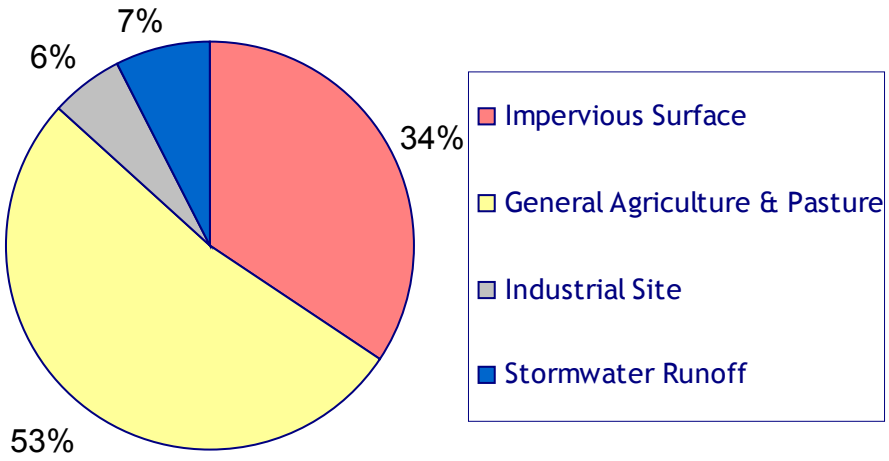


The Yadkin River basin was experiencing moderate to severe drought conditions in 2001, which had the potential to reduce the impacts from nonpoint sources and magnify the impacts from point source discharges. This below average flow regime in the basin should be considered when looking at changes in the 2006 monitoring cycle.

Habitat Degradation

The severe bank erosion, shifting sandy substrates, channelization, and sedimentation described above, point to an overall pattern of habitat degradation in the watershed. This habitat degradation is reflected in many impaired streams. 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 watershed make streams highly vulnerable to these stressors. Figure 2-3 shows the potential sources contributing to habitat degradation in this subbasin.

Figure 2-3. Potential Sources Contributing to Habitat Degradation



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 2-4. 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 in their chosen watershed.

Figure 2-4. Watershed Planning

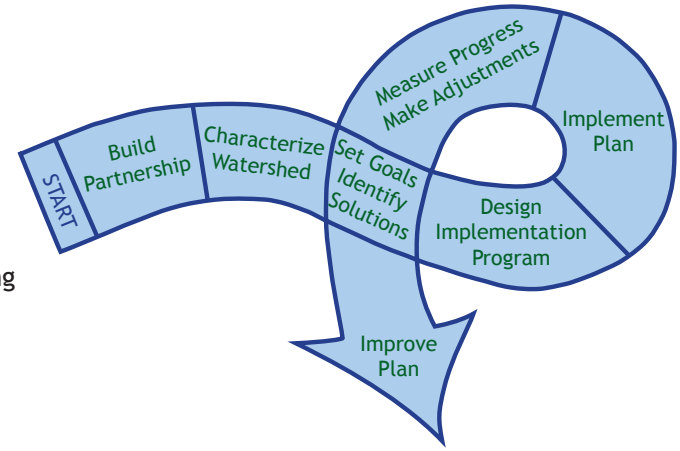


Table 2-1. Streams Impaired or Impacted by Habitat Degradation in the South Yadkin River

AU Number	Name	Subbasin	Miles	Classification	Impaired	Impacted	Potential Source
12-108-(5.5)	South Yadkin River	03-07-06	14.6	WS-IV	-	X	Agriculture, Impervious Surface
12-108-11-3-3	Olin Creek	03-07-06	9.7	C	-	X	Agriculture
12-108-16-6	North Little Hunting Creek	03-07-06	23.8	WS-III	-	X	Agriculture
12-108-18-(3)	Bear Creek	03-07-06	8.6	WS-IV	X	-	Agriculture, Impervious Surface
12-108-20-3	Morrison Creek	03-07-06	7.8	C	-	X	Agriculture, Impervious Surface
12-108-20-4a	Third Creek	03-07-06	16.8	C	X	-	Impervious Surface, Agriculture

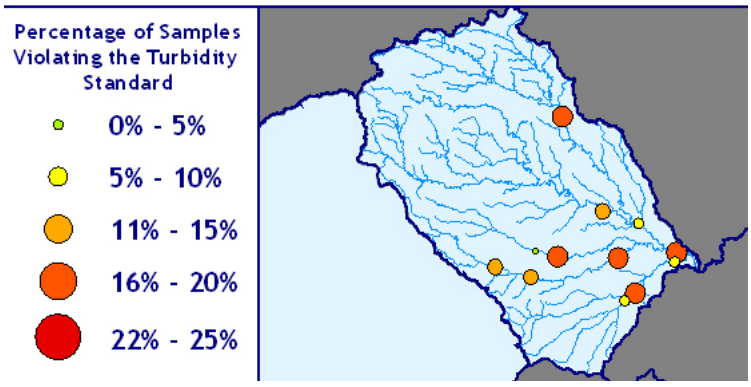
AU Number	Name	Subbasin	Miles	Classification	Impaired	Impacted	Potential Source
12-108-20-4b	Third Creek	03-07-06	22.1	C	X	-	Agriculture, MS4 NPDES, Impervious Surface
12-108-20a1	Fourth Creek	03-07-06	10.2	C	X	-	Agriculture, Impervious Surface, Industrial Site
12-108-20a3	Fourth Creek	03-07-06	7.8	C	X	-	WWTP NPDES, Stormwater Runoff, MS4 NPDES
12-108-20c	Fourth Creek	03-07-06	5.5	C	X	-	Stormwater Runoff
12-108-21-3	Withrow Creek	03-07-06	11.2	C	-	X	Agriculture
12-108-9-(0.6)	Snow Creek	03-07-06	12.5	WS-IV	X	-	Agriculture

Ambient Water Quality

Turbidity

Turbidity violations are common in the South Yadkin River watershed (Figure 2-5). 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 beds (reducing fish survival and growth rates), harm 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 treatment systems, and fill reservoirs. (USEPA, 1999 and Waters, 1995). Sand and/silt were noted in the stream substrate at many of the biological sample sites in the South Yadkin River subbasin.

Figure 2-5. Turbidity Violations



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 South Yadkin River watershed. It appears, however, violations are highest in the agricultural areas. Violations are lowest in the upper watershed where land use is predominantly forest.

It is likely that a combination of human caused land disturbances and natural erosion are causing the majority of turbidity violations in this watershed, human causes being the leading contributor. To appropriately address turbidity and sediment problems in the South Yadkin 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. A ***turbidity TMDL*** has been completed for Fourth Creek, a major tributary to the South Yadkin River.

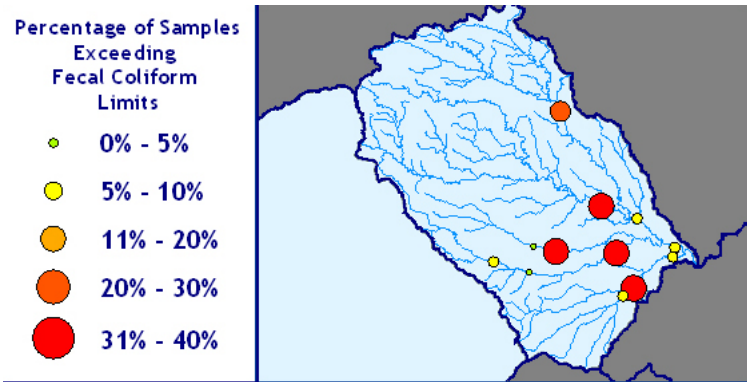
Table 2-2. Monitored Streams Impaired or Impacted by Turbidity in the South Yadkin River

AU Number	Name	Subbasin	Miles	Classification	Impaired	Impacted	Potential Sources
12-108-(14.5)	South Yadkin River	03-07-06	9.5	WS-IV	X	-	Unknown
12-108-(19.5)b	South Yadkin River	03-07-06	5.3	C	X	-	Stormwater Runoff
12-108-16-(0.5)	Hunting Creek	03-07-06	49.3	WS-III	X	-	Agriculture, Mining
12-108-20-4a	Third Creek	03-07-06	16.8	C	X	-	Impervious Surface, Agriculture
12-108-20-4b	Third Creek	03-07-06	22.1	C	X	-	Agriculture, MS4 NPDES, Impervious Surface
12-108-20a3	Fourth Creek	03-07-06	7.8	C	X	-	WWTP NPDES, Stormwater Runoff, MS4 NPDES
12-108-21b	Second Creek (North Second Creek)	03-07-06	3.4	C	X	-	Unknown

Fecal Coliform Bacteria

Fecal Coliform concentrations often exceeded 400 colonies/100ml in the South Yadkin River Watershed (Figure 1-6). 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 2-6. FCB Violations



An analysis of all ambient water quality stations in the South Yadkin River watershed shows a downward trend in fecal coliform bacteria concentrations from 2002-2006. Rainfall, which influences bacteria concentrations, did not appear to be driving this trend. Therefore, the decrease is likely due to implementation of agricultural BMPs and sewer infrastructure improvements. However, concentrations remain elevated and further work remains to be done. Additional funds will be necessary to continue implementing these improvements. A ***fecal coliform TMDL*** has been completed for Fourth Creek, a major tributary to the South Yadkin River.

Table 2-3. Monitored Streams Impaired or Impacted by Fecal in the South Yadkin River

Assessment Unit	Name	Subbasin	Classification	Miles	Impaired	Impacted	Source
12-108-(14.5)	South Yadkin River	03-07-06	WS-IV	9.5	X	-	Agriculture
12-108-20-4b	Third Creek	03-07-06	C	22.1	X	-	Agriculture, MS4 NPDES
12-108-20a2	Fourth Creek	03-07-06	C	5.8	-	X	Unknown

Other Water Quality Concerns

Low pH readings were recorded in Hunting Creek. Two general stormwater permits have been issued for a quarry and asphalt paving operation in the stream headwaters, but no data exists linking the industrial facilities to the pH readings. Further investigation is needed.

Table 2-4. Other Stressors Impacting Monitored Streams

Assessment Unit	Name	Subbasin	Classification	Miles	Impaired	Stressor	Source
12-108-16-(0.5)	Hunting Creek	03-07-06	WS-III	49.3	X	Low pH	Unknown

See: ***Yadkin Ambient Monitoring System Report*** and ***Yadkin Basinwide Assessments*** for more information regarding specific monitoring sites.

Population and Land Use

Water quality is generally best in the forested and sparsely populated area in the northwestern portion of the watershed. Impervious surfaces and the highest population densities are located in the area in and around Statesville. The most significant impacts to water quality occur in this portion of the basin and demonstrate the negative affect urban and suburban development can have on aquatic resources. These impacts are reversible and avoidable by effectively implementing ***watershed restoration plans*** and adopting ***land use ordinances*** that protect aquatic resources.

Agricultural land uses in the remainder of the watershed appear to have less impact than the Statesville area, major exceptions being Hunting and Snow Creeks. Agricultural BMPs are a priority in these watersheds. The ***North Carolina's Agriculture Cost Share Program*** is an effective program to use for BMP implementation.

Because much of the land in this hydrologic unit is forest and agriculture, DWQ believes land conservation accompanied with stream restoration projects can be very successful. Stream restoration projects can easily exceed $500,000 per mile. Protection and conservation projects many cost one tenth of that. (Haupt, 2002 and Weinkam, 2001) 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.

Figure 2-7. Population Dot-Density Map

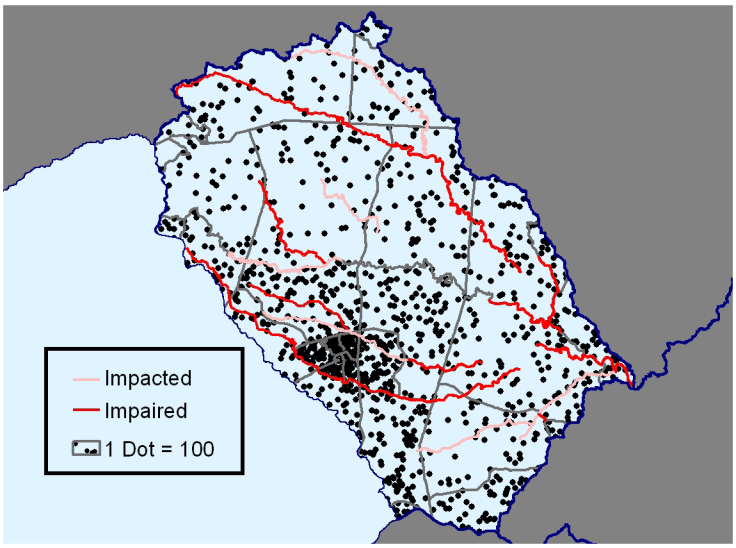
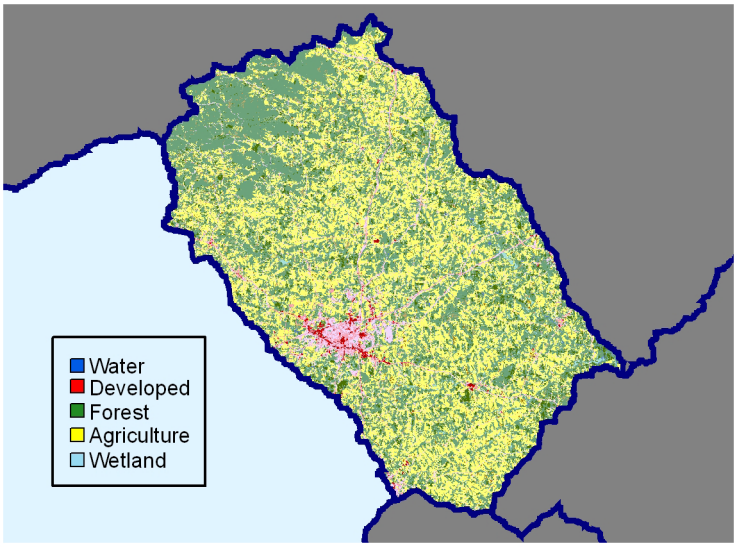


Figure 2-8. Land cover



Clean Water Management Trust Fund

Created in 1996, the ***Clean Water Management Trust Fund*** (CWMTF) makes grants to local governments, state agencies and conservation non-profits to help finance projects that specifically address water pollution problems. The fund has made several investments in the South Yadkin River Watershed. Figure 2-9 shows the distribution of projects to date in the watershed and Table 2-5, includes a list of recent projects and their cost. These projects include several land acquisitions. As discussed above, DWQ encourages further investment in the upper reaches of this watershed.

Figure 2-9. CWMTF Projects

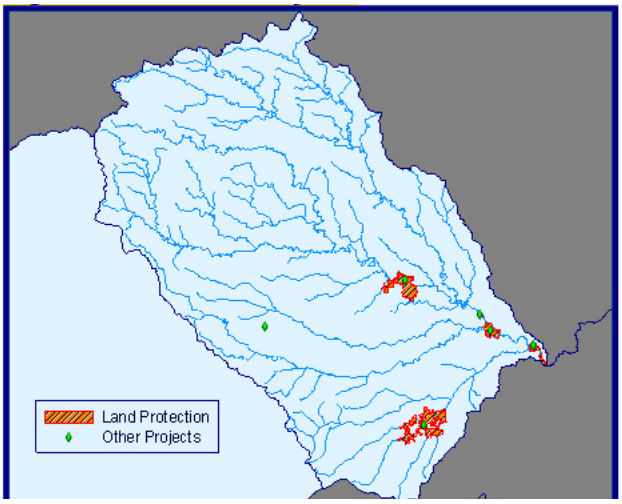


Table 2-5. CWMTF Funded Projects In The South Yadkin River Watershed (9/1/01-8/31/06).

Project Number	Application Name	Proposed Project Description	Amount Funded
2001B-011	LandTrust for Central North Carolina- Acquisition/ South Yadkin River tributaries	Provide funds to acquire the riparian, floodplain, & wetland portions of 6 tracts (up to 1200 ac) through fee simple purchase along the South Yadkin River, Third & Fourth Creeks, & Yadkin River. Total of 1900 ac to be protected with all funding sources.	$1,913,000
2004B-018	LandTrust for Central North Carolina- Acq/ Adams Tract, South Yadkin	Protect through conservation easements 2,289 acres along the South Yadkin River. CWMTF and Farmland Preservation Program funds to purchase easement on 604 acres and landowner to donate permanent conservation easements on additional 1,750 acres.	$465,000
2005A-022	NC Wildlife Resources Commission - Acq/ Kannapolis Tract, Second and Sloan Creeks	Protect through fee simple purchase 2,842 acres, 96% of which are riparian, along Second and Sloan Creeks (WS II). The tract will become part of the Game Lands program.	$2,522,000

This list does not include:
regional or statewide projects that were in multiple river basins, or projects that were funded and subsequently withdrawn.

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 following TMDLs have been completed in the South Yadkin River watershed and should be adopted by all residents and local governments within the watershed.

Table 2-6. Finalized TMDL's in the South Yadkin River Watershed

Waterbody	Pollutant	Link	Final TMDL Date
Fourth Creek	Fecal Coliform	*Final TMDL*	Dec. 19, 2001
Fourth Creek	Turbidity	*Final TMDL*	Nov. 22, 2004

High Rock Lake TMDL

Although it is not located within this hydrologic unit, all streams in the South Yadkin River watershed drain to High Rock Lake. High Rock Lake is impaired due to violations of the turbidity and chlorophyll *a* standards. Therefore, DWQ has initiated a TMDL development process for the lake. As discussed above, turbidity and sedimentation are a significant water quality issue in the South Yadkin River watershed. The sediment generated in this watershed contributes directly to the water quality impairment observed in High Rock Lake. In addition to sediment, runoff from the South Yadkin River watershed delivers substantial nutrients to High Rock Lake that lead to chlorophyll *a* violations. Residents and government agencies in the Yadkin River headwaters should be active in the TMDL development process for the lake and continue implementing nonpoint source pollution reduction strategies.

Local Initiatives

Cooperative Conservation Partner Initiative

The Cooperative Conservation Partnership Initiative (***CCPI***) is a voluntary program established to foster conservation partnerships that focus technical and financial resources on conservation priorities in watersheds of special significance. See the ***Rapid Watershed Assessment*** completed in the South Yadkin River subbasin for more information.

Section 319-Grant Program

The ***Section 319 Grant Program*** was established to provide funding for efforts to reduce nonpoint source (NPS) pollution, including that which occurs though stormwater runoff. The U.S. Environmental Protection Agency provides funds to state and tribal agencies, which are then allocated via a competitive grant process to organizations to address current or potential NPS concerns. Each fiscal year North Carolina is awarded nearly 3 million dollars to address nonpoint source pollution through its 319 Grant Program. Thirty percent of the funding supports ongoing state nonpoint source programs. The remaining seventy percent is made available through a competitive grants process.

Table 2-7. 319 Project in the South Yadkin River Watershed

Fiscal Year	Contract Number	Name	Description	Agency	Funding
2003	EW04007	Fourth Creek TMDL Implementation Project, Phase I	TMDL Implementation	Carolina Land and Lakes, Inc.	$200,000

North Carolina Agriculture Cost Share Program

Nonpoint source pollution is a significant source of stream degradation in the South Yadkin River subbasin. 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 2-8 shows the number of projects implemented and in the South Yadkin River Hydrologic Unit and the dollar amount invested. Table 2-9 shows the water quality benefits realized from that investment.

Table 2-8. ACSP Project Expenditures In the South Yadkin River

	Erosion Reduction/ Nutrient Loss Reduction in Fields			Sediment/Nutrient Delivery Reduction from Fields			Stream Protection from Animals			Proper Animal Waste Management		
12-digit HU	Total Implemented		Cost	Total Implemented		Cost	Total Implemented		Cost	Total Implemented		Cost
030401020100	52.2 ac.		$9,530	3.79 ac.		$5,221	34 units	11,035 LF	$88,923	11 units		$118,812
030401020101							2 units	2,576 LF	$8,573	1 unit		$24,750
030401020200	208.22 ac.		$31,812	187.1 ac.		$3,648	32 units	16,121 LF	$101,610	11 units		$87,590
030401020300					1 unit	$78	36 units	29,550 LF	$51,218	3 units		$15,627
030401020400	1.25 ac.		$2,216				14 units	8,038 LF	$39,265	3 units		$13,729
030401020500				4.25 ac.	2 units	$10,410	15 units	7,148 LF	$43,857	2 units		$1,463
Total			$43,558			$19,357			$333,446			$261,971

Table 2-9. NC ASCP Water Quality Benefits

	Soil Saved (tons)	Nitrogen Saved (lbs)	Phosphorus Saved (lbs)	Waste-N Managed (lbs)	Waste-P Managed (lbs)
030401020100	396	22,709	18,391	183,320	205,233
030401020101					
030401020200	5,964	28,492	3,358	132,437	123,164
030401020300	106	3,865	2,323	17,274	3,442
030401020400	1,027	3,844	2,320	1,192,282	
030401020500	146	13,725	310	6,240	3,770
Total	**7,638**	**72,635**	**26,702**	**1,531,553**	**335,609**

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