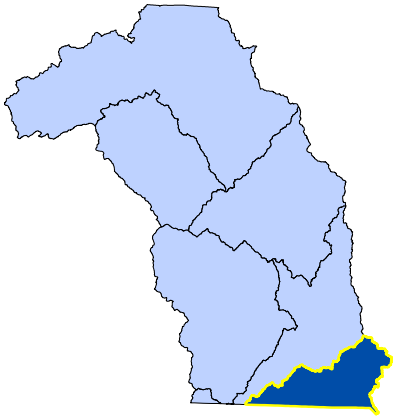


Pee Dee River

Subbasin HUC 03040201

Water Quality Overview

Of the monitored streams 53 percent are supporting their uses and 10 percent are impaired in the aquatic life category. The current impairments resulted from samples taken during the mid-1990s. Recent sampling efforts have not resulted in any new impairments to this subbasin. Habitat degradation, nutrient enrichment and low dissolved oxygen are aquatic life stressors that need to be addressed to prevent future impairments.

Watershed at a Glance

Counties

Anson, Richmond, Scotland

Municipalities

Hamlet, Hoffman, Rockingham, Wadesboro

Permitted Facilities

NPDES WWTP:	
Major	4
Minor	2
NPDES Nondischarge:	5
NPDES Stormwater:	
General	22
Individual	2
Phase II	0
Animal Operations:	19

Stream Summary

Total Streams:.....329 mi
.....17.5 ac
Total Monitored:.....138.6 mi
.....12.2 ac
Total Supporting:.....73.3 mi
.....12.2 ac
Total Impaired:.....23.9 mi
Total Not Rated:.....41.4 mi
Total No Data:.....190.4 mi
.....5.3 ac

General Description

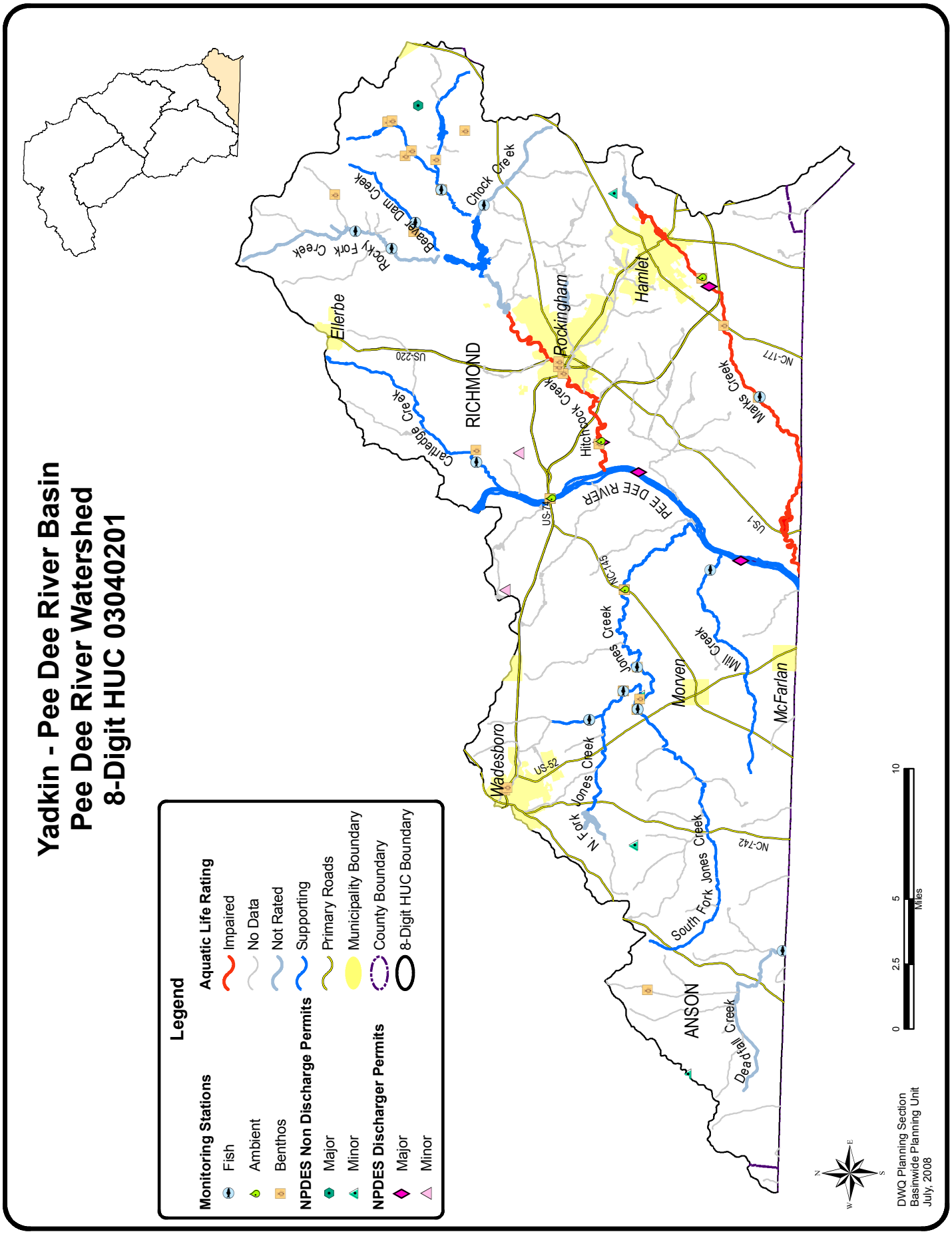
The Pee Dee River hydrologic unit (HUC) includes the Pee Dee River and its tributaries below Blewett Falls Lake. Much of Anson and Richmond Counties are included in this subbasin. Rockingham, Hamlet, and a portion of Wadesboro are the largest urban areas. Most of the land cover is forest.

The subbasin straddles the divide between the piedmont and coastal plain and containing portions of three ecoregions. Far western portions of the subbasin fall within a Triassic Basin, which consists of shale, sandstones, mudstones, siltstones, and conglomerates. Streams often experience low flow as a result of clay soils with little permeability. Stream substrates are generally composed of sands and clays. The remainder of much of the western half of the HUC is in the Carolina Slate Belt. Boulders and cobbles compose much of the stream substrate. Most of the eastern half of the subbasin is in the Sand Hills, a hilly region composed primarily of sands and clays. Permeable sandy soils allow for a large capacity for infiltration; therefore, streams in the ecoregion rarely dry or flood. Sands make up much of the substrate for streams in the region.

Several stream corridors, watersheds, and ecosystems in Richmond County were identified by the North Carolina Natural Heritage Program as significant.

- The upper portions of Rocky Fork, Beaverdam, and Hitchcock Creeks drain the western section of the Sand Hills Game Land (SGL) in Richmond County. SGL is composed of large areas mostly in Richmond and Scotland Counties. SGL contains an ecosystem that is nearly intact, supports a high diversity of flora and fauna, and provides a population pool for longleaf pine.
- The lower 1.5 miles of Hitchcock Creek falls within the Pee Dee River Megasite, and is significant for flowing from the coastal plain to the piedmont (only one of four North Carolina streams to do this), cutting a relatively deep valley before its confluence with Pee Dee River. A floodplain forest is also found on this lower section of Hitchcock Creek.
- Marks Creek shares the unusual characteristic with Hitchcock Creek of flowing from the coastal plain to the piedmont. The lower portion has few road crossings, affording some protection to the beech-dominant hardwood forest in the stream corridor. The coastal plain section of Marks Creek includes a large area of swamp forest dominated by black gum.
- Whites Creek Headwaters includes a large contiguous longleaf pine forest. Water from the drainage area flows into South Carolina and eventually into Pee Dee River.

Figure 6-1. Pee Dee River Watershed HUC 03040201



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 6-1. shows monitoring station locations and impaired streams for the Pee Dee 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 basinwide collections were made in 2006. Nine sites were sampled for fish only, two for macroinvertebrates only, and two were sampled for both macroinvertebrates and fish. Fish sites in the Sand Hills ecoregion are not rated because of naturally low flows. Otherwise for fish sites there was one rating of Excellent, two Good, two Good-Fair, and one Poor. For benthic sites three rated as Good, one as Good-Fair.

The watershed above the fish site on Cartledge Creek at SR 1142/Richmond County drains a portion of Ellerbe at its headwaters. There was little change in the fish community at the site between 2001 and 2006.

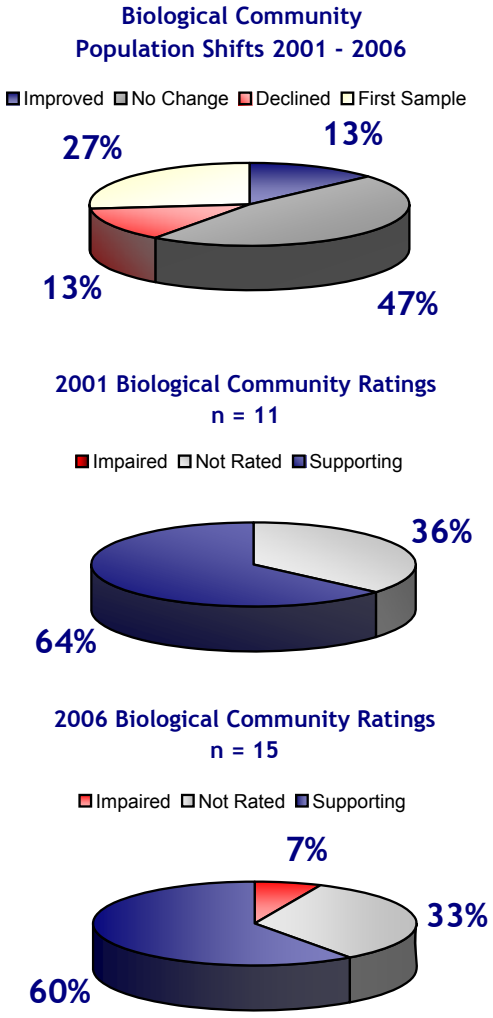
The upper portion of the Hitchcock watershed was sampled at four sites for fish in 2006; one of those four sites was also sampled for macroinvertebrates. None of the fish sites received ratings because of naturally low flow. The ecosystem, however, appeared healthy at these sites. The benthic data for three sampling events (1996, 2001, and 2006) at Hitchcock Creek at SR 1486/Richmond County indicate stable water quality. Overall, biological data from the upper Hitchcock watershed indicate constant to slightly improving water quality.

In contrast to the upper portion of the watershed, the macroinvertebrate site on Hitchcock Creek at SR 1109/Richmond County in the lower portion of the watershed has shown a marked improvement over three sampling events in 1996, 2001, and 2006. The site is about 1.5 stream miles above the confluence with Pee Dee River. Improving water quality at the site coincides with the loss of discharge to the stream from Laurel Hill Paper Company beginning in February 1998. Bioclassifications for the site have improved from Poor in 1996, to Good-Fair in 2001, and to Good in 2006.

The watershed above the fish site on Bailey Creek at SR 1811/Anson County includes western portions of Wadesboro. Between sampling events at the site in 1996 and 2001 there was very little change in the number of species collected and in NCIBI values; the site was rated Good for both of those years. A marked drop in the number of species collected and in the NCIBI value resulted in a bioclassification of Good-Fair for 2006. Low flow in 2006 may be influencing the results for the latest collection.

The fish site on South Fork Jones Creek at SR 1821/Anson County is within one stream-mile of the confluence with North Fork Jones Creek. There is a marked difference between the fish collections made in 2001 and 2006. Three fewer species collected and a 10-point drop in the NCIBI value resulted in a drop of two classifications between 2001 and

Figure 6-2. Biological Health Summary



2006, from Excellent to Good-Fair. As with Bailey Creek, the decline in the fish community at South Fork Jones Creek may be due to low-flow conditions sometime during the year as indicated by the loss of several species of sunfish, which inhabit pools.

A new fish site was established on Mill Creek at SR 1826/Anson County, and rated as Excellent for 2006. The site was the most species-rich for all fish sites sampled in 2006, and is a new regional fish reference site.

Marks Creek at SR 1104/Richmond County has been sampled for fish in 2001 and 2006. Along with other Sand Hills fish sites, the site was not rated. There was a gain in the number of species collected, from 13 in 2001 to 21 in 2006. High abundance and diversity may be due to enrichment from Hamlet WWTP. Specific conductance at the site is elevated for a Sand Hills stream.

Deadfall Creek at SR 1109/Anson County was sampled for fish for the first time in 2006. The site received a rating of Poor. A lack of diverse habitat and low flow at the site are implicated for low numbers of individuals and species collected.

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

Several streams are impacted by habitat degradation. 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 area make streams highly vulnerable to these stressors.

Many tools are available to address habitat degradation including; ***urban stormwater BMPs, agricultural BMP***s, ordinance/rule changes at the local, state, and federal levels, volunteer activism, and education programs. Figure 6-3 illustrates a general process for developing ***watershed restoration plans***. This process can and should be applied to streams suffering from habitat degradation. Organizations have begun this process in a few watersheds in the Yadkin River Headwaters. Similar efforts on all streams listed in Table 6-1 are necessary. Interested parties should contact the ***Basinwide Planning Program*** to discuss opportunities to begin the planning and restoration process in their chosen watershed.

FIGURE 6-3

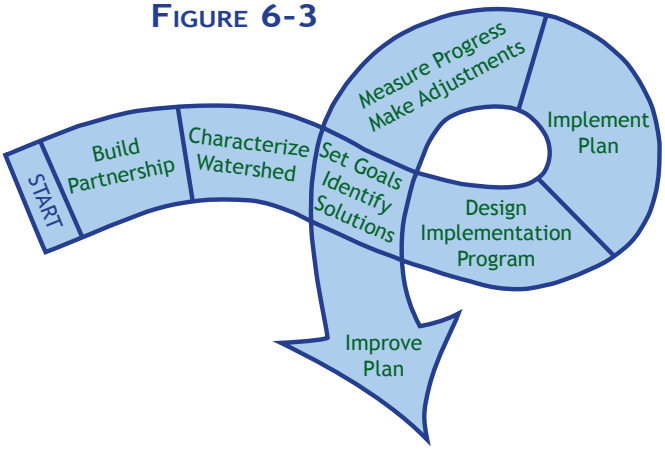


Table 6-1. Stressors in the Pee Dee River Watershed

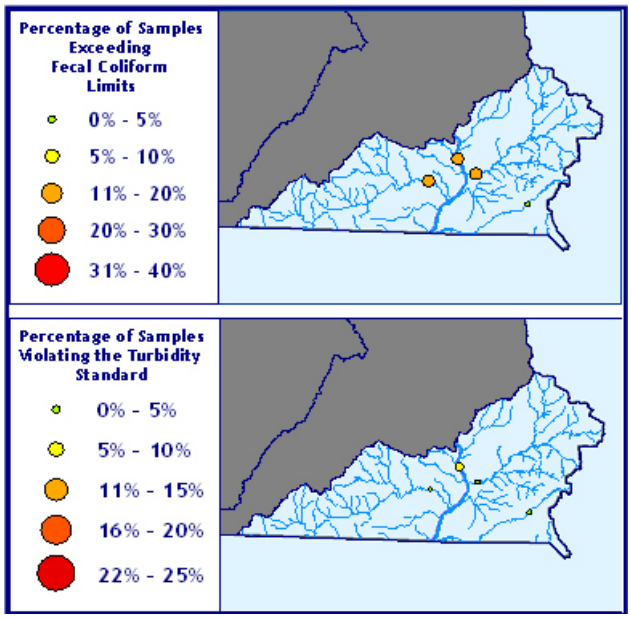
Assessment Unit	Name	Subbasin	Class.	Stressor	Impaired	Impacted	Potential Source	Length Miles
13-(34)a	Pee Dee River	03-07-16	C	Mercury	X		Impoundment	6.3
				Habitat Degradation			Impoundment	
13-39-(1)	Hitchcock Creek (McKinney Lake, Ledbetter Lake)	03-07-16	WS-III	Mercury	X		Impoundment	10.0
13-39-(10)	Hitchcock Creek (Midway Pond, Steeles Mill Pond)	03-07-10	C	Low pH		X	Natural Conditions	11.3
13-42-1-(0.5)	North Fork Jones Creek	03-07-17	C	Habitat Degradation		X	Natural Conditions	7.4
							Impoundment	
13-42-1-3	Bailey Creek	03-07-17	C	Nutrient Impacts		X	Impervious Surface	2.0
				Habitat Degradation			Agriculture/Pasture	
							Natural Conditions	
13-42-2	South Fork Jones Creek	03-07-17	C	Habitat Degradation		X	Agriculture/Pasture	15.0
							Natural Conditions	
13-45-(2)a	Marks Creek (Boyds Lake, City Lake, Everetts Lake)	03-07-16	C	Low Dissolved Oxygen		X	Natural Conditions	5.4
				Low pH			WWTP NPDES	
13-39-12-(7.5)	Falling Creek	03-07-16	WS-III; CA	Aquatic Weeds	X			0.6
							Total	57.4

Ambient Water Quality

Fecal Coliform Bacteria

Fecal coliform concentrations often exceed 400 colonies/100ml. in the Pee Dee River (Figure 6-4). 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. BMPs similar to those mentioned in the Habitat Degradation section can also be used to reduce fecal coliform contamination.

Figure 6-4. Turbidity and FCB Violations



Nutrient Enrichment

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 (NH_3-N), total Kjeldahl nitrogen (TKN) and nitrite+nitrate nitrogen (NO_2+NO_3-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 NH_4OH, a form toxic to fish and other aquatic organisms. Nutrient inputs also influence dissolved oxygen concentrations in streams.

Dissolved oxygen is one of the most important of all the chemical measurements. Dissolved oxygen provides valuable information about the ability of the water to support aquatic life and the capacity of water to assimilate pollution. Concentrations less than 4.0 mg/L can be problematic. Consistently low concentrations of dissolved oxygen can point to excessive wastewater discharges or nutrient rich runoff, although sometimes low dissolved oxygen can occur naturally in and near swamp waters.

Several streams in this subbasin suffer from low dissolved oxygen. Because this is a transitional area between the piedmont and sandhills/coastal plain, some of the low dissolved oxygen measurements may be natural (Hitchcock Creek). However, biologists identified excessive algal growth in some streams that indicate the dissolved oxygen values are human induced (Bailey and Marks Creeks). Most sources of nutrient enrichment in this hydrologic unit are agricultural runoff and waste water treatment plants. DWQ will continue to work with treatment plant operators to reduce nutrient impacts. Agricultural inputs can be addressed through the ***Agriculture Cost Share Program.***

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

Population and Land Use

The human population is clustered around Rockingham, Hamlet, and Wadesboro. Impervious surface is highest in these areas. The rest of the watershed is sparsely populated and characterized by large tracts of forest and agriculture lands.

Stream impacts roughly follow the population density and land use patterns. They occur in the eastern portion of the watershed near Rockingham (Figures 6-5 & 6-6). ***Urban Stormwater*** and ***Agricultural BMPs*** are needed in these watersheds. The remainder of the watershed offers many opportunities for ***protecting and conserving stream buffers and natural areas*** that will prevent stream degradation in the long term.

Figure 6-5. Population Density in 2000

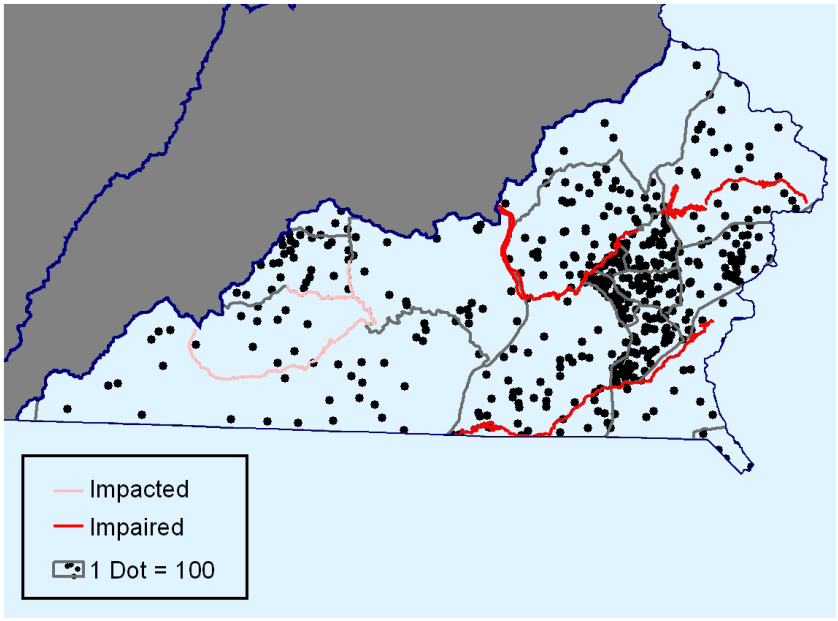
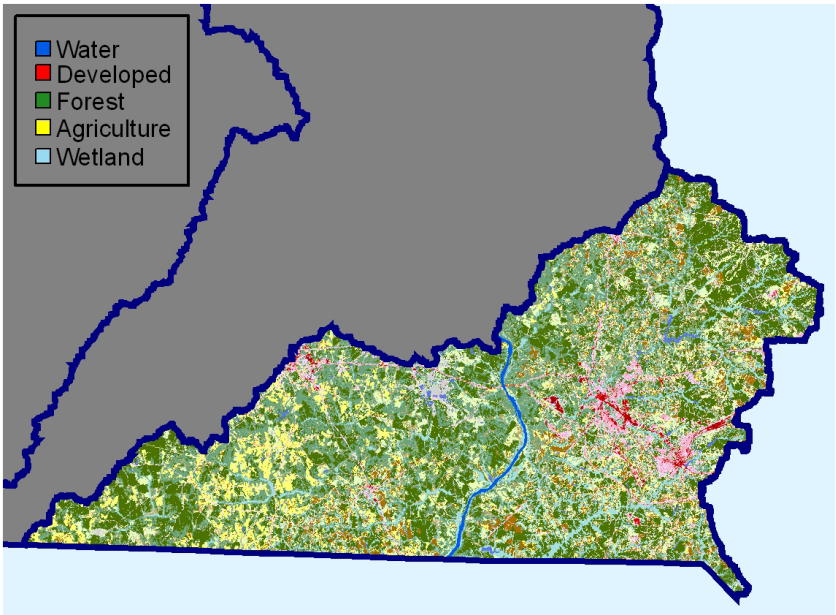


Figure 6-6. Land Cover



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. Figure 6-7 shows the distribution of projects to date in the watershed and Table 6-2, includes a list of projects and their cost. These projects include land acquisitions, capital improvements to wastewater and stormwater infrastructure, and stream restoration planning.

Figure 6-7. CWMTF Projects

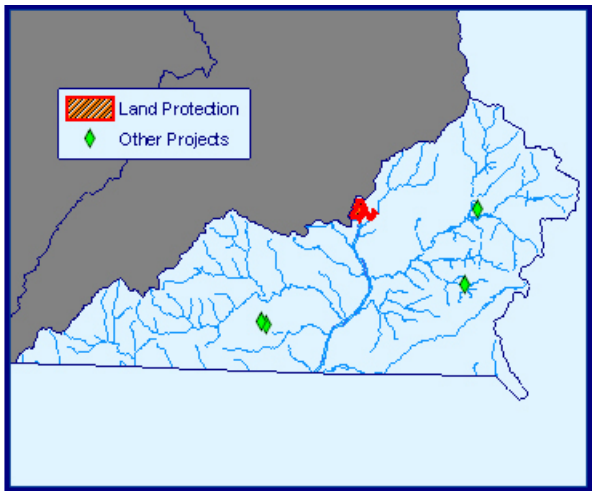


Table 6-2. CWMTF Funded Projects (9/1/2001-8/31/2006)

Project Number	Application Name	Proposed Project Description	Amount Funded
2002A-505	Morven, Town of, - Jones Creek Sewer System Rehabilitation	Replace 10 manholes and inspect sewer lines with video along Mill and Jones Creek.	$63,000
2003A-808	Resource Institute, Inc.- Plan./ Hitchcock Creek	Conduct a watershed assessment in the Hitchcock Creek watershed to determine stream restoration needs. Includes inventory of 91 miles of stream, erosion indexing, site selection and prioritization, landowner outreach, and mapping.	$215,000
2005B-807	Morven, Town of - Plan/ WW/ Collection System Rehabilitation Strategy, Jones & Mill Creeks	Continue smoke testing and video inspections for infiltration and inflow problems and needs. CWMTF previously funded a project to inspect the first 2/3 of the system. This project will complete the study.	$40,000
2006A-029	NC Wildlife Resources Commission - Acq./ Chalk/ Howell Tracts, Cartledge Creek	Protect through fee simple purchase 610 acres along Cartledge Creek. CWMTF funds to purchase the 180 riparian acres. Aids protection of rare aquatic species. Tract to become part of the NC Game Lands Program.	$433,000
This list does not include:			
regional or statewide projects that were in multiple river basins, or projects that were funded and subsequently withdrawn.			

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 5 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. Any of the impaired streams listed above are candidates for 319 funding. Interested parties should contact the ***Basinwide Planning Program*** to discuss potential projects.

Table 6-3. 319 Project

Fiscal Year	Contract Number	Name	Description	Agency	Funding
1999	EW200024	Sandhills WQ Project	Agriculture, Innovative BMP	Env. Impact RC&D	$37,000

North Carolina Agriculture Cost Share Program

Nonpoint source pollution is a significant source of stream degradation in the Pee Dee 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 6-4 shows the number of projects implemented and in the Pee Dee River Hydrologic unit and the dollar amount invested. Table 6-5 shows the water quality benefits realized from that investment.

Table 6-4. ACSP Project Expenditures

	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
030402010100	230.8 ac.	$27,692						1 unit	2 tons	$20,205
030402010200	12.6 ac.	$2,835			13.2 units	1,466 LF	$21,778	2 units		$11,393
030402010300										
030402010400								3 units		$24,631
030402010600										
030402010700								1 unit		$15,601
Total		$30,527					$21,778			$71,830

Table 6-5. NC ASCP Water Quality Benefits

	Water Quality Benefits				
	Soil Saved (tons)	Nitrogen Saved (lbs)	Phosphorus Saved (lbs)	Waste-N Managed (lbs)	Waste-P Managed (lbs)
030402010100	531	2,034	319	153,327	142,054
030402010200	21	1,712		64,405	60,750
030402010300					
030402010400				4,653	8,521
030402010600				66,880	72,320
030402010700				9,504	15,840
Total	552	3,746	319	298,769	299,485

References

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

Waters, T.F. 1995. Sediment in streams—Sources, biological effects, and control. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, MD.