Chapter 1
Cape Fear River Subbasin 03-06-01
Including: Haw River, Troublesome Creek and Little Troublesome Creek

1.1 Subbasin Overview

Subbasin 03-06-01 at a Glance

Land and Water Area

Total area:	189 mi²
Land area:	187 mi²
Water area:	2 mi²

Population

2000 Est. Pop.: 66,449 people
Pop. Density: 352 persons/mi²

Land Cover (percent)

Forest/Wetland:	58.6 %
Water:	2.0 %
Urban:	1.7 %
Cultivated Crop:	7.1 %
Pasture/Managed Herbaceous:	30.6 %

Counties

Alamance, Caswell, Forsyth, Guilford and Rockingham

Municipalities

Reidsville and Stokesdale

This subbasin is a piedmont watershed characterized by highly erodible soils. Most of the watershed is forested with extensive agriculture. Development is occurring north of Greensboro and around Reidsville. Population is expected to grow by 140,000 people in counties with portions or all of their areas in this subbasin by 2020.

There are 11 individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 7.8 MGD (Figure 4). The largest is Reidsville WWTP (7.5 MGD). Refer to Appendix VI and Chapter 30 for more information on NPDES permit holders. Issues related to compliance with NPDES permit conditions are discussed below in Section 1.3 for Impaired waters.

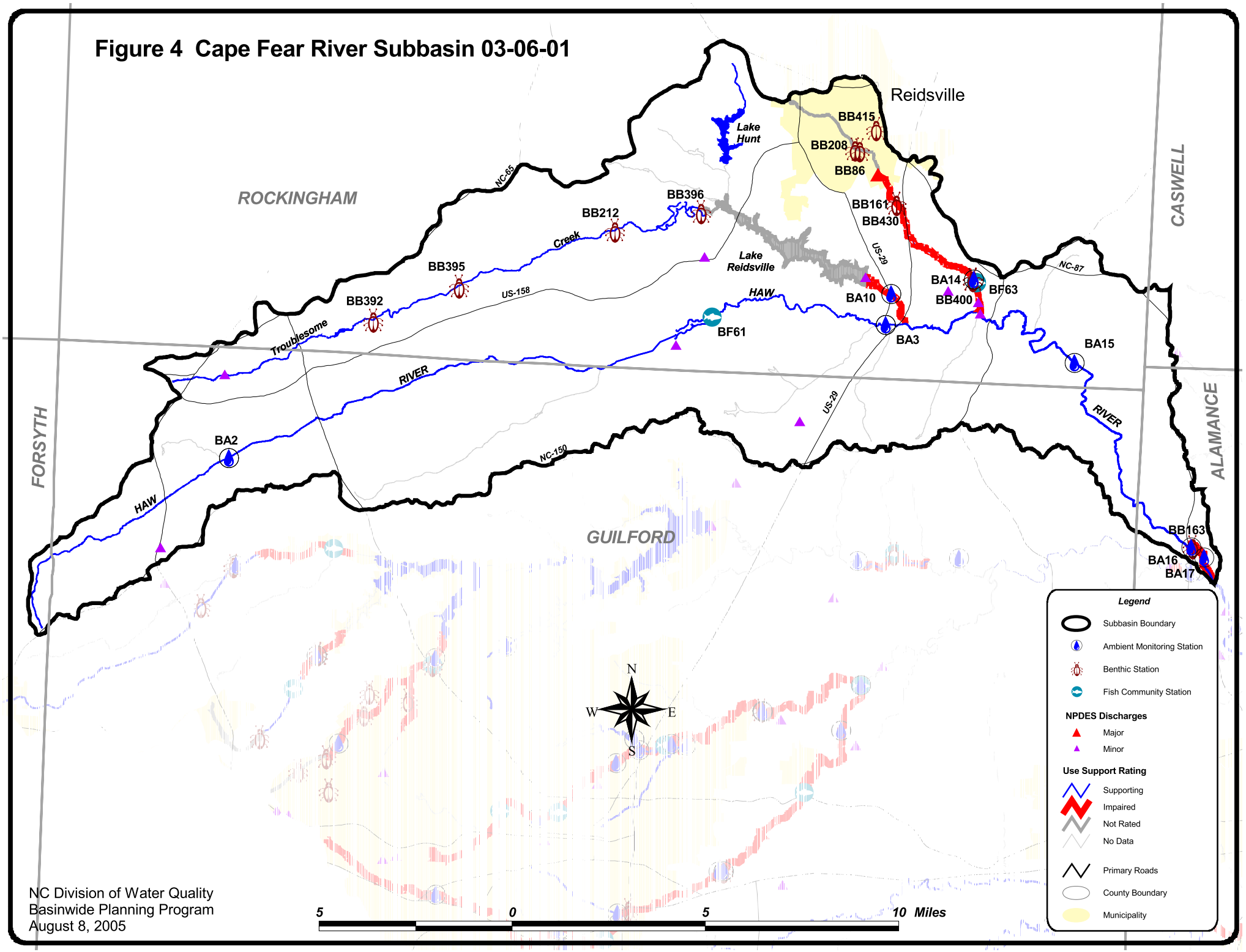
There are no municipal areas in this subbasin required to develop a stormwater program (Chapter 31).

There is one registered cattle, two registered swine, and four registered dairy operations, as well as one registered horse farm in this subbasin. Issues related to agricultural activities are discussed below in Section 1.3 for Impaired waters.

There were 11 benthic macroinvertebrate community samples and two fish community samples (Figure 4 and Table 4) collected during this assessment period. Some sites were not sampled because of high flows in 2003, and low flows in 2001 and 2002 may have had impacts on the biological communities as well. Data were collected from eight ambient monitoring stations including four DWQ stations, two UCFRBA (Appendix V) stations, and two shared stations. Two reservoirs were also monitored. Refer to the *2003 Cape Fear River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Waters in the following sections are identified by an assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list, and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment unit is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Figure 4 Cape Fear River Subbasin 03-06-01



NC Division of Water Quality
Basinwide Planning Program
August 8, 2005

Table 4 CAPE FEAR Subbasin 03-06-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
HAW RIVER													
16-(1)a	C NSW	7.8 FW Miles	From source to SR 2109	**S**	BA2	NCE			**NR***	BA2	NCE	Habitat Degradation	Impervious Surfac
												Habitat Degradation	Agriculture
												Fecal Coliform Bacteria	WWTP NPDES
												Fecal Coliform Bacteria	Impervious Surfac
16-(1)b	C NSW	12.5 FW Miles	From SR 2109 to SR 2426	**S**	BA3	NCE			**S**	BA3	NCE	Low Dissolved Oxygen	Unknown
					BF61	G	'1998						
16-(1)c	C NSW	21.2 FW Miles	From SR 2426 to NC 87	**S**	BA15	NCE	Turbidity	7.3	**S**	BA15	NCE	Habitat Degradation	Unknown
					BA16	NCE						Turbidity	Land Clearing
					BB163	GF	'2003					Turbidity	Agriculture
					BF61	G	'1998						
16-(1)d1	C NSW	1.3 FW Miles	From NC 87 to Subbasin 01/02 boundary	**S**	BA17	NCE			**I**	BA17	CE	Fecal Coliform Bacteria	MS4 NPDES
Little Troublesome Creek													
16-7a	C NSW	3.5 FW Miles	From source to Reidsville WWTP	**NR**					ND			Habitat Degradation	Impervious Surfac
					BB208	NR	'2001						
					BB415	NR	'2001						
					BB86	NR	'2000						
16-7b	C NSW	5.1 FW Miles	From Reidsville WWTP to Haw River	**I**	BA14	NCE	Turbidity	9.3	**S**	BA14	NCE	Fecal Coliform Bacteria	MS4 NPDES
					BB161	F	'2001					Turbidity	Impervious Surfac
					BB161	F	'2000					Habitat Degradation	Agriculture
					BB400	F	'2003					Habitat Degradation	Road Construction
					BB400	F	'2001					Habitat Degradation	Impervious Surfac
					BB400	F	'2001						
					BB400	F	'2000						
					BF63	P	'1998						
					BF63	GF	'2003						

Table 4 CAPE FEAR Subbasin 03-06-01

AU Number / Description	Classification	Length/Area		Aquatic Life Assessment						Recreation Assessment					
				AL Rating	Station	Result	Year/ Parameter	% Exc		REC Rating	Station	Result		Stressors	Sources
Troublesome Creek															
16-6-(0.3)	WS-III NS	16.4	FW Miles	**S**						ND				Low Dissolved Oxygen	WWTP NPDES
From source to Rockingham County SR 2423					BB212	GF	2002								
					BB392	GF	2002								
					BB395	GF	2002								
					BB396	GF	2002								
16-6-(3)	C NSW	1.8	FW Miles	**I**	BA10	CE	Low DO	12.8		**S**	BA10	NCE		Turbidity	Unknown
					BA10	NCE	Turbidity	7.3						Low Dissolved Oxygen	Impoundment
From dam at Lake Reidsville to Haw River															
Troublesome Creek (Lake Reidsville)															
16-6-(0.7)	WS-III NS	667.5	FW Acres	**NR**	BL17	NCE	Chlor a	66		ND				Turbidity	Agriculture
From Rockingham County SR 2423 to dam at Lake Reidsville (City of Reidsville water supply intake)														Chlorophyll a	Agriculture
														Low Dissolved Oxygen	Agriculture
Unnamed Tributary to Troublesome Creek (Lake Hunt)															
16-6-2-(1)	WS-III&B	176.4	FW Acres	**S**	BL18	NCE				ND					
From source to dam at Lake Hunt															

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AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment				
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result	Stressors	Sources

AL - Aquatic Life	BF - Fish Community Survey	E - Excellent	S - Supporting, I - Impaired
REC - Recreation	BB - Benthic Community Survey	G - Good	NR - Not Rated
	BA - Ambient Monitoring Site	GF - Good-Fair	NR*- Not Rated for Recreation (screening criteria exceeded)
	BL- Lake Monitoring	F - Fair	ND-No Data Collected to make assessment
	S- DEH RECMON	P - Poor	**Results**
		NI - Not Impaired	CE-Criteria Exceeded > 10% and more than 10 samples
	Miles/Acres	S- Severe Stress	NCE-No Criteria Exceeded
	FW- Fresh Water	M-Moderate Stress	
	S- Salt Water	N- Natural	

Aquatic Life Rating Summary

S	m	59.2	FW Miles
NR	m	3.5	FW Miles
I	m	6.8	FW Miles
S	m	176.4	FW Acres
NR	m	667.5	FW Acres
ND		34.9	FW Miles
ND		24.8	FW Acres

Recreation Rating Summary

S	m	40.5	FW Miles
NR*	m	7.8	FW Miles
I	m	1.3	FW Miles
ND		54.8	FW Miles
ND		868.7	FW Acres

Fish Consumption Rating Summary

I	e	104.5	FW Miles
I	e	868.7	FW Acres

1.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-06-01 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption category because of fish consumption advice (Chapter 27) that applies to the entire basin. In the water supply category, all WS classified waters (843.9 acres and 24.3 miles) are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants. Refer to Appendix X for a complete list of monitored waters and more information on Supporting monitored waters.

There were 69.6 stream miles (66.6 percent) and 843.9 freshwater acres (97 percent) monitored during this assessment period in the aquatic life category. There were 6.8 miles (6.5 percent) of Impaired waters in this category. There were also 1.3 stream miles (1.2 percent) Impaired for recreation in this subbasin.

1.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Refer to the overview for more information on AUs. Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

1.3.1 Haw River [AU# 16-(1)a and b and d1]

2000 Recommendations
The 2000 basin plan recommended that no new discharges be permitted in these segments of the Haw River, and that further monitoring be done to determine the extent of agricultural impacts and to identify stressors to the biological community.

Current Status
The Haw River [16-(1)a] from the source to SR 2109 (7.8 miles) is Supporting aquatic life because no criteria were exceeded at site BA2 although dissolved oxygen was below 5 mg/l in 17 percent of samples collected during the assessment period. Previous benthic community ratings were Fair at this site, although a benthic community sample was not collected during the most recent assessment period due to high flows. This segment is Not Rated for recreation because fecal coliform bacteria screening criteria were exceeded at site BA2. The Oak Ridge Military Academy (NC0046043) had significant violations of the fecal coliform bacteria permit limits in the last two years of the assessment period as well. The discharge is into an unnamed tributary of the Haw River off NC 68. Oak Ridge Military Academy has had violations of other parameters in 2004 that were handled with notice of violations (NOV) and enforcement actions by DWQ.

The Haw River [16-(1)b] from SR 2109 to SR 2426 (12.5 miles) is Supporting aquatic life because of a Good fish community rating at site BF61. The site has regular high flows that have made sampling difficult at site BF61. In 2003, flow was too high and the water was too turbid to collect fish community samples. Dissolved oxygen was below 5 mg/l in 14 percent of samples at site BA3 about six miles downstream of BF61.

No new dischargers have been permitted into these two segments. The western portion of the watershed is currently experiencing rapid development from Greensboro and Kernersville. The Ag Sediment Initiative (Chapter 28) identified runoff from impervious surfaces and streambank erosion as stressors to the biological community in both segments.

The Haw River [16-(1)c] from SR 2426 to NC 87 (21.2 miles) is Supporting aquatic life because of a Good-Fair benthic community rating at site BB163 and a Good fish community rating at site BF61. Turbidity was above the standard in 7 percent of samples at site BA15.

The Haw River [16-(1)d1] from NC 87 to the subbasin boundary (1.3 miles) is Supporting aquatic life because no criteria were exceeded at site BA17. This segment is Impaired for recreation because the fecal coliform bacteria standard was violated at site BA17.

2005 Recommendations

DWQ will continue to monitor these segments of the Haw River and work with DSWC staff to further implement BMPs to reduce the impacts of development and agriculture in this watershed. Further recommendations to protect streams in urbanizing areas and to restore streams in existing urban areas are discussed in Chapter 31. The NPDES compliance process will continue to be used to address the significant permit violations noted above and any ongoing violations.

Segment 16-(1)a will remain on the 303(d) list due to an Impaired biological community from 1998 sampling. Segment 16-(1)b will be removed from the 303(d) list because of the improved biological community rating. Segment 16-(1)d1 will be added to the 303(d) list because it is Impaired for recreation. TMDLs (Chapter 35) will be developed for identified stressors within 8-13 years of listing.

Water Quality Initiatives

The Ag Sediment Initiative (Chapter 28) estimates that over $1.2 million is needed in this watershed to preserve 1,000 acres of farmland, repair 20,000 feet of streambank, and install BMPs on 525 acres of cropland. An urban conservationist is also recommended to help address impacts in this watershed associated with conversion of cropland to development.

In 1998, the Haw River Assembly received a $24,500 CWMTF grant to preserve four acres around the headwater springs of the Haw River. In 2002, the Piedmont Land Conservancy received a minigrant of $25,000 for pre-acquisition of 500 acres along the Haw River and Troublesome Creek. In 2001, the Haw River Assembly received a minigrant of $14,500 for pre-acquisition of six tracts in the headwaters of the Haw River. The NCEEP has also preserved 3,628 linear feet of stream in this watershed (See Chapter 34 for information on all projects).

1.3.2 Little Troublesome Creek [AU# 16-7a and b]

2000 Recommendations
The 2000 basin plan recommended that DWQ work on a detailed study of Little Troublesome Creek as part of the WARP project to assess the effects of nonpoint source runoff on the creek.

Current Status
Little Troublesome Creek [AU# 16-7a] from the source to the Reidsville WWTP (3.5 miles) is Not Rated for aquatic life because benthic community ratings could not be assigned at sites BB208, BB415 and BB86 because of the small size of the stream.

Little Troublesome Creek [AU# 16-7b] from Reidsville WWTP to the Haw River (5.1 miles) is Impaired for aquatic life because of Fair benthic community ratings at sites BB161 and BB400. The fish community at site BF63 improved from Poor to Good-Fair after the Reidsville WWTP discharge was moved to the Haw River in 1998. Turbidity also exceeded the water quality standard in 9 percent of samples at site BA14.

A WARP study completed in November 2002 identified toxicity, organic enrichment, and widespread habitat degradation from storm sewers and runoff as being stressors to the biological communities in both segments. An assessment made as part of the Little Troublesome Creek Local Watershed Plan (Chapter 34) indicated that 43 to 59 percent of the buffer had been disturbed in the upper watershed and greater than 10 percent was disturbed in the lower watershed. The assessment also concluded that sediment from agricultural land was not a problem in the watershed. The Ag Sediment Initiative (Chapter 28) identified runoff from impervious surfaces, urban development, unpaved roads, road construction, cropland erosion and streambank erosion as stressors to the biological community in both segments.

DWQ developed a fecal coliform bacteria TMDL (Chapter 35), approved by EPA in September 2002, that recommended a 40 percent reduction in fecal coliform bacteria loading to Little Troublesome Creek.

2005 Recommendations
DWQ will continue to work with all agencies and local governments involved in the Local Watershed Planning (Chapter 34) process to identify funding for and implementation of restoration, BMPs and preservation projects in the watershed. The City of Reidsville should develop measures to help protect Little Troublesome Creek from stormwater impacts and to reduce fecal coliform loading to the TMDL target of 40 percent.

Both segments of Little Troublesome Creek will remain on the 303(d) list. TMDLs (Chapter 35) will be developed for identified stressors within 8-13 years of listing.

Water Quality Initiatives
The Ag Sediment Initiative (Chapter 28) estimates that over $160,000 is needed in this watershed to install field borders on 74 acres of cropland, 34 acres of cropland conversion, and other BMPs to help improve water quality from agriculture areas in the watershed.

In 2001, the NCEEP initiated a Local Watershed Planning effort for Troublesome and Little Troublesome Creeks. The two watersheds present sharp contrasts: Troublesome Creek is

relatively large, predominantly rural, and includes the Reidsville Lake water supply reservoir; Little Troublesome Creek's watershed is much smaller, heavily urbanized in its headwater reaches, and includes a significant reach of mainstem that is characterized by impaired water quality and degraded aquatic habitat. The two major watershed management issues, therefore, relate to (1) protection/preservation of streams, riparian buffers and wetlands within the Troublesome Creek system – especially as encroaching development is rapidly spreading northward from Guilford County and Greensboro; and (2) opportunities for stream restoration and urban storm water BMP projects/retrofits in the greater Reidsville area within the Little Troublesome Creek watershed. Numerous watershed project opportunities have been identified within both these watersheds, and NCEEP staff are working with local resource professionals and landowners in an effort to begin design and construction on the priority sites. The Local Watershed Plan may be downloaded at:
http://www.nceep.net/services/lwps/Troublesome_Creek/troublesome.htm

1.3.3 Troublesome Creek [AU# 16-6-(0.3) and 16-6-(3)]

2000 Recommendations
The 2000 basin plan recommended that no new discharges be permitted in these two segments of Troublesome Creek and that further monitoring be done to determine the extent of agricultural impacts and to identify stressors to the biological community.

Current Status
Troublesome Creek [16-6-(0.3)] from the source to SR 2423 (16.4 miles) is Supporting aquatic life because of Good-Fair benthic community ratings at sites BB212, BB392, BB395 and BB396. A special study conducted in April 2002 found the benthic communities was slightly more degraded than the reference stream, but there were no indications of toxicity or nutrient impacts. There were indicators of low dissolved oxygen instream, although no ambient water quality data were collected in this segment. The sandy stream bottom is thought to be a natural condition in upper piedmont streams. Monroeton Elementary School (NC0036994) had significant violations of the biological oxygen demand permit limit in the last two years of the assessment period. The discharge was into an unnamed tributary of Troublesome Creek off SR 2422 just upstream of site BB396. This facility is no longer discharging and the permit has been rescinded.

Lake Reidsville [16-6-(0.7)], a 667.5-acre impoundment of Troublesome Creek, is Not Rated for aquatic life. Although dissolved oxygen, chlorophyll *a* and turbidity exceeded water quality standards during lakes monitoring, not enough samples were collected to assign a use support rating. Dissolved oxygen saturation was elevated, and nutrient levels were higher than in previous years as well.

Reidsville uses the reservoir as a water supply and has implemented a 100-foot buffer on the impoundment and 50-foot buffers on all tributaries. Reidsville should continue to protect the water supply by implementing BMPs where possible to reduce nutrient loading and turbidity in the watershed. DWQ will determine if increased monitoring efforts in this lake are warranted to better assess water quality.

Troublesome Creek [16-6-(3)] from dam at Reidsville Lake to the Haw River (1.8 miles) is Impaired for aquatic life because dissolved oxygen levels violated the standard in 13 percent of samples at site BA10 during the assessment period.

2005 Recommendations
DWQ will continue to monitor Troublesome Creek and work with DSWC staff to further implement BMPs to reduce the impacts of agriculture in this watershed. DWQ will investigate releases from the Reidsville Lake Dam to determine if the source of the low DO is from dam releases.

Segment 16-6-(0.3) will be removed from the 303(d) list because of the improved biological community rating. Segment 16-6-(3) will be added to the 303(d) list because of the dissolved oxygen standard violation. TMDLs (Chapter 35) will be developed for identified stressors within 8-13 years of listing.

Water Quality Initiatives
In 2002, the Piedmont Land Conservancy (Chapter 34) received a minigrant of $25,000 to pay for pre-acquisition of 500 acres along the Haw River and Troublesome Creek. NCEEP has initiated a local watershed planning effort that includes this watershed. The plan is discussed above with Little Troublesome Creek. NCEEP has purchased a 52-acre parcel of riparian wetlands in the Troublesome Creek watershed to aid in the preservation of water quality. The Local Watershed Plan may be downloaded at:
http://www.nceep.net/services/lwps/Troublesome_Creek/troublesome.htm

1.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix X. Waters in the following section are identified by assessment unit number (AU#). See overview for more information on AU#s.

1.4.1 Mears Fork [AU# 16-3]

Current Status and 2005 Recommendations
Mears Fork from source to Haw River, was not assessed for use support determination. This stream is near high growth areas north of Greensboro. This stream as well tributaries may be adversely impacted by poor development practices. Further recommendations to protect streams in urbanizing areas and to restore streams in existing urban areas are discussed in Chapter 31.

Water Quality Initiatives
Mears Fork Conservation Plan. In 1999, the Haw River Assembly (Chapter 34) received a $200,000 CWMTF (Chapter 34) grant to acquire 46 acres of land and for landowner permanent conservation easements on another 60 acres in this watershed.

1.5 Additional Water Quality Issues within Subbasin 03-06-01

The following section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

1.5.1 Jordan Haw River Watershed Nutrient Sensitive Waters Strategy

All land uses and discharges of wastewater and stormwater in subbasin 03-06-01 potentially contribute nutrients to Jordan Reservoir in subbasins 03-06-04 and 03-06-05. The reservoir is Impaired for aquatic life because chlorophyll *a* violated the standard in all segments of the reservoir. Refer to Chapter 36 for more information on this strategy.