Chapter 5 -
Roanoke River Subbasin 03-02-05
Includes Hyco Lake, Marlowe Creek and Mayo Reservoir

5.1 Water Quality Overview

Subbasin 03-02-05 at a Glance

Land and Water Area	
Total area:	337 mi^2
Land area:	322 mi^2
Water area:	15 mi^2
Population Statistics	
1990 Est. Pop.:	9,903 people
Pop. Density:	31 person / mi^2
Land Cover (%)	
Forest / Wetland:	71.9
Surface Water:	4.5
Urban:	1.3
Cultivated Crop:	2.4
Pasture / Managed Herbaceous:	19.8

The Hyco River watershed in North Carolina, including Hyco and South Hyco Creeks and Hyco Lake, as well as Mayo Creek and the Mayo Reservoir watershed are contained in this subbasin. Other waters include Storys and Marlowe Creeks, Lake Roxboro and Roxboro Lake. Roxboro is the only municipality. All major streams flow generally northward into Virginia. A map of this subbasin including water quality sampling locations is presented in Figure B-5.

Bioclassifications for sample locations are presented in Table B-11. Use support ratings for each applicable category in this subbasin are summarized in Tables B-12 and B-13. Refer to Appendix III for a complete listing of monitored waters and further information about use support ratings.

Land within this subbasin is mostly low rolling hills, characteristic of the piedmont. Land use is dominated by forest (71 percent) and agricultural activities (22 percent), although residential development is increasing. The estimated subbasin population, based on the 1990 census, is 9,903. The population of Person County is projected to increase 14 percent and Caswell County six percent over a twenty-year period (1998-2018).

There are 7 permitted dischargers. The Town of Roxboro WWTP is the largest. During dry months, this discharge is more than 99 percent of total flow in Marlowe Creek. Carolina Power and Light Company's (CP&L) Roxboro and Mayo generating plants discharge tens of millions of gallons per day of cooling water to Hyco Lake and Mayo Reservoir. These two discharges, as well as the Roxboro WWTP and Cogentrix, are required to monitor their effluent's toxicity. Historically, the Roxboro WWTP had toxicity problems, but most of the problems with the discharge have been resolved. Cogentrix, however, also discharging in the Marlowe Creek watershed, failed the majority of toxicity tests over the past five years.

Four lakes in this subbasin are monitored by DWQ: Hyco Lake, Lake Roxboro, Roxboro Lake and Mayo Reservoir. All four lakes are fully supporting the aquatic life and secondary recreation designated use. Hyco Lake is also fully supporting its primary recreation use, but is only partially supporting the fish consumption use. This lake is discussed further in Part 5.2.2.

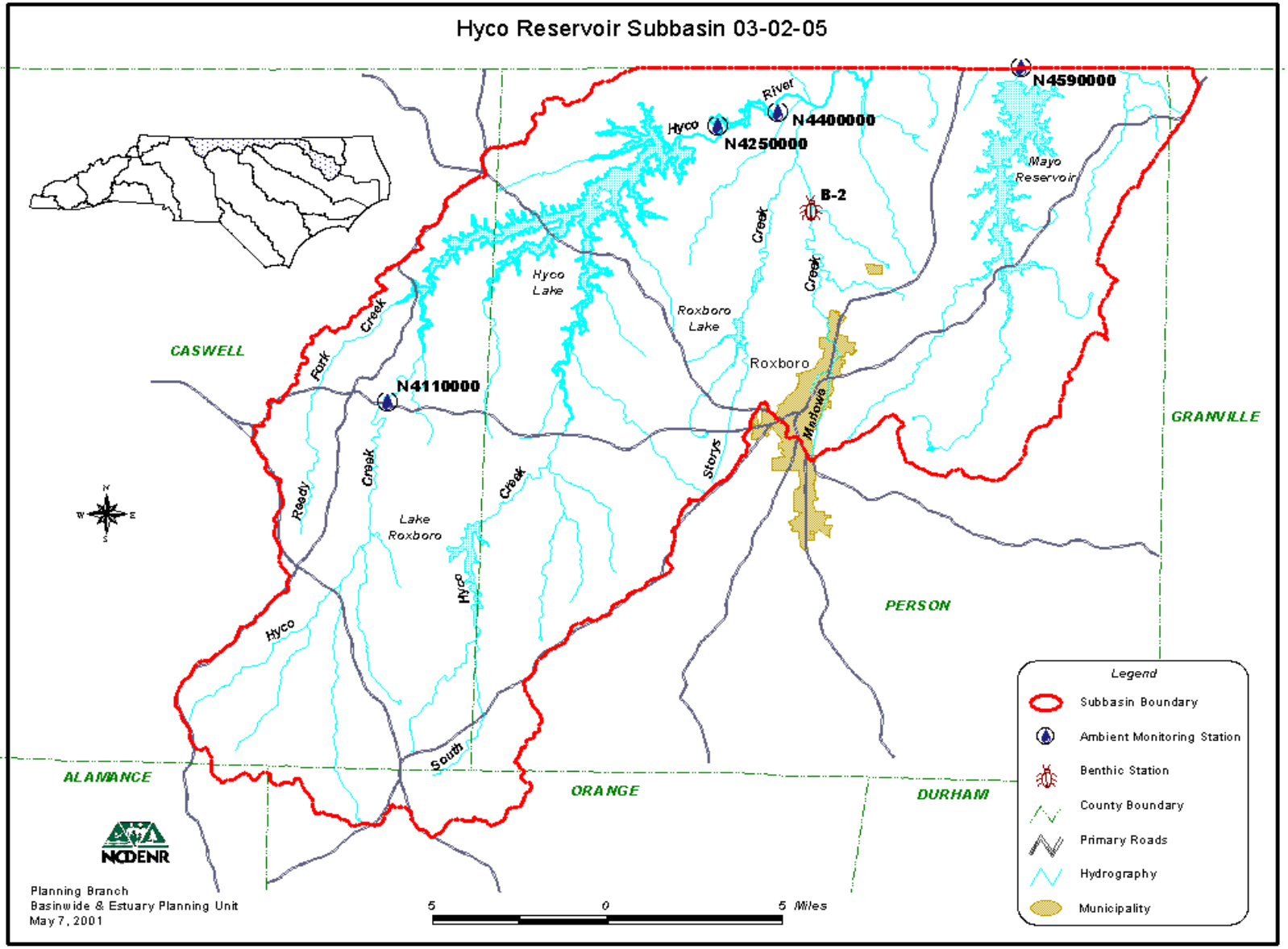

Figure B-5 Sampling Locations within Subbasin 03-02-05

Table B-11 DWQ Monitoring Locations and Benthic Macroinvertebrate Bioclassifications (1999) for Roanoke River Subbasin 03-02-05

Site	Stream	County	Location	Bioclassifcation
Benthic Macroinvertebrates				
B-2*	Marlowe Creek	Person	SR 1322	Fair
Ambient Monitoring				
N4110000	Hyco Creek	Caswell	US 158	N/A
N4250000	Hyco River	Person	Mcghees Mill	N/A
N4510000	Hyco River	Halifax, VA	US 501	N/A
N4400000	Marlowe Creek	Person	SR 1322	N/A
N4590000	Mayo Creek	Person	SR 1501	N/A

* Historical data are available; refer to Appendix II.

Observations during the very dry summer of 1999 indicated that many streams in this subbasin stopped flowing. Seasonally intermittent low flow may limit the diversity of the fish and benthic macroinvertebrate communities.

The bioclassification for Marlowe Creek improved from Poor in 1994 to Fair in 1999. This change coincided with a significant reduction in Roxboro WWTP's effluent toxicity. However, the aquatic life/secondary recreation designated use is still impaired in this stream. Marlowe Creek is discussed in detail in the following sections.

Historically, Hyco Creek received a Good-Fair bioclassification under low flow and normal flow conditions, but declined to a Fair bioclassification under high flow conditions. This pattern suggests nonpoint source impacts to this stream. No sample was collected in 1999 because no flowing water was observed in the creek during the sampling period. Hyco Creek is discussed further in Part 5.5 of this chapter.

Water chemistry samples are collected monthly from five sites in this subbasin: Hyco Creek; Hyco River near McGhees Mill; Hyco River near Denniston, Virginia; Marlowe Creek; and Mayo Creek. The Marlowe Creek site is downstream of the Roxboro WWTP. Results at this location showed elevated nitrate, phosphorus and copper concentrations. Data from all other locations do not indicate any water quality problems. For further information about ambient monitoring station data, refer to Section A, Chapter 3.

For more detailed information on sampling and assessment of streams in this subbasin, refer to the *Basinwide Assessment Report - Roanoke River Basin* (DENR-DWQ, May 2000), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

Table B-12 Use Support Ratings Summary (1999) for Monitored Lakes (acres) in Roanoke River Subbasin 03-02-05

Use Support Category	FS	PS	NS	Total[1]
Aquatic Life/ Secondary Recreation	6,957	0	0	6,957
Fish Consumption	0	3,750	0	3,750
Primary Recreation	6,745	0	0	6,745
Water Supply	6,957	0	0	6,957

Table B-13 Use Support Ratings Summary (1999) for Monitored and Evaluated[2] Freshwater Streams (miles) in Roanoke River Subbasin 03-02-05

Use Support Category	FS	PS	NS	NR	Total[1]
Aquatic Life/ Secondary Recreation	84.8	10.8	0	99.3	194.9
Fish Consumption[3]	0	0.2	0	0	0.2
Primary Recreation	0	0	0	11.3	11.3
Water Supply	47.3	0	0	0	47.3

[1] Total stream miles assigned to each use support category in this subbasin. Column is not additive because some stream miles are assigned to more than one category.

[2] For the fish consumption use support category, only monitored stream miles are presented.

[3] These waters are impaired because of a statewide fish consumption advisory for bowfin. Refer to Section A, Part 4.8.4 for further information.

5.2 Status and Recommendations for Previously Impaired Waters

This section reviews use support and recommendations detailed in the 1996 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for each waterbody. The 1996 Roanoke River basin plan identified one impaired stream in this subbasin: Marlowe Creek from its source in Roxboro to the confluence with Storys Creek. This stream is discussed below.

5.2.1 Marlowe Creek (10.8 miles from source to Storys Creek)

1996 Recommendation(s)

Historically, the discharge from the Roxboro WWTP was not in compliance with permit limits and repeatedly failed toxicity tests. During dry months, the discharge is more than 99 percent of the flow in Marlowe Creek, so there is essentially no dilution from upstream. The first basin plan listed the stream as partially supporting because of elevated copper concentrations and recommended that improvements be made to the Roxboro WWTP. It was also recommended that other sources of nonpoint source pollution in the watershed be identified and addressed.

Status of Progress
Benthic macroinvertebrates in Marlowe Creek again received a Fair bioclassification in 1999, so the stream remains impaired. Compliance and toxicity problems with Roxboro's WWTP discharge have been resolved. However, Cogentrix, a power generating facility that discharges to Mitchell Creek (a tributary to Marlowe Creek) upstream of DWQ's sampling location, experienced toxicity problems over the two-year review period. The facility paid almost $6,000 in fines and conducted a Toxicity Reduction Evaluation (TRE). The TRE helped determine that the composition of a chemical used in the steam generation process had been changed by the vendor without notice. Compliance with toxicity tests was expected by the end of 2000.

There are collection system overflows in the Town of Roxboro that likely impact aquatic communities downstream, however, not to the extent that the discharge problems did. In addition, the headwaters of Marlowe Creek were historically channelized around the Town of Roxboro. Most of the stormwater runoff from this urban area flows into Marlowe Creek. There is significant sedimentation over the entire length of the stream which likely resulted from streambank erosion, scouring, runoff from urban areas and construction sites, and agricultural activities (in the lower portion of the watershed).

2001 Recommendation(s)
DWQ will continue to work with the Town of Roxboro's WWTP and Cogentrix to correct remaining problems at these facilities and Roxboro's collection system. However, it is possible that aquatic life will remain impaired because of significant habitat degradation in the stream. The Town of Roxboro should begin to install urban stormwater controls and best management practices to prevent further degradation by runoff from urban areas and construction sites. DWQ will continue to monitor the stream and work with local NPS agencies to restore water quality.

5.2.2 **Hyco Lake** (3,750 acres)

1996 Recommendation(s)
The 1996 basin plan identified Hyco Lake as partially supporting the fish consumption use support category due to an advisory related to elevated levels of selenium. High selenium concentrations in this lake, like Belews Lake, are associated with runoff from coal ash ponds (refer to Chapter 1, Part 1.2.1 of this section for more detailed information). Carolina Power & Light Company switched to a dry ash disposal system in 1990, significantly reducing selenium concentrations in their discharge (to meet lower permit limits). DWQ required long-term monitoring of the lake in order to evaluate the effect of new permit limits. The consumption advisory was partially lifted in 1995, and the recommendation was to continue to monitor the decline of selenium in fish tissue until the advisory is lifted completely.

Status of Progress
Hyco Lake was most recently sampled by DWQ during the summer of 1999. All selenium concentrations were less than the laboratory detection level (<5.0 µg/l) with the exception of one location in June. Monitoring by Carolina Power & Light Company (CP&L) in 1997 and 1998 also noted that selenium concentrations in surface waters were less than laboratory detection levels. A shift in the fish community from undesirable, selenium-tolerant species such as satinfin shiner and green sunfish to a bluegill-dominated community was first observed in 1994. CP&L fish community data demonstrated that largemouth bass and bluegill catch rates met expectations

for a piedmont reservoir in 1997 and 1998. The data also indicated that successful reproduction of these sport species was occurring in the lake.

The consumption of fish from the lake remains under an advisory due to elevated selenium levels from the coal ash pond discharge. Mean selenium concentrations in green sunfish and white catfish have been less than EPA consumption criteria of 5µg/g since the fall of 1996. In 2000, these two fish were removed from the consumption advisory. However, a limited advisory remains in effect for common carp, and the fish consumption designated use for Hyco Lake remains impaired.

2001 Recommendation(s)
DWQ, in cooperation with Carolina Power & Light Company, will continue to monitor Hyco Lake and the permitted discharge to insure a continued decline in selenium concentrations. DWQ will work closely with the Department of Health and Human Services to lift the advisory when there is no longer a risk to human health from consumption of fish from Hyco Lake. For more information regarding fish consumption advisories, contact the Division of Public Health at (919) 733-3816 or visit the website at http://www.schs.state.nc.us/epi/fish/current.html.

5.3 Status and Recommendations for Newly Impaired Waters

No stream segments were rated as impaired based on recent DWQ monitoring (1995-1999); however, as mentioned previously, some impacts to water quality were observed. Refer to Part 5.5 of this chapter, as well as Section A, Chapter 4 for further discussion of potential water quality problems in this portion of the basin.

5.4 Section 303(d) Listed Waters

Two waters in this subbasin are currently listed on Part I of the state's year 2000 §303(d) list: Marlowe Creek and Hyco Lake. Copper is currently listed as a cause of impairment for Marlowe Creek, while Hyco Lake's impairment is due to levels of selenium in fish tissue that exceed consumption criteria. TMDLs are required for both of these waters; however, in both cases the majority, if not all, of the listed pollutants (copper and selenium) come from point sources. These two lakes are discussed in detail above. Refer to Appendix IV for more information on the state's §303(d) list and listing requirements.

5.5 Other Issues and Recommendations

The surface waters discussed in this section are fully supporting designated uses (or not rated) based on recent DWQ monitoring; however, data revealed some impacts to water quality. Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended. DWQ will notify local agencies of water quality concerns regarding these waters and work with them to conduct further monitoring and to locate sources of water quality protection funding. Additionally, education on local water quality issues is always a useful tool to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VI.

5.5.1 Hyco Creek

The benthic macroinvertebrate community of Hyco Creek was sampled in 1994. The stream received a Fair bioclassification indicating impacts to water quality were present. As was mentioned previously in this chapter, the flow was too low in the stream for it to be sampled in 1999; and therefore, the stream is currently not rated.

Analyses of ambient monitoring data show elevated turbidity, iron and fecal coliform concentrations over the past five years. The turbidity reference level was exceeded in 10 percent of samples collected from Hyco Creek, and lake assessment data showed high turbidity and nutrient levels in the Hyco Creek arm of Hyco Lake. Shoreline development, as well as residential development along US Highway 158, has increased in recent years. Iron concentrations exceeded reference levels in 63 percent of samples. However, samples from Hyco Creek passed instream chronic toxicity tests conducted by DWQ in 2000.

Although the geometric mean of fecal coliform samples did not exceed the 200 colonies/100ml water quality standard, concentrations were as high as 15,000 colonies/100ml in some samples. This stream feeds the westernmost arm of Hyco Lake, which is classified by DWQ for primary recreation. Fecal coliform concentrations in the main body of the lake did not exceed the standard in 1999.

BMPs should be carefully installed and maintained in this area during construction because of the high erosion potential of local soils. Agricultural and forestry BMPs for controlling sediment should also be installed to protect aquatic life in the Hyco Creek watershed. Measures should be put in place now to reduce sediment and nutrient inputs and to protect this stream (and the lake) from further water quality degradation. Section A, Chapter 4 discusses habitat degradation, including sedimentation, and provides general recommendations.

5.5.2 Projected Population Growth

The population of Person County is projected to increase 14 percent and Caswell County six percent over a twenty-year period (1998-2018). Growth management within the next five years will be imperative in order to maintain good water quality in this subbasin. Growth management can be defined as the application of strategies and practices that help achieve sustainable development in harmony with the conservation of environmental qualities and features of an area. On a local level, growth management often involves planning and development review requirements that are designed to maintain or improve water quality. Refer to Section A, Chapter 4 for more information about minimizing impacts to water quality from development.