Chapter 2 -
Catawba River Subbasin 03-08-31
Includes Warrior Fork, Johns River and Rhodhiss Lake

2.1 Water Quality Overview

Subbasin 03-08-31 at a Glance

Land and Water Area (sq. mi.)

Total area:	581
Land area:	578
Water area:	3

Population Statistics

1990 Est. Pop.:	92,541 people
Pop. Density:	160 persons/mi^2

Land Cover (%)

Forest/Wetland:	85%
Surface Water:	1%
Urban:	3%
Cultivated Crop:	1%
Pasture/ Managed Herbaceous:	10%

Use Support Ratings:

Freshwater Streams:

Fully Supporting:	463.6 mi.
Fully Supporting but Threatened:	94.7 mi.
Partially Supporting:	35.3 mi.
Not Supporting:	0.0 mi.
Not Rated:	75.6 mi.

Lakes:

Lake Rhodhiss - Fully Supporting

This subbasin contains the cities of Morganton, Lenoir, Drexel and Granite Falls. Many headwater tributaries are designated as HQW because they are native trout waters. Portions of this catchment, including Wilson Creek, are within the Pisgah National Forest and have received ORW designation. The Johns River catchment contains some high quality areas, but also has widespread agricultural land use. Urban development and runoff from Lenoir and Morganton have impacted several tributaries to the Catawba River in the southeastern portion of the subbasin. A map of this subbasin including water quality sampling locations is presented in Figure B-2. Biological ratings of these sites are presented in Table B-2.

All of the monitored streams with headwaters in the Pisgah National Forest had Good or Excellent water quality ratings based on biological data. Even though there is recreational use in the upper sections of these creeks and development in many of the watersheds, the water quality has remained high.

As watersheds become more developed around Morganton and Lenoir, the water quality ratings were lower (Good-Fair or Fair). None of the streams showed a change in water quality since sampling in 1992.

Lower Creek was the most degraded stream sampled in the basin. Data from this site have resulted in a Fair bioclassification in all years. A special study in 1997 did not detect additional impacts to Lower Creek from the WWTP, but this may be masked by the Fair water quality above the WWTP's discharge. Throughout the watershed, Lower Creek and many of its tributaries suffer from urban development and runoff, as well as cattle access to streams.

Four facilities monitor effluent toxicity. All facilities have been compliant with their permits during the past 5 years.

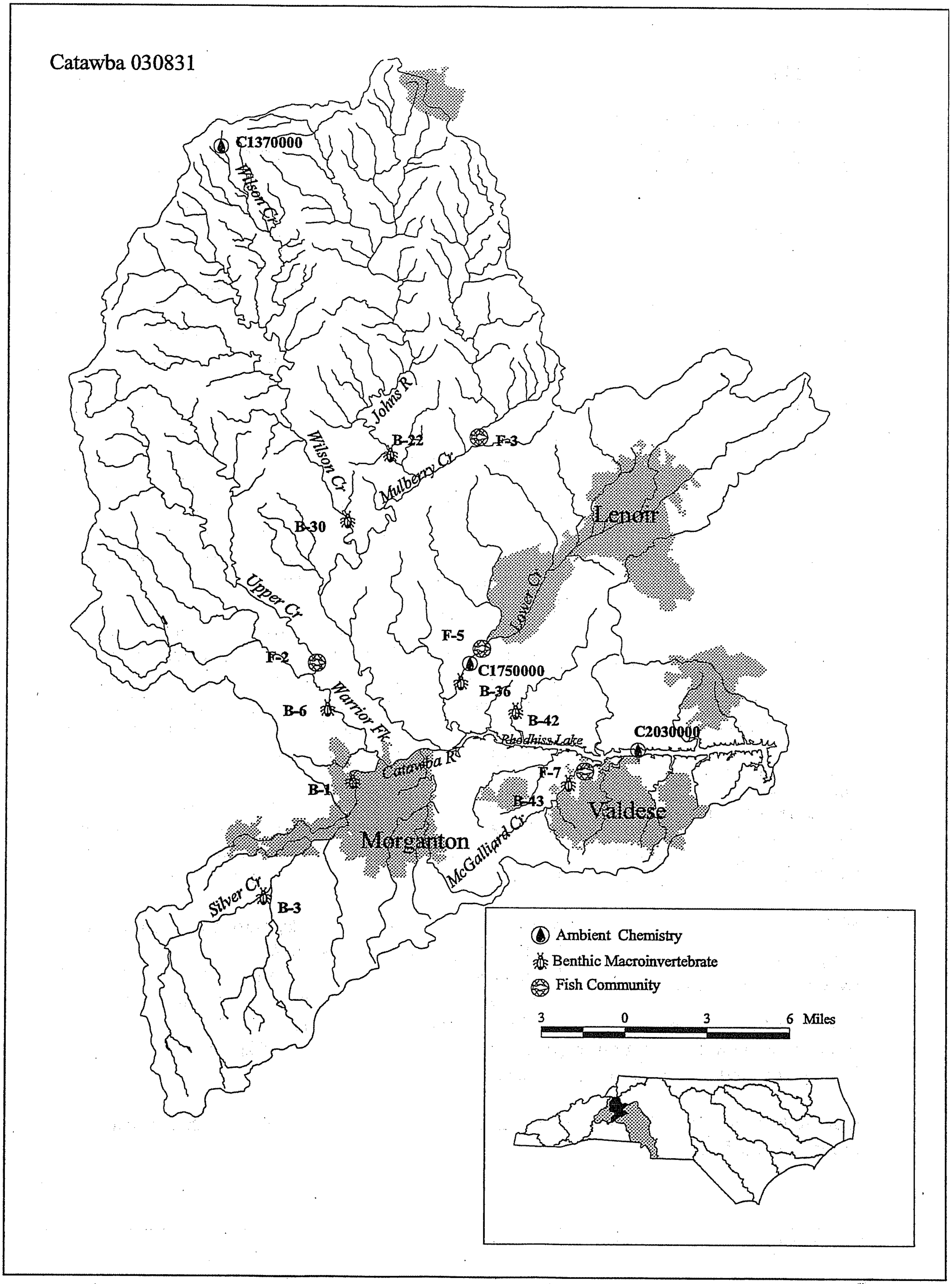


Figure B-2 Sampling Locations within Subbasin 03-08-31

Table B-2 Biological Assessment Sites in Catawba River Subbasin 03-08-31 (1997)

Site	Stream	County	Road	Rating
B-1	Catawba River	Burke	NC 181	Good-Fair
B-2	Canoe Creek	Burke	SR 1250	Good-Fair
B-3	Silver Creek	Burke	SR 1149	Good-Fair
B-6	Warrior Creek	Burke	SR 1440	Excellent
B-22	Johns River	Caldwell	SR 1356	Excellent
B-30	Wilson Creek	Caldwell	SR 1335	Excellent
B-36	Lower Creek	Caldwell	SR 1501	Fair
B-42	Smoky Creek	Burke	SR 1515	Good
B-43	McGalliard Creek	Burke	SR 1538	Good-Fair
F-1	Canoe Creek	Burke	SR 1250	Fair
F-2	Upper Creek	Burke	SR 1439	Good-Fair
F-3	Mulberry Creek	Caldwell	NC 90	Good
F-5	Lower Creek	Burke	SR 1501	Fair
F-7	McGalliard Creek	Burke	SR 1538	Poor

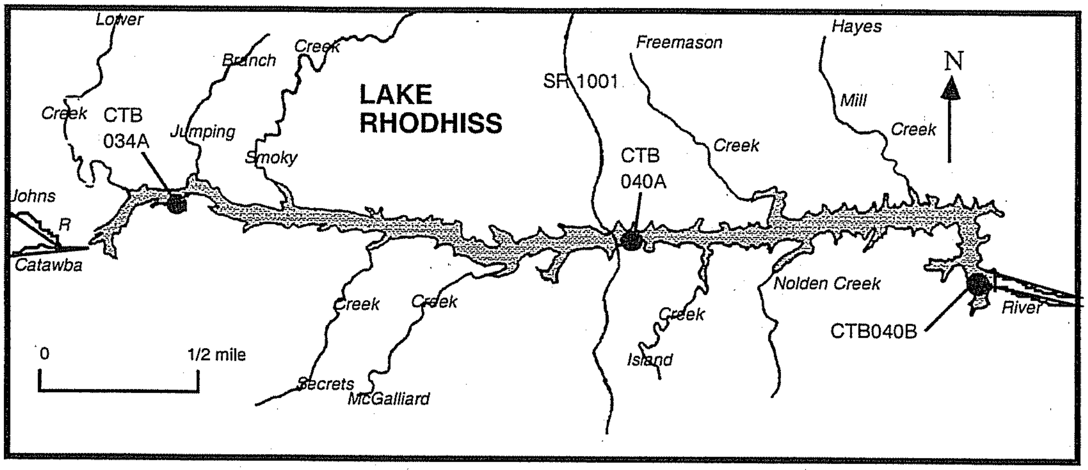
Key:
B = Benthic Macroinvertebrate Sites
F = Fish Sites

Lake Rhodhiss Assessment

COUNTY:	Caldwell/Burke	**CLASSIFICATION:**	WS-IV B CA
SURFACE AREA:	3515 acres (1423 hectares)	**MEAN DEPTH:**	20 feet (6 meters)
VOLUME:	36.7 x10^6m^3	**WATERSHED:**	1090 mi^2 (2823 km^2)
SHORELINE:	90 miles	**RETENTION TIME:**	21 days

Biological and chemical monitoring data are used to develop use support ratings. These ratings are used to prioritize DWQ activities towards protecting and restoring waters in the basin. A complete listing of use support ratings for this subbasin can be found in Appendix III.

Lake Rhodhiss is owned by Duke Energy and is formed by the discharge of Lake James into the Catawba River and by the Johns River. The lake was filled when the construction of the Rhodhiss Hydroelectric Station was completed in 1925. Rhodhiss is a relatively small and narrow lake located between Lake James and Lake Hickory on the Catawba River. Three-fourths of the land in the watershed is forested. The waters of the lake are used for recreational purposes as well as to generate hydroelectric power.



Lake Rhodhiss was most recently sampled in June, July and August 1997 by Duke Energy. Water quality in the lake fluctuates due to the short retention time. The lake was found to be mesotrophic in June, oligotrophic in July and mesotrophic in August. While nutrient values are adequate to support nuisance algal blooms, the short retention time of this lake prevents this from occurring.

In 1995, Lake Rhodhiss was the first reservoir in the Catawba River Chain to have its bottom profile mapped using hydroacoustics. Scientists with Duke Energy compared data collected during this survey with the original topographic survey conducted in 1925 when the reservoir was constructed. This comparison revealed areas within Lake Rhodhiss which had filled in with several feet of sediment, thus reducing the storage capacity of the reservoir (Duke Energy, 1997).

The US Geological Survey conducted an investigation of Lake Rhodhiss from January 1993 through March 1994 in cooperation with the Western Piedmont Council of Governments (Giorgino and Bales, 1997). The objectives of this investigation were to describe ambient hydrologic and water quality conditions, estimates of nutrient loading and suspended solids from selected tributaries and point sources, and to simulate hydraulic circulation and water quality characteristics of Lake Rhodhiss using a hydrodynamic computer model. Based on nutrient concentrations measured during this study, Lake Rhodhiss was determined to be eutrophic. Calculations of total suspended solids, nitrogen and phosphorus loading indicated that all of the suspended solids and the majority of the nitrogen and phosphorus entering the headwaters of the reservoir originated from nonpoint sources. While less than one percent of the suspended solids load to the reservoir was from point sources, up to 27% and 22% of the total nitrogen and total phosphorus loads, respectively, were from point sources (Giorgino and Bales, 1997).

For more detailed information on water quality in subbasin 03-08-31, refer to the *Basinwide Assessment Report - Catawba River Basin - August 1998*, available from the DWQ Environmental Sciences Branch at (919) 733-9960.

2.2 Prior Basinwide Plan Recommendations (1995) and Achievements

2.2.1 Impaired Waters

The 1995 Catawba River Basinwide Plan identified only Lower Creek as impaired in this subbasin.

Lower Creek

Approximately 6.6 miles of Lower Creek near Morganton were identified as partially supporting due to both nonpoint and point sources of pollution. The plan cited the need to target best management practice (BMP) implementation along Lower Creek.

Status of Progress

The Lower Creek sampling site is located approximately 2 miles downstream of Lenoir and the community of Gamewell and approximately 6 miles downstream of the Lenoir WWTP. Land use near the sampling station is pasture with cattle access to the creek. Data from this site have resulted in a Fair bioclassification in all years. Throughout the watershed, Lower Creek and many of its tributaries suffer from urban development and runoff. Lower Creek is still rated as impaired, and recommendations for improving water quality can be found in Part 2.3.

2.2.2 Other Recommendations

Rhodhiss Lake Studies

The Western Piedmont Council of Governments (WPCOG) and the US Geological Survey (USGS), in conjunction with DWQ, were to perform a water quality study of Rhodhiss Lake. The objectives of this study included an effort to estimate the assimilative capacity of Rhodhiss Lake for oxygen-consuming wastes. Rhodhiss Lake receives a considerable load of oxygen-consuming wastes from both point and nonpoint sources.

Status of Progress

USGS, in cooperation with WPCOG, developed a water quality model of Rhodhiss Lake (USGS Open File Report 94-509 and USGS Water Resources Investigations Report 97-4131). Data collected for this study indicated that the majority of nutrients entering the lake headwaters originated from the Lower Creek watershed. Most of the sediment and nutrients in the headwaters were from nonpoint sources. A water quality model was used to simulate water movement and water quality in the lake. The water quality parameters of concern are chlorophyll *a* and dissolved oxygen.

The water quality model provided valuable information on Rhodhiss Lake. Chlorophyll *a* levels in the lake during 1992-1993 were relatively insensitive to the phosphorus discharge from the Valdese WWTP, but were very sensitive to phosphorus levels entering the lake from upstream. However, dissolved oxygen levels in the deeper waters of the reservoir were sensitive to increases in the phosphorus load at the Valdese WWTP. Thus, any increase in phosphorus from the facility would result in lower average dissolved oxygen levels in the lake.

1999 Recommendation(s)

DWQ is using the model to develop a management strategy to protect the water quality of Rhodhiss Lake. The USGS developed model was used to evaluate the response of chlorophyll *a* levels in the lake to a variety of nutrient reduction scenarios. Reductions of phosphorus and nitrogen were considered at the headwaters of the lake and at the Valdese Rhodhiss Lake WWTP. The model runs indicated that the mean lake-wide concentrations of chlorophyll *a* were only moderately sensitive to nutrient reductions. Peak or maximum concentrations of chlorophyll *a* were more sensitive to nutrient reductions.

DWQ, with input from local stakeholders, will develop a management strategy for controlling nutrient inputs to Rhodhiss Lake. Using the model results as a guide, point and nonpoint source controls may be required to achieve nutrient reductions. Point sources were documented to contribute approximately 22 percent of the phosphorus load and 27 percent of the nitrogen load to the headwaters of the lake (USGS 1997). The remaining nutrient loads were attributed to nonpoint sources. The point source discharges that contribute to nutrient loading include the Marion WWTP, Valdese WWTP, Morganton WWTP and Lenoir WWTP. Recommendations such as those presented by the WPCOG for the Lower Creek watershed may form the basis of nonpoint source nutrient controls throughout the subbasin. The overall nutrient management strategy will be described in the next basin plan.

2.3 Current Priority Issues and Recommendations

2.3.1 Monitored Impaired Waters

Lower Creek and its tributaries are listed as impaired waters based on the most recent sampling. These waters are also on the state's year 2000 (not yet EPA approved) 303(d) list (see Part 2.3.2 below).

Lower Creek Mainstem and Several Tributaries

The entire length of Lower Creek below the junction of Zacks Fork (approximately 12.7 miles) is rated as partially supporting, primarily due to urban runoff. The mainstem has water quality problems such as sedimentation and turbidity, as well as elevated fecal coliform bacteria levels. Several major tributaries to Lower Creek are also listed as partially supporting. These include: Zacks Fork Creek (8.2 miles), Spainhour Creek (4.3 miles), Greasy Creek (4.5 miles) and Bristol Creek (5.6 miles). These streams are listed impaired due to nonpoint sources of pollution such as agriculture and cattle access to the creeks, urban runoff and construction activities. The upper reach of Lower Creek is listed as fully supporting but threatened; a status that is not considered to be impaired; however, degradation is apparent.

DWQ conducted a watershed survey to help identify areas of pollution as a first step in identifying areas to concentrate restoration efforts. Four sites on Lower Creek and five tributaries (Zacks Fork, Spainhour Creek, Greasy Creek, Husband Creek and Bristol Creek) were sampled in June 1997. The survey did not identify specific areas on which to concentrate restoration efforts due to the many sources of pollution, mostly nonpoint in origin. However, there may be several riparian zones that could be restored to reduce runoff and further erosion. Eight of nine sampling sites had severe streambank erosion with little protection by a riparian buffer zone, and high fecal coliform bacteria counts were prevalent.

The Western Piedmont Council of Governments (WPCOG) received a grant from DWQ in 1996 to get local involvement in improving water quality in the Lower Creek watershed (see Section C for more information). The WPCOG report prioritized subbasin areas for nonpoint source reduction and restoration projects. (Note: WPCOG denotes subbasins differently than DWQ. Maps of the areas prioritized are available from WPCOG). Three areas were given a high priority: Lower Creek below Lenoir; Spainhour Creek flowing into Lower Creek above Lenoir; and the headwaters of Lower Creek, Greasy Creek, the length of Lower Creek near Gamewell, Briston Creek and two unnamed tributaries above Lenoir. Medium priority subbasin areas include: Zacks Fork, Husband Creek and Abingdon tributaries. The report made several recommendations for corrective actions for these streams, as presented below.

1999 Recommendation(s)

DWQ supports the WPCOG study, which makes several recommendations for addressing the nonpoint sources of pollution in the Lower Creek watershed. The recommendations are grouped into two general areas: watershed protection and urban stormwater planning. The key implementers of these recommendations, and others that may be developed in the future, are the local governments and citizens of the Lower Creek watershed. Funding opportunities for implementation are available through several programs, some of which are presented in Section C.

WPCOG Study recommendations for watershed protection include:

1. Establish 50-foot buffers along streams in the Lower Creek watershed.
2. Within targeted subbasins, identify property owners interested in participating in nonpoint source demonstration projects.
3. Develop a strategy to raise awareness and educate the public about major pollution sources to Lower Creek.
4. Encourage bioengineered solutions for future projects to stabilize streambanks.
5. Establish a Lower Creek Nonpoint Source Team to assist in implementing recommendations and evaluate progress.

WPCOG Study recommendations for consideration by the local governments for urban stormwater include:

1. Adopt strategies and regulations to minimize new impervious surfaces.
2. Encourage use of curb cuts and reduce street curb and gutter systems.
3. Encourage cluster development or open space zoning near perennial streams.
4. Encourage treatment of "hot spots" including gas stations and trash storage and handling areas.

5. Label stormwater drains.
6. Participate in regional stormwater discussions.

The implementation of actions at the local level, such as those presented in these recommendations, will help restore the water quality in this watershed. Improved water quality in Lake Rhodhiss will depend on actions taken to reduce pollutant inputs from Lower Creek, since data indicate that the majority of nutrients entering the lake are from the Lower Creek watershed. DWQ will work with local interests to develop a management strategy for this watershed.

2.3.2 303(d) Listed Waters

There are seven stream segments in this subbasin listed on the year 2000 (not yet EPA approved) 303(d) list. These include three sections of Lower Creek, Zacks Fork Creek, Spainhour Creek, Greasy Creek, Bristol Creek and Harper Creek. These waters are currently impaired and are discussed above. For further information on 303(d) listing requirements and approaches, refer to Appendix IV.