Chapter 5 -
Catawba River Subbasin 03-08-34
Includes Sugar Creek and its tributaries

5.1 Water Quality Overview

Subbasin 03-08-34 at a Glance

Land and Water Area (sq. mi.)

Total area:	324
Land area:	317
Water area:	7

Population Statistics

1990 Est. Pop.: 435,725 people
Pop. Density: 1,375 person/mi^2

Land Cover (%)

Forest/Wetland:	52%
Surface Water:	2%
Urban:	32%
Cultivated Crop:	0%
Pasture/ Managed Herbaceous:	13%

Use Support Ratings

Freshwater Streams:

Fully Supporting:	28.7 mi.
Fully Supporting but Threatened:	5.4 mi.
Partially Supporting:	82.1 mi.
Not Supporting:	2.6 mi.
Not Rated:	131.3 mi.

Lakes:

Lake Wylie - Fully Supporting

(Note: 300 acres of the Catawba Creek Arm and 570 acres of the Crowders Creek Arm are Fully Supporting but Threatened.)

Water quality in this heavily developed subbasin is affected by intensive urban runoff from the City of Charlotte and Mecklenburg County growth, as well as discharges from several large wastewater treatment plants. A map of this subbasin including water quality sampling locations is presented in Figure B-5. Biological ratings for these sample sites are presented in Table B-5.

There are currently over 50 permitted dischargers in this subbasin. The largest discharger is the Charlotte-Mecklenburg Utilities (CMUD), which discharges to Irwin Creek, McAlpine Creek and Little Sugar Creek. Thirty-three facilities in this subbasin currently monitor effluent toxicity under their NPDES permit. Only three of these facilities have experienced toxicity test failures in the past 5 years.

Most of the sample sites in the subbasin received a bioclassification of Poor or Fair based on benthic data since 1983. All 1997 benthos sites received a Fair rating. However, Irwin Creek and Little Sugar Creek improved from Poor to Fair between 1992 and 1997. Sugar Creek improved from Poor to Good-Fair between 1983 and 1992, but it received a Fair rating again in 1997. These are intensely urbanized streams draining the City of Charlotte.

Irwin Creek and Little Sugar Creek are rated Poor based on fish data. However, there were some improvements in the fish community in Irwin Creek between the 1993 and 1997 samplings. For example, approximately twice as many fish were collected in 1997 compared with 1993 and a greater percentage of multiple age groups was represented. This was indicative of more successful fish reproduction at the sampling point in 1997 than in 1993.

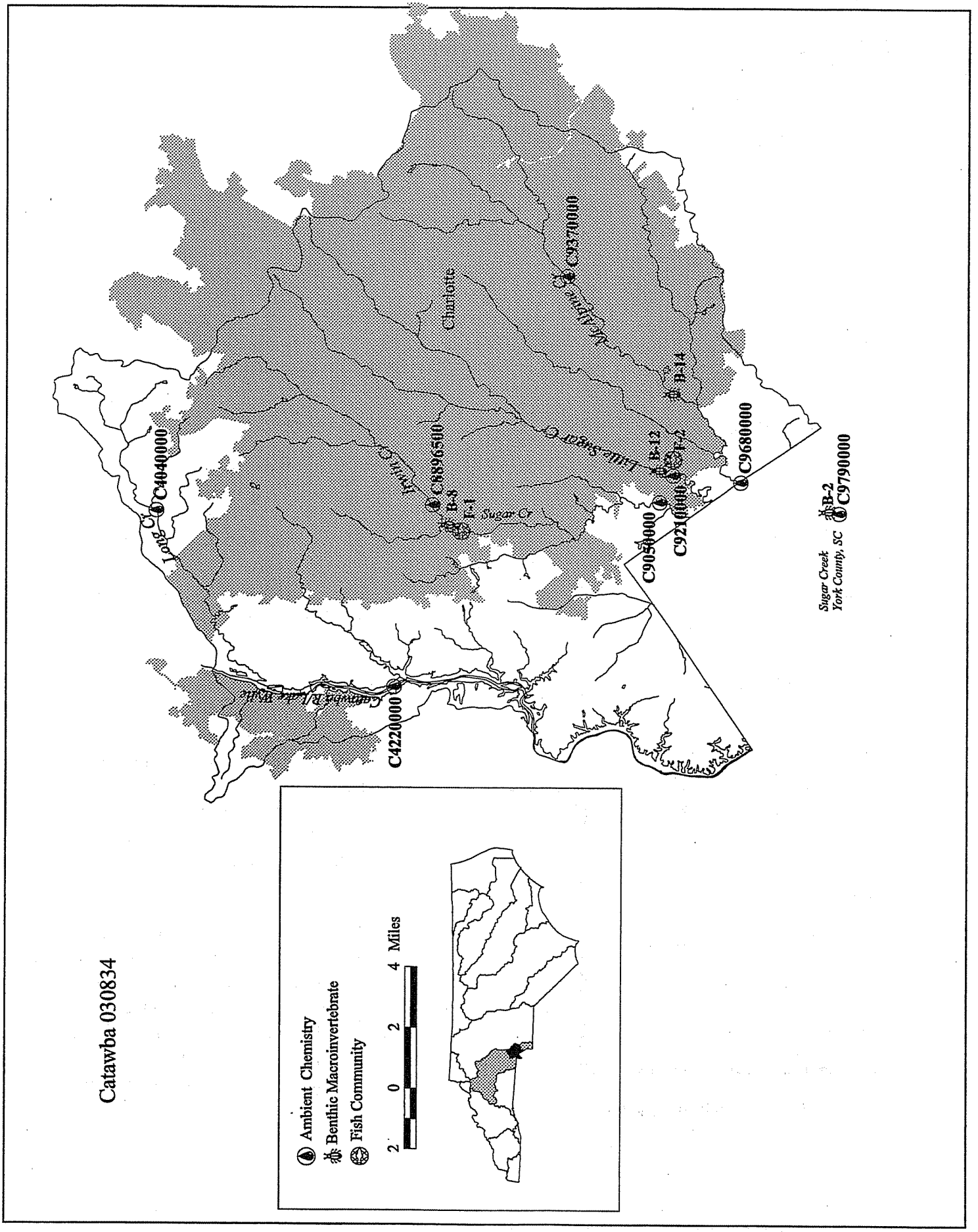


Figure B-5 Sampling Locations within Subbasin 03-08-34

Table B-5 Biological Assessment Sites in Catawba River Subbasin 03-08-34 (1997)

Site	Stream	County	Road	Rating
B-2	Sugar Creek	York, SC	SC 160	Fair
B-8	Irwin Creek	Mecklenburg	SR 1156	Fair
B-12	Little Sugar Creek	Mecklenburg	NC 51	Fair
B-14	McAlpine Creek	Mecklenburg	NC 51	Fair
F-1	Irwin Creek	Mecklenburg	SR 1156	Poor
F-2	Little Sugar Creek	Mecklenburg	NC 51	Poor

Key:
B = Benthic Macroinvertebrate Sites
F = Fish Sites

Historical data indicate that Sugar Creek has long been a severely polluted stream. Fisheries collections in the 1960s and 1970s usually recorded "no fish" in Sugar Creek. Both urban runoff and several large wastewater treatment plants contributed to these problems. This watershed is still characterized by Fair to Poor water quality.

The Mecklenburg County Department of Environmental Protection (MCDEP) has developed a stream bioassessment program to enhance the City of Charlotte's Storm Water Services' protection of streams in Charlotte and Mecklenburg County. This program uses benthic macroinvertebrate surveys to determine the overall water quality of the streams. Sampling methods are similar to DWQ, but stream classifications are slightly different.

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. With the exception of the Catawba River mainstem, all monitored waters in this subbasin are impaired. Refer to Appendix III for a complete listing of monitored waters and use support ratings.

Lake Wylie Assessment

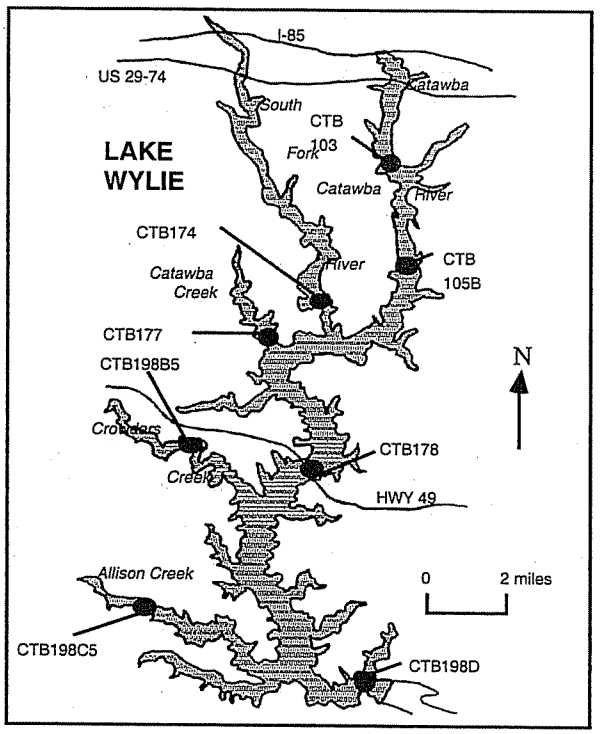
COUNTY:	Gaston/Mecklenburg	**CLASSIFICATION:**	WS-IV, WS-V B CA
SURFACE AREA:	12450 acres (5039 hectares)	**MEAN DEPTH:**	23 feet (7 meters)
VOLUME:	$35.3 \times 10^6 m^3$	**WATERSHED:**	3020 mi^2 (7822 km^2)
SHORELINE:	327 miles in NC	**RETENTION TIME:**	32 days

The Lake Wylie dam was built in 1904 and reconstructed and enlarged in 1928m making it the first lake built on the Catawba River. The lake is owned by Duke Energy and is located in Gaston and Mecklenburg counties in North Carolina and York County in South Carolina. Major tributaries include the Catawba River, the South Fork Catawba River, Crowders Creek, Catawba Creek and Allison Creek. The upstream watershed consists of forested areas along with agriculture and urban land uses. The waters of the lake are used to generate electricity and for

recreational purposes. The lake is classified WS-IV CA from Mountain Island Dam to the Interstate Highway 85 bridge at Belmont, WS-IV B CA from the Interstate 85 bridge to the upstream side of the Paw Creek arm of Lake Wylie, and WS-V B from the Paw Creek arm to the North Carolina-South Carolina state line.

Lake Wylie was most recently sampled by DWQ in June, August and September 1997. Lake Wylie was determined to be eutrophic in June, mesotrophic in August and eutrophic in September 1997. Historical data collected at Lake Wylie from 1981 to 1997 found total phosphorus, total organic nitrogen and chlorophyll *a* concentrations to be greatest in the Crowders Creek arm as compared with other sampling sites.

In response to continued public concern regarding the water quality of Lake Wylie and the proliferation of wastewater dischargers into the lake, the states of NC and SC conducted a joint water quality study of Lake Wylie in 1989 and 1990. Results of this study are presented in Section A, Chapter 4, Part 4.1.3.



For more detailed information on water quality in subbasin 03-08-34, refer to the *Basinwide Assessment Report - Catawba River Basin - August 1998*, available from the DWQ Environmental Sciences Branch at (919) 733-9960.

5.2 Prior Basinwide Plan Recommendations (1995) and Achievements

The 1995 basinwide plan identified many streams in this subbasin as impaired. These are described below along with recommendations for addressing this impairment.

McCullough Branch, Brier Creek, Fourmile Creek, McMullen Creek and Steele Creek

These streams were previously rated impaired based on evaluated information. Use support methodology has been improved, and only monitored data are now used in use support determinations (see Section A, Chapter 3 for more information). The planned management strategy for these streams was to rely on the City of Charlotte Storm Water Program.

Current Status

These streams are located within the Sugar Creek watershed. This watershed is discussed further below. The City of Charlotte Storm Water Program is described further in Section C.

Dixon Branch, McIntyre Creek and Walker Branch

These streams were previously incorrectly rated impaired based on evaluated information. The streams should have been given a rating of fully supporting but threatened (ST). In addition, use support methodology has been improved, and only monitored data are now used in use support determinations (see Section A, Chapter 3 for more information). The planned management strategy for these streams was to rely on point source discharge removal.

Current Status

There are no longer any NPDES dischargers on these creeks.

Sugar Creek Watershed Including: *Sugar Creek, Little Sugar Creek, Irwin Creek, Stewart Creek, McAlpine Creek and Irwin Creek*

The Sugar Creek watershed receives a significant amount of wastewater from three facilities operated by Charlotte-Mecklenburg Utilities (CMUD): Irwin Creek WWTP, Sugar Creek WWTP and McAlpine Creek WWTP. In addition, the Sugar Creek watershed receives pollutant loads from several minor discharges and a highly urbanized area.

A water quality study of 32.3 stream miles in the Sugar Creek, Little Sugar Creek and McAlpine Creek watersheds was performed to calibrate a water quality model. This model was used to predict dissolved oxygen, ammonia and biochemical oxygen demand at low flow conditions.

Each major facility was given revised permit limits that were to become applicable when modifications were undertaken.

Status of Progress

As recommended, McAlpine Creek WWTP, Sugar Creek WWTP and Irwin Creek WWTP began operation of advanced tertiary treatment to meet revised permit limits. Sugar Creek, Irwin Creek, Little Sugar Creek and McAlpine Creek are all currently listed as impaired waters. Recommendations for addressing this impairment are discussed in Part 5.3.1. Stewart Creek is no longer impaired based on recent DWQ monitoring.

5.3 Current Priority Issues and Recommendations

5.3.1 Monitored Impaired Waters

This subbasin contains the highest number of impaired stream miles based on DWQ monitoring data. A large number of stream miles within this subbasin are not sampled by DWQ and are, therefore, not rated. It is likely that the number of impaired stream miles would be much higher if sampling was conducted on all streams in the subbasin. In large part, the highly urbanized nature of the subbasin is responsible for this impairment and makes it challenging and costly to retrofit the urbanization to make measurable water quality improvements. The streams that are listed impaired by DWQ are presented below. These streams are also on the state's year 2000 (not yet EPA approved) 303(d) list (see Part 5.3.2 below).

The City of Charlotte and Mecklenburg County Department of Environmental Protection conduct chemical and biological sampling on many streams within this subbasin. This data was used to support use support determinations where DWQ had a sampling station nearby.

Long Creek

Approximately 15.3 miles of Long Creek are rated impaired (partially supporting) due to turbidity and exceedences of the manganese water quality standard. Impairment is likely due to urban runoff, construction and agriculture in the watershed. This evaluation is based on chemical monitoring data since DWQ does not have biological monitoring locations on Long Creek at this time.

1999 Recommendation(s)

DWQ will conduct further monitoring on Long Creek to better determine sources of impairment. Long Creek is also on the 303(d) list for developing a management strategy (see Part 5.3.2). To assist in these efforts, an in-depth watershed assessment is needed.

Sugar Creek, Irwin Creek, Little Sugar Creek and McAlpine Creek

The entire length of each of these creeks (Sugar Creek = 13.3 mi., Irwin Creek = 11.8 mi., Little Sugar Creek = 20.7 mi., and McAlpine Creek = 20.4 mi.) is listed as impaired (partially supporting) due to wastewater discharges and urban runoff. Problem parameters include turbidity and fecal coliform bacteria as well as poor to fair biological communities. This impairment is perceived to be responsible for some portion of the impact to the water quality of Lake Wateree in South Carolina.

1999 Recommendation(s)

The waters of this subbasin are part of a larger watershed that spans both North and South Carolina. Sugar Creek is part of the Fishing Creek Reservoir watershed in South Carolina. Downstream of Fishing Creek Reservoir is Cedar Creek Reservoir and Lake Wateree. Fishing Creek and Cedar Creek Reservoirs and Lake Wateree are on the South Carolina 303(d) list. A

TMDL must be developed to address the causes and sources of impairment for these lakes. South Carolina Department of Health and Environmental Control (DHEC) is working with DWQ to develop a management plan for phosphorus reduction to SC's waters. DHEC has proposed the development of a phosphorus TMDL, as presented in Figure B-6.

The University of South Carolina is performing a nonpoint source assessment and modeling study in cooperation with SC DHEC to meet the goal of TMDL development. This study has four components: nonpoint source water quality field studies, watershed/nonpoint source modeling, nutrient response modeling, and consensus building for load allocation to Lake Wateree. This study should provide significant insight into nutrient contributions from nonpoint sources and direct management strategies to address these sources.

Using the currently available information, as described in the Interim column of Figure B-6, DHEC plans to include total phosphorus limits for South Carolina NPDES dischargers with flows greater than 50,000 gallons per day beginning in year 2000. DHEC has been placing phosphorus limits on all new and expanding dischargers, regardless of size, since 1998.

Significant discharges of phosphorus also come from the NC portion of the Fishing Creek Reservoir watershed. Early estimates indicate that approximately 40 percent of the phosphorus load comes from the Sugar Creek subbasin in NC. Thus, some phosphorus controls are needed from both NC and South Carolina sources to improve water quality in Lake Wateree.

Charlotte-Mecklenburg Utilities (CMUD) has three NPDES discharges in this subbasin that carry a significant amount of the phosphorus load through the watershed. CMUD has expressed an interest in working with DHEC and DWQ to establish goals and develop a plan of action to reduce nutrient loading. CMUD recently developed a Long-Term Monitoring Program at the McAlpine, Sugar and Irwin Creek WWTPs addressing nutrients entering the facilities, and how existing treatment processes and operating practices affect effluent nutrient concentrations. In addition, CMUD has diverted the waste activated sludge (and primary sludge) stream from the Sugar Creek WWTP to the McAlpine Creek WWTP, where different treatment processes and flow routing produce lower phosphorus levels in the plant effluent and higher treatment levels.

CMUD believes the elevated phosphorus levels from the Sugar Creek WWTP may be due to sludge storage tank digester processes. CMUD is completing construction to transfer all solids treatment from the Sugar Creek facility to the McAlpine Creek facility. The goal is to reduce concentrations of total phosphorus being discharged from the Sugar Creek WWTP to those levels documented at the other plants on McAlpine Creek and Irwin Creek.

CMUD has also initiated, in cooperation with Mecklenburg County, a monitoring plan for determining nutrient levels in the receiving streams above and below the WWTPs. CMUD has also recently begun a system of collecting nutrient information for Significant Industrial Users (SIUs) and commercial dischargers that discharge to the sanitary sewer system as a means of better understanding potential sources and influent levels.

DWQ will recommend plant optimization for these three facilities upon permit renewal. Plant optimization could significantly reduce nutrient loadings from the facilities. After completion of data gathering and modeling analysis, DWQ will assess the need for additional nutrient

reductions and permit limits for total phosphorus on dischargers in the subbasin at future permit renewal.

Additional management strategies need to be developed to address the other problem parameters for these waters: fecal coliform bacteria and turbidity. The Mecklenburg County SWIM program will be instrumental in implementing strategies to restore these waters. DWQ will support the actions of SWIM as much as possible.

DWQ is currently developing fecal coliform TMDLs for Sugar Creek, Little Sugar Creek and McAlpine Creek. Data on these waters have been collected by DWQ, the Mecklenburg County Department of Environment Protection (MCDEP) and the USGS. Data from all of these sources will be considered in developing the TMDL. The MCDEP is also providing land use data and other information to support TMDL development.

Existing data indicate that fecal coliform levels are elevated throughout these watersheds. Fecal coliform levels are especially high during storm events, but elevated concentrations during non-storm periods are common. While work to characterize sources of fecal coliform is still ongoing, it is likely that several types of sources are important. These sources include runoff from urban surfaces as well as leaking sanitary sewer lines. While several municipal wastewater plants discharge into these waters, they are not believed to be major contributors to the problem.

Each TMDL will include: 1) an assessment of current fecal coliform loadings from particular source types or source areas; 2) an estimate of the loading capacity (i.e., a determination of the fecal coliform loading each stream can sustain and still meet water quality standards); 3) an allocation of the loading capacity to specific source types or source areas; and 4) specifying the extent of reduction from various sources necessary to bring the loading down to the specified level. An implementation plan will also be developed, discussing the specific measures that will be taken to attain the loading reductions required by the TMDL.

DWQ will work closely with Mecklenburg County and the City of Charlotte during development of the TMDL and implementation plan. As much as possible, the implementation plan will function in cooperation with the Mecklenburg County Surface Water Improvement and Management (SWIM) initiative (see Section C). It is the intent of DWQ to complete a draft of the fecal coliform TMDLs in 2000. Development of the implementation plan will follow completion of the TMDL.

5.3.2 303(d) Listed Waters

Several streams within this subbasin are on the state's year 2000 (not yet EPA approved) 303(d) list. All of these waters are currently considered to be impaired and are discussed above. Refer to Appendix IV for more information on 303(d) listing requirements.

Proposed TMDL Development for Lake Wateree, SC

SC 303(d) listed reservoirs in the Catawba River Basin:
Fishing Creek Reservoir
Cedar Creek Reservoir Lake Wateree

Interim (1999-2000)		Final (2002-2003)
1-D Nutrient Response Model of Lake Wateree. Funded by WHOA. Models chlorophyll-a and DO. Discretized longitudinally, not vertically (i.e., depth averaged). (USC, 1997)	Nutrient Response Model	***Lake Wateree Nutrient Field Study.*** Additional monitoring including recommendations from 1997 modeling report. (EPA, 2000) ***Nutrient Model Refinement.*** Using new study results and WARMF Wateree model or existing Lake Wateree model. (USC, 2001?)
Point Load Estimates. Where water quality and flow data are available, estimate the total nutrient loads. (DHEC & DWQ, 1999) ***TP fate and transport.*** TP fate below Lk Wylie, mainstem Catawba. (USGS, 1999)	Watershed/ NPS Loading Model	***NPS Water Quality Field Studies.*** Storm event monitoring to verify coefficients in WARMF. Cane or Rocky Creek watershed. (USC, 1999-2001) ***Watershed/NPS Modeling.*** Nutrients in watershed below Lk Wylie modeled using WARMF. MCDEP data may be used to assist model calibration. (USC, 2002)
Interim Nutrient Management. Develop interim plan for management of nutrients until more comprehensive plan is developed. (DHEC & DWQ, 1999-2000)	Allocation and Management Strategy	***Load Allocation.*** Allocate nutrient loads to point and nonpoint sources. (USC,DHEC, DWQ, stakeholders, 2002-2003) ***TMDL Development with Implementation Plan.*** (DHEC & DWQ, 2003)

draft

Figure B-6 Proposed TMDL Development for the Watershed of Lake Wateree, South Carolina