Chapter 3 -
Summary of Water Quality Information for the Catawba River Basin

3.1 General Sources of Pollution

Human activities can negatively impact surface water quality, even when the activity is far removed from the waterbody. With proper management of wastes and land use activities, these impacts can be minimized. Pollutants that enter waters fall into two general categories: *point sources* and *nonpoint sources.*

Point Sources

- Piped discharges from municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state.

Nonpoint Sources

- Stormwater runoff
- Land clearing activities (construction and preparing land for crops and development)
- Road construction related to timber harvesting activities
- Agricultural lands
- Rural residential development
- Septic systems
- Mining

Nonpoint sources are from a broad range of land use activities. Nonpoint source pollutants are typically carried to waters by rainfall, runoff or snowmelt. Sediment and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given the diffuse nature of nonpoint source pollution, it is difficult and resource intensive to quantify nonpoint contributions to water quality degradation in a given watershed. While nonpoint source pollution control often relies on voluntary actions, the state has many programs designed to reduce nonpoint source pollution.

Every person living in or visiting a watershed contributes to impacts on water quality. Therefore, each individual should be aware of these contributions and take actions to reduce them.

While any one activity may not have a dramatic effect on water quality, the cumulative effect of land use activities in a watershed can have a severe and long-lasting impact.

3.2 Description of Surface Water Classifications and Standards

Program Overview

North Carolina's Water Quality Standards program adopted classifications and water quality standards for all the state's river basins by 1963. The program remains consistent with the Federal Clean Water Act and its amendments. Water quality classifications and standards have also been modified to promote protection of surface water supply watersheds, high quality waters, and the protection of unique and special pristine waters with outstanding resource values.

Statewide Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Most supplemental classifications have been developed to provide special protection to sensitive or highly valued resource waters. A full description of the state's primary and supplemental classifications are available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina.* Information on this subject is also available at DWQ's website: http://h2o.enr.state.nc.us/wqhome.html.

Statewide Water Quality Standards

Each primary and supplemental classification is assigned a set of water quality *standards* that establish the level of water quality that must be maintained in the waterbody to support the uses associated with each classification. Some of the standards, particularly for HQW and ORW waters, outline protective management strategies aimed at controlling point and nonpoint source pollution. These strategies are discussed briefly below. The standards for C and SC waters establish the basic protection level for all state surface waters. With the exception of Sw, all of the other primary and supplemental classifications have more stringent standards than for C and SC, and therefore, require higher levels of protection.

Some of North Carolina's surface waters are relatively unaffected by pollution sources and have water quality higher than the standards that are applied to the majority of the waters of the state. In addition, some waters provide habitat for sensitive biota such as trout, juvenile fish, or rare and endangered aquatic species. These waters may be rated as HQW or ORW.

Table A-18 Primary and Supplemental Surface Water Classifications
(Primary classifications beginning with an "S" are assigned to saltwaters)

PRIMARY FRESHWATER AND SALTWATER CLASSIFICATIONS	
Class	**Best Uses**
C and SC	Aquatic life propagation/protection and secondary recreation.
B and SB	Primary recreation and Class C uses.
SA	Waters classified for commercial shellfish harvesting.
WS	*Water Supply watershed.* There are five WS classes ranging from WS-I through WS-V. WS classifications are assigned to watersheds based on land use characteristics of the area. Each water supply classification has a set of management strategies to protect the surface water supply. WS-I provides the highest level of protection and WS-IV provides the least protection. A Critical Area (CA) designation is also listed for watershed areas within a half-mile and draining to the water supply intake or reservoir where an intake is located.
SUPPLEMENTAL CLASSIFICATIONS	
Class	**Best Uses**
Sw	*Swamp Waters*: Recognizes waters that will naturally be more acidic (have lower pH values) and have lower levels of dissolved oxygen.
HQW	*High Quality Waters*: Waters possessing special qualities including excellent water quality, Native or Special Native Trout Waters, Critical Habitat areas, or WS-I and WS-II water supplies.
ORW	*Outstanding Resource Waters*: Unique and special surface waters which are unimpacted by pollution and have some outstanding resource values.
NSW	*Nutrient Sensitive Waters*: Areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.

High Quality Waters

Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

Criteria for HQW Classification

- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native and special native trout waters or primary nursery areas by the Wildlife Resources Commission.
- Waters designated as primary nursery areas by the Division of Marine Fisheries.
- Critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture.
- Waters classified by DWQ as WS-I, WS-II and SA are HQW by definition, but these waters are not specifically assigned the HQW classification because the standards for WS-I, WS-II and SA waters are at least as stringent as those for waters classified HQW.

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. In addition, the Division of Land Resources requires more stringent sedimentation controls for land-disturbing projects within one mile and draining to HQWs.

Outstanding Resource Waters

A small percentage of North Carolina's surface waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource.

The ORW rule defines outstanding resource values as:

- outstanding fisheries resource;
- a high level of water-based recreation;
- a special designation such as National Wild and Scenic River or a National Wildlife Refuge;
- being within a state or national park or forest; or
- having special ecological or scientific significance.

The requirements for ORW waters are more stringent than those for HQWs. Special protection measures that apply to North Carolina ORWs are set forth in 15A NCAC 2B .0225. At a minimum, no new discharges or expansions are permitted, and stormwater controls for most new developments are required. In some circumstances, the unique characteristics of the waters and resources that are to be protected require that a specialized (or customized) ORW management strategy be developed.

Classifications and Standards in the Catawba River Basin

The waters of the Catawba River basin have a variety of surface water quality classifications applied to them. Water Supply watersheds range from WS-II to WS-V. Water supply watersheds, Outstanding Resource Waters and High Quality Waters are presented in Figure A-15.

Classification and standards for the entire basin can be found in a separate document titled *Classifications and Water Quality Standards Assigned to the Waters of the Catawba River Basin* available by calling the Planning Branch of DWQ at (919) 733-5083. They can also be accessed through DWQ's Water Quality Section website: http://h2o.enr.state.nc.us/wqhome.html.

Pending and Recent Reclassifications in the Catawba River Basin

There is one pending reclassification in the Catawba River basin on Little Grassy Creek in Avery County. The proposed reclassification is from C Tr to C Tr ORW went to public hearings in May 1999. DWQ will continue to assess the proposed reclassification.

Recent reclassifications in the basin include Armstrong Creek in McDowell County (from WS-II Tr to C Tr HQW), Lookout Shoals Lake (from WS-V and WS-IV to WS-IV and WS-IV CA), and the Catawba River near Morganton in McDowell County (WS-IV Protected Area revision). These recent reclassifications became effective in April 1999. There were five reclassifications in 1998.

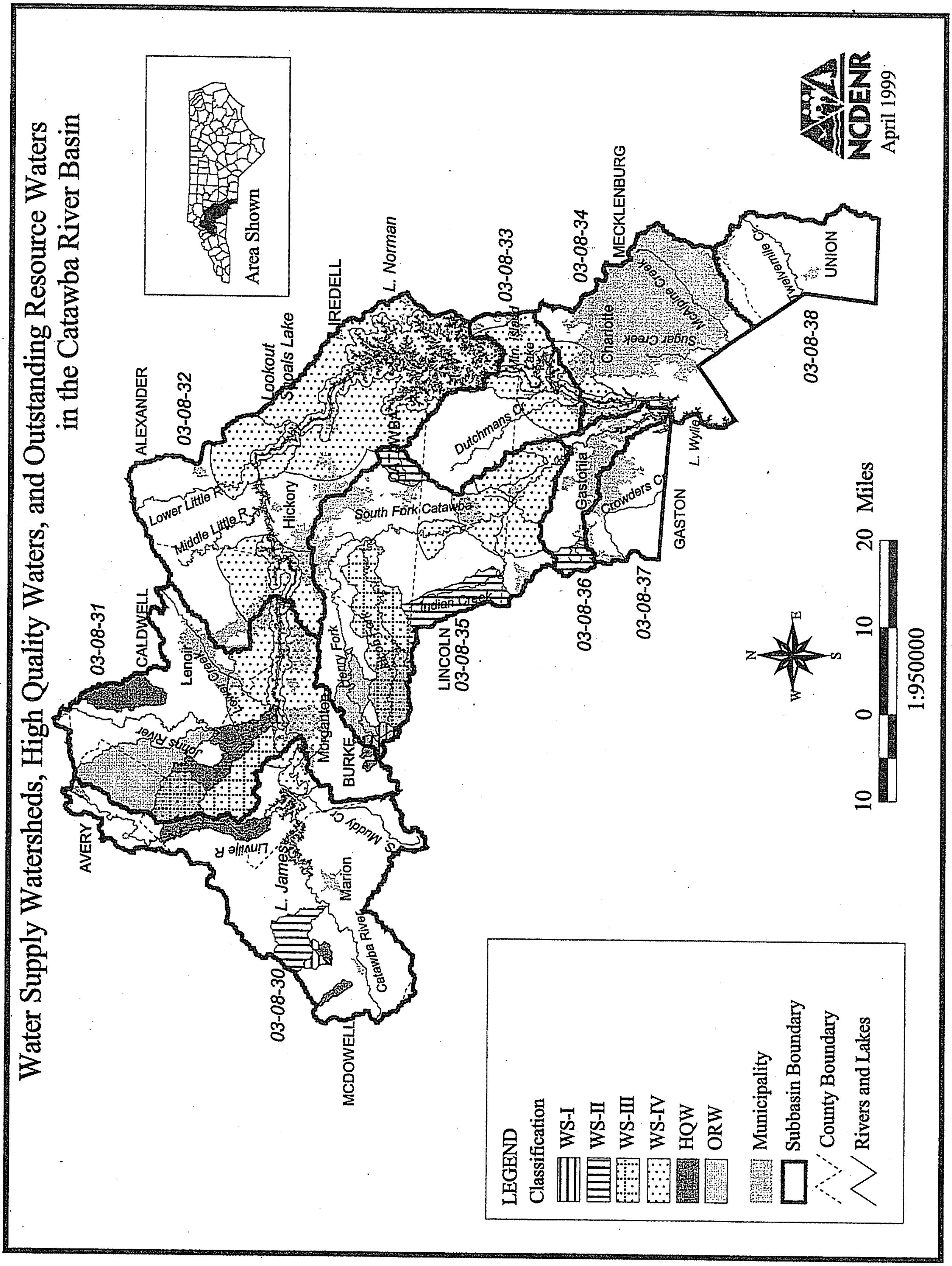


Figure A-15 Water Supply Watersheds, Outstanding Resource Waters and High Quality Waters in the Catawba River Basin

3.3 DWQ Water Quality Monitoring Programs in the Catawba River Basin

The Environmental Sciences Branch of DWQ collects a variety of biological, chemical and physical data. The following discussion contains a brief introduction to each program, followed by a summary of water quality data in the Catawba River basin for that program. A more complete discussion on biological and chemical monitoring within the basin can be found in the *Catawba River Basinwide Assessment Report* (DENR, August 1998 or at the Environmental Sciences website address: http://esb.ehnr.state.nc.us).

> *DWQ monitoring programs for the Catawba River Basin include:*
>
> - benthic macroinvertebrates (Section 3.3.1)
> - fish assessments (Section 3.3.2)
> - aquatic toxicity monitoring (Section 3.3.3)
> - lakes assessment (Section 3.3.4)
> - ambient monitoring system (Section 3.3.5)

3.3.1 Benthic Macroinvertebrates

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since macroinvertebrates have life cycles of six months to over one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification rating to each benthic sample based on the number of different species present in the pollution intolerant groups of Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies); or commonly referred to as EPTs. Different criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina. The ratings fall into five categories ranging from Poor to Excellent.

Overview of Benthic Macroinvertebrate Data

Appendix A-II lists all the benthic macroinvertebrate collections in the Catawba River basin between 1983 and 1996, giving site location, collection date, taxa richness, biotic index values and bioclassifications. Benthic macroinvertebrates have been collected at 217 sites in the Catawba River basin since 1983, and 67 of these sites were sampled during the 1997 basinwide surveys. For the 1997 collections, bioclassifications were given to sites in the following breakdown: Excellent (11), Good (21), Good-Fair (18), Fair (16) and Poor (1). The distribution of water quality ratings is similar for all collections since 1983 versus 1997 ratings. However, a lower percentage of Poor sites was observed in the 1997 samples. This reflects a change in the type of surveys conducted by Division biologists, rather than any improvement in water quality. Basinwide collections in 1997 are aimed at sampling larger streams, while prior collections include many surveys of small streams affected by point source dischargers. Future collections will attempt to assess improvements in water quality for small streams. Table A-19 lists the biological ratings for sample sites since 1983 by subbasin for the Catawba River basin.

Table A-19 Biological Ratings for Recent Samplings in the Catawba River Basin

Subbasin 03-08-30 to 03-08-38	Excellent	Good	Good-Fair	Fair	Poor
Headwaters (to Lake James) - 30	10	24	8	2	2
Johns R and L Rhodhiss Tribs - 31	19	8	8	8	0
Lower Catawba to L Norman - 32	0	5	8	1	4
Dutchmans Cr/McDowell Cr - 33	4	3	1	1	0
Charlotte area - 34	0	0	3	9	6
S Fork Catawba R - 35	10	13	8	8	4
Long Cr - 36	0	8	6	3	0
Crowders Cr/Catawba Cr - 37	0	0	5	7	7
Waxhaw area - 38	0	0	3	0	0
Total (#)	43	61	50	39	23
Total (%)	20%	28%	23%	18%	11%

High quality streams in the Catawba River basin (Good and Excellent ratings) are concentrated in two areas: northern tributaries of the Catawba River above Lake Rhodhiss in 03-08-30 and 03-08-31 and the Henry Fork/Jacob Fork catchments in 03-08-35. Macroinvertebrate sampling has found the greatest number of water quality problems in smaller effluent-dominated streams and streams draining highly urbanized catchments. Charlotte (03-08-34), Gastonia (03-08-37) and Lincolnton (03-08-35) have the greatest number of Fair and Poor ratings.

Long-term changes in water quality were evaluated at 52 sites in the Catawba River basin, with the majority of sites showing no changes in water quality (Table A-20). High flows in 1997 caused several changes over a 5-year period either due to greater scour at sites affected by nonpoint source runoff or due to dilution in effluent-dominated streams. Negative changes in water quality were usually related to nonpoint source problems. Improvements in water quality were usually associated with the elimination or improvements of wastewater treatment plants. For greater detail, go to specific subbasin chapters of this document.

Table A-20 Long-Term Changes in Water Quality Using Benthic Macroinvertebrate Samples

Subbasin 03-08-30 to 03-08-38	# Trend Sites	5-year trend			Long-term (>5 years) trend		
		None	+	-	None	+	-
Headwaters (to Lake James) - 30	21	15	0	4	3	4	1
Johns R and L Rhodhiss Tribs - 31	7	7	0	0	2	0	0
Lower Catawba to L Norman - 32	6	5	0	1	0	0	0
Dutchmans Cr/McDowell Cr - 33	3	2	0	1(1*)	1	0	0
Charlotte area - 34	4	1	2	1(1*)	0	1	0
S Fork Catawba R - 35	6	4	2(2*)	0	2	3	0
Long Cr - 36	2	2	0	0	1	1	0
Crowders Cr/Catawba Cr - 37	1	0	1(1*)	0	0	1	0
Waxhaw area - 38	0	0	0	0	2	0	0
Total	52	36	5(3*)	7(2*)	11	10	1

* Number of changes in bioclassification related to between-year differences in flow, not indicative of any long-term change in water quality.

3.3.2 Fish Assessments

In 1997, 32 sites representing all nine of the subbasins were sampled and evaluated using the North Carolina Index of Biotic Integrity (NCIBI). The NCIBI uses a cumulative assessment of 12 parameters or metrics. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score. Finally, the NCIBI score is used to determine the NCIBI class, as proposed by Karr (1981), of the stream from which the sample was collected (Table A-21 and Appendix A-II).

The NCIBI has been revised since the 1995 Catawba River basinwide monitoring was conducted. Recently, the focus of using and applying the Index has been restricted to wadeable streams that can be sampled by a crew of 2-4 persons using backpack electrofishers and following the NCDWQ Standard Operating Procedures (NCDENR, 1997). In an effort to simplify and standardize the evaluation of a stream's ecological integrity and water quality bioclassification whether using a fish community or benthic invertebrate assessment, the fish community integrity classes were also modified.

Overview of Fish Community Assessment Data

The NCIBI classifications at these sites ranged from Good to Poor (Figure A-16). The fish communities with the highest biological integrity scores were Mulberry Creek and Jacob Fork (in Caldwell and Burke counties, respectively). The fish communities with the lowest biological integrity scores were McDowell Creek, Irwin Creek, Little Sugar Creek (all in Mecklenburg County), Hoyle and Indian Creek (Lincoln County), and Crowders Creek (Gaston County).

Of the 32 sites sampled in 1997, twelve of the sites were previously sampled in 1993 (Figure A-17 and Appendix A-II). The 1997 average NCIBI score was 41 with an NCIBI classification of Fair. The 1993 average NCIBI score was 36 with a NCIBI classification of Poor. It, thus, seems that between 1993 and 1997 the overall ecological health of these twelve sites improved slightly.

Fish ratings were much lower than the benthos ratings in subbasins 03-08-33, 03-08-35 and 03-08-36, suggesting that sediment is the primary stress factor for the aquatic fauna in these areas.

Table A-21 Scores, Integrity Classes and Class Attributes for Evaluating a Wadeable Stream Using the North Carolina Index of Biotic Integrity

NCIBI Scores	NCIBI Classes	Class Attributes
56 - 60	Excellent	Comparable to the best situations without human disturbance. All regionally expected species for the habitat and stream size, including the most intolerant forms are present, along with a full array of size classes and a balanced trophic structure.
50 - 54	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant species; some species are present with less than optimal abundance or size distributions; and the trophic structure shows some signs of stress.
44 - 48	Good-Fair	Signs of additional deterioration include the loss of intolerant species, fewer species and a highly skewed trophic structure.
38 - 42	Fair	Dominated by omnivores, tolerant species and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; and diseased fish often present.
< 36	Poor	Few fish present, mostly introduced or tolerant species; and disease fin damage and other anomalies are regular.

<u>Overview of Fish Tissue Sampling</u>

Fish tissue was sampled at 10 stations within the Catawba drainage during 1997 as part of routine basinwide assessments. All fish samples collected during 1997 contained metals at non-detectable levels or at levels below FDA and EPA criteria. A small number of fish were also analyzed for chlorinated pesticides and PCBs during the 1997 assessment. Results showed only trace amounts of the DDT metabolites DDD and DDE in fish from Mountain Island Lake and the South Fork Catawba River near Belmont. Concentrations of DDD and DDE at these stations were below EPA and FDA criteria. Only one fish sample collected from the Catawba basin during 1997 contained an organic pollutant exceeding accepted criteria. A largemouth bass sample from South Fork Catawba River contained PCBs exceeding the EPA screening value, but results were below FDA limits. Targeted organic analytes were not detected at other stations during the 1997 survey.

At present, there are no fish tissue consumption advisories posted specifically in the Catawba basin. However, the entire basin is posted for bowfin, as part of a statewide mercury advisory on the species. Consumption of bowfin is limited to no more than 2 meals per month for the general population. Children and women of childbearing age are advised not to consume bowfin.

Figure A-16 The North Carolina Index of Biotic Integrity for the Catawba River Basin (1997)

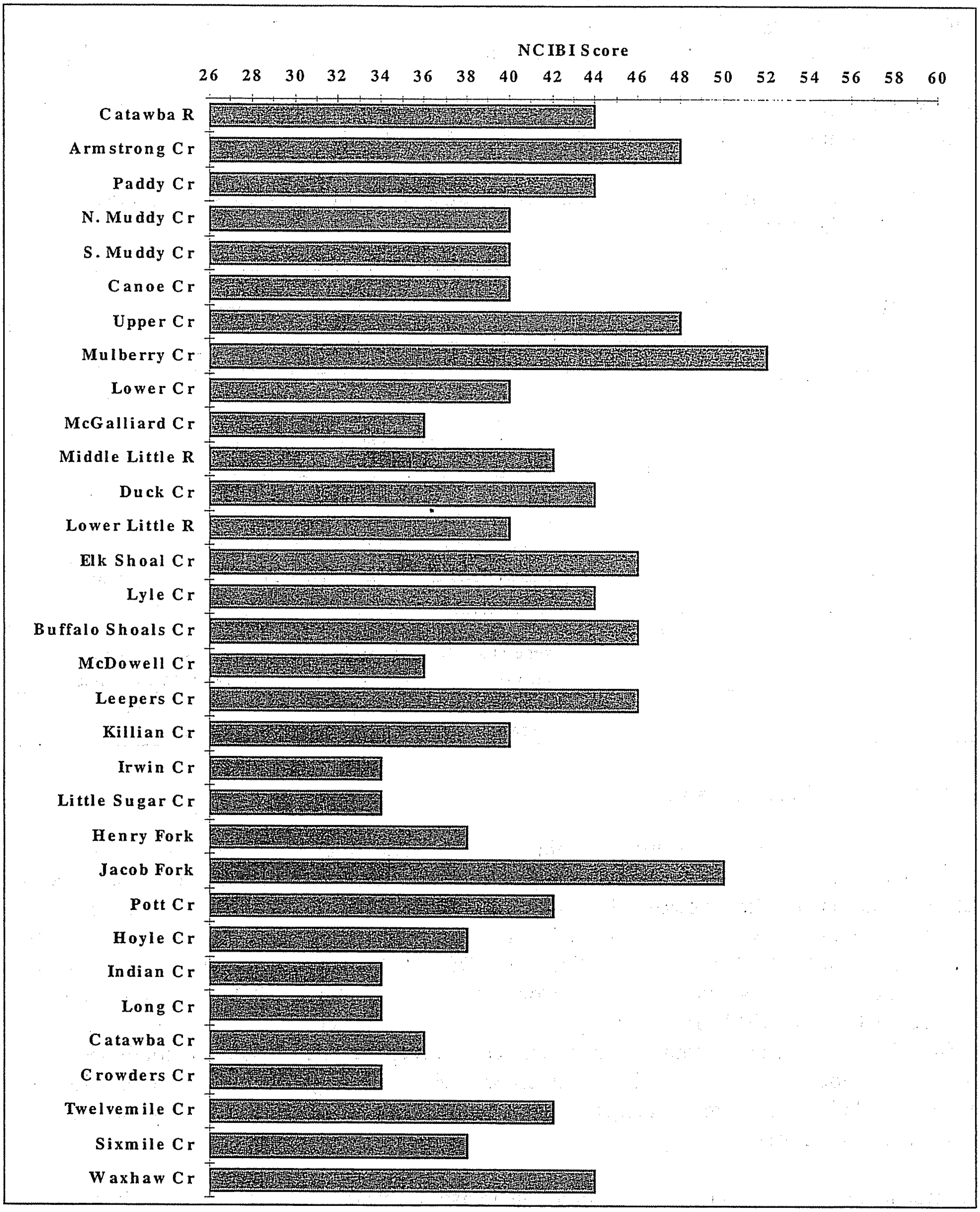
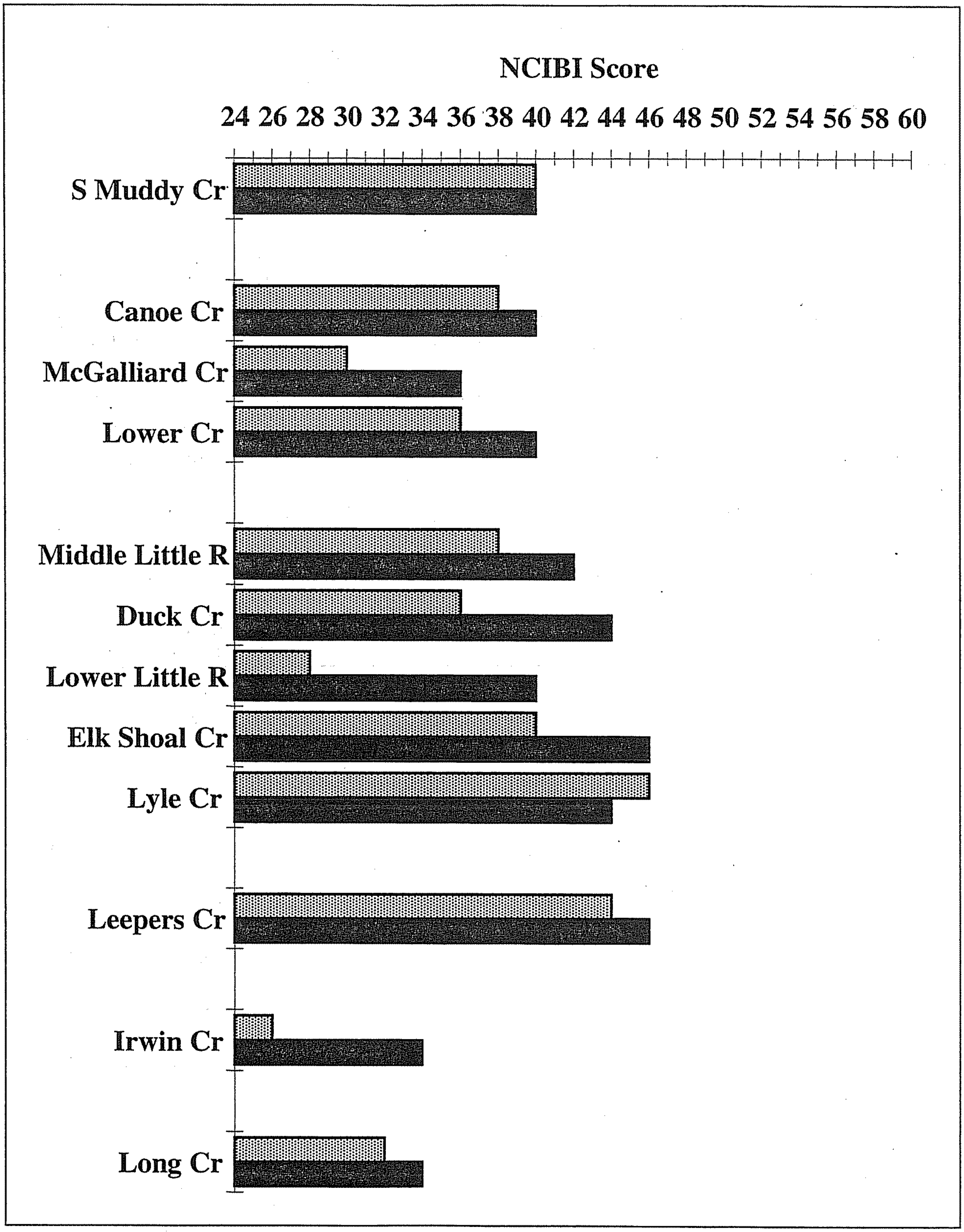


Figure A-17 The North Carolina Index of Biotic Integrity for the Catawba River Basin 1993 (shaded bars) *vs.* 1997 (solid bars)



Catawba River Basin Fish Kills

Field investigators reported 19 fish kill events in the Catawba River basin from 1987 to 1997. Mortality estimates ranged from 50 to 1500 individuals. Causes for most events during the period were cited as unknown or the result of chemical, industrial and municipal spills. The majority of fish kill activity in the basin was reported from 03-08-34 and includes the Charlotte metropolitan area.

3.3.3 Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity by their NPDES permit. Other facilities may be tested by DWQ's Aquatic Toxicology Laboratory.

The Aquatic Toxicology Unit maintains a compliance summary for all facilities required to perform tests and provides a monthly update of this information to regional offices and DWQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge. A summary of compliance for the Catawba River basin from 1986 through 1997 is presented in Table A-22 below.

Table A-22 Summary of Compliance with Aquatic Toxicity Tests in the Catawba River Basin

Year	Number of Facilities	Number of Tests	% Meeting Permit Limit*
1985	5	29	37.9
1986	7	62	69.3
1987	19	129	56.5
1988	32	372	43.0
1989	45	420	63.1
1990	48	519	74.6
1991	51	555	79.6
1992	52	603	83.2
1993	54	628	85.2
1994	58	631	86.2
1995	63	694	89.2
1996	64	726	92.4
1997	68	781	93.5

* This number was calculated by determining whether a facility was meeting its ultimate permit limit during the given time period, regardless of any SOCs in force.

† "No. Tests" is not the actual number of tests performed, but the number of opportunities for limit compliance evaluation. Assumptions were made about compliance for months where no monitoring took place based on data previous to that month. Facilities compliant in a given month were assumed to be in compliance during months following, until the next actual monitoring event. This same policy was applied to facilities in noncompliance.

3.3.4 Lakes Assessment Program

Eight lakes in the Catawba River basin were sampled as part of the Lakes Assessment Program in 1997. Of these lakes, seven were sampled by Duke Energy (Lake James, Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake). Monitored lakes are presented below by subbasin. Six lakes were sampled for their potential of supporting algal blooms with the Algal Growth Potential Test (AGPT).

03-08-30	03-08-31	03-08-32	03-08-33	03-08-34	03-08-35
Lake James	Lake Rhodhiss	Lake Hickory Lookout Shoals Lake Norman	Mountain Island Lake	Lake Wylie	Maiden Lake

Each lake is individually discussed in the appropriate subbasin chapter, with a focus on the most recent available data. Figure A-18 shows the most recent NCTSI scores for the eight lakes of the Catawba River basin.

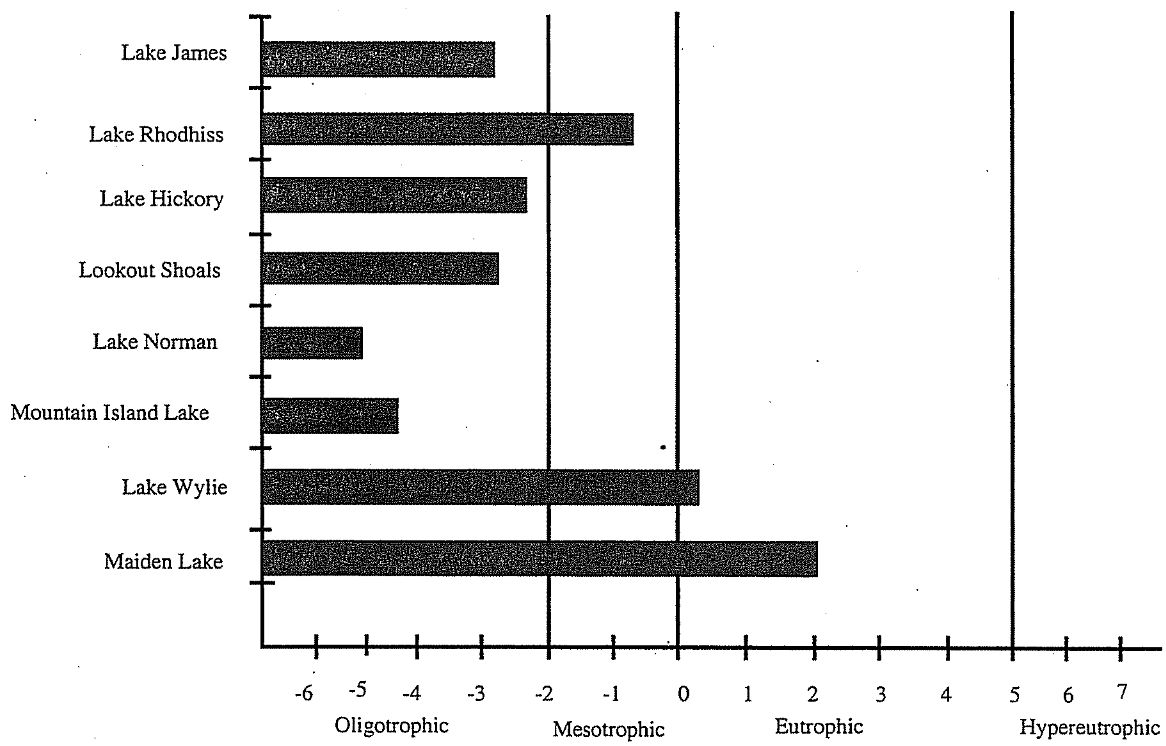


Figure A-18 NCTSI Scores for Lakes in the Catawba River Basin Sampled in 1997

3.3.5 Ambient Monitoring System Program

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine sample stations strategically located for the collection of physical and chemical water quality data. North Carolina has 37 stations in the Catawba River basin (Table A-23). For the purpose of this report those stations are divided into five drainages: the Catawba River mainstem, tributaries of the Catawba River, the South Fork Catawba River mainstem, tributaries of the South Fork

Catawba River and Lake Ambient Stations. Discussions of the more significant findings of these samplings are below.

Catawba River Mainstem

Total phosphorus was high at Greenlee, Pleasant Gardens and Belmont in comparison to the other sites. Total nitrogen concentrations gradually increase downstream with Belmont location having the highest median value. The irregular pattern of total phosphorus is possibly due to the effect of the lakes along the mainstem; however, this does not seem to be the case for total nitrogen.

Catawba River Tributaries

Dissolved oxygen concentrations in the tributary streams is relatively constant with a slight decrease in the downstream tributaries. There are some low (<5.0 mg/l) dissolved oxygen concentrations recorded from the tributaries around the Charlotte area. These are Crowders Creek, Irwin Creek, Sugar Creek, Little Sugar Creek and McAlpine Creek.
The Charlotte area tributaries have very high concentrations of total phosphorus. In particular, Little Sugar Creek, McAlpine Creek Camp Cox and Sugar Creek Fort Mill have very high levels of total phosphorus (median >1 mg/l). There are high concentrations at the downstream tributaries in general and in particular at Crowders Creek and Sugar Creek Pineville. The same general distribution of total nitrogen is seen at downstream tributaries, in particular Crowders Creek and Sugar Creek Pineville.

South Fork Catawba Mainstem

Total phosphorus concentrations are low in the upper Henry Fork and Jacob Fork; however, the lower Henry Fork Brookford has high levels of total phosphorus. The mainstem of the South Fork Catawba also has high concentrations at Startown and McAdenville. Total nitrogen concentrations show the same pattern in distribution as total phosphorus concentrations.

South Fork Catawba Tributaries

Total phosphorus and total nitrogen are slightly higher in Clark Creek than in Indian or Long Creek. Both nutrient distributions decrease in a downstream direction for the three tributaries.

Catawba Lake Stations

Regular ambient sampling was done for five lakes in the basin (Lake Rhodhiss, Lake Hickory, Lake Norman, Mountain Island Lake and Lake Wylie). Total phosphorus was higher in Lake Rhodhiss and Lake Wylie. Lake Wylie also has higher total nitrogen levels.

Table A-23 Ambient Monitoring System Stations within the Catawba River Basin

Primary No	STORETNo	Station Name	Subbasin
Catawba Mainstem			
0213649985	C0009000	Catawba River at SR 1273 at Old Fort NC	03-08-30
02137500	C0145000	Catawba River at SR 1234 near Greenlee NC	03-08-30
02137727	C0250000	Catawba River at SR 1221 near Pleasant Gardens	03-08-30
02139036	C1210000	Catawba River at SR 1147 near Glen Alpine NC Marion	03-08-30
02142808	C3900000	Catawba River at NC Hwy 27 near Thrift NC	03-08-33
02142938	C4220000	Catawba River at South Belmont	03-08-34
Catawba Tributaries			
02138133	C0550000	North Fork Catawba River at SR 1552 near Hankins NC	03-08-30
02138500	C1000000	Linville River at NC Hwy 126 near Nebo NC	03-08-30
02140304	C1370000	Wilson Creek at US Hwy 221 near Gragg NC	03-08-31
0214031250	C1385000	Wilson Creek at SR 1358 at Edgemont NC	03-08-31
02141245	C1750000	Lower Creek at SR 1501 near Morganton NC Marion	03-08-31
02142000	C2818000	Lower Little River at SR 1313 near All Healing Springs	03-08-32
0214272204	C3860000	Dutchmans Creek at SR 1918 at Mountain Island NC	03-08-33
02142900	C4040000	Long Creek at SR 2042 near Paw Creek NC	03-08-34
02145524	C7400000	Catawba Creek at SR 2302 NC-SC State Line	03-08-37
02145640	C8660000	Crowders Creek at Ridge Road near Bowling Green SC	03-08-37
02146300	C8896500	Irwin Creek at Irwin Creek WWTP near Charlotte NC	03-08-34
02146381	C9050000	Sugar Creek at NC Hwy 51 at Pineville NC	03-08-34
02146530	C9210000	Little Sugar Creek at NC Hwy 51 at Pineville NC	03-08-34
02146600	C9370000	McAlpine Creek at Sardis Road near Charlotte NC	03-08-34
0214676115	C9680000	McAlpine Creek at SC SR 2964 near Camp Cox SC	03-08-34
02146800	C9790000	Sugar Creek near Fort Mill SC	03-08-34
02146900	C9819500	Twelve Mile Creek near Waxhaw NC	03-08-38
South Fork Mainstem			
02143000	C4300000	Henry Fork at SR 1124 near Henry River NC	03-08-35
02143027	C4360000	Henry Fork River at SR 1143 near Brookford NC	03-08-35
02143040	C4370000	Jacob Fork at SR 1924 at Ramsey NC	03-08-35
02143069	C4380000	South Fork Catawba River at NC 10 near Startown NC	03-08-35
02145112	C6500000	South Fork Catawba River at NC Hwy 7 at McAdenville NC	03-08-36
02145442	C7000000	South Fork Catawba River at SR 2524 near S Belmont NC	03-08-36
South Fork Tributaries			
02143260	C4800000	Clark Creek at Grove Street at Lincolnton NC	03-08-35
02143500	C5170000	Indian Creek at SR 1252 near Laboratory NC	03-08-35
02144000	C5900000	Long Creek at SR 1456 near Bessemer City NC	03-08-36
Lake Stations			
02141461	C2030000	Lake Rhodhiss at SR 1001 near Baton NC Marion	03-08-31
02141840	C2600000	Lake Hickory at NC Hwy 127 near Hickory Clean Lakes	03-08-32
0214253319	C3420000	Lake Norman at SR 1004 near Mooresville Clean Lakes	03-08-32
0214266050	C3699000	Mountain Island Lake above Gar Creek near Croft Clean Lakes	03-08-33
02145531	C7500000	Lake Wylie at NC Hwy 49 near Oak Grove Clean Lakes	03-08-37

Fecal Coliform Bacteria

Fecal coliform bacteria are widely used as an indicator of the potential presence of pathogens typically associated with the intestinal tract of warm-blooded animals. The water quality standard for fecal coliform bacteria is based on a geometric mean of 200 colonies/100ml. Sites with 10 or more fecal coliform samples within the last 5 years that have a geometric mean exceeding 200 colonies/100ml are in bold print in Table A-24. Fecal coliform bacteria are listed in the use support information for these waters as a problem parameter (see Section A, Part 3.5).

There are fecal coliform problems in the Catawba River basin. Fourteen stations reported geometric means above 200 colonies/100ml for this assessment period. Most of these are in the Charlotte area. There were also two stations, Long Creek (near Paw Creek) and Lower Creek (near Morganton), with a geometric mean less than 200 colonies/100ml, but the sites had elevated fecal coliform levels.

3.4 Other Water Quality Research

There are many other water quality sampling programs being conducted throughout the Catawba River basin. Any available data from this research has been reviewed and included in DWQ analysis for developing the 303(d) list and considered as use support determinations were made. These research efforts have also been used by DWQ to adjust biological and chemical sampling sites. Programs or research that developed these data are presented in Section C.

Table A-24 Fecal Coliform Summary Data for the Catawba River Basin - 1993 to 1997

Site	Total Samples	Geometric Mean	Samples >200/100ml	Percent >200/100ml	First Sample	Last Sample
Clark Creek at Grove St at Lincolnton NC	**56**	**682.36**	**48**	**85.7**	**930107**	**971106**
Long Creek at SR 1456 near Bessemer City NC	**52**	**573.98**	**42**	**80.8**	**930107**	**971113**
McAlpine Creek at Sardis Road near Charlotte NC	**55**	**557.47**	**42**	**76.4**	**930121**	**971120**
Little Sugar Creek at NC Hwy 51 at Pineville NC	**54**	**493.85**	**38**	**70.4**	**930126**	**971120**
Sugar Creek near Fort Mill SC	**55**	**482.27**	**46**	**83.6**	**930126**	**971120**
Indian Creek at SR 1252 near Laboratory NC	**55**	**478.41**	**47**	**85.5**	**930107**	**971106**
Irwin Creek at Irwin Creek WWTP near Charlotte NC	**53**	**474.97**	**41**	**77.4**	**930217**	**971113**
Henry Fork River at SR 1143 near Brookford NC	**49**	**429.36**	**30**	**61.2**	**930111**	**971029**
South Fork Catawba River at NC 10 near Startown NC	**51**	**394.95**	**32**	**62.7**	**930111**	**971124**
McAlpine Creek at SC SR 2964 near Camp Cox SC	**53**	**384.78**	**34**	**64.2**	**930126**	**971120**
Sugar Creek at NC Hwy 51 at Pineville NC	**54**	**298.49**	**33**	**61.1**	**930126**	**971120**
Crowders Creek at Ridge Road near Bowling Green SC	**51**	**260.84**	**30**	**58.8**	**930120**	**971113**
Twelve Mile Creek near Waxhaw NC	**55**	**231.11**	**26**	**47.3**	**930125**	**971120**
Dutchmans Creek at SR 1918 at Mountain Island NC	**56**	**220.45**	**28**	**50.0**	**930120**	**971106**
Long Creek at SR 2042 near Paw Creek NC	55	176.94	26	47.3	930120	971106
Lower Creek at SR 1501 near Morganton NC Marion	51	172.03	28	54.9	930127	970930
Lower Little River at SR 1313 near All Healing Springs	54	131.85	22	40.7	930111	971105
South Fork Catawba River at NC Hwy 7 at McAdenville NC	51	120.78	19	37.3	930120	971113
Henry Fork at SR 1124 near Henry River NC	51	52.6	11	21.6	930111	971029

3.5 Use Support Summary

3.5.1 Introduction to Use Support

Waters are classified according to their best intended uses. Determining how well a waterbody supports its designated uses is an important method of interpreting water quality data and assessing water quality. Use support assessments for the Catawba River basin are summarized in this section and presented in the appropriate subbasin chapters in Section B.

The use support ratings refer to whether the classified uses of the water (such as water supply, aquatic life protection and swimming) are supported, partially supported or not supported. For instance, waters classified for fishing and water contact recreation (Class C) are rated as fully supporting if data used to determine use support (such as chemical/physical data collected at ambient sites or benthic macroinvertebrate bioclassifications) did not exceed specific criteria. However, if these criteria were exceeded, then the waters would be rated as ST, PS or NS, depending on the degree of exceedence. Streams rated as either partially supporting or not supporting are considered *impaired.*

> ***Use support ratings for streams and lakes:***
>
> - *fully supporting (FS)*
> - *fully supporting but threatened (ST)*
> - *partially supporting (PS)*
> - *not supporting (NS)*
> - *not rated (NR)*

> ***Impaired waters categories:***
>
> - Partially Supporting
> - Not Supporting

A water is fully supporting but threatened (ST) for a particular designated use when it supports that use, but has some notable water quality problems. Although threatened waters are currently supporting their uses; they are treated as a separate category from waters fully supporting uses. Streams which had no data to determine their use support were listed as not rated (NR). For a more complete description of use support methodology, refer to Appendix III.

3.5.2 Revisions to Methodology Since 1992-1993 305(b) Report

Methodology for determining use support has been revised. In the 1992-1993 305(b) Report, evaluated information from older reports and workshops were included in the use support process. Streams rated using this information were considered to be rated on an evaluated basis. In the current use support process, this older, evaluated information has been discarded, and streams are now rated using only monitored information (including current and older monitoring data). Streams are rated on a monitored basis if the data are less than five years old. Streams are rated on an evaluated basis under the following conditions:

- If the only existing data for a stream are more than five years old.
- If a stream is a tributary to a monitored segment of a stream rated fully supporting (FS) or fully supporting but threatened (ST), the tributary will receive the same rating on an evaluated basis. If a stream is a tributary to a monitored segment rated partially supporting (PS) or not supporting (NS), the stream is considered not rated (NR).

These changes resulted in a reduction in streams rated on an evaluated basis.

3.5.3 Comparison of Use Support Ratings to Streams on the 303(d) List

Section 303(d) of the Clean Water Act requires states to identify waters not meeting standards. EPA must then provide review and approval of the listed waters. A list of waters not meeting standards is submitted to EPA biennially. Waters placed on this list, termed the 303(d) list, require the establishment of total maximum daily loads (TMDLs) intended to guide the restoration of water quality. See Appendix IV for a description of 303(d) listed waters in the Catawba River basin.

Waters are placed on North Carolina's 303(d) list primarily due to a partially or not supporting use support rating, as determined in the 305(b) or basinwide planning process. These use support ratings are based on biological and chemical data. When the state water quality standard is exceeded, then this constituent is listed as the problem parameter. TMDLs must be developed for problem parameters on the 303(d) list. Other strategies may be implemented to restore water quality; however, the waterbody must remain on the 303(d) list until improvement has been realized based on either biological ratings or water quality standards.

The 303(d) list and accompanying data are updated as the basinwide plans are revised. In some cases, the new data will demonstrate water quality improvement and waters may receive a better use support rating. These waters may be removed from the 303(d) list since water quality improvement has been attained. In other cases, the new data will show a stable or decreasing trend in overall water quality resulting in the same, or lower, use support rating. These waters remain on the 303(d) list until water quality has improved.

In some cases, a waterbody appears on the 303(d) list, but supports its uses. There are two major reasons for this: 1) biological data show full use support, but chemical impairment continues; or 2) fish consumption advisories exist on the water. These waters will remain on the 303(d) list until the problem pollutant meets water quality standards or a TMDL is developed. Thus, there are inconsistencies between the use support impaired waters and the 303(d) listed waters.

3.5.4 Use Support Ratings for the Catawba River Basin

A summary of current use support ratings for the Catawba River basin is presented in Table A-25. For further information and definition of monitored and evaluated streams, refer to Appendix A-III.

Table A-25 Use Support Summary Information for All Monitored and Evaluated Streams in the Catawba River Basin (1999)

	Monitored and Evaluated Streams*			Monitored Streams Only**	
	Miles	%		Miles	%
Supporting	2375.3	79			
Fully Supporting	1694.5	56		638.2	59
Fully Supporting but Threatened	680.8	23		265.9	25
Impaired	186.0	6			
Partially Supporting	173.6	6		162.1	15
Not Supporting	12.4	<1		7.4	1
Not Rated	444.1	15			

* = Percent based on total of all named and classified streams, both monitored and evaluated.
** = Percent based on total of all monitored streams.

Table A-26 shows the total number of stream miles and stream miles per each use support category for each subbasin. This table presents use support for both the monitored and evaluated streams in the basin. More detailed information on the monitored stream segments can be found in Appendix III. Color maps showing use support ratings for the basin are presented in Figures A-19 and A-20. Refer to Section A, Chapter 4, Table A-28 for a listing of impaired waters in the basin.

Table A-26 Use Support Determination for Monitored and Evaluated Freshwater Streams

Catawba Use Support Ratings in Miles for 1993-1997						
Subbasin	**Fully Supporting**	**Fully Supporting but Threatened**	**Partially Supporting**	**Not Supporting**	**Not Rated**	**Total**
03-08-30	408.1	213.6	5.3	0	23.9	650.9
03-08-31	463.6	94.7	35.3	0	75.6	669.2
03-08-32	341.3	121.0	0	0	19.8	482.1
03-08-33	147.5	0	9.8	0	10.1	167.4
03-08-34	28.7	5.4	81.5	2.6	131.9	250.1
03-08-35	285.6	106.3	19.0	0	81.2	492.1
03-08-36	19.7	22.7	0.8	0	26.2	69.4
03-08-37	0	14.5	21.9	9.8	26.8	73.0
03-08-38	0	102.6	0	0	48.6	151.2
TOTAL	1694.5	680.8	173.6	12.4	444.1	3005.4
%	56	23	6	<1	15	100

Figure A-19. Use Support Ratings for the Upper Catawba River Basin

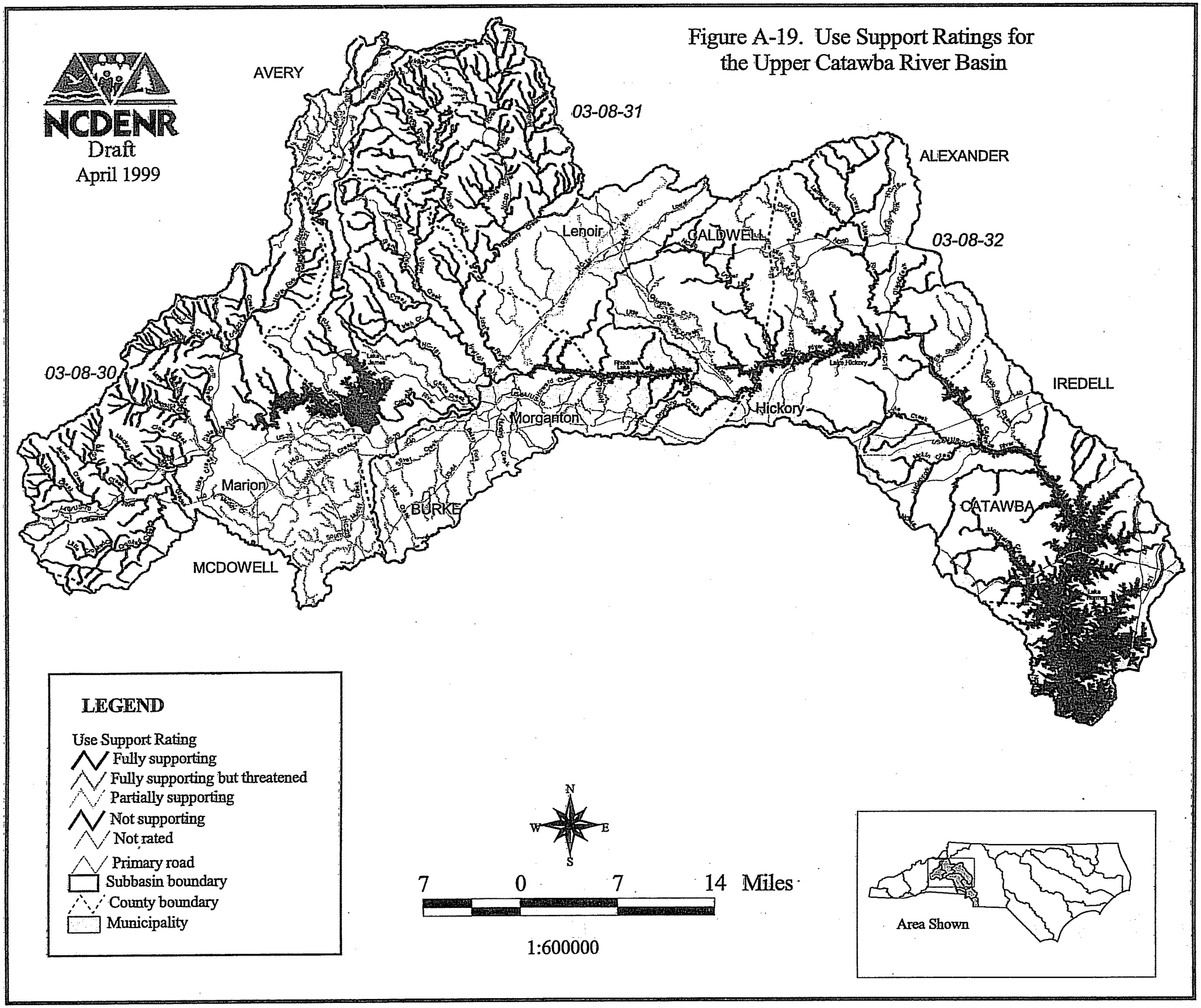
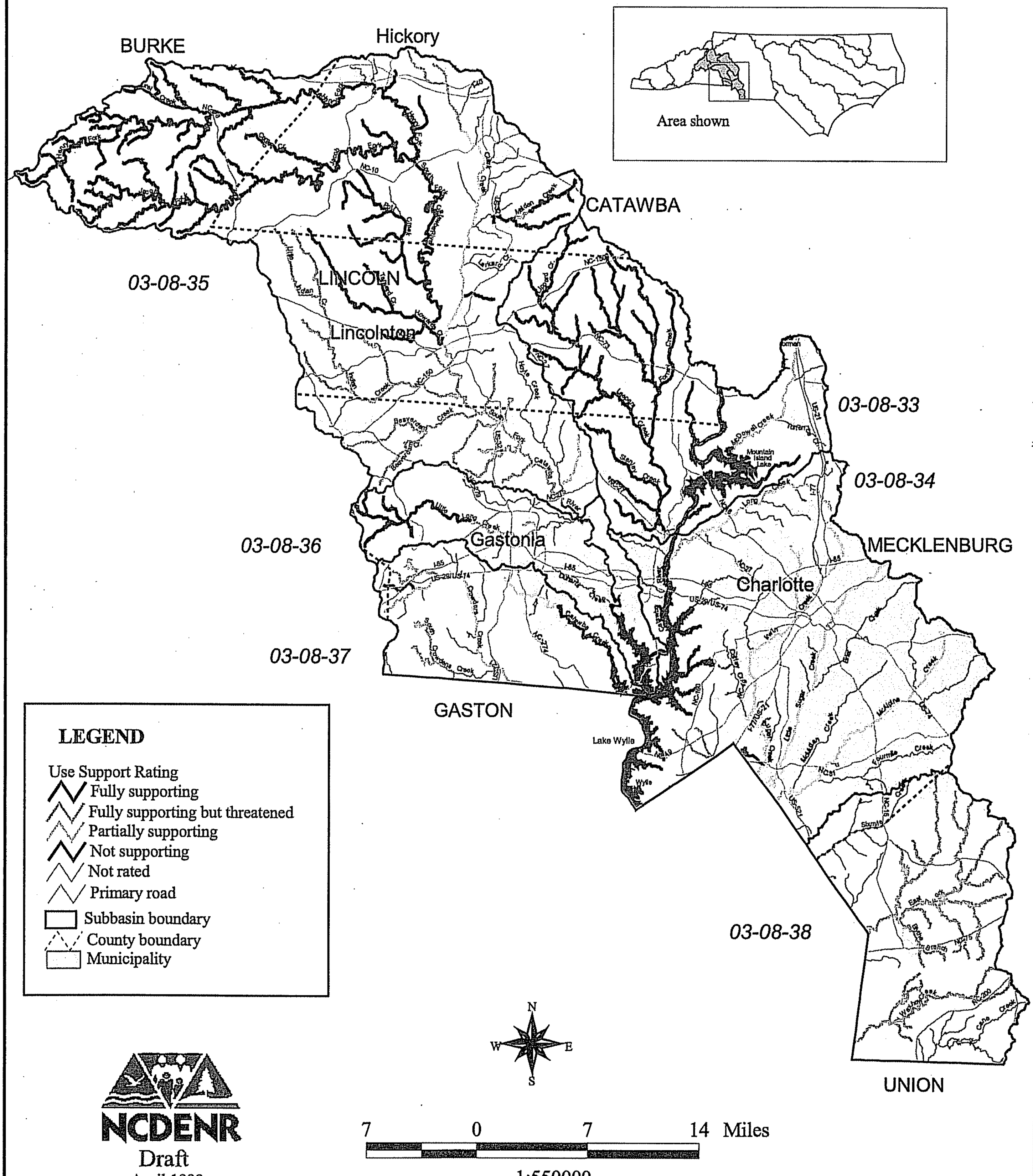


Figure A-20. Use Support Ratings for the Lower Catawba River Basin



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