Section B - Chapter 3
Catawba River Subbasin 03-08-32
Lower, Middle and Upper Little Rivers, Lake Hickory, Lookout Shoals Lake and Lake Norman

3.1 Subbasin Overview

Subbasin 03-08-32 at a Glance

Land and Water Area

Total area:	706 mi²
Land area:	647 mi²
Water area:	59 mi²

Population Statistics

2000 Est. Pop.: 180,804 people
Pop. Density: 257 persons/mi²

Land Cover (percent)

Forest/Wetland:	57%
Surface Water:	9%
Urban:	3%
Agriculture:	34%

Counties

Alexander, Burke, Caldwell, Catawba, Iredell, Lincoln and Mecklenburg

Municipalities

Cajah Mountain, Catawba, Claremont, Connelly Springs, Conover, Cornelius, Davidson, Granite Falls, Hickory, Hildebran, Hudson, Huntersville, Lenoir, Long View, Mooresville, Newton, Rhodhiss, Sawmills, Taylorsville and Troutman

This subbasin is located in the Northern Inner Piedmont and Southern Outer Piedmont ecoregions with the extreme northwestern headwaters of several streams in the Eastern Blue Ridge Foothills ecoregion. The southeastern portion of this subbasin (east of the Lower Little River and south of the Catawba River) is flatter and more characteristic of Piedmont areas than the northern section.

Highly erodible soils and moderate gradients contribute large amounts of sediment in the Little River watershed. However, a majority of the subbasin remains forested. Major reservoirs in this subbasin include Lakes Hickory and Norman and Lookout Shoals Lake. Because of these impoundments, a greater percentage of this subbasin is classified as a water supply watershed than any of the other subbasins, highlighting the increased pressure placed on the resource by ever expanding populations. In fact, the populations of Alexander, Catawba, Iredell, Lincoln and Mecklenburg counties are all expected to increase by over 20 percent by the year 2020 (Table A-6).

There were 24 benthic macroinvertebrate community samples and 13 fish community samples (Figure B-3 and Table B-5) collected during this assessment period. Two sites improved; 12 sites remained the same; two sites had a lower bioclassification, and three sites were sampled for the first time during this assessment period. Data were also collected from three ambient monitoring stations as well. Refer to *2003 Catawba River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Sixteen facilities monitor effluent toxicity, some having multiple discharges. Four dischargers had problems with toxicity, although three were very small dischargers with a permitted flow less than 0.02 MGD. This group of discharges was associated with either groundwater remediation or contact cooling water.

Figure B-3 Catawba River Subbasin 03-08-32

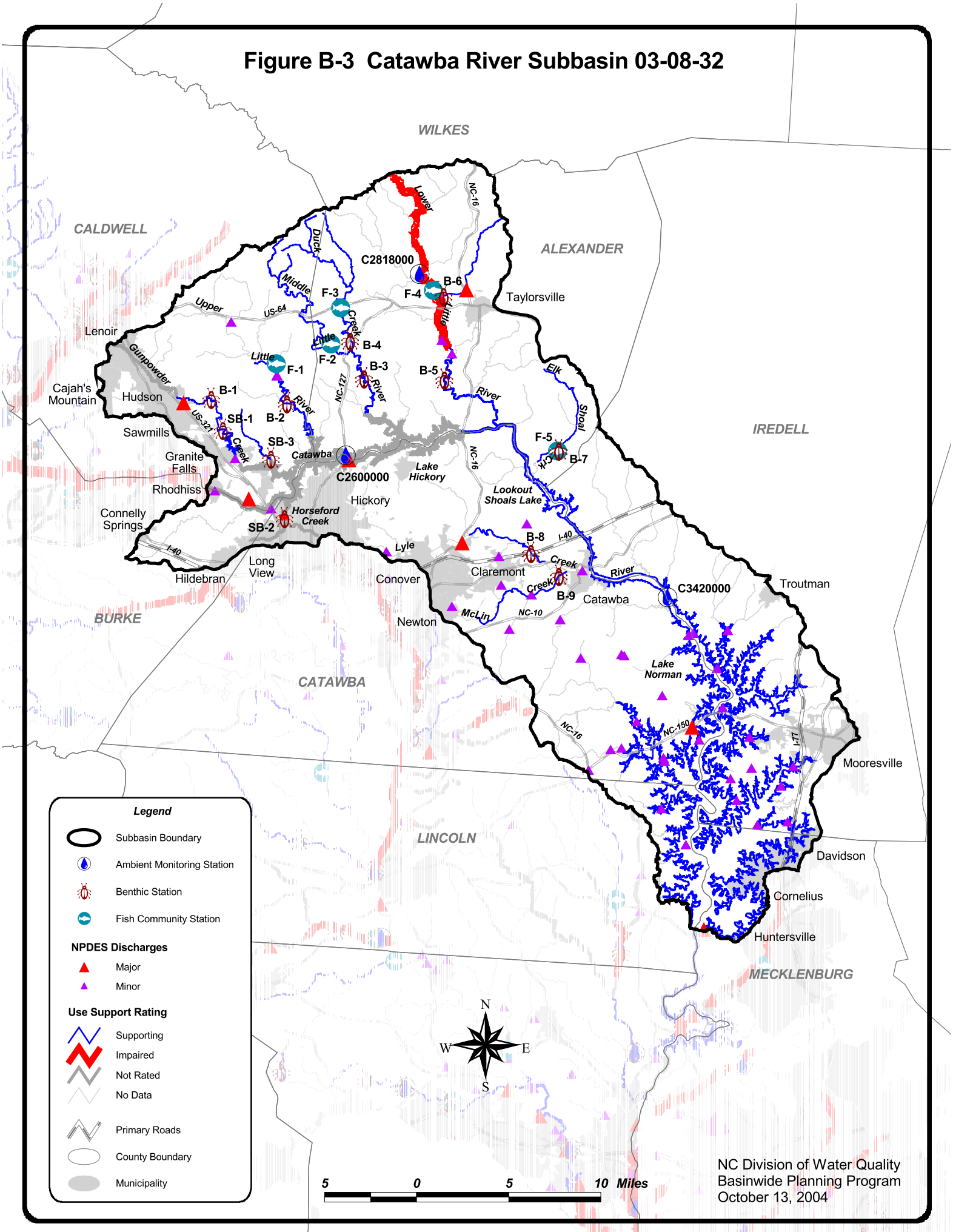

Table B-5 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-08-32

Waterbody	Assessment	DWQ Classification	Length / Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
CATAWBA RIVER (Lake Hickory below elevation 935)	11-(51)	WS-IV & B CA	263.1 ac.	AL		C2600000 nce	L-1 ce	NR	FS
CATAWBA RIVER (Lake Hickory below elevation 935)	11-(53)	WS-IV & B CA	1,232.8 ac.	AL		C2600000 nce	L-1 ce	NR	FS
CATAWBA RIVER (Lake Hickory below elevation 935)	11-(59.5)	WS-V & B	2,093.6 ac.	AL		C2600000 nce	L-1 ce	NR	FS
CATAWBA RIVER (Lake Norman below elevation 760)	11-(74)	WS-IV CA	265.3 ac.	AL		C3420000 nce	L-3 nce	S	FS
CATAWBA RIVER (Lake Norman below elevation 760)	11-(75)	WS-IV & B CA	31,331.6 ac.	AL		C3420000 nce	L-3 nce	S	FS
CATAWBA RIVER (Lookout Shoals Lake below elevation 845)	11-(67)	WS-IV	182.7 ac.	AL			L-2 nce	S	FS
CATAWBA RIVER (Lookout Shoals Lake below elevation 845)	11-(68.5)	WS-IV CA	95.4 ac.	AL			L-2 nce	S	FS
CATAWBA RIVER (Lookout Shoals Lake below elevation 845)	11-(72)	WS-IV & B CA	577.8 ac.	AL			L-2 nce	S	FS
CATAWBA RIVER (Lookout Shoals Lake below elevation 845)	11-(73.5)	WS-IV & B CA	175.4 ac.	AL			L-2 nce	S	FS
Duck Creek	11-62-2-(4)	C	4.4 mi.	AL	B-4 GF--97 B-4 G--02 F-3 G--02			S	ST

Table B-5 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-08-32

Waterbody	Assessment	DWQ Classification	Length / Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
Elk Shoal Creek (East Side)	11-73-(0.5)	WS-IV	7.8 mi.	AL	B-7 GF--97 B-7 GF--02 F--5 E--97 F-5 G--02			S	ST
Gunpowder Creek (Old Mill Pond)	11-55-(1.5)	WS-IV	13.4 mi.	AL	B-1 GF--97 B-1 GF--02			S	ST
Horseford Creek	11-54-(0.5)	WS-IV	0.4 mi.	AL	SB-2 P--02			I	-
Lower Little River	11-69-(0.5)	C	14.0 mi.	AL	F-4 G--97 F-4 F--02	C2818000 nce		I	FS
Lower Little River	11-69-(5.5)	WS-IV	8.6 mi.	AL	B-5 G--97 B-5 GF--02			S	FS
Lyle Creek	11-76-(3.5)	WS-IV	6.3 mi.	AL	B-8 GF--97 B-8 GF--02			S	FS
McLin Creek	11-76-5-(3)	WS-IV CA	0.7 mi.	AL	B-9 GF--97 B-9 GF--02			S	FS
Middle Little River	11-62	C	21.5 mi.	AL	B-3 GF--97 B-3 F--02 B-3 GF--03 F-2 G--97 F-2 E--02			S	ST
Muddy Fork	11-69-4	C	6.8 mi.	AL	B-6 GF--97 B-6 F--02 B-6 GF--03			S	ST
Silver Creek	11-56-(2)	WS-IV CA	0.8 mi.	AL	SB-3 GF--02			S	-
Upper Little River (Cedar Creek)	11-58-(5.5)	WS-IV	9.8 mi.	AL	B-2 G--97 B-2 G--02 F-1 GF--97 F-1 GF--02			S	FS
CATAWBA RIVER (Lake Hickory below elevation 935)	11-(53)	WS-V & B	1,232.8 ac.	REC		C2600000 nce		S	-

Table B-5 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-08-32

Waterbody	Assessment	DWQ Classification	Length / Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
CATAWBA RIVER (Lake Hickory below elevation 935)	11-(59.5)	WS-V & B	2,093.6 ac.	REC		C2600000 nce		S	-
CATAWBA RIVER (Lake Norman below elevation 760)	11-(74)	WS-IV CA	265.3 ac.	REC		C3420000 nce		S	-
CATAWBA RIVER (Lake Norman below elevation 760)	11-(75)	WS-IV & B CA	31,331.6 ac.	REC		C3420000 nce		S	-
Lower Little River	11-69-(0.5)	C	14.0 mi.	REC		C2818000 ce		NR	-

Assessment Unit Number - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:	**Monitoring data type:**	**Bioclassifcations:**	**Use Support Ratings 2004**:
AL - Aquatic Life	F - Fish Community Survey	E - Excellent	S - Supporting, I - Impaired, NR - Not Rated
REC - Recreation	B - Benthic Community Survey	G - Good	
	SB - Special Benthic Community Study	GF - Good-Fair	**Use Support Ratings 1998**:
	L - Lakes Assessment	F - Fair	FS - fully supporting, ST - supporting but threatened
		P - Poor	PS - partially supporting, NS - not supporting
		Ambient Data	NR - not rated, N/A - not applicable
		nce - no criteria exceeded	
		ce - criteria exceeded	

There are three ambient monitoring sites in this subbasin: two on Lakes Hickory and Norman, and one on the Lower Little River. There were few unusual measurements at the two lake sites, although high algal production sometimes produced high dissolved oxygen concentrations and pH readings. Elevated fecal coliform bacteria concentrations and high turbidity levels were noted on the Lower Little River after rainfall events.

Recent biological data produced Good or Good-Fair bioclassifications for most monitored streams in this subbasin. However, a Fair bioclassification was recorded for a section of Middle Little River and for Muddy Fork. Fish data also produced a Fair bioclassification for a section of the Lower Little River. The Fair bioclassification for the Middle Little River seemed to be due to low flow in 2002 and did not indicate a significant water quality problem. This finding was reinforced by the Excellent fish community bioclassification given to the river. Muddy Fork, however, showed signs of organic loading from nearby animal operations. The cause of the Fair bioclassification for the headwaters of the Lower Little River (above the Town of Taylorsville WWTP) was unknown, although a sand-dipping operation was noted just above the sampling reach.

Based upon benthic macroinvertebrate data, water quality was fairly stable in this subbasin. The majority of the between-year changes in bioclassification were associated with between-year changes in flow. These changes fell into three categories:

1. Streams where drought conditions resulted in loss of flow. These streams showed a decline during the extreme drought. Example: Middle Little River.
2. Streams which maintained flow under drought conditions and were influenced mainly by nonpoint source pollution. These streams improved under drought conditions due to a reduction in nonpoint source runoff. Example: Duck Creek.
3. Streams influenced by point source dischargers. These streams declined under drought conditions due to higher instream waste concentrations. Example: the downstream segment of the Lower Little River below the Town of Taylorsville.

Lake Hickory has been sampled by DWQ since 1981. This reservoir was consistently evaluated as eutrophic based on summer samples from 1981 to 1992. Since then, however, the reservoir has been most frequently evaluated as mesotrophic. High productivity was indicated in August 2002, but no visible algal blooms were observed.

Lookout Shoals Lake is a small run-of-the-river lake with a retention time of only nine days. It has been sampled by DWQ since 1981, and the trophic state has fluctuated from oligotrophic to eutrophic depending on the nutrient loading and flow conditions. The reservoir's water quality is thought to be more reflective of releases from upstream impoundments than conditions in the immediate, surrounding watershed.

Lake Norman is the largest of the Catawba River reservoirs. It has been monitored by Duke Power since the 1970s, and DWQ has sampled the reservoir since 1981. This reservoir has consistently been evaluated as oligotrophic with low nutrient values and low algal production.

A nuisance aquatic plant, *Myriophyllum aquaticum*, infested the upper ends of Lake Hickory and Lookout Shoals Lake. This plant can interfere with recreational and industrial uses of the lakes.

Lookout Shoals Lake was drawn down in the fall of 2002 in an attempt to control the spread of this plant.

Hydrilla, another nuisance aquatic plant, was found in Lake Norman. This macrophyte is invasive, can decrease fish habitat, and can impact recreational activities such as swimming and boating. It also has the potential of clogging intakes of water treatment plants. In an effort to manage its growth, Duke Power is treating the infestation with herbicide.

Waters in Parts 3.3 and 3.4 are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list, and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings are summarized in Part 3.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 and newly Impaired waters are discussed in Part 3.3 below. Supporting waters with noted water quality impacts are discussed in Part 3.4 below. Refer to Appendix III for use support methods and more information on all monitored waters.

3.2 Use Support Assessment Summary

Use support ratings in subbasin 03-08-32 were assigned for aquatic life, fish consumption, recreation and water supply. There is no fish consumption advice for waters in this subbasin; therefore, all waters are rated No Data for Fish Consumption. All water supply waters are Supporting on an Evaluated basis based on reports from DEH regional water treatment plant consultants. Refer to Table B-6 for a summary of use support ratings by use support category for waters in the subbasin.

Table B-6 Summary of Use Support Ratings by Use Support Category in Subbasin 03-08-32

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	101.4 mi 32,628.1 ac	0	34,923.2 ac	0
Impaired	14.5 mi	0	0	0
Not Rated	0.7 mi 3,589.4 ac	0	14.0 mi	0
Total	**116.6 ac 36,217.5 ac**	**0**	**14.0 mi 34,923.2 ac**	**0**
Unmonitored Waters				
Supporting	10.4 mi	0	0	260.8 mi 36,217.5 ac
Impaired	0	0	0	0
Not Rated	10.6 mi	0	0	0
No Data	315.6 mi	453.2 mi 36,217.5 ac	439.1 mi. 1,294.3 ac.	0
Total	**336.6 mi**	**453.2 mi 36,217.5 ac**	**439.1 mi 1,294.3 ac**	**260.8 mi 36,217.5 ac**
Totals				
All Waters	**453.2 mi 36,217.5 ac**	**453.2 mi 36,217.5 ac**	**453.2 mi 36,217.5 ac**	**260.8 mi 36,217.5 ac**

Note: All waters include monitored, evaluated and waters that were not assessed.

3.3 Status and Recommendations of Newly and Previously Impaired Waters

The following waters were identified in the 1999 basin plan as Impaired or are newly Impaired based on recent data. The current status and recommendations for addressing these waters are presented below. These waters are identified by assessment unit number (AU#). Refer to the overview above for more information on AUs.

3.3.1 Horseford Creek [AU# 11-54-(0.5) and 11-54-(3)]

Current Status and 2004 Recommendations

Horseford Creek is a tributary to Lake Hickory. It is formed from the confluence of Frye and Cripple Creeks, which both originate in the City of Hickory. The drainage area of Horseford Creek is fairly small (4.7 mi^2); the watershed is 100 percent urban, and there are no NPDES dischargers. In response to a citizen complaint, a benthic macroinvertebrate sample (site SB-2) was collected in September 2002 from Horseford Creek in the City of Hickory. This stream had good habitat, but water quality problems associated with urban runoff produced a Poor

bioclassification. Therefore, the 1.1 mile segment from Frye Creek to Lake Hickory is Impaired for aquatic life.

This unusual combination of good habitat and poor biological integrity suggests that even favorable instream habitat cannot compensate for the toxic effects of poorly controlled urban runoff. Local citizen groups should cooperate with city officials and local business leaders to develop a plan for reducing the impacts of urban runoff. Please refer to Section A, Chapter 4, Part 4.11 for information on ways to reduce those impacts.

3.3.2 Lower Little River [AU# 11-69-(0.5)]

Current Status and 2004 Recommendations
This stream's watershed drains the northeast portion of the Brushy Mountains and northwestern Alexander County, northwest of the Town of Taylorsville. It is a tributary to Lookout Shoals Reservoir. In 2002, a new sand dipping operation was functional above the sampling reach. Additionally, resource agency staff has noted significant sediment deposits at the mouth of the Lower Little River where it enters the Catawba River/Lookout Shoals Lake headwaters.

A precipitous bioclassification decline from Good to Fair occurred at fish community site F-4. Therefore, aquatic life is Impaired in this 14.0-mile reach from its source to Stirewalt Creek. A less severe decline was also documented downstream in the benthic community at site B-5. This site declined from Good to Good-Fair between 1997 and 2002. Further investigations into the major sources of sediment in this watershed should be conducted in order to find opportunities for sediment control BMP installations. Opportunities for cooperation between local and county planners should also be pursued to expedite the implementation of such BMPs.

3.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement. Waters in the following section are identified by assessment unit number (AU#). See overview for more information on AUs.

3.4.1 Lake Hickory [AU# 11-(51), 11-(53), and 11-(59.5)]

Current Status and 2004 Recommendations
Lake Hickory is a run-of-river impoundment located between Lake Rhodhiss and Lookout Shoals Lake on the Catawba River. The lake was filled in 1928 and is operated by Duke Power. Approximately one-half of the drainage area is forested and another one-third is agricultural. The major tributaries into Lake Hickory are the Catawba River, Middle Little River and Gunpowder Creek. The waters of the lake are used to generate hydroelectric power, for public water supply, and for recreational purposes. Lake Hickory is classified from the Rhodhiss Dam to the US Highway 321 bridge on the Catawba River as WS-IV B CA, and from the US Highway 321 bridge to Oxford Dam as WS-V and Class B. There are several municipal wastewater dischargers located in the reservoir's immediate watershed. These discharges, as

well as nonpoint source pollution, have contributed to the eutrophic conditions observed over the years. Because of algal blooms, taste and odor problems, and dissolved oxygen percent saturation values greater than 120 percent, aquatic life use support in Lake Hickory (3,589 acres) is Not Rated.

The water quality in Lake Hickory is driven by a variety of stressors including runoff from rural and urban areas, NPDES discharges, and perhaps most notably, the discharge from Lake Rhodhiss. The intimate link between these two reservoirs was made more evident by the continuance of taste and odor issues in Lake Hickory during the summer of 2002 until the algal populations died back in Lake Rhodhiss. This close relationship leads DWQ to the conclusion that a regional watershed management plan, encompassing the drainages of both Lake Hickory and Lake Rhodhiss, must be developed to address the water quality concerns in each reservoir. Because such a strategy would be applied across multiple subbasins, please refer to Section A, Chapter 4, Part 4.7.2 for more information on a regional watershed plan.

3.4.2 Muddy Fork [AU# 11-69-4]

Current Status and 2004 Recommendations
Muddy Fork originates in north central Alexander County and is a tributary to the Lower Little River. Muddy Fork is currently rated as Supporting, but has very poor habitat, generally lacking riffles and pools. The immediate riparian zones are used for cattle grazing and cattle have direct access to this 6.8-mile stream. A major industrial discharger has an outflow several miles above the sample site. The stream received a Good-Fair bioclassification in 1997, a Fair in 2002, and Good-Fair again in 2003 during a resample effort. Problems seem to be caused by organic loading, possibly from cattle wastes. DWQ recommends Muddy Fork be considered for installation of agriculture BMPs, including cattle exclusion fencing.

3.4.3 Middle Little River [AU# 11-62]

Current Status and 2004 Recommendations
The watershed of the Middle Little River drains western Alexander and eastern Caldwell counties, including the southwest portion of the Brushy Mountains. Site B-3 has shown a steady decline in bioclassification over the past 10 years: Good in 1992, Good-Fair in 1997, and Fair in 2002. A resample to verify the Fair rating resulted in a Good-Fair bioclassification. Therefore, this stream continues to be rated Supporting, although it demonstrates significant habitat degradation. It is likely that these impacts are the result of poor land use practices. DWQ will continue to monitor this stream and recommends further work be done to determine the cause of habitat degradation in this stream.

3.4.4 Gunpowder Creek [AU# 11-55-(0.5) and 11-55-(1.5)]

Current Status and 2004 Recommendations
Gunpowder Creek drains the southeastern portion of the City of Lenoir before passing through Granite Falls and emptying into Lake Hickory. The City of Lenoir operates a wastewater treatment plant on this 13.4-mile long creek. The stream is currently Supporting its designated use with a Good-Fair bioclassification at site SB-1 in both 1997 and 2002. However, heavy sedimentation has resulted in habitat degradation. DWQ will continue to monitor this stream and recommends further work be done to determine the cause of habitat degradation in this stream.

3.4.5 Lookout Shoals Lake [AU# 11-(72) and 11-(73.5)]

Current Status and 2004 Recommendations
Lookout Shoals Lake, situated between Lakes Hickory and Norman, is one of the smaller impoundments on the Catawba River. The lake is operated by Duke Power and is used for hydropower generation, public water supply, and public recreation. The lake's water quality is more reflective of releases from upstream impoundments (Lake Hickory and Lake Rhodhiss) than conditions in the immediate watershed. It is, therefore, likely that effective management in the Lake Rhodhiss and Lake Hickory watersheds coupled with tailwater management by Duke Power will help prevent water quality degradation in Lookout Shoals Lake. Please refer to Section A, Chapter 4, Part 4.7.2 for more information on a regional watershed plan.

In 2002, the upper end of the lake was infested with *Myriophyllum aquaticum*, the same species that is thriving in Lake Hickory. To control the spread of Parrot Feather, Duke Power drew down the water level to a target of 20 feet below full pool in November 2002. But due to rainfall in December, the water level rose to 14.3 feet below full pool in early January 2003. The pool level was brought to its normal operation level of three feet below full pool by February 2003 to accommodate annual fish spawning. Thus, the efficacy of the drawdown will probably be minor.

Duke Power, along with stakeholders and DWQ, will continue to develop and implement a Parrot Feather management program for the reservoir (see Section A, Chapter 4, Part 4.7.4).

3.4.6 Lake Norman [AU# 11-(74) and 11-(75)]

Current Status and 2004 Recommendations
Lake Norman, the state's largest man-made reservoir, is located between Lookout Shoals and Mountain Island Lakes on the Catawba River. The lake is operated by Duke Power and is used to generate hydroelectric power at Cowans Ford Dam and for multiple purposes at the Marshall Steam Station and the McGuire Nuclear Plant. The lake is also used for public water supply and recreation.

In 1999, approximately 25 acres of *Hydrilla* were discovered in the reservoir by Duke Power staff. This invasive macrophyte has the potential for rapid growth with the subsequent loss of swimming and boating areas. It also has the potential to clog intakes of water treatment and power generation plants. A survey conducted in October 2002 by Duke Power staff found *Hydrilla* as far upstream as the NC 150 bridge. There is also the potential for Parrot Feather, *Myriophyllum aquaticum*, to become established in Lake Norman via introduction from contaminated boat trailers or from plant fragments floating downstream from Lookout Shoals Lake. The occurrence of *Hydrilla* and the potential for Parrot Feather infestation pose an immediate threat to recreation, water supply use, and power generation uses in the lake.

The area around Lake Norman is also experiencing the inevitable water quality impacts associated with rapid development and increased recreational use. Elevated dissolved oxygen levels, elevated nutrient and metal levels, and boating congestion have all been noted on the lake (NCDENR-DWQ, June 2003). Lake Norman's massive volume has allowed the lake to absorb these human induced impacts and maintain reasonable water quality. But ultimately, the increased demands on the lake's aquatic resources could overwhelm its ability to accommodate them, resulting in declining water quality. Now is the time to implement management strategies

that will offset the impacts of development and possibly avoid critical water quality situations as seen on other lakes in the Catawba River Chain Lakes and in other river basins (see Section A, Chapter 4, Part 4.7).

Over the next basinwide planning cycle, DWQ will look for opportunities to develop appropriate and cost-effective management strategies. Please refer to the sections on Urbanization, FERC Relicensing, and Local Involvement (Section A, Chapter 4, Parts 4.7 and 4.8) for more information. Duke Power, along with stakeholders and DWQ, will continue to develop and implement an invasive plant management program for the reservoir (Section A, Chapter 4, Part 4.7.4).