

Appendix III

Use Support Methodology and Use Support Ratings

Use Support: Definitions and Methodology

A. Introduction to Use Support

Waters are classified according to their best intended uses. Determining how well a waterbody supports its designated uses (*use support* status) is another important method of interpreting water quality data and assessing water quality. Use support assessments are presented in Section A, Chapter 3 and for each subbasin in Section B.

Surface waters (streams, lakes or estuaries) are rated as either *fully supporting* (FS), *fully supporting but threatened* (ST), *partially supporting* (PS) or *not supporting* (NS). The terms refer to whether the classified uses of the water (such as water supply, aquatic life protection and swimming) are fully supported, partially supported or are not supported. For instance, waters classified for fishing and water contact recreation (Class C for freshwaters or SC for saltwaters) 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 nonsupporting are considered *impaired*. A waterbody is fully supporting but threatened (ST) for a particular designated use when it fully supports that use, but has some notable water quality problems. Although threatened waters are currently supporting 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 the purposes of this document, the term *impaired* refers to waters that are rated either partially supporting or not supporting their uses based on specific criteria discussed more fully below. There must be a specified degree of degradation before a stream is considered impaired. This differs from the word impacted, which can refer to any noticeable or measurable change in water quality, good or bad.

B. Interpretation of Data

The assessment of water quality presented in this document involved evaluation of available water quality data to determine a waterbody's use support rating. In addition, an effort was made to determine likely causes (e.g., sediment or nutrients) and sources (e.g., agriculture, urban runoff, point sources) of pollution for impaired waters. Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data and DEH shellfish sanitation surveys (as appropriate). Although there is a general procedure for analyzing the data and determining a waterbody's use support rating, each stream segment is reviewed individually, and best professional judgment is applied during these determinations.

Interpretation of the use support ratings compiled by DWQ should be done with caution. The methodology used to determine the ratings must be understood, as should the purpose for which the ratings were generated. The intent of this use support assessment was to gain an overall

picture of the water quality; how well these waters support the uses for which they were classified; and the relative contribution made by different categories of pollution within the basin. In order to comply with guidance received from EPA to identify likely sources of pollution for all impaired stream mileage, DWQ used the data mentioned above.

The data are not intended to provide precise conclusions about pollutant budgets for specific watersheds. Since the assessment methodology is geared toward general conclusions, it is important not to manipulate the data to support policy decisions beyond the accuracy of these data. For example, in many areas nonpoint source pollution has been determined to be the greatest source of water quality degradation. However, this does not mean that there should be no point source control measures. All categories of point and nonpoint source pollution have the potential to cause significant water quality degradation if proper controls and practices are not utilized.

The threat to water quality from all types of activities heightens the need for point and nonpoint source pollution control. It is important to consider any source (or potential source) of pollution in developing appropriate management and control strategies. The potential for further problems remains high as long as the activity in question continues carelessly. Because of this potential, neglecting one pollution source in an overall control strategy can mask the benefits achieved from controlling all other sources.

C. Assessment Methodology - Freshwater Bodies

Many types of information were used to determine use support assessments and to determine causes and sources of use support impairment. A use support data file is maintained for each of the 17 river basins. In these files, stream segments are listed as individual records. All existing data pertaining to a stream segment (from the above list) are entered into its record. In determining the use support rating for a stream segment, corresponding ratings are assigned to data values where this is appropriate. The following data and the corresponding use support ratings are used in the process. (Note: The general methodology for using these data and translating the values to use support ratings corresponds closely to the 305(b) guidelines with some minor modifications.)

1. Biological Data

Benthic Macroinvertebrate Bioclassification

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample based on the number of taxa present in the intolerant groups Ephemeroptera, Plecoptera and Trichoptera (EPTs) and the Biotic Index (BI) which summarizes tolerance data for all taxa in each collection. The bioclassifications are translated to use support ratings as follows:

<u>Bioclassification</u>	<u>Rating</u>
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting but Threatened
Fair	Partially Supporting
Poor	Not Supporting

Fish Community Structure

The North Carolina Index of Biotic Integrity (NCIBI) is a method for assessing a streams biological integrity by examining the structure and health of its fish community. The index incorporates information about species richness and composition, trophic composition, fish abundance and fish condition. The index is translated to use support ratings as follows:

<u>NCIBI</u>	<u>Rating</u>
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting but Threatened
Fair	Partially Supporting
Poor	Not Supporting

Phytoplankton and Algal Bloom Data

Prolific growths of phytoplankton, often due to high concentrations of nutrients, sometimes result in "blooms" in which one or more species of alga may discolor the water or form visible mats on top of the water. Blooms may be unsightly and deleterious to water quality, causing fish kills, anoxia, or taste and odor problems. An algal sample with a biovolume larger than 5,000 mm³/m³, density greater than 10,000 units/ml, or chlorophyll *a* concentration approaching or exceeding 40 micrograms per liter (the NC state standard) constitutes a bloom. Best professional judgment is used on a case-by-case basis in evaluating how bloom data should be used to determine the use support rating of specific waters. The frequency, duration, spatial extent, severity of blooms, associated fish kills or interference with recreation or water supply uses are all considered.

Chemical/Physical Data

Chemical/physical water quality data are collected through the Ambient Monitoring System as discussed in Section A, Chapter 3. These data are downloaded from STORET to a desktop computer for analysis. Total number of samples and percent exceedences of the NC state standards are used for use support ratings. Percent exceedences correspond to use support ratings as follows:

<u>Standards Violation</u>	<u>Rating</u>
Criteria exceeded <10%	Fully Supporting
Criteria exceeded 11-25%	Partially Supporting
Criteria exceeded >25%	Not Supporting

It is important to note that some waters may exhibit characteristics outside the appropriate standards due to natural conditions. These natural conditions do not constitute a violation of water quality standards.

Lakes Program Data

Assessments have been made for all publicly accessible lakes, lakes which supply domestic drinking water, and lakes where water quality problems have been observed.

2. Sources and Cause Data

In addition to the above data, existing information was entered for potential sources of pollution (point and nonpoint). It is important to note that not all impaired streams will have a potential source and/or cause listed for them. Staff and resources do not currently exist to collect this level of information. Much of this information is obtained through the cooperation of other agencies (federal, state and local), organizations and citizens.

a. Point Source Data

Whole Effluent Toxicity Data

Many facilities are required to monitor whole effluent toxicity by their NPDES permit or by administrative letter. Streams that receive a discharge from a facility that has failed its whole effluent toxicity tests may be rated ST (unless water quality data indicated otherwise) and have that facility listed as a potential source of impairment.

Daily Monitoring Reports

Streams which receive a discharge from a facility significantly out of compliance with permit limits may be rated ST (unless water quality data indicated otherwise) and have that facility listed as a potential source of impairment.

b. Nonpoint Source Data

Information related to nonpoint source pollution (i.e., agricultural, urban and construction) was obtained from monitoring staff, other agencies (federal, state and local), land use reviews, and workshops held at the beginning of each basin cycle.

c. Problem Parameters

Causes of use support impairment (problem parameters), such as sedimentation and low dissolved oxygen, were also identified for specific stream segments. For ambient water quality stations, those parameters which exceeded the water quality standard >10% of the time for the review period were listed as a problem parameter. For segments without ambient stations, information from reports, other agencies and monitoring staff was used if it was available.

3. Monitored vs. Evaluated

Assessments were made on either a monitored (M) or evaluated (E) basis, whichever, depending on the level of information that was available. 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 of a stream rated partially supporting (PS) or not supporting (NS), the stream is considered not rated (NR).
- Because a monitored rating is based on more recent and site-specific data, it is treated with more confidence than an evaluated rating.

Refer to the following summary for an overview of assigning use support ratings.

Summary of Basis for Assigning Use Support Ratings to Freshwater Streams		
Overall Basis	Specific Basis	Description
Monitored	Monitored (M)	Monitored stream segments* with data** <5 years old.
	Monitored/Evaluated (ME)	Stream segment* is unmonitored but is assigned a use support rating based on another segment of same stream for which data** <5 years old are available.
Evaluated	Evaluated (E)	Unmonitored streams that are direct or indirect tributaries to stream segments rated FS or ST.
	Evaluated/Old Data (ED)	Monitored stream segments* with available data** >5 years old.
Not Rated	Not Rated (NR)	No data available to determine use support. Includes unmonitored streams that are direct or indirect tributaries to stream segments rated PS or NS.

* A stream segment is a stream, or a portion thereof, listed in the Classifications and Water Quality Standards for a river basin. Each segment is assigned a unique identification number (Index No.).

** Major data sources include: Benthic Macroinvertebrate Bioclassification; Fish Community Structure (NCIBI); Chemical/Physical Monitoring Data.

D. Assessment Methodology - Saltwater Bodies

Estuarine areas are assessed by the Division of Environmental Health (DEH) shellfish management areas. The following data sources are used when assessing estuarine areas.

1. DEH Sanitary Surveys

The DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Growing areas are sampled continuously and reevaluated every three years to determine if their classification is still applicable. Growing waters are classified as follows:

- *Approved Area* - an area determined suitable for the harvesting of shellfish for direct market purposes.
- *Conditionally Approved-Open* - waters that are normally open to shellfish harvesting but are closed on a temporary basis in accordance with management plan criteria.
- *Conditionally Approved-Closed* - waters that are normally closed to shellfish harvesting but are open on a temporary basis in accordance with management plan criteria.
- *Restricted Area* - an area from which shellfish may be harvested only by permit and subjected to an approved depuration process or relayed to an approved area.
- *Prohibited Area* - an area unsuitable for the harvesting of shellfish for direct market purposes.

2. Chemical/Physical Data

Water quality data are collected from estuarine ambient monitoring stations. Parameters are evaluated based on the salt waterbody classification and corresponding water quality standards.

3. Phytoplankton and Algal Bloom Data

Prolific growths of phytoplankton, often due to high concentrations of nutrients, sometimes result in "blooms" in which one or more species of algae may discolor the water or form visible mats on top of the water. Blooms may be unsightly and deleterious to water quality, causing fish kills, anoxia, or taste and odor problems. An algal sample with a biovolume larger than 5000 mm³/m³, density greater than 10,000 units/ml, or chlorophyll *a* concentrations approaching or exceeding 40 micrograms per liter (the NC standard) constitutes a bloom. Best professional judgment is used on a case-by-case basis in evaluating how bloom data should be used to determine the use support rating of specific waters. The frequency, duration, spatial extent, severity of blooms, associated fish kills or interference with recreation or water supply uses are all considered.

Saltwaters are classified according to their best use. When assigning a use support rating, the waterbody's assigned classification is used with the above parameters to make a determination of use support. The following table describes how these factors are combined in use support determination.

DWQ Classification	DEH Shellfish Classification	Chemical/ Physical Data	Phytoplankton Data
Fully Supporting			
SA	Approved	standard exceeded ≤10% of measurements	no blooms
SB & C	Does not Apply	standard exceeded ≤10% of measurements	no blooms
Fully Supporting but Threatened			
SA	Conditionally Approved-Open	no criteria	no blooms
SB & SC	Does not Apply	no criteria	no blooms
Partially Supporting			
SA	Prohibited, Restricted or Conditionally Approved-Closed	standard exceeded 11-25% of measurements	blooms
SB & SC	Does not Apply	standard exceeded 11-25% of measurements	blooms
Not Supporting			
SA	Prohibited or Restricted	standard exceeded >25% of measurements	blooms
SB & SC	Does not Apply	standard exceeded >25% of measurements	blooms

In addition to the above categories, SA estuarine waters are not rated when categorized by DEH as prohibited because DEH does not sample them due to the absence of a shellfish resource. It is a federal requirement that DEH prohibit harvesting in such areas, although actual coliform concentrations are unknown.

It is important to note that DEH classifies all actual and potential growing areas (which includes all saltwater and brackish water areas) as to their suitability for shellfish harvesting, but different DWQ use classifications may be assigned to separate segments within DEH management areas. In determining use support, the DEH classifications and management strategies are only applicable to those areas that DWQ had assigned the use classification of SA. This will result in a difference of acreage between DEH areas classified as Prohibited or Restricted and DWQ waterbodies rated as PS. For example, if DEH classifies a 20-acre waterbody as prohibited, but only 10 acres have a DWQ use classification of SA, only those 10 acres classified as SA will be rated as partially supporting their uses. DWQ areas classified as SB and SC are rated using chemical/physical data and phytoplankton data.

E. Assigning Use Support Ratings

At the beginning of each assessment, all data are reviewed by subbasin with the monitoring staff, and data are adjusted where necessary based on best professional judgment. Discrepancies between data sources are resolved during this phase of the process. For example, a stream may be sampled for both benthos and fish community structure, and the bioclassification may differ from the NCIBI (i.e., the bioclassification may be FS while the NCIBI may be PS). To resolve

this, the final rating may defer to one of the samples (resulting in FS or PS), or it may be a compromise between both of the samples (resulting in ST).

After reviewing the existing data, ratings are assigned to the streams. If one data source exists for the stream, the rating is assigned based on the translation of the data value as discussed above. If more than one source of data exists for a stream, the rating is assigned according to the following hierarchy:

- Benthic Bioclassification/Fish Community Structure
- Chemical/Physical Data
- Monitored Data >5 years old
- Compliance/Toxicity Data

This is only a general guideline for assigning use support ratings and not meant to be restrictive. Each segment is reviewed individually, and the resulting rating may vary from this process based on best professional judgment, which takes into consideration site specific conditions.

After assigning ratings to streams with existing data, streams with no existing data were assessed. Streams that were direct or indirect tributaries to streams rated FS or ST received the same rating (with an evaluated basis) if they had no known significant impacts, based on a review of the watershed characteristics and discharge information. Streams that were direct or indirect tributaries to streams rated PS or NS, or that had no data, were assigned a NR rating.

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

Two significant changes to use support methodology have been made since the 1992-1993 305(b) report pertaining to the use of older information and fish consumption advisories.

Methodology for determining use support has been revised to more accurately reflect water quality conditions. In the 1992-1993 305(b) report, information from older reports and workshops were included in making use support determinations. Streams assessed using this information were rated on an evaluated basis, because the reports were considered outdated, and the workshops relied on best professional judgment since actual monitoring data were not available. In place of these older reports and workshop information, DWQ is now relying more heavily on data from its expanded monitoring network. These changes resulted in a reduction in streams rated on an evaluated basis. The basinwide process allows for concentrating more resources on individual basins during the monitoring phase. See the discussion above for more information on how 'monitored' versus 'evaluated' is defined.

Mercury levels in surface waters are primarily related to increases in atmospheric mercury deposition from global/regional sources, rather than from local surface water discharges. As a result, fish consumption advisories due to mercury have been posted in many areas (primarily coastal areas) of the state.

Waters with fish consumption advisories (mercury, dioxin, etc.) are no longer considered for use support determination. However, these waters will continue to appear on the 303(d) list, and management strategies will be developed for these waters as required by the Clean Water Act.

USE SUPPORT RATINGS FOR MONITORED STREAMS IN THE CATAWBA RIVER BASIN. NC DIVISION OF WATER QUALITY

Stream name	Description	Miles	Sampling station location	CHEM		BENTHOS RATING					FISH		Problem parameter	Major source	Possible source*	Rating Basis	
				Subbasin		1993	1994	1995	1996	1997	1997	1997					
				93-97						G-F	G-F	sed					culvert construction
CATAWBA RIVER	From source to Old Fort Finishing Plant WSI	7.5	B-SR 1274; F-SR 1103; B-SR 1273, McDowell	30830	FS									NP		ST	M
Mill Creek	From source to Swannanoa Creek	4.9	Ab RR bridge at Graphite; SR 1400/1407, McDowell	30830			E									FS	M
Mill Creek	From Swannanoa Creek to Catawba River	3.3	SR 1401/1407, McDowell	30830												FS	M
Swannanoa Creek	From source to Mill Creek	3.2	off SR 1400, McDowell	30830			E									FS	M
CATAWBA RIVER	From Dam At Old Fort Finishing Plant to SR 1234	1.8	SR 1234, McDowell	30830	FS											ST	M
CATAWBA RIVER	From SR 1234 to I40	1.3		30830												FS	ME
CATAWBA RIVER	From I40 to N Fk Catawba	13.7	SR 1221, McDowell	30830	FS											FS	M
Curtis Creek	From source to Catawba River	9.4	SR 1227 ab WWTP; US 70 be WWTP, McDowell	30830			G (be WWTP)							P	trout farms	FS	M
Crooked Creek	From source to Catawba	15.6	SR 1135, McDowell	30830									sed	NP	ag	FS	M
Mackey Creek	From source to Marion Water Supply	2.4		30830										NP	trout farms, ag	FS	ME
Mackey Creek	From Marion Water Supply to Laurel Fork	0.3		30830										NP	trout farms, ag	FS	ME
Mackey Creek	From Laurel Fork Creek to US 70	2.4	SR 1453; ab US 70, McDowell	30830					G					NP	trout farms, ag	FS	M
Mackey Creek	From US 70 to Catawba River	0.6	be US 70, McDowell	30830									metals discharge	P	Metal Industries	PS	M
Buck Creek	From source to Dam at Lake Tahoma	5.4	NC 80 ab Lake Tahoma, McDowell	30830			E						sed	NP		FS	M
Little Buck Creek	From source to Lake Tahoma, Buck Creek	3.8	SR 1436, McDowell	30830										NP		FS	M
Buck Creek	From Dam at Lake Tahoma to a point .6 mile upstream of Marion Water Supply	2.3		30830										NP		ST	ME
Buck Creek	From 0.6 mi upstream of Marion WSI to Marion WSI	0.6	US 70, McDowell	30830			G-F							NP		ST	M
Buck Creek	From Marion Water Supply Intake To Catawba R	0.4		30830										NP		ST	ME

Stream name	Description	Miles	Sampling station location	Subbasin	BENTHOS RATING					FISH		Major source	Possible source*	Rating	Basis
					93-97	1993	1994	1995	1996	1997	1997				
Toms Creek (Fall Branch)	From source to Harris Creek	1.8		30830										FS	ME
Toms Creek (Morgan Lake)	From Harris Creek to Catawba River	5.5	SR 1434, McDowell	30830					G					FS	M
CATAWBA RIVER (Lake James)	From North Fork Catawba River to a point 1.0 mile upstream of Burke-McDowell Co Line	7.5		30830	lakes									FS	M
	Laurel Branch to Armstrong Creek	9.3	US 221; SR 1573; SR 1560 McDowell	30830					E; G			NP		FS	M
North Fork Catawba River	From Armstrong Creek to Lake James,	6.6	SR 1559; A:SR 1552, McDowell	30830	FS				G		NP		FS	M	
Armstrong Creek	From source to Hickory Bottom Creek	10.7	B: end of FS rd; F:SR 1456; B: off NC 226	30830					E				FS	M	
Three Mile Creek	From source to Armstrong Creek	3.1	SR 1443, McDowell	30830					E				FS	M	
Cox Creek	From source to Armstrong Creek	3.8	Off NC 226, McDowell	30830					E				FS	M	
Armstrong Creek	From Hickory Bottom Cr to American Thread Company Water Sup. Dam	0.4		30830									FS	ME	
Armstrong Creek	From American Thread Company Water Sup Dam to North Fk Catawba R	0.1		30830									FS	ME	
CATAWBA RIVER (Lake James)	From 1.0 mile upstream of Burke-McDowell Co Line To Bridgewater Dam	4.5		30830	lakes								FS	M	
Paddy Creek	From 2.5 mi above NC Hwy 126 to Hwy 126	2.5	NC Hwy 126, Burke	30830					99;G	F	NP	cattle access, trout farms, ag	ST	M	
Paddy Creek	From Hwy 126 to Catawba River	1.5		30830									ST	ME	
Linville River	From source to Grandmother Creek	6.4	off NC 105 ab golf course; nr NC 105 nr Brier Knob Avery	30830					G; G		NP	non-urban development	FS	M	

Stream name	Description	Miles	Sampling station location	Subbasin	BENTHOS RATING					FISH	Problem parameter	Major source	Possible source*	Rating Basis			
					1993	1994	1995	1996	1997								
Linville River	From Grandmother Creek to Linville Falls	15.1	NC 221, Avery	30830						G-F/G-F			non-urban development, urban	NP		ST	M
Little Grassy Creek	From source to Linville River	1.5	ab golf course, Avery	30830						E						FS	M
Linville River	From Linville Falls to S. boundary of Daniel Boone Wildlife Mgmt Area.	9.9		30830												FS	ME
Linville River	From S Boundary of Daniel Boone Wildlife Mgmt Area to Shooks Ck	6.2		30830												FS	ME
Linville River	From Shooks Ck to Lake James, Catawba River	0.7	Hwy 126 nr Nebo, Burke	30830	FS					E						FS	M
CATAWBA RIVER	From Bridgewater Dam (Linville Dam) to 1.2 miles upstream of Canoe Ck	10.8	SR 1147 nr Glen Alpine, Burke	30830	FS					G						FS	M
Muddy Creek	From source to Catawba	4.6		30830									sed	NP		ST	ME
North Muddy Creek	From source to .3 miles upstream from Thompsons	14.7	SR 1760, McDowell	30830						G			sed, turb	NP		ST	M
Coperning Creek	From source to Marion WWTP	4.2	SR 1819, McDowell	30830						F				NP		PS	M
Coperning Creek	From Marion WWTP to North Muddy Creek	0.5	SR 1794, McDowell	30830									urban, Marion WWTP	NP, P		PS	M
North Muddy Creek	From .3 mi upstream of Thompsons Fk to Muddy Ck	2.2		30830									sed, turb	NP		ST	ME
South Muddy Creek	From source to .5 mile upstream of Hoppers Ck	11.4		30830									sed, turb	NP		ST	ME
South Muddy Creek	From 0.5 mile upstream of Hoppers Ck to Muddy Creek	4.8	SR 1764	30830						G-F			sed, turb	NP		ST	M
CATAWBA RIVER	From 1.2 miles upstream of Canoe Ck to 0.7 mi upstream of Canoe Ck	0.5		30830												FS	ME
CATAWBA RIVER	From 0.7 miles upstream of Canoe Ck to 0.6 miles upstream of Warrior Fork	3.8		30830												FS	ME
Canoe Creek	From source to Burke co SR 1248	6.2		30830									logging	NP		ST	ME

Stream name	Description	Miles	Sampling station location	Subbasin	BENTHOS RATING					FISH			Problem parameter	Major source	Possible source*	Rating Basis			
					1993	1994	1995	1996	1997	G-F	G-F	sed					logging		
Canoe Creek	From Burke Co SR 1248 to Catawba River	5.3	SR 1250, Burke Co,	30830											NP	logging	ST	M	
Silver Creek	From source to 1.3 miles downstream of Clear Ck	13.7	SR 1149, Burke Co,	30831											NP	ag	ST	M	
Silver Creek	From 1.3 miles downstream of Clear Ck to Catawba River	3		30831											NP	ag, urban	ST	ME	
CATAWBA RIVER	From 0.6 miles upstream of Warrior Fork To Johns River	2.7		30831													FS	ME	
Warrior Fork	From source to .6 mile upstream of city of Morganton water supply intake	3.6	SR 1440, Burke	30831														FS	M
Upper Creek	Source to Timbered Br.	9.6	NC 181; USFS 128, ab USFS 982, Burke	30831														FS	M
Upper Creek	From Timbered Branch to Holly Spring Br	1.1	USFS 982, Burke	30831														FS	M
Timbered Branch	From source to Upper Creek	2.3	USFS 982, Burke	30831														FS	M
Upper Creek (Clear)	From Holly Spring Branch to Dam at Clear Water Beach	3.9		30831														FS	ME
Upper Creek	From Dam at Clear Water Beach Lake to Warrior Fk	5.5	SR 1407; SR 1439, Burke	30831														FS	ME
Warrior Fork	From 0.6 mile upstream of City of Morganton water supply intake to City of Morganton water supply intake	0.6		30831														FS	ME
Warrior Fork	From City of Morganton water supply intake to Rhodhiss Lake, Catawba	1.1		30831														FS	ME
CATAWBA RIVER (L. Rhodhiss)	From Johns River to Rhodhiss Dam	13.7	SR 1001 nr Baton, Burke	30831														FS	M
Johns River	From Gragg Prong to Reids Creek	10.2		30831														FS	ME
Johns River	From Reids Creek to Wilson Cr	22.3	SR 1356, Caldwell	30831														FS	M
Mulberry Creek	From source to Boone Fork	7.6		30831											NP			FS	ME

Stream name	Description	Miles	Sampling station location	Subbasin	BENTHOS RATING					FISH 1997	Problem parameter	Major source	Possible source*	Rating	Basis
					1993	1994	1995	1996	1997						
Elk Shoal Creek	From source to Guys Br	4.2		30832							NP	ag	ST	ME	
Elk Shoal Creek	From Guys Br to Lookout Shoals Lake,	4.8		30832				G-F	G-F	turb, sed	NP	ag	ST	M	
CATAWBA RIVER (Lookout Shoals L.)	From 0.5 mile upstream of Lookout Shoals Dam to Lookout Shoals Dam	0.5		30832 lakes									FS	M	
CATAWBA RIVER (Lake Norman)	From Lookout Shoals Dam to Lyle Creek	3.6		30832 lakes									FS	M	
CATAWBA RIVER (Lake Norman)	From Lyle Creek to Cowan's Ford Dam	28.9		30832 lakes									FS	M	
Lyle Creek	From source to Bakers Ck	8.7		30832							NP		FS	ME	
Lyle Creek	From Bakers Ck to US Hwys 64&70	6.4	US 64/70, Catawba.	30832				G	G-F	sed	NP		FS	M	
Lyle Creek	From US Hwy 64&70 to Lake Norman, Catawba	1.8		30832							NP		FS	ME	
McLin Creek	From source to Catawba Co SR 1734	1.1		30832							NP		FS	ME	
McLin Creek	From Catawba Co SR 1734 to 0.2 mile upstream of Catawba Co SR 1722	7.7		30832							NP		FS	ME	
McLin Creek	From 0.2 mile upstream of Catawba Co SR 1722 to Lyle Ck	0.6	SR 1722, Catawba	30832				G			NP		FS	M	
Buffalo Shoals Creek	From source to 0.2 mi downstream of Broad Meadow Ck	8.4		30832					G-F		NP		ST	M	
Buffalo Shoals Creek	From 0.2 mile downstream of Broad Meadow Ck to Lake Norman	0.6		30832							NP		ST	ME	
CATAWBA RIVER (Mountain Island L.)	From Cowan's Ford Dam to Water Intake at River Bend Steam Station	6.5		30833									FS	M	
CATAWBA RIVER (Mountain Island L.)	From Water Intake at River Bend Steam Station to Mt Island Dam	8.4		30833 lakes									FS	M	
McDowell Creek	From source to US Hwy 21	1.1		30833							NP		PS	ME	

Stream name	Description	Miles	Sampling station location	CHEM		BENTHOS RATING					FISH		Problem parameter	Major source	Possible source	Rating	Basis	
				Subbasin	93-97	1993	1994	1995	1996	1997	1997	1997						
McDowell Creek	From US Hwy 21 to SR 2136 Mecklenburg Co	5	SR 2136, Mecklenburg	30833								P		NP			PS	M
McDowell Creek	From SR 2136 Mecklenburg Co to .7 mile upstream from mouth	3	SR 2128, Mecklenburg	30833										NP			PS	ME
McDowell Creek	From 0.7 mile upstream of mouth to Mountain Island Lake, Catawba	0.7		30833										NP			PS	ME
Gar Creek	From source to 0.6 mile upstream from mouth	3.5	SR 2074, Mecklenburg	30833		G						G					FS	M
Gar Creek	From 0.6 mile upstream from mouth to Mountain Island Lake,	0.6		30833													FS	ME
Catawba River	From Mountain Island Dam to I Hwy 85 Bridge at	5.9	NC 27, Mecklenburg	30833	FS												FS	M
Dutchmans Creek	From source to 0.8 miles downstream of Taylors Ck	7.2	SR 1918, Gaston	30833	ST								E	NP	ag		FS	M
Leepers Creek	From source to 0.8 mile upstream of mouth	9.1	b:SR 1354, b/f:NC 73 (Lincoln), b:SR 1820 (Gaston)	30833								G-F		NP	ag		FS	M
Leepers Creek	From 0.8 miles upstream of mouth to Dutchmans Ck	0.8		30833										NP	ag		FS	ME
Killian Creek	From source to 1.2 miles upstream of mouth	14.7	b:SR 1511, f:NC 73 (Lincoln)	30833									E	NP	ag		FS	M
Killian Creek	From 1.2 miles upstream of mouth to Dutchmans Creek	1.2		30833										NP	ag		FS	ME
Long Creek	From source to 0.6 mile downstream of Mecklenburg Co SR 2074	5.1		30834										NP	urban, construction, ag		PS	ME
Long Creek	From 0.4 mile upstream of Mecklenburg Co SR 1606 to Lake Wylie, Catawba	1.8		30834										NP	urban, construction, ag		PS	M

Stream name	Description	Miles	Sampling station location	CHEM		BENTHOS RATING							Problem parameter	Major source	Possible source*	Rating	Basis
				Subbasin	93-97	1993	1994	1995	1996	1997	1997						
Maiden Creek	From 0.7 mile upstream from backwaters of Maiden Reservoir to dam at Maiden Reservoir	0.7		30835	lakes								sed, hi P, NOx, lo secchi	NP		ST	M
Maiden Creek	From dam at Maiden Reservoir located 680 feet more or less upstream from the bridge on Catawba co SR 1810 to Pinch Gut Creek	1.5	SR 1810, Catawba	30835		G										FS	M
Carpenter Creek	From source to Clark Creek/NC-301	3.1	US 301, Lincoln	30835			G									FS	M
Indian Creek	From source to 0.5 mile upstream of Mill Creek	13.9		30835										NP	cattle	ST	ME
Indian Creek	From 0.5 mile upstream of Mill Cr to 0.4 mile upstream of mouth of Lick Fork	0.5		30835										NP	cattle, ag	ST	ME
Indian Creek	From 0.4 mile upstream of mouth of Lick Fork to 0.3 mi upstream of Lincoln Co. SR 1169	2.4		30835									fecal	NP	cattle, ag	ST	ME
Indian Creek	From 0.3 mi upstream of Lincoln Co. SR 1169 to South Fork Catawba R.	5.5	SR 1252, Lincoln	30835	ST					G			fecal	NP	cattle, ag	ST	M
South Fork Catawba River	Muddy Ck to Town of High Shoals water Supply Intake	0.5		30835										NP, P	Clark Cr.	ST	ME
South Fork Catawba River	water Supply Intake to 0.6 mile upstream of NC Hwy 275	8.1		30835										NP, P	Clark Cr.	ST	ME
Mauney Creek	From source to Hoyle Creek	4.3	ab and be SR 1831, Gaston	30835								F/F		NP, P	Stanley WWTP	PS	M
South Fork Catawba River	From 0.6 mile upstream of NC Hwy 275 to 0.4 mile upstream of Long Cr	2.2		30836										NP		ST	ME

Stream name	Description	Miles	Sampling station location	Subbasin	CHEM					BENTHOS/RATING					FISH	Problem parameter	Major source	Possible source*	Rating	Basis
					93	97	1993	1994	1995	1996	1997	1997	1997	1997						
South Fork Catawba River	From 0.4 mile upstream of Long Cr. to Cramerton Dam & L. Wylie at Upper Armstrong Br.	10.3	a&b:NC 7; a:SR 2524, Gaston	30836	FS										sed	NP,P	Crompton&K nowles Colors	ST	M	
Long Creek	From Source 0.7 mile upstream of Gaston Co SR 1408	2.7		30836														FS	ME	
Limekiln Creek	From source to Long Creek	1.6	SR 1409 Gaston	30836														FS	M	
Long Creek	From 0.7 mile upstream of Gaston Co SR 1408 to Mountain Cr	1.8	SR 1408, SR 1405 Gaston	30836					G							NP		FS	M	
Long Creek	From Mountain Cr to SR 1456	6.4	NC 274, SR 1443, SR 1448, Gaston	30836					G/G/G							NP		FS	M	
Long Creek	From SR 1456 to NC 275	0.7	SR 1456, Gaston	30836	ST										sed, fecal	NP	cattle	ST	M	
Long Creek	Branch	4.5	NC 275, Gaston	30836					G						sed, fecal	NP	cattle	ST	ME	
Catawba Creek	From SR 2446 to SR-2439, Gaston	2.9	SR 2439, Gaston	30837													Gastonia WWTP, urban			
Catawba Creek	From SR 2439 to Lake Wylie	4.5	SR 2435, Gaston	30837							P					NP,P	urban	NS	M	
Crowders Creek	From source to SR 1118	1.8	SR 1118, Gaston	30837												NP	cattle, urban	NS	M	
Crowders Creek	SR 1118 to SR 1125	1.7	SR 1125, Gaston	30837												NP	urban	PS	ME	
Crowders Creek	Sr 1125 to SR1131	4.5	SR 1131, Gaston	30837												NP	urban, Lithium Corp	PS	ME	
Crowders Creek	SR 1131 to SR 1108	4.2	SR 1108, Gaston	30837												NP	urban	PS	ME	
Crowders Creek	SR 1108 to NC 321	1.4	NC 321, Gaston	30837											fecal	NP	urban	PS	ME	
Crowders Creek	NC 321- SR 2424	1.4	SR 2424, Gaston	30837													urban, CBR Resources	PS	ME	
Crowders Creek	SR 2424 to NC/SC line	0.8	SC 564, York Co. SC	30837											fecal	P, NP	urban, CBR Resources	PS	ME	
Abernethy Creek	From source to Lithium Co. discharge	2.2	SR 1302, ab Lithium Co.	30837											fecal	P, NP	urban, CBR Resources	PS	M	
Abernethy Creek	From Lithium Co. discharge to Crowders Ck	2.2	SR 1302, be Lithium Co. discharge	30837												NP	urban	ST	M	
Waxhaw Creek	From source to NC/SC	16	SR 1103, Union	30838												NP,P	ag	ST	M	

NOTES: See next page for key and comments

Stream name	Description	Miles	Sampling station location	CHEM Subbasin 93:97	BENTHOS RATING	FISH 1997	Problem parameter	Major source	Possible source*	Rating Basis
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NOTES

*"Ag" denotes agriculture, which could include row crops and animal operations. Where "cattle" is noted, cattle were observed on site at the time of sampling or the watershed hosts many cattle farms.

"Rating" = Use Support Rating

Where rating is given, but no monitoring data are noted, data from an adjacent stream segment are used to give rating.

"Non-urban development" is residential and/or commercial development outside urban areas.

ABBREVIATION KEY

E = Excellent

G = Good

G-F = Good-fair

F = Fair

P = Poor (Benthos/fish ratings)

P = Point Source Pollution (Major source)

NP = Non-point Source Pollution

M = Monitored

ME = Monitored-evaluated

FS = Fully Supporting

ST = Fully Supporting but Threatened

PS = Partially Supporting

NS = Not Supporting

