Section A: Chapter 3
Summary of Water Quality Information for the Yadkin-Pee Dee 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 can be grouped 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

- Construction activities
- Roads, parking lots and roof tops
- Agriculture
- Failing septic systems and straight pipes
- Timber harvesting
- Hydrologic modifications

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.

Cumulative Effects

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

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. Table A-21 briefly describes the best uses of each classification. A full description is available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina* (NCDENR-DWQ, 2000b). Information, including a database of North Carolina's stream classifications, is also available on DWQ's website at http://h2o.enr.state.nc.us/csu/.

Table A-21 Primary and Supplemental Surface Water Classifications

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.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.
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.

* Primary classifications beginning with a "S" are assigned to saltwaters.

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.

Trout Waters

Different water quality standards for some parameters, such as dissolved oxygen, temperature and turbidity, have been developed to protect freshwaters for natural trout propagation and survival of stocked trout. These water quality standards result in more restrictive limits for wastewater discharges to trout waters (Tr). There are no watershed development restrictions associated with the Tr classification. However, the NC Division of Land Resources does require a 25-foot vegetated buffer between Tr waters and graded construction sites.

A state fishery management classification, Designated Public Mountain Trout Waters, is administered by the NC Wildlife Resources Commission. It provides for public access to streams for fishing and regulates fishing activities (seasons, size limits, creel limits, and bait and lure restrictions). Although many of these waters are also classified Tr by DWQ, this is not the same classification.

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 or special native trout waters by the Wildlife Resources Commission.
- Waters designated as primary nursery areas or other functional nursery areas by the Division of Marine Fisheries.
- Waters classified by DWQ as WS-I, WS-II or SA.

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. The low density option requires a 30-foot vegetated buffer between development activities and the stream; whereas, the high density option requires structural stormwater controls. In addition, the Division of Land Resources requires more stringent erosion 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 including one or more of the following:

- an 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;
- within a state or national park or forest; or
- a 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 a 30-foot vegetated buffer or stormwater controls for 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.

Water Supply Watersheds

The purpose of the Water Supply Watershed Protection Program is to provide an opportunity for communities to work with the state to strengthen protection of their water supplies. There are five water supply classifications (WS-I to WS-V) that are defined according to the amount and types of permitted point source discharges, as well as requirements to control nonpoint sources of pollution (Table A-20). Watersheds draining to waters classified WS carry some restrictions on point source discharges and on many land use activities including urban development, agriculture, forestry and highway sediment control. Minimum requirements for WS-I to WS-IV include a 30-foot undisturbed vegetated setback. The WS-I and WS-II classifications are HQW by definition because requirements for these levels of water supply protection are at least as stringent as for HQWs.

Classifications and Standards in the Yadkin-Pee Dee River Basin

There are four watersheds in the Yadkin-Pee Dee River basin that contain Outstanding Resource Waters. In subbasin 03-07-01, the Elk Creek watershed and several streams in the Roaring River watershed are classified ORW. The Mitchell River watershed, in subbasin 03-07-02, is also ORW and is used for primary recreation (Class B). Waters classified ORW in subbasin 03-07-09 are Barnes Creek and its tributaries in the Uwharrie National Forest.

A portion of the Little River, along with the entire Densons Creek watershed in subbasin 03-07-15, is classified High Quality Waters. Bridgers Creek and a portion of Rocky Creek are also HQW. There are many other watersheds in the Yadkin-Pee Dee River basin that contain HQW protection because they are drinking water supplies classified either WS-I or WS-II. In the upper portion of the basin, these include most of the Reddies River watershed and Little Cub Creek in subbasin 03-07-01; the Fisher River watershed and the Elkin Creek watershed in subbasin 03-07-02; the Toms Creek watershed in subbasin 03-07-03; and the headwaters of the South Yadkin River in subbasin 03-07-06.

In the lower portion of the basin, water supply watersheds with HQW protection include Back Creek draining to and including Back Creek Lake, as well as an unnamed tributary to Cedar Fork Creek draining to and including Lake Bunch in subbasin 03-07-09; the Coddle Creek watershed from its source to the City of Concord water supply intake in subbasin 03-07-11; the headwaters of Dutch Buffalo Creek in subbasin 03-07-12; the headwaters of Marks Creek including Water Lake in subbasin 03-07-16; and the headwaters of North Fork Jones Creek draining to Wadesboro City Pond in subbasin 03-07-17.

Portions of the Yadkin-Pee Dee River basin that contain these special classifications are shown on Figures A-12 and A-13.

Pending and Recent Reclassifications in the Yadkin-Pee Dee River Basin

In February 2002, the Citizens Against River Pollution requested that a portion of the Uwharrie River be reclassified to B and/or ORW. DWQ is currently completing studies needed to determine whether the proposed waters meet requirements for either or both of these more protective classifications.

All or part of Hunting Creek, Rocky Creek, Little Hunting Creek, North Little Hunting Creek, and a larger segment of the upper South Yadkin River would likely qualify for either HQW or ORW, but a proposal for reclassification has not yet been received. Biological surveys indicate that the West Fork Little River might also be eligible for reclassification to HQW. Data also indicate that South Fork Jones Creek qualifies for this more protective classification. Citizens, organizations or local governments can recommend waters for reclassification at any time, and DWQ will consider them for these protective classifications.

Figure A-12 Water Supply Watersheds, Outstanding Resource Waters and High Quality Waters in the Upper Yadkin-Pee Dee River Basin

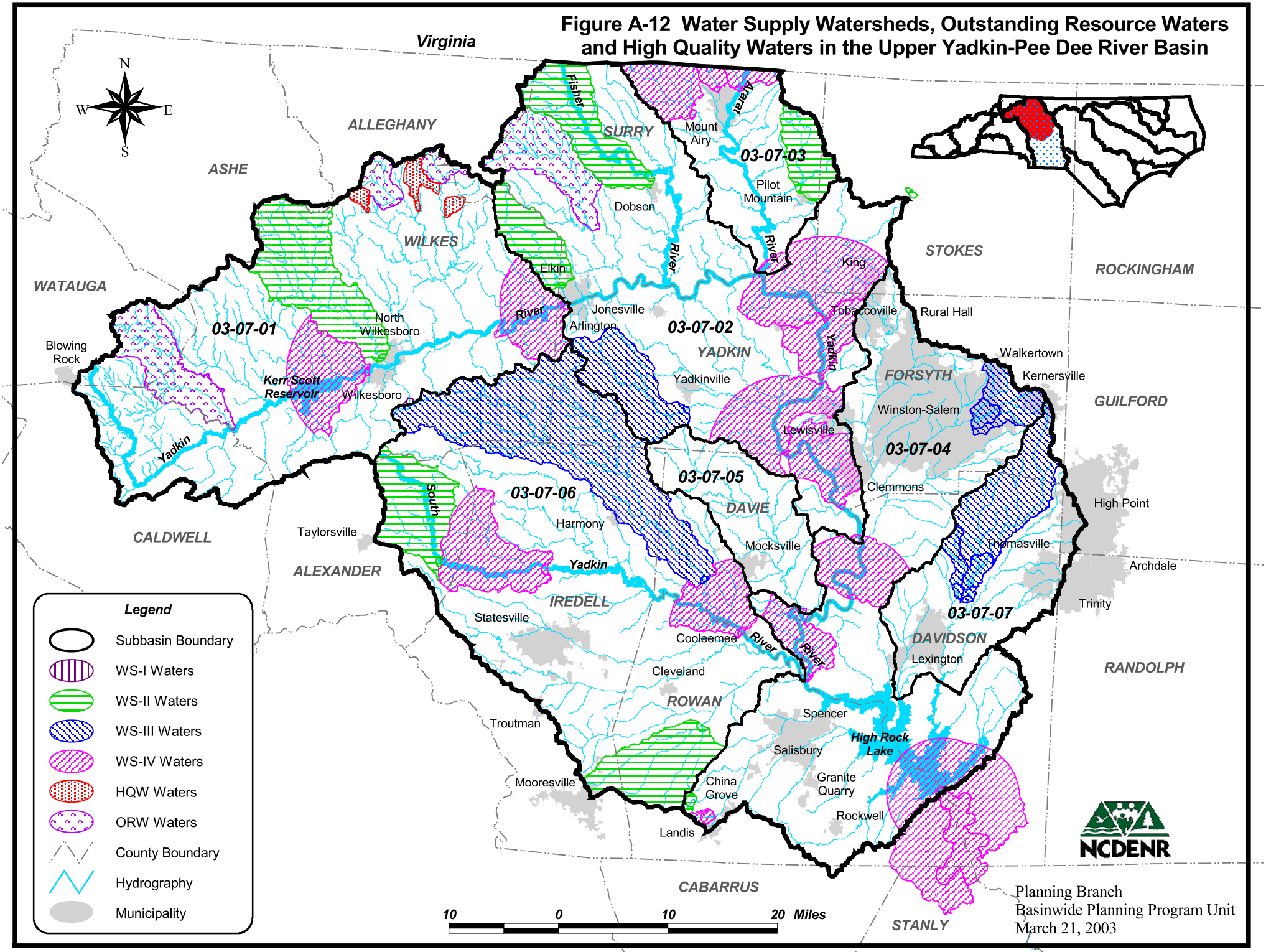
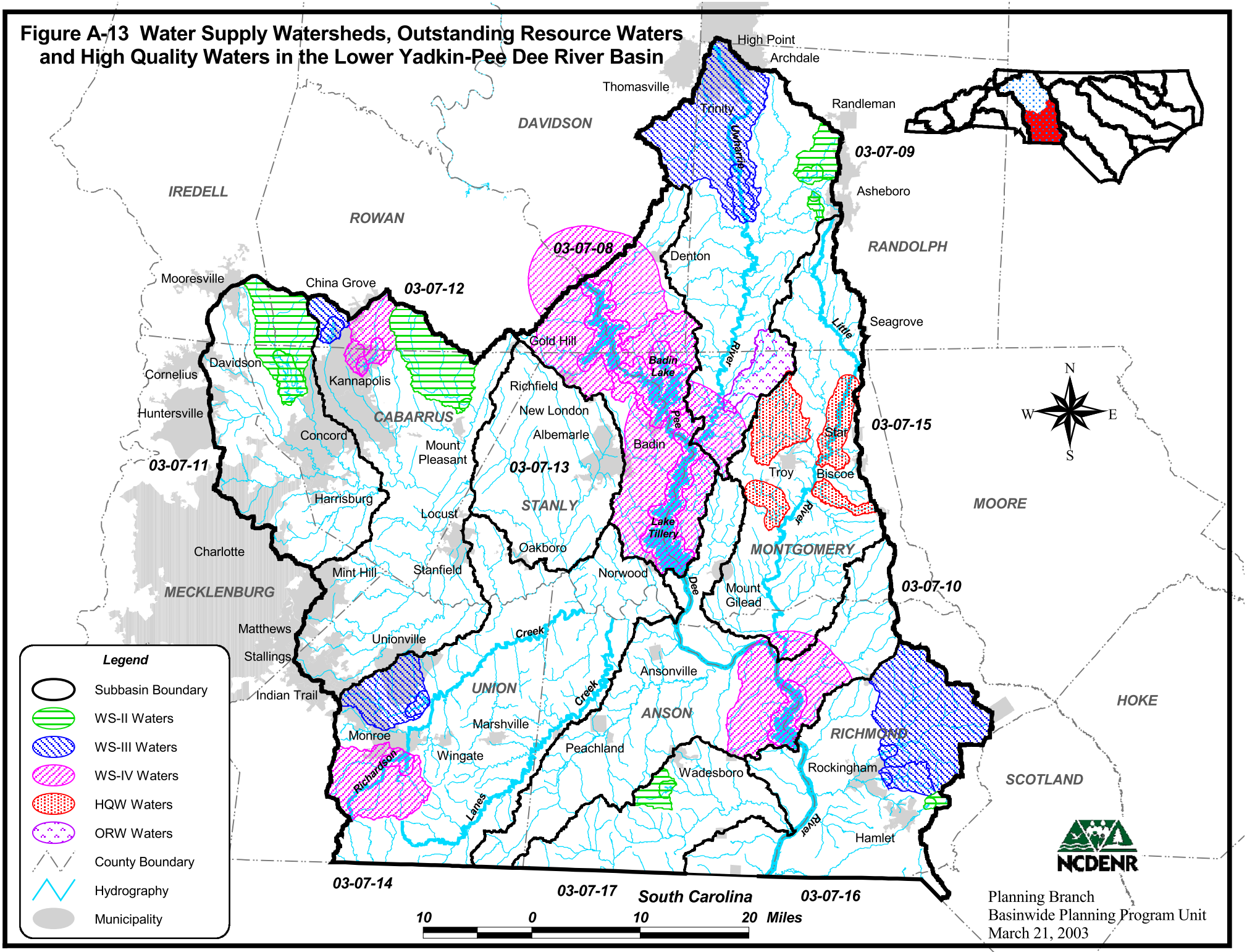


Figure A-13 Water Supply Watersheds, Outstanding Resource Waters and High Quality Waters in the Lower Yadkin-Pee Dee River Basin



3.3 DWQ Water Quality Monitoring Programs in the Yadkin-Pee Dee River Basin

Staff in the Environmental Sciences Branch and Regional Offices of DWQ collect 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 Yadkin-Pee Dee River basin for that program. For more detailed information on sampling and assessment of streams in this basin, refer to the *Basinwide Assessment Report* for the Yadkin-Pee Dee River basin, available from the Environmental Sciences Branch website at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

Monitoring programs for the Yadkin-Pee Dee River Basin include:

- benthic macroinvertebrates (Part 3.3.1)
- fish assessments (Part 3.3.2)
- aquatic toxicity monitoring (Part 3.3.3)
- lakes assessment (Part 3.3.4)
- ambient monitoring (Part 3.3.5)
- basin association monitoring (Part 3.3.6)

3.3.1 Benthic Macroinvertebrate Monitoring

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 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), commonly referred to as EPTs; and a Biotic Index value, which gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina. Bioclassifications fall into five categories ranging from Poor to Excellent.

Extensive evaluation of swamp streams across eastern North Carolina suggests that current coastal plain criteria are not appropriate for assessing the condition of water quality in these special systems. Swamp streams are characterized by slower flow, lower dissolved oxygen, lower pH, and sometimes very complex braided channels and dark-colored water. DWQ is working to refine biological criteria that may be used in the future to assign bioclassifications to these streams. Refer to page 113 of Section A, Chapter 4 for more detailed information.

Overview of Benthic Macroinvertebrate Data

Appendix II lists all the benthic macroinvertebrate collections in the Yadkin-Pee Dee River basin between 1983 and 2001, giving site location, collection date, taxa richness, biotic index values

and bioclassifications. Benthic macroinvertebrates have been collected at more than 300 sites in the Yadkin-Pee Dee River basin since 1983. Table A-22 lists the most recent bioclassifications (by subbasin) for all benthos sites in the Yadkin-Pee Dee River basin. Benthos sampling may slightly overestimate the proportion of Fair and Poor sites, as DWQ special studies often have the greatest sampling intensity (number of sites/stream) in areas where it is believed that water quality problems exist.

Table A-22 Summary of Bioclassifications for All Benthic Macroinvertebrate Sites (using the most recent score for each site) in the Yadkin-Pee Dee River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Total
03-07-01	12	21	7	0	0	40
03-07-02	7	18	21	2	0	48
03-07-03	0	3	10	4	0	17
03-07-04	0	2	16	9	5	32
03-07-05	0	1	3	3	0	7
03-07-06	11	7	8	4	0	30
03-07-07	0	1	8	12	3	24
03-07-08	0	0	3	2	0	5
03-07-09	6	2	8	0	0	16
03-07-10	0	2	2	1	0	5
03-07-11	0	0	6	5	1	12
03-07-12	0	2	8	10	3	23
03-07-13	0	3	3	6	2	14
03-07-14	0	3	3	6	2	14
03-07-15	9	5	5	1	0	20
03-07-16	2	2	5	2	0	11
03-07-17	0	0	5	1	0	6
Total (#)	**47**	**72**	**121**	**68**	**16**	**324**
Total (%)	**15%**	**22%**	**37%**	**21%**	**5%**	**100%**

Samples over the past five-year planning cycle were almost all collected under severe to extreme drought conditions. Below average precipitation and streamflow tends to concentrate the effects of point sources of pollution while, in many cases, minimizing the effects of nonpoint source pollution. These conditions must be considered when evaluating water quality data. A summary of how drought affects aquatic life and water quality is found on page 102 of this section.

During basinwide surveys in 2001 (not including special study sites), benthic macroinvertebrate communities were sampled at 112 sites. Bioclassifications were not assigned at five sites due to low flow conditions or lack of criteria to properly assess the community. Figure A-14 presents the following bioclassifications: Excellent – 16 (15%), Good – 26 (24%), Good-Fair – 36 (34%),

Fair – 26 (24%), Poor – 3 (3%). Excellent benthic macroinvertebrate communities were only found in six of 17 subbasins. The largest number of sites receiving Excellent or Good bioclassifications were located in the upper Yadkin River (subbasins 03-07-01 and 03-07-02) and upper South Yadkin River (subbasin 03-07-06) watersheds. With a few exceptions, Poor and Fair bioclassifications were concentrated in subbasins with large amounts of developed area.

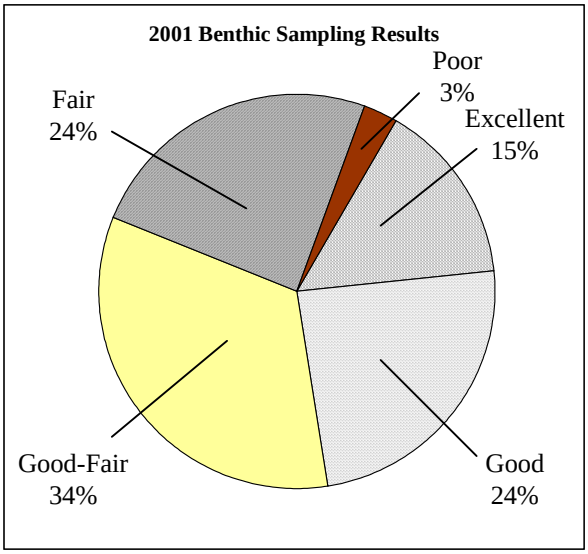


Figure A-14 Bioclassifications for 107 Yadkin-Pee Dee River Basin Benthic Macroinvertebrate Sites Sampled by DWQ in 2001

Figure A-15 presents long-term trends (>5 years of data) in water quality that were evaluated at 108 sites in the Yadkin-Pee Dee River basin. The largest number of sites (87) showed no change in water quality, other than flow-related shifts in community structure. Improving water quality was observed at 11 sites. A decline in water quality was documented at 10 sites which are presented in Table A-23; aquatic life in Grants, Second and Swearing Creeks are now Impaired. The subbasin chapters in Section B discuss all streams in Table A-23 in more detail.

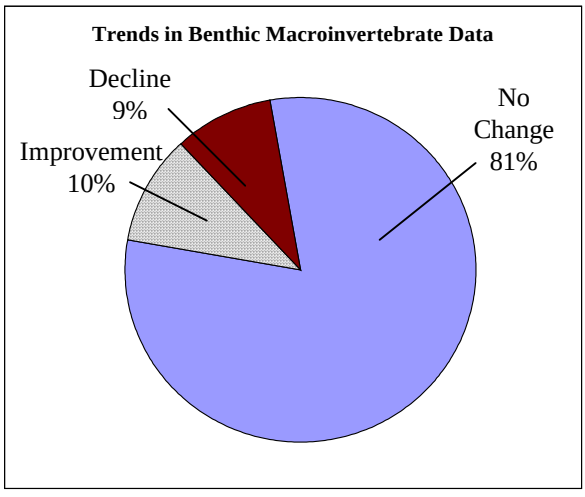


Figure A-15 Summary of Trends over Time in Benthic Macroinvertebrate Data

Table A-23 Benthic Macroinvertebrate Sites Exhibiting a Decline in Bioclassification

Subbasin	Stream	Location	County
03-07-01	Upper Yadkin River	NC 268	Caldwell
03-07-01	Roaring River	SR 1990	Wilkes
03-07-02	Little Fisher River		Surry
03-07-03	Stewarts Creek	NC 89	Surry
03-07-04	Upper Reynolds Creek	Above WWTP	Forsyth
03-07-04	Grants Creek		Rowan
03-07-05	Dutchman Creek		Davie
03-07-06	South Yadkin River	SR 1561	Iredell
03-07-06	Second Creek		Rowan
03-07-07	Swearing Creek	NC 47	Davidson

3.3.2 Fish Assessments

The condition of the fish community is one of the most meaningful indicators of ecological integrity to the public. Fish occupy the upper levels of the aquatic food web and are both directly and indirectly affected by chemical and physical changes in the environment. Water quality conditions that significantly affect lower levels of the food web (such as benthic macroinvertebrates) will affect the abundance, species composition and condition of the fish population. Three types of fish assessments are conducted by DWQ: fish community, fish tissue and information about fish kills.

Scores are assigned to fish community samples 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. Appendix II contains more information regarding the NCIBI.

During the late 1990s, application of the NCIBI has been restricted to wadeable streams that can be sampled by a crew of 2-4 persons using backpack electrofishers and following the DWQ Standard Operating Procedures (NCDEHNR, 1997). DWQ has no Index of Biotic Integrity calculated for fish populations in lakes, and the NCIBI is not used for high elevation trout streams due to their naturally limited fish diversity.

Overview of Fish Community Data

Appendix II lists all of the fish community collections in the Yadkin-Pee Dee River basin between 1990 and 1999, giving site location, collection date and NCIBI rating. Fish community samples have been collected at 86 sites in the Yadkin-Pee Dee River basin since 1990. Table A-24 lists the most recent ratings since 1990, by subbasin, for all fish community sites.

Table A-24 Summary of NCIBI Categories for All Freshwater Fish Community Sites (using the most recent rating for each site) in the Yadkin-Pee Dee River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Total
03-07-01	9	7	0	0	0	16
03-07-02	2	4	1	0	0	7
03-07-03	2	0	0	0	0	2
03-07-04	0	0	2	3	1	6
03-07-05	0	1	1	0	0	2
03-07-06	1	1	3	1	2	8
03-07-07	0	0	1	0	1	2
03-07-08	0	1	2	0	0	3
03-07-09	1	1	1	0	0	3
03-07-10	2	3	2	0	0	7
03-07-11	1	1	0	0	1	3
03-07-12	0	3	3	1	0	7
03-07-13	0	1	0	0	0	1
03-07-14	1	1	1	2	0	5
03-07-15	4	5	0	1	0	10
03-07-16	0	1	0	0	0	1
03-07-17	1	1	0	0	1	3
Total (#)	**24**	**31**	**17**	**8**	**6**	**86**
Total (%)	**28%**	**36%**	**20%**	**9%**	**7%**	**100%**

During basinwide surveys in 2001 (not including special study sites), fish communities were sampled at 56 sites. Bioclassifications were not assigned at three sites due to lack of criteria to properly assess the community. Figure A-16 presents the following bioclassifications: Excellent – 15 (28%), Good – 17 (31%), Good-Fair – 13 (25%), Fair – 4 (8%), Poor – 4 (8%).

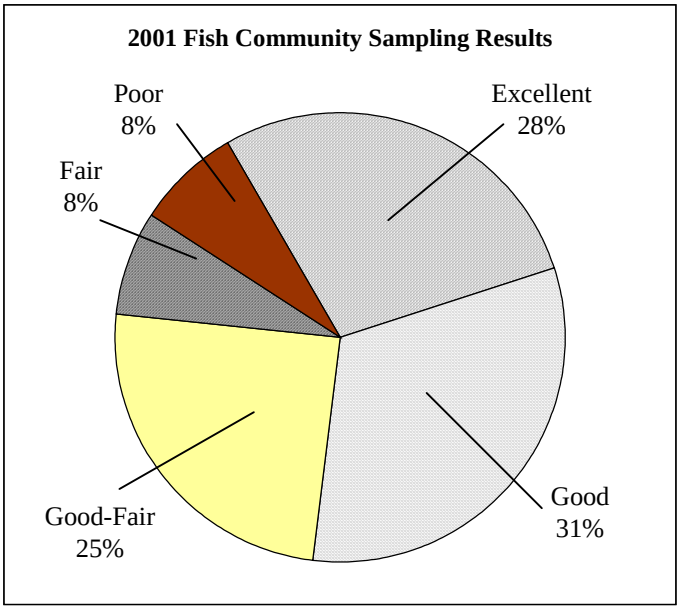


Figure A-16 Bioclassifications for 53 Yadkin-Pee Dee River Basin Fish Community Sites Sampled by DWQ in 2001

Figure A-17 presents long-term trends (5 years of data) in water quality that were evaluated at 35 sites in the Yadkin-Pee Dee River basin. The largest number of sites (17) showed no significant change in water quality. Improving water quality was observed at 13 sites. A decline in water quality was documented at five sites which are presented in Table A-25; aquatic life in Third Creek is now Impaired. The subbasin chapters in Section B discuss all streams in Table A-25 in more detail.

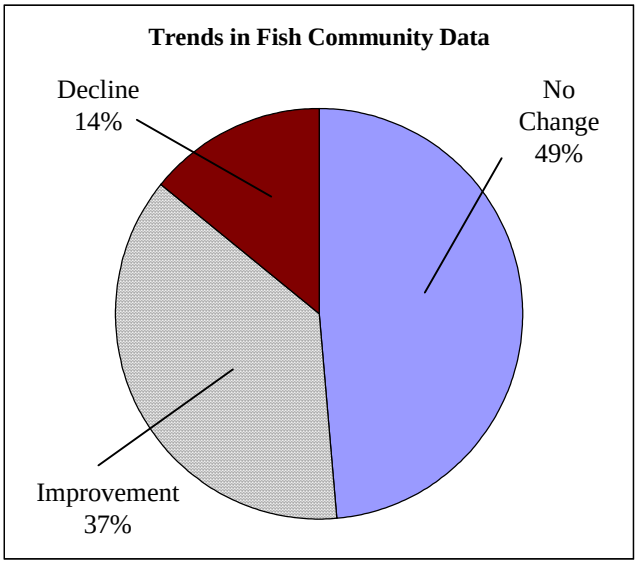


Figure A-17 Summary of Trends over Time in Fish Community Data at 35 Sites

Table A-25 Fish Community Sites Exhibiting a Decline in Bioclassification

Subbasin	Stream	Location	County
03-07-06	Third Creek	SR 1970	Rowan
03-07-08	Mountain Creek	SR 1720	Stanly
03-07-09	Betty McGees Creek	SR 1107	Randolph
03-07-12	Cold Water Creek	NC 73	Cabarrus
03-07-15	West Fork Little River	SR 1311	Montgomery

Overview of Fish Tissue Sampling

Since 1997, fish tissue surveys have been conducted by DWQ at two stations within the basin. Fish samples were collected from the Pee Dee River at US 74 during 1999 and from the Pee Dee River immediately below Blewett Falls Dam during 2000. All metal contaminants, including mercury, were undetectable or at levels below current US Environmental Protection Agency, US Food and Drug Administration, and North Carolina fish consumption criteria.

Significant mercury levels were discovered in fish from Ledbetter Lake in 1993. A fish consumption advisory for largemouth bass due to mercury contamination remains in effect for this lake. Refer to Chapter 16 of Section B (beginning on page 256) for more information.

Yadkin-Pee Dee River Basin Fish Kills

DWQ field investigators reported 19 fish kill events between 1997 and 2001; five of the kills were in small, private lakes or ponds. Kill activity and fish mortality were the highest in 1997 (11 kills affecting 5,250 fish) in the Yadkin-Pee Dee River basin, but levels even in that year are relatively low when compared with other large river basins in North Carolina. Six events (32 percent) were caused by spills. Two spills were related to failing wastewater infrastructure and three were related to failure of agricultural equipment or lagoons. Algae blooms and low dissolved oxygen related to excess nutrients and high temperatures were cited as the cause of five fish kills (26 percent). The cause of 42 percent of kills in the basin over the five-year period is unknown. Fish most often affected were sunfishes, suckers, catfishes and largemouth bass.

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 or by administrative letter. 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. Figure A-18 presents this summary for the Yadkin-Pee Dee River basin. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

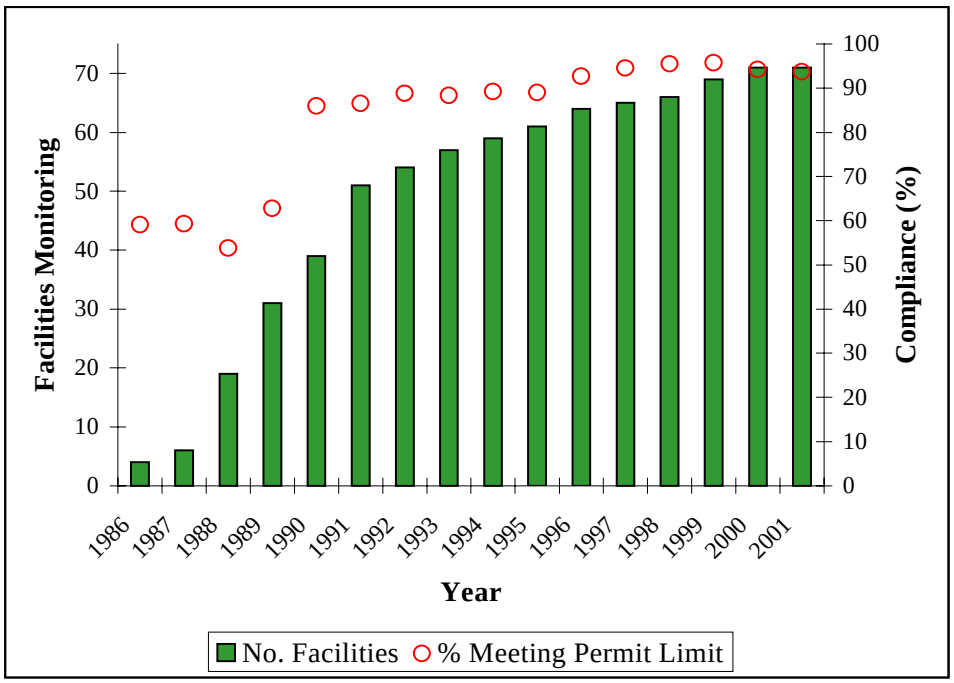


Figure A-18 Summary of Compliance with Aquatic Toxicity Tests in the Yadkin-Pee Dee River Basin

Currently, 80 facilities in the Yadkin-Pee Dee River basin have NPDES permits which require whole effluent toxicity (WET) monitoring. Of these, 77 permits have a WET limit; the other three facility permits have episodic discharges and their permits specify monitoring but with no limit. In addition, six of the facilities with a WET limit were either temporarily inactive or so new that they had not yet provided data as of 2001; therefore, only 71 facilities are represented in Figure A-18.

The number of facilities required to monitor whole effluent toxicity has increased steadily since 1987, the first year that whole effluent toxicity limits were written into permits in North Carolina. The compliance rate has risen as well. Since 1990, the compliance rate has stabilized at approximately 95 percent. Facilities with toxicity problems during the most recent two-year review period are discussed in the subbasin chapters in Section B. A complete listing of facilities that are required to monitor WET is presented in the *Basinwide Assessment Report – Yadkin-Pee Dee River Basin* (NCDENR-DWQ, June 2002).

3.3.4 Lakes Assessment Program

Twenty-six lakes in the basin were monitored as part of the Lakes Assessment Program between 1999 and 2001. Each lake was sampled one to three times during the summer months. There were a variety of water quality concerns documented during this time period. Appendix II contains surface physical data and photic zone chemistry data (1994-2001) for each lake.

Sixteen lakes in the basin exhibited symptoms of excessive nutrient loading, including elevated dissolved oxygen and pH values, documented algae blooms, and green or brownish-green colored water. Most nutrient inputs appeared to be from nonpoint sources (i.e., storm runoff from agricultural lands and urban areas). Elevated nutrient inputs increase the likelihood of blooms of nuisance blue-green algae that, in turn, reduce the aesthetic appearance of the lake, cause taste and odor problems in drinking water, and diminish the appeal of recreational activities such as swimming.

Sediment loading is also a problem in this river basin. Excess sediment reduces the storage capacities of lakes over time, introduces nutrients, and reduces aesthetic appeal by giving the water a muddy appearance. Soils of the Yadkin-Pee Dee River basin are highly erodible. The most notable example of this problem can be seen in the upper end of High Rock Lake. Winston Lake and Lake Concord also show signs of accelerated sedimentation.

Elevated levels of manganese, iron and zinc were occasionally observed in a few lakes throughout the basin. All of these metals are naturally occurring in piedmont soils and do not represent significant threats to the use of these lakes. Eight lakes had copper concentrations above the state water quality standard (7 µg/l). Five of these lakes (Wright, Corriher, Twitty, Water and Wadesboro City Pond) had been treated for algal blooms using copper sulfate prior to, or during, the summer sampling events. Only one sample at the other three lakes (High Rock, Thom-A-Lex and Kannapolis) exceeded the standard. These results are not considered to represent significant threats to the uses of these lakes.

High Rock Lake, Lake Thom-A-Lex and Back Creek Lake are all impaired due to supersaturated dissolved oxygen (DO) conditions. Excessive DO saturation is defined in North Carolina's water quality standards as greater than 110 percent. There are two concerns related to percent DO saturation: 1) the potential for "gas bubble disease" in aquatic life; and 2) excessive algal photosynthesis. Fish exposed to water with an excessive concentration of dissolved oxygen are killed when the dissolved gases in their circulatory system come out of solution to form bubbles that block the flow of blood through the capillary vessels. In shallow water systems, excessive saturation is even more deadly due to the restricted movement of the fish. Even when gas bubble disease does not occur, intermittent exposure of fish to highly saturated waters can be stressful, possibly depressing the fish's immune system and contributing to increased susceptibility of other diseases. Other aquatic life may also be impacted. Daphnia die within a few days at exposures of 115 percent saturation. Stoneflies have increased mortality at 130 percent saturation (EPA, 1986).

In terms of algal blooms, percent saturation in combination with other eutrophication-related parameters (chloropyll *a*, pH, DO) can be an early warning sign of blooms. For instance, most blue-green algae are low in chlorophyll *a* and may reach bloom proportions long before exceeding the chloropyll *a* standard. However, as they reach bloom levels, they photosynthesize - increasing the dissolved oxygen in the water and raising the percent saturation. Percent DO saturation for High Rock Lake ranged from 148 to 157 percent between 1999 and 2001. Subbasin chapters in Section B contain further discussion of the water quality condition of each of these impaired lakes.

Concerns that warrant additional follow-up were documented for three lakes:

- Nuisance levels of aquatic macrophytes continue to be observed in Rockingham City Lake.
- Hamlet City Lake was drained during the monitoring period for the last basinwide planning cycle. It has since been refilled, and sampling in 2000 indicates that the lake is still experiencing problems due to aquatic macrophytes and possibly increased sedimentation.
- Badin Lake experienced fish kills and poor water quality conditions in 2000 and 2001. Fish kills primarily involved striped bass, bream and catfish. Some of these fish had small sores and appeared to be emaciated. [DWQ conducted a special study of Badin Lake in 2002. Chapter 8 of Section B (page 191) contains details.]

Due to quality assurance issues with laboratory analyses for chlorophyll *a* from 1996 through February 2001, only a few of the lakes have 2001 NCTSI scores. No NCTSI scores were calculated for 1996-2000. Lakes for which one or more uses are Impaired are listed in Table A-36 on page 87 and are discussed in the appropriate subbasin chapter in Section B.

3.3.5 Ambient Monitoring System

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 46 stations in the Yadkin-Pee Dee River basin. These locations are listed in Appendix II and shown on the individual subbasin maps in Section B. Each is sampled monthly for 27 parameters.

Dissolved Oxygen

During this assessment period (9/1996-8/2001), dissolved oxygen fell below 5.0 mg/l in more than 10 percent of samples at eight stations. Two stations are on streams that exhibit characteristics of swamp streams (Marks Creek and Brown Creek), which include naturally lower dissolved oxygen, and are located in the small Coastal Plain portion of the basin. Rich Fork and Abbotts Creek are Impaired, primarily due to problems with point source discharges, and are discussed in more detail in Section B, Chapter 7. The four remaining stations are on the Yadkin-Pee Dee River mainstem; three are directly below hydroelectric facilities. Figure A-19 presents dissolved oxygen concentrations for all stations along the Yadkin-Pee Dee River mainstem over the assessment period. Table A-26 summarizes dissolved oxygen data for the four mainstem stations at which more than 10 percent of samples contained concentrations less than 5.0 mg/l. During the last part of the monitoring period (1999-2001), the Yadkin-Pee Dee River basin was experiencing a severe drought. Refer to page 102 for details about the relationship between drought and water quality.

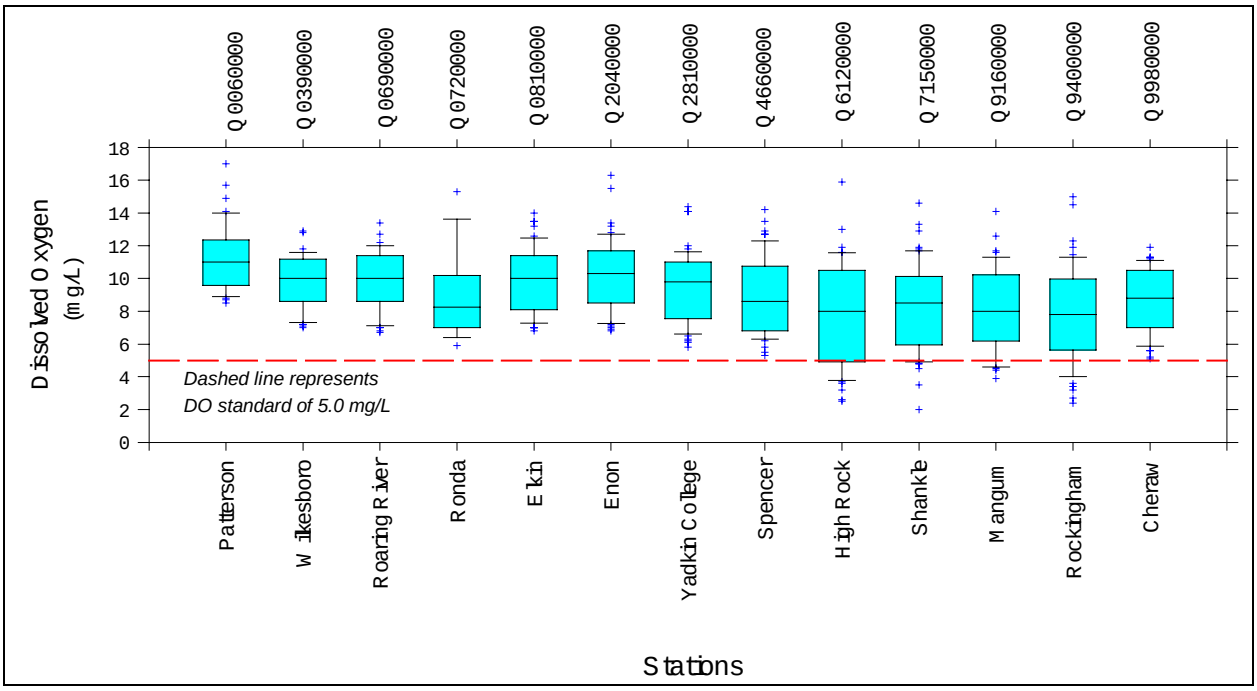


Figure A-19 Summary of Dissolved Oxygen Concentrations for the Mainstem Yadkin-Pee Dee River (9/1996-8/2001)

Table A-26 Summary of Dissolved Oxygen Data for Four Yadkin-Pee Dee River Mainstem Ambient Monitoring Stations (9/1996-8/2001)

Station	Location	No. of samples used in %	% of samples <4.0 mg/l	% of samples <5.0 mg/l
Q6120000	Yakin River below High Rock dam	48	10.4	25.0
Q7150000	Pee Dee River below Lake Tillery dam	57	3.5	10.5
Q9160000	Pee Dee River at NC 109	53	1.9	11.3
Q9400000	Pee Dee River below Blewett Falls	55	9.1	18.2

No trend in dissolved oxygen concentrations (increasing or decreasing) at these stations can be discerned over the last 20 years. However, the Pee Dee River below Blewett Falls (Q9400000) has recently begun to show an increasing frequency of measurements less than 5.0 mg/l. These data warrant further observation as additional data are collected.

Although data from the Uwharrie River at NC 109 (Station Q6810000) showed no long-term trends in dissolved oxygen, it is within this assessment period that the only measurements less than 5.0 mg/l were observed. Four of the 55 samples (7.3 percent) collected during this assessment period contained dissolved oxygen in concentrations less than 5.0 mg/l. During the previous assessment period (1992-1996), the minimum concentration observed at this station was 6.9 mg/l. The Uwharrie River is discussed in more detail in Section B, Chapter 10.

Seventeen stations showed abnormally elevated (greater than 15.0 mg/l) concentrations of dissolved oxygen over the assessment period.

Turbidity

More than 10 percent of samples exceeded turbidity water quality standards at 11 stations in the Yadkin-Pee Dee River basin within this assessment period (9/1996-8/2001). Table A-27 summarizes turbidity data for these stations over the assessment period. Stations situated in the arms of reservoirs had the greatest proportion of samples exceeding the turbidity standard. The only station in classified Trout waters is the Yadkin River at NC 268; turbidity there exceeded the standard of 10 NTU in 23 percent of the samples. The frequency of which the standard was exceeded also increased at this station during the assessment period.

Table A-27 Summary of Turbidity Data for Ambient Monitoring Stations at which 10 Percent of Samples Exceeded the Water Quality Standard (9/1996-8/2001)

Station	Subbasin	Location	Classification	No. of Samples Used in %	% > than the Turbidity Standard
Q0060000	03-07-01	Yadkin River at NC 268	Tr	44	22.7
Q1950000	03-07-03	Ararat River at SR 2080	WS-IV	56	12.5
Q2040000	03-07-02	Yadkin River at SR 1605	WS-IV	58	10.3
Q3460000	03-07-06	South Yadkin River	WS-IV	55	10.9
Q4600000	03-07-04	Grants Creek near mouth	C	56	10.7
Q4660000	03-07-04	Yadkin River at NC 150	WS-V	55	10.9
Q5360000	03-07-04	Town Creek Arm of High Rock Lake	WS-V	55	27.3
Q5970000	03-07-04	Abbotts Creek Arm of High Rock Lake at NC 47	WS-V & B	56	26.8
Q5999000	03-07-04	Abbotts Creek Arm of High Rock Lake at SR 2295	WS-V & B	45	26.7
Q7330000	03-07-11	Rocky River at SR 2420	C	56	10.7
Q8090000	03-07-12	Irish Buffalo Creek	C	57	10.5

* Turbidity standard = 10 NTU for trout waters; 25 NTU for reservoirs; and 50 NTU for all other stations.

Turbidity data collected since 1980 were examined for long-term patterns. Decreases in the long-term data were noted for a few stations, and an increase was noted for the Yadkin River at NC 268 (Station Q0060000).

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 and are therefore found in their wastes. Coliform bacteria are relatively easy to identify and are usually present in larger numbers than more dangerous pathogens, even though they respond to the environment and to treatment in much the same way. Sources of fecal coliform bacteria, as well as other more

dangerous pathogens, include runoff from pastures, feedlots, poultry operations and lagoons that do not employ appropriate best management practices. Other sources include straight pipes, leaking and failing septic systems, and noncompliant WWTPs. Wildlife and pet waste also contribute to elevated concentrations of pathogens.

Five streams that are classified by DWQ for primary recreation (Class B) contain ambient monitoring stations. Elk Creek is the only one that had a geometric mean greater than 200 colonies per 100 ml over the assessment period. Table A-28 presents all stations with geometric means greater than 200 colonies/100ml. Stations where 20 percent or more of samples contained concentrations greater than 400 colonies/100ml are also presented. These waters are discussed in more detail in the subbasin chapters in Section B.

Table A-28 Ambient Monitoring Stations with Fecal Coliform Geometric Means Greater than 200 Colonies/100ml or with 20 Percent of Samples Greater than 400 Colonies/100ml in the Yadkin-Pee Dee River Basin

Station	Location	Classification	No. of Samples Used in Mean	Geometric Mean	% >400 col/100ml
Q0690000	Yadkin River at SR 2327	WS-V	42	117	23.8
Q0220000	Elk Creek at NC 268	B ORW	11	220	--
Q2510000	Salem Creek at Elledge WWTP	C	56	773	71.4
Q2600000	Muddy Creek at SR 2995	C	55	488	49.1
Q4660000	Yadkin River at NC 150	WS-V	58	104	20.7
Q3460000	South Yadkin River at SR 1159	WS-IV	54	398	44.4
Q3484000	Hunting Creek at SR 2115	WS-III	56	234	33.9
Q3435000	Fourth Creek at SR 2308	C	56	504	51.8
Q3934500	Third Creek at SR 1970	WS-IV	57	375	56.1
Q4120000	Second Creek at US 70	WS-IV	57	309	33.3
Q4600000	Grants Creek near mouth	C	57	291	36.8
Q5930000	Abbotts Creek at SR 1243	C	50	149	22.0
Q5780000	Rich Fork at SR 1800	C	52	254	32.7
Q7330000	Rocky River at SR 2420	C	57	249	33.3
Q8090000	Irish Buffalo Creek at SR 1132	C	56	234	26.8
Q8210000	Rocky River at US 601	C	55	234	21.8
Q8360000	Goose Creek at SR 1524	C	57	241	26.3

Nutrients

The term nutrients in this document refers to the two major plant nutrients: nitrogen and phosphorus. Three different forms of nitrogen are monitored by DWQ under the ambient monitoring program. They are NH_3 or ammonia, NO2+NO3 or nitrite/nitrate nitrogen, and TKN or total nitrogen. Eleven stations exhibited elevated concentrations of both phosphorus and

nitrogen over the most recent assessment period (9/1996-8/2001). Generally, concentrations were higher in the Yadkin River above High Rock Lake than in the mainstem river at all stations downstream. Stations with elevated nutrients were clustered in the upper Rocky River and the Abbotts Creek watersheds. However, Richardson Creek contained the highest concentrations of phosphorus and nitrite/nitrate nitrogen of any station in the basin.

Few statistically significant long-term patterns were evident when all available nutrient data were examined. The Roaring River (Q0600000) and the Yadkin River near Elkin (Q0810000) showed increasing concentrations for nitrite/nitrate nitrogen, but most values were still less than 0.75 mg/l. Many stations depicted a dramatic decrease in concentration for nutrients during the 1970s and 1980s. Jones Creek (Q9777000) showed a significant decrease in nitrite/nitrate nitrogen beginning in late 1992.

Metals

Arsenic, cadmium, chromium, nickel, lead and mercury were detectable (i.e., greater than the reporting level) in less than one percent of sample results over the most recent assessment period. Nickel and lead were detectable at several stations, but no station showed more than 10 percent of samples greater than the appropriate action level. Nickel concentrations, from waters classified as drinking water supplies, exceeded the action level of 25 µg/l only once at one station (Station Q2810000; 34 µg/l).

Metals that typically had a sufficient number of detectable values were aluminum, copper, iron, manganese and zinc. Aluminum and iron are elements commonly observed to exceed their action levels; but these elements are found naturally in the clay-based soils of the piedmont, and aquatic life seem to be generally adapted to the observed levels (verified by biological sampling or toxicity testing). For copper, 35 stations had more than 10 percent of samples greater than the action level (7.0 µg/l). However, there were only three streams where the median concentrations exceeded 7.0 µg/l: Ararat River, Long Creek and Hamby Creek. Zinc was observed to exceed its action level (50 µg/l) at many stations. However, laboratory or sampling-related contamination may have produced higher than expected values of zinc between April 1995 and March 1999. Median values for all stations were less than 50 µg/l except for the station on Muddy Creek (Q2600000) where a median of 61 µg/l was reported.

Manganese samples are now required to be collected from all waters with water supply classifications (WS-I through WS-V). However, not all stations with this classification have a sufficient number of samples to provide any confidence in a statistical summary. Only Abbotts Creek at NC 47 exceeded the action level of 200 µg/l.

3.3.6 Yadkin-Pee Dee River Basin Association Monitoring Program

The Yadkin-Pee Dee River Basin Association (YPDRBA) formed in 1998 is comprised of 36 members representing local governments, industries and others that own and operate facilities requiring NPDES permits for discharging wastewater. A Memorandum of Agreement with DWQ allows the basin association to conduct all instream sampling (using an independent contractor) and perform all required analyses (using a state-certified lab) such that each facility that participates does not have to conduct individual sampling in order to meet the NPDES

permit monitoring requirements. Under this agreement, monitoring sites and parameters sampled are strategically located and established such that instream monitoring basinwide is more efficient and effective.

Approximately 70 sites (listed in Appendix II) have been sampled on a monthly basis since June 1998. Since June 1998, monthly measurements (at minimum, some stations are sampled more frequently) of temperature, pH, dissolved oxygen, conductivity, turbidity and fecal coliform bacteria have been collected at each site. A few stations were also sampled for selected nutrients and metals.

Because the YPDRBA only began water quality monitoring in June 1998, the data represent only a portion of the DWQ assessment period (9/1996-8/2001). Overall streamflow has decreased since 1998 due to drought conditions, and these low flows often present a very different water quality scenario. In addition, some YPDRBA stations are located downstream of wastewater treatment plants in dissolved oxygen sag zones. Therefore, some caution should be used in making comparisons between data collected by the DWQ ambient monitoring program and the YPDRBA monitoring program during this basinwide planning cycle.

Dissolved Oxygen

Dissolved oxygen fell below 5.0 mg/l in more than 10 percent of samples at 10 YPDRBA stations between June 1998 and August 2001. Three stations duplicate DWQ ambient monitoring stations. During this monitoring period (1999-2001), the Yadkin-Pee Dee River basin was experiencing a severe drought. Refer to page 102 for details about the relationship between drought and water quality. Table A-29 summarizes dissolved oxygen data for stations where dissolved oxygen levels are of concern to DWQ. These streams are discussed in more detail in the appropriate subbasin chapter in Section B.

Table A-29 Summary of Dissolved Oxygen Data for Stations of Concern Collected by the Yadkin-Pee Dee River Basin Association (6/1998-8/2001)

Station	Subbasin	Location	No. of Samples used in %	% of Samples <4.0 mg/l	% of Samples <5.0 mg/l
Q3105000*	03-07-05	Dutchman Creek at US 64	53	3.8	9.4
Q3555000*	03-07-06	Bear Creek at SR 1116	53	1.9	5.7
Q5785000*	03-07-07	Rich Fork Creek at SR 1787	93	2.2	20.4
Q5790000*	03-07-07	Rich Fork Creek at SR 2123	94	2.1	14.9
Q5940000	03-07-07	Abbotts Creek at I-85	93	5.4	9.7
Q5980000*	03-07-04	Abbotts Creek at NC 47 (duplicates DWQ ambient site)	92	1.1	6.5
Q6180000*	03-07-08	UT to Lick Creek near Denton	50	30.0	42.0
Q6705000	03-07-10	Uwharrie River at NC 49	52	1.9	15.4
Q8340000*	03-07-12	UT to Clear Creek at SR 3104	85	7.1	17.6
Q8342000*	03-07-12	Clear Creek at US 601	93	1.9	7.5
Q8360000*	03-07-12	Goose Creek at SR 1524 (duplicates DWQ ambient site)	93	3.2	8.6
Q8386000*	03-07-12	N Fork Crooked Creek at SR 1520	85	5.9	17.6
Q8386200*	03-07-12	N Fork Crooked Creek at SR 1514	93	1.1	10.8
Q8800000	03-07-14	Richardson Creek at SR 1751	93	1.1	15.1
Q8820000*	03-07-14	Richardson Creek at SR 1006	93	1.1	8.6
Q9021300	03-07-14	Lanes Creek at SR 1005	53	43.4	54.7
Q9400000	03-07-16	Pee Dee River below Blewett Falls (duplicates DWQ ambient site)	61	4.9	16.4

* These monitoring stations are directly downstream of wastewater treatment plant discharges. Several of them are within the dissolved oxygen sag zone.

Turbidity

More than 10 percent of samples exceeded turbidity water quality standards at 13 YPDRBA monitoring stations within this assessment period (6/1998-8/2001). Table A-30 summarizes turbidity data for these stations. Turbidity at four mainstem Yadkin River monitoring locations exceeded the water quality standard in 13-21 percent of samples collected. Water from both the South Yadkin River (mostly to agricultural land use) and the upper end of North Fork Crooked Creek (mostly developed/urban land use) exceeded turbidity standards in approximately 24 percent of samples. Six sites are located in the upper Rocky River watershed.

Table A-30 Summary of Turbidity Data for YPDRBA Monitoring Stations of Concern

Station	Subbasin	Location	Classification	No. of Samples Used in %	% > than the Turbidity Standard
Q1350000	03-07-02	Yadkin River at SR 1003	WS-IV	38	15.8
Q2180000	03-07-02	Yadkin River at US 158	WS-IV	38	13.2
Q2810000	03-07-04	Yadkin River at US 64 (duplicates DWQ ambient site)	WS-IV CA	38	21.1
Q4660000	03-07-04	Yadkin River at US 150 (duplicates DWQ ambient site)	WS-V	38	18.4
Q3105000	03-07-05	Dutchman Creek at US 64	C	38	13.2
Q3735000	03-07-06	Fourth Creek at SR 2308 (duplicates DWQ ambient site)	C	38	13.2
Q3970000	03-07-06	S Yadkin River at US 601	C	38	23.7
Q7600000	30-07-11	Rocky River at SR 1304	C	38	13.2
Q8385000	03-07-12	Rocky River at SR 1606	C	38	13.2
Q8386000	03-07-12	N Fork Crooked Cr at SR 1520	C	33	24.2
Q8386200	03-07-12	N Fork Crooked Cr at SR 1514	C	38	13.2
Q8388000	03-07-12	Crooked Creek at NC 218	C	38	15.8
Q8388900	03-07-12	Crooked Creek at ST 1601	C	38	21.1

* Turbidity standard = 10 NTU for trout waters; 25 NTU for reservoirs; and 50 NTU for all other stations.

Fecal Coliform

Table A-31 presents all YPDRBA stations with geometric means greater than 200 colonies/100ml between 1998 and 2001. Stations where 20 percent or more of samples contained concentrations greater than 400 colonies/100ml are also presented. No monitoring of waters classified by DWQ for primary recreation (Class B) is currently conducted by the association.

Table A-31 YPDRBA Monitoring Stations with Fecal Coliform Geometric Means Greater than 200 Colonies/100ml or with 20 Percent of Samples Greater than 400 Colonies/100ml in the Yadkin-Pee Dee River Basin

Station	Location	No. of Samples Used in Mean	Geometric Mean	% >400 col/100ml
Q0450000	Yadkin River at US Bus 421	38	323	44.7
Q1710000	Ararat River	38	180	34.2
Q1725000	Ararat River	38	185	23.7
Q1935000	Ararat River	38	166	31.6
Q2090000	N Deep Creek at SR 1605	38	423	47.4
Q2120000	N Deep Creek	36	297	30.6

Q2135000	S Deep Creek	38	268	21.1
Q2291000	Muddy Creek at I-40	38	265	21.1
Q2479455	Salem Creek	38	307	42.1
Q2540000	Salem Creek	38	327	39.5
Q2570000	Salem Creek at 2991	38	368	39.5
Q2720000	Muddy Creek	38	255	23.7
Q2810000	Yadkin River at US 64	38	118	23.7
Q3105000	Dutchman Creek at US 64	38	572	55.3
Q3555000	Bear Creek	38	382	39.5
Q3720000	Fourth Creek at SR 2316	38	543	63.2
Q3735000	Fourth Creek	38	306	44.7
Q3900000	Third Creek	38	314	50.0
Q3932000	Third Creek at 2359	38	294	28.9
Q3970000	South Yadkin River	38	225	21.1
Q4030000	Second Creek	38	359	47.4
Q41650000	Second Creek	38	194	21.1
Q4540000	Grants Creek at 3rd St. Ext.	38	282	34.2
Q4600000	Grants Creek	37	231	21.6
Q5135000	Swearing Creek	38	295	31.6
Q5750000	Rich Fork	38	330	44.7
Q5785000	Rich Fork	38	236	21.1
Q5790000	Rich Fork	38	169	21.1
Q6180000	UT Lick Creek	37	291	29.7
Q7210000	Clarks Creek	37	136	21.6
Q7330000	Rocky River at SR 2420	38	433	44.7
Q7450000	Rocky River at NC 29	38	243	23.7
Q7600000	Rocky River at 1304	38	300	21.1
Q8200000	Coldwater Creek at SR 1132	38	290	28.9
Q8340000	UT Clear Creek at SR 3104	36	325	52.8
Q8342000	Clear Creek at US 601	38	464	50.0
Q8355000	Rocky River at SR 1606	38	124	21.1
Q8359000	Goose Creek at SR 4228	38	988	84.2
Q8360000	Goose Creek	38	412	42.1
Q8386000	N Fork Crooked Cr at SR 1520	33	349	42.4
Q8386200	N Fork Crooked Cr at SR 1514	38	318	28.9
Q8388000	Crooked Creek	38	210	28.9
Q8388900	Crooked Creek at SR 1601	38	290	34.2
Q8800000	Richardson Creek	38	105	21.1
Q9400000	Toms Branch	36	285	30.6

3.4 Other Water Quality Research

North Carolina actively solicits "existing and readily available" data and information for each basin as part of the basinwide planning process. Data meeting DWQ quality assurance objectives are used in making use support determinations. Data and information indicating possible water quality problems are investigated further. Both quantitative and qualitative information are accepted during the solicitation period. High levels of confidence must be present in order for outside quantitative information to carry the same weight as information collected from within DWQ. This is particularly the case when considering waters for the 303(d) list. Methodology for soliciting and evaluating outside data is presented in North Carolina's *Draft Water Quality Assessment and Impaired Waters List* (NCDENR-DWQ, June 2002).

DWQ data solicitation includes the following:

- Information, letters and photographs regarding the uses of surface waters for boating, drinking water, swimming, aesthetics and fishing.
- Raw data submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples. Maps showing sampling locations must also be included.
- Summary reports and memos, including distribution statistics and accompanied by documentation of quality assurance methods used to collect and analyze the data.

Contact information must accompany all data and information submitted.

In addition to the Yadkin-Pee Dee River Basin Association monitoring program data that are discussed in the previous section, five sets of data and information were submitted during the most recent data solicitation period. John Cardarelli submitted an electronic database of volunteer monitoring data for Salem and Dunegan Creeks. Electronic data from instream monitoring of Rich Fork were submitted by the City of High Point. The Forsyth County Department of Environmental Affairs submitted electronic data from University of North Carolina at Asheville studies as well as a summary report on many streams in the Muddy Creek watershed. Information about current and future land-disturbing activities in the South Yadkin River watershed was submitted by Keep Iredell Clean, and the Mecklenburg County Department of Environmental Protection also submitted electronic data.

The next data solicitation period for the Yadkin-Pee Dee River is planned for fall 2005.

3.5 Use Support Summary

3.5.1 Introduction to Use Support

Surface waters are classified according to their best intended uses. Determining how well a waterbody supports its uses (*use support* status) is an important method of interpreting water quality data and assessing water quality.

Surface waters are currently rated as *Supporting* or *Impaired*. These ratings refer to whether the classified uses of the water (such as water supply, aquatic life protection and recreation) are being met. For example, waters classified for aquatic life protection and secondary recreation (Class C for freshwater) are rated Supporting if data used to determine use support meet certain

criteria. However, if these criteria were not met, then the waters would be rated as Impaired. Waters with inconclusive data are listed as Not Rated. Waters lacking data are listed as No Data.

In previous use support assessments, surface waters were rated fully supporting (FS), partially supporting (PS) and not supporting (NS). FS was used to identify waters that were meeting their designated uses. Impaired waters were rated PS and NS, depending on their degree of degradation. NR was used to identify waters lacking data, or having inconclusive data. In response to a request presented in the EPA's *2002 Integrated Water Quality Monitoring and Assessment Report Guidance*, North Carolina no longer subdivides the Impaired category.

Historically, the Supporting use support rating was also subdivided into fully supporting (FS) and fully supporting but threatened (ST). ST was used to identify waters that were fully supporting but had some notable water quality concerns and could represent constant, degrading or improving water quality conditions. North Carolina's past use of ST was very different from that of the US Environmental Protection Agency (EPA), which uses it to identify waters that demonstrate declining water quality (EPA *Guidelines for Preparation of the Comprehensive State Water Quality Assessments [305(b) Reports] and Electronic Updates*, 1997). Given the difference between the EPA and North Carolina definitions of ST and the resulting confusion that arose from this difference, North Carolina no longer subdivides the Supporting category. However, these waters and the specific water quality concerns are identified in the Section B subbasin chapters so that data, management and the need to address the identified concerns are presented.

Beginning in 2000 with the *Roanoke River Basinwide Water Quality Plan*, DWQ assesses ecosystem health and human health risk through the development of use support ratings for six categories: aquatic life and secondary recreation, fish consumption, shellfish harvesting, primary recreation, water supply and "other" uses. These categories are tied to the uses associated with the primary classifications applied to NC rivers and streams. A single water could have more than one use support rating corresponding to one or more of the six use support categories. For many waters, a use support category will not be applicable (N/A) to the use classification of that water (e.g., water supply is only applied to Class WS waters). This method of determining use support differs from that done prior to 2000; there is no longer an *overall* use support rating for a water. For more detailed information regarding use support methodology, refer to Appendix III.

3.5.2 Comparison of Use Support Ratings to Streams on the Section 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) listing methodology.

Waters are placed on North Carolina's 303(d) list primarily due to an Impaired use support rating. These use support ratings are based on biological and chemical data and, for some categories, human health advisories. 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 bioclassifications or water quality standards.

The 303(d) list and accompanying data are updated as the basinwide plans are revised and as TMDL investigations are performed. 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. Attention remains focused on these waters until water quality standards are being met.

3.5.3 Use Support Ratings for the Yadkin-Pee Dee River Basin

The aquatic life/secondary recreation use support category is applied to all waters in North Carolina. Therefore, this category is applied to the total number of stream miles (5,862.2) and lake acres (22,987.6) in the North Carolina portion of the Yadkin-Pee Dee River basin. Table A-32 presents use support ratings by subbasin for both monitored and evaluated waters in the aquatic life/secondary recreation category.

Approximately 37 percent of stream miles (2,181.8) and 91 percent of lake acres (21,020.1) were monitored for the protection of aquatic life and secondary recreation by DWQ during this basinwide planning cycle (Table A-33). Impaired waters account for 17 percent of monitored stream miles and 56 percent of monitored lake acres. Refer to page 87 for details regarding Impaired waters in all use support categories.

Table A-32 Aquatic Life/Secondary Recreation Use Support Ratings for Monitored and Evaluated Waters Listed by Subbasin (1997-2001)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-07-01	Miles	653.1	0.0	0.0	213.2	**866.3**
	Acres	1,043.4	0.0	0.0	0.0	**1,043.4**
03-07-02	Miles	380.3	0.0	0.0	335.6	**715.9**
	Acres	8.4	0.0	0.0	126.5	**134.9**
03-07-03	Miles	124.8	11.7	0.0	36.3	**172.8**
	Acres	0.0	0.0	0.0	14.1	**14.1**
03-07-04	Miles	69.3	48.2	3.3	317.2	**438.0**
	Acres	275.3	10,449.7	71.0	341.3	**11,137.3**
03-07-05	Miles	48.2	0.0	6.3	78.6	**133.1**
	Acres	41.6	0.0	0.0	0.0	**41.6**
03-07-06	Miles	320.4	67.1	34.7	262.1	**684.3**
	Acres	7.7	0.0	0.0	0.0	**7.7**
03-07-07	Miles	52.8	65.9	7.1	77.5	**203.3**
	Acres	52.5	889.9	0.0	0.0	**942.4**
03-07-08	Miles	59.2	13.5	0.0	82.3	**155.0**
	Acres	2,498.8	0.0	2,550.0	0.0	**5,048.8**
03-07-09	Miles	108.1	27.3	0.6	138.8	**274.8**
	Acres	69.6	354.8	45.0	0.0	**469.4**
03-07-10	Miles	99.4	15.3	28.5	184.0	**327.2**
	Acres	0.0	0.0	2,570.0	13.6	**2,583.6**
03-07-11	Miles	41.5	53.0	0.0	124.4	**218.9**
	Acres	5.1	0.0	0.0	16.6	**21.7**
03-07-12	Miles	94.8	33.6	1.3	187.4	**317.1**
	Acres	0.0	0.0	697.0	25.1	**722.1**
03-07-13	Miles	76.0	0.0	11.9	50.5	**138.4**
	Acres	0.0	0.0	0.0	0.0	**0.0**
03-07-14	Miles	162.7	37.3	2.5	289.0	**491.5**
	Acres	0.0	0.0	347.0	0.0	**347.0**
03-07-15	Miles	237.1	0.0	19.8	131.2	**388.1**
	Acres	18.5	0.0	0.0	0.0	**18.5**
03-07-16	Miles	69.4	6.3	30.7	110.7	**217.1**
	Acres	98.9	0.0	273.0	0.0	**371.9**
03-07-17	Miles	62.3	0.0	0.6	57.5	**120.4**
	Acres	0.0	0.0	76.2	7.0	**83.2**
TOTAL	**Miles**	**2,659.4**	**379.2**	**147.3**	**2,676.3**	**5,862.2**
	Acres	**4,119.8**	**11,694.4**	**6,629.2**	**544.2**	**22,987.6**
Percent	Miles	45.4%	6.5%	2.5%	45.6%	100%
Percent	Acres	17.9%	50.9%	28.8%	2.4%	100%

Table A-33 Aquatic Life/Secondary Recreation Use Support Summary Information for Waters in the Yadkin-Pee Dee River Basin (2001)

Aquatic Life/Secondary Recreation Use Support Ratings	Monitored and Evaluated Waters*		Monitored Waters Only**	
	Miles or Acres	%	Miles or Acres	%
Supporting	**2,659.4 mi 4,119.8 ac**	**45.4% 17.9 %**	**1,655.3 mi 2,696.5 ac**	**75.9% 12.8%**
Impaired	**379.2 mi 11,694.4 ac**	**6.5% 50.9 %**	**379.2 mi 11,694.4 ac**	**17.4% 55.6%**
Not Rated	**147.3 mi 6,629.2 ac**	**2.5% 28.8 %**	**147.3 mi 6,629.2 ac**	**6.7% 31.5%**
No Data	**2,676.3 mi 544.2 ac**	**45.6% 2.4 %**		
TOTAL	**5,862.2 mi 22,987.6 ac**		**2,181.8 mi 21,020.1 ac**	

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

Fish Consumption

Like the aquatic life/secondary recreation use support category, fish consumption is also applied to all waters in the state. Fish consumption use support ratings are based on fish consumption guidelines issued by the NC Department of Health and Human Services. Therefore, if a fish consumption advisory is posted at the time of the use support assessment, the water is rated Impaired. For details about how use support determinations are made, refer to Appendix III.

Due to high levels of mercury in three freshwater and four saltwater fish species, the NC Division of Public Health has issued broad health advice for consumption of these fish caught south and east of Interstate 85. In addition, a specific fish consumption advisory is posted for largemouth bass from Ledbetter Lake due to elevated mercury concentrations. For details about these advisories, refer to the discussion beginning on page 104. Table A-34 presents use support ratings by subbasin for all waters in the fish consumption use support category.

Fish tissue was monitored in only 0.1 percent of stream miles (6.3) and 0.3 percent of lake acres (67.0) during this basinwide planning cycle. A basinwide summary of current fish consumption ratings is presented in Table A-35. Fish tissue samples were collected from the Pee Dee River at US 74 during 1999 and from the Pee Dee River immediately below Blewett Falls Dam during 2000. All metal contaminants, including mercury, were undetectable or at levels below current US Environmental Protection Agency, US Food and Drug Administration, and North Carolina fish consumption criteria. However, significant mercury levels were discovered in fish from Ledbetter Lake in 1993.

Table A-34 Fish Consumption Use Support Ratings for Monitored and Evaluated Waters Listed by Subbasin (1997-2001)

Subbasin	Units	Supporting	Impaired	Total
03-07-01	Miles	866.3	0.0	**866.3**
	Acres	1,043.4	0.0	**1,043.4**
03-07-02	Miles	715.9	0.0	**715.9**
	Acres	134.9	0.0	**134.9**
03-07-03	Miles	172.8	0.0	**172.8**
	Acres	14.1	0.0	**14.1**
03-07-04	Miles	352.7	85.3	**438.0**
	Acres	301.8	10,835.5	**11,137.3**
03-07-05	Miles	133.1	0.0	**133.1**
	Acres	41.6	0.0	**41.6**
03-07-06	Miles	684.3	0.0	**684.3**
	Acres	7.7	0.0	**7.7**
03-07-07	Miles	146.6	56.7	**203.3**
	Acres	86.7	855.7	**942.4**
03-07-08	Miles	0.0	155.0	**155.0**
	Acres	0.0	5,048.8	**5,048.8**
03-07-09	Miles	0.0	274.8	**274.8**
	Acres	0.0	469.4	**469.4**
03-07-10	Miles	0.0	327.2	**327.2**
	Acres	0.0	2,583.6	**2,583.6**
03-07-11	Miles	152.5	66.4	**218.9**
	Acres	21.7	0.0	**21.7**
03-07-12	Miles	0.0	317.1	**317.1**
	Acres	0.0	722.1	**722.1**
03-07-13	Miles	0.0	138.4	**138.4**
	Acres	0.0	0.0	**0.0**
03-07-14	Miles	0.0	491.5	**491.5**
	Acres	0.0	347.0	**347.0**
03-07-15	Miles	0.0	388.1	**388.1**
	Acres	0.0	18.5	**18.5**
03-07-16	Miles	0.0	217.1	**217.1**
	Acres	0.0	371.9	**371.9**
03-07-17	Miles	0.0	120.4	**120.4**
	Acres	0.0	83.2	**83.2**
TOTAL	Miles	**3,224.2**	**2,638.0**	**5,862.2**
	Acres	**1,651.9**	**21,335.7**	**22,987.6**
Percent	Miles	55.0%	45.0%	100%
Percent	Acres	7.2%	92.8%	100%

Table A-35 Fish Consumption Use Support Summary Information for Waters in the Yadkin-Pee Dee River Basin (2001)

Aquatic Life/Secondary Recreation Use Support Ratings	Monitored and Evaluated Waters*			Monitored Waters Only**	
	Miles or Acres	%		Miles or Acres	%
Supporting	**3,224.2 mi 1,651.9 ac**	**55.0% 7.2%**		**0.0 mi 0.0 ac**	**0.0% 0.0%**
Impaired	**2,638.0 mi 21,335.7 ac**	**45.0% 95.8%**		**6.3 mi 67.0 ac**	**100.0% 100.0%**
TOTAL	**5,862.2 mi 22,987.6 ac**			**6.3 mi 67.0 ac**	

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

Primary Recreation

There are 218 stream miles and 15,314 lake acres currently classified for primary recreation in the Yadkin-Pee Dee River basin. Primary recreation use support ratings are based on swimming advisories issued by the NC Department of Health and Human Services. Currently, there is one swimming advisory posted for a portion of Elk Creek in subbasin 03-07-01. This stream is discussed in detail in Chapter 1 of Section B. Table A-36 presents use support ratings by subbasin for all waters in the primary recreation category.

Approximately 28 percent of stream miles (61.5) and 97 percent of lake acres (14,886.4) were monitored for the protection of primary recreation by DWQ over the past five years (Table A-37). Impaired waters account for 14.5 percent of monitored stream miles.

Table A-36 Primary Recreation Use Support Ratings for Monitored and Evaluated Waters Listed by Subbasin in Miles (1997-2001)

Subbasin	Units	Supporting	Impaired	No Data	Total
03-07-01	Miles	19.9	9.1	49.9	**78.9**
	Acres	948.7	0.0	0.0	**948.7**
03-07-02	Miles	30.0	0.0	22.8	**52.8**
	Acres	0.0	0.0	17.6	**17.6**
03-07-03	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-04	Miles	0.0	0.0	3.0	**3.0**
	Acres	4,880.9	0.0	359.5	**5,240.4**
03-07-05	Miles	0.0	0.0	18.9	**18.9**
	Acres	0.0	0.0	41.6	**41.6**
03-07-06	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-07	Miles	11.0	0.0	0.0	**11.0**
	Acres	855.7	0.0	0.0	**855.7**
03-07-08	Miles	5.0	0.0	9.0	**14.0**
	Acres	5,048.8	0.0	0.0	**5,048.8**
03-07-09	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-10	Miles	20.0	0.0	8.4	**28.4**
	Acres	3,152.3	0.0	8.6	**3,160.9**
03-07-11	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-12	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-13	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-14	Miles	0.0	0.0	6.4	**6.4**
	Acres	0.0	0.0	0.0	**0.0**
03-07-15	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
03-07-16	Miles	0.0	0.0	4.5	**4.5**
	Acres	0.0	0.0	0.0	**0.0**
03-07-17	Miles	0.0	0.0	0.0	**0.0**
	Acres	0.0	0.0	0.0	**0.0**
TOTAL	Miles	**85.9**	**9.1**	**122.9**	**217.9**
	Acres	**14,886.4**	**0.0**	**427.3**	**15,313.7**
Percent	Miles	39.4%	4.2%	56.4%	100%
Percent	Acres	97.2%	0.0%	2.8%	100%

Table A-37 Primary Recreation Use Support Summary Information for Waters in the Yadkin-Pee Dee River Basin (2001)

Aquatic Life/Secondary Recreation Use Support Ratings	Monitored and Evaluated Waters*			Monitored Waters Only**	
	Miles or Acres	%		Miles or Acres	%
Supporting	**85.9 mi 14,886.4 ac**	**39.4% 97.2%**		**52.4 mi 14,886.4 ac**	**85.2% 100.0%**
Impaired	**9.1 mi 0.0 ac**	**4.2% 0.0%**		**9.1 mi 0.0 ac**	**14.5% 0.0%**
No Data	**122.9 mi 427.3 ac**	**56.4% 2.8%**			
TOTAL	**217.9 mi 15,313.7 ac**			**61.5 mi 14,886.4 ac**	

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

Water Supply

There are 1,655.6 stream miles and 21,549.0 lake acres currently classified for water supply in the Yadkin-Pee Dee River basin. All were evaluated within the past five years; all are fully supporting. A basinwide summary of current water supply use support ratings is presented in Table A-38.

Table A-38 Water Supply Use Support Summary Information for Waters in the Yadkin-Pee Dee River Basin (2001)

Water Supply Use Support Ratings	Evaluated Waters	
	Miles	%
Supporting	**1,655.6 mi 21,549.0 ac**	**100% 100%**
Impaired	**0.0 mi 0.0 ac**	**0% 0%**
Not Rated	**0.0 mi 0.0 ac**	**0% 0%**
TOTAL	**1,655.6 mi 21,549.0 ac**	

Impaired Waters

Table A-39 presents Impaired waters (in all categories), listed by subbasin, in the Yadkin-Pee Dee River basin. Ratings for each applicable use support category are shown, even though only one use may be Impaired. Descriptions of Impaired segments, as well as potential causes and sources, are outlined in Appendix III. Maps showing current use support ratings are presented in the appropriate subbasin chapter in Section B, along with a discussion of management strategies.

Table A-39 Monitored Impaired Waters within the Yadkin-Pee Dee River Basin (as of 2000)[1]

				Use Support Categories/Rating– Impaired Miles (or Acres)				
Impaired Water[1]	**Subbasin**	**Chapter in Section B**	**Classification[2]**	**Aquatic Life/ Secondary Recreation**	**Fish Consumption**	**Primary Recreation**	**Water Supply**	**Potential Sources**
Elk Creek	03-07-01	1	B ORW	S	S	I – 9.1 mi	*N/A*	NP
Lovills Creek	03-07-03	3	WS-IV, C	I – 4.2 mi	S	*N/A*	S	NP, P
Faulkner Creek	03-07-03	3	C	I – 6.1 mi	S	*N/A*	*N/A*	NP
Heatherly Creek	03-07-03	3	C	I – 4.2 mi	S	*N/A*	*N/A*	P, NP
Muddy Creek	03-07-04	4	C	I – 15.2 mi	S	*N/A*	*N/A*	NP
Salem Creek	03-07-04	4	C	I – 12.0 mi	S	*N/A*	*N/A*	NP, P
Grants Creek	03-07-04	4	C	I – 1.2 mi	S	*N/A*	*N/A*	P, NP
Town Creek	03-07-04	4	C	I – 15.4 mi	S	*N/A*	*N/A*	NP, P
High Rock Lake	03-07-04	4	WS-V, WS-IV B	I – 15,750.0 ac	I*	S	S	NP, P
South Yadkin River	03-07-06	6	C	I – 5.3 mi	S	*N/A*	*N/A*	NP, P
Fourth Creek	03-07-06	6	C	I – 29.3 mi	S	*N/A*	*N/A*	NP, P
Third Creek	03-07-06	6	C	I – 22.1 mi	S	*N/A*	*N/A*	NP, P
Second Creek	03-07-06	6	C	I – 10.4 mi	S	*N/A*	*N/A*	NP, P
Lake Thom-A-Lex	03-07-07	7	WS-III	I – 650.0 ac	S	*N/A*	S	NP
Abbotts Creek	03-07-07	7	C	I – 8.0 mi	I*	*N/A*	*N/A*	NP, P
Rich Fork	03-07-07	7	C	I – 20.1 mi	I*	*N/A*	*N/A*	P
Hamby Creek	03-07-07	7	C	I – 11.1 mi	I*	*N/A*	*N/A*	P
North Hamby Creek	03-07-07	7	C	I – 5.8 mi	I*	*N/A*	*N/A*	NP
Swearing Creek	03-07-07	7	C	I – 14.3 mi	S	*N/A*	*N/A*	NP
Yadkin River	03-07-08	8	WS-IV B	I – 0.8 mi	I*	S	S	Dam
Lick Creek	03-07-08	8	C, WS-IV	I – 7.7 mi	I*	*N/A*	S	NP
Little Mountain Creek	03-07-08	8	C, WS-IV	I – 5.7 mi	I*	*N/A*	S	P

				Use Support Categories/Rating– Impaired Miles (or Acres)				
Impaired Water[1]	**Subbasin**	**Chapter in Section B**	**Classification**[2]	**Aquatic Life/ Secondary Recreation**	**Fish Consumption**	**Primary Recreation**	**Water Supply**	**Potential Sources**
Uwharrie River	03-07-09	9	C	I – 26.7 mi	I*	*N/A*	*N/A*	Dam
Back Creek Lake	03-07-09	9	WS-II	I – 250.0 ac	I*	*N/A*	S	NP
Pee Dee River	03-07-10	10	WS-V B	I – 15.3 mi	I*	S	S	Dam, P
Rocky River	03-07-11 03-07-12	11, 12	C	I – 42.6 mi	I*	*N/A*	*N/A*	P, NP
Dye Branch	03-07-11	11	C	I – 4.4 mi	I*	*N/A*	*N/A*	NP, P
Coddle Creek	03-07-11	11	C	I – 14.5 mi	I*	*N/A*	*N/A*	NP
Goose Creek	03-07-12	12	C	I – 13.1 mi	I*	*N/A*	*N/A*	P, NP
Duck Creek	03-07-12	12	C	I – 9.7 mi	I*	*N/A*	*N/A*	NP
North Fork Crooked Cr	03-07-12	12	C	I – 12.0 mi	I*	*N/A*	*N/A*	NP, P
Richardson Creek	03-07-14	14	C	I – 9.9 mi	I*	*N/A*	*N/A*	NP, P
Lanes Creek	03-07-14	14	C	I – 36.8 mi	I*	*N/A*	*N/A*	NP
Ledbetter Lake	03-07-16	16	WS-III	ND	I	*N/A*	S	NP
Pee Dee River	03-07-16	16	C	I – 6.3 mi	I[3]	*N/A*	*N/A*	Dam

* These waters are Impaired because of broad, mercury-related fish consumption health advice for three freshwater fish species. However, the waters are not monitored for the fish consumption category during this basinwide cycle. Refer to page 104 for further information.

S	Supporting	ND	No Data	P	Point Sources
I	Impaired	N/A	Not Applicable	NP	Nonpoint Sources

Notes

[1] These waters are currently, or will be placed, on the 303(d) list, and a TMDL and/or management strategy will be developed to address causes and sources of impairment. Refer to Appendix IV for further information regarding 303(d) listing methodology.

[2] An index for DWQ freshwater classifications can be found on page 54 of this section (Table A-20).

[3] Analysis of fish tissue samples, collected by DWQ in 1999 and 2000 from the Pee Dee River at two locations, revealed one largemouth bass with elevated levels of mercury. No other species or sample contained elevated levels of any metals tested. Refer to Appendix II for details of fish tissue assessment in the Yadkin-Pee Dee River basin.