Section A - Chapter 3

Summary of Water Quality Information for the Neuse River Basin

3.1 General Sources of Pollution

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

Point Sources

Piped discharges from:

- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) (see page 25) permit from the state.

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 (see page 89) and nutrients (see page 92) are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria (see page 92), heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Nonpoint Sources

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

Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given these characteristics, 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-17 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*. Information on this subject is also available at DWQ's website: http://h2o.enr.state.nc.us/wqhome.html.

Table A-17 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. 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.

High Quality Waters

There are 582.4 acres of HQW waters (Figure A-10) in the Neuse River basin, mostly associated with Greens Creek and Smith Creek in the lower basin. Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

Criteria for HQW Classification

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

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. 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

There are also 63,513 acres of ORW waters (Figure A-10) in the Neuse River basin portion of the Core Sound. These 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.

Primary Recreation (Class B and SB)

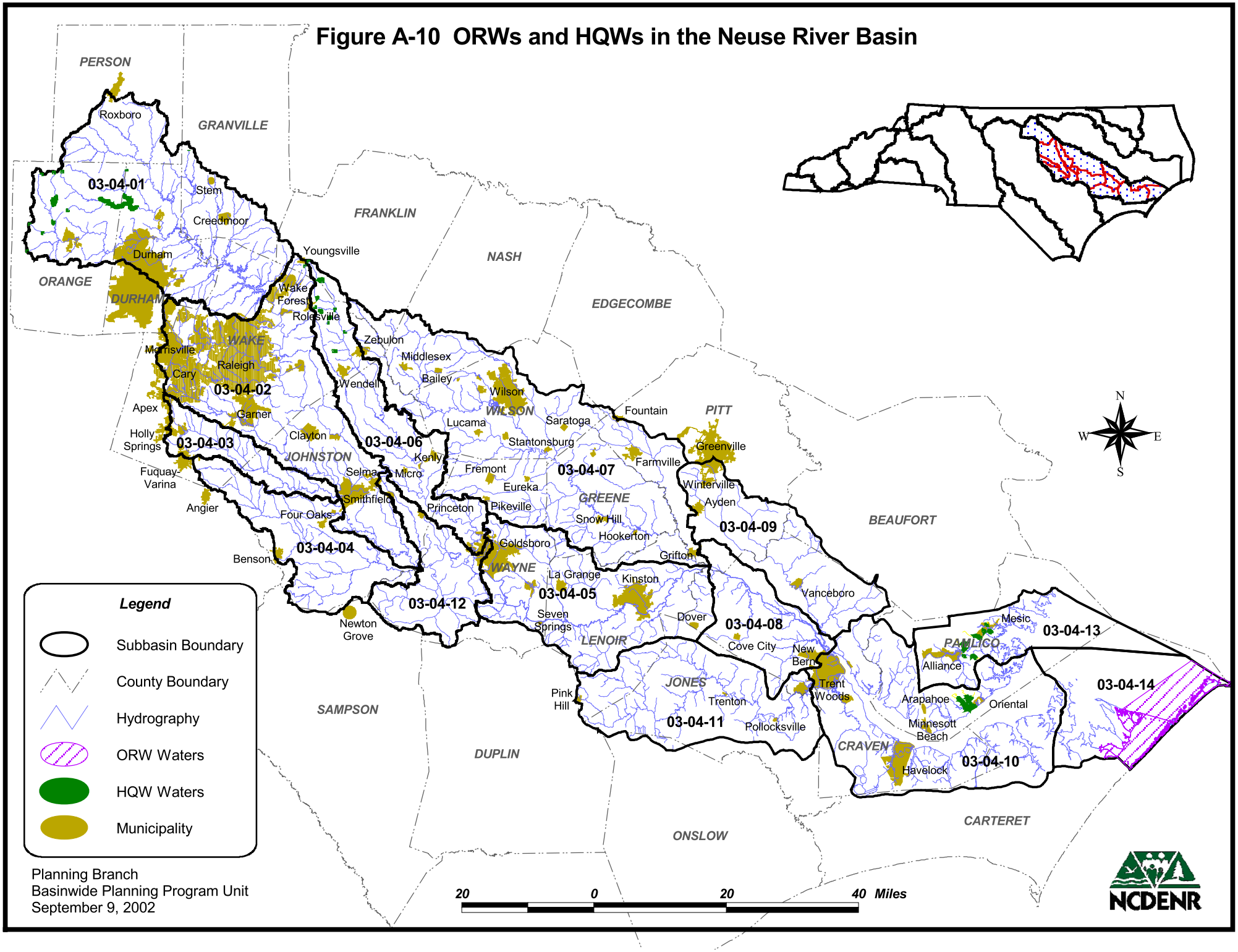
There are 10,951 freshwater acres, 27,230 estuarine acres, 78 stream miles, and 21 miles of Atlantic coastline classified for primary recreation in the Neuse River basin. Primary recreation is also a classified use of Class SA waters.

Water Supply Watersheds

There are 15,962 freshwater lake acres and 847 stream miles within 1,146 square miles of Water Supply Watershed in the Neuse River basin (Figure A-11). The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local governments administer the program based on state minimum requirements. There are restrictions on wastewater discharges, development, landfills and residual application sites to control the impacts of point and nonpoint sources of pollution.

There are five water supply classifications (WS-I to WS-V) that are defined according to the land use characteristics of the watershed. The WS-I classification carries the greatest protection for water supplies. No development is allowed in these watersheds. Generally, WS-I lands are publicly owned. WS-V watersheds have the least amount of protection and do not require development restrictions. These are either former water supply sources or sources used by industry. WS-I and WS-II classifications are also HQW by definition because requirements for these levels of water supply protection are at least as stringent as those for HQWs. Those watersheds classified as WS-II through WS-IV require local governments having jurisdiction within the watersheds to adopt and implement land use ordinances for development that are at least as stringent as the state's minimum requirements. A 30-foot vegetated setback is required on perennial streams in these watersheds.

Figure A-10 ORWs and HQWs in the Neuse River Basin



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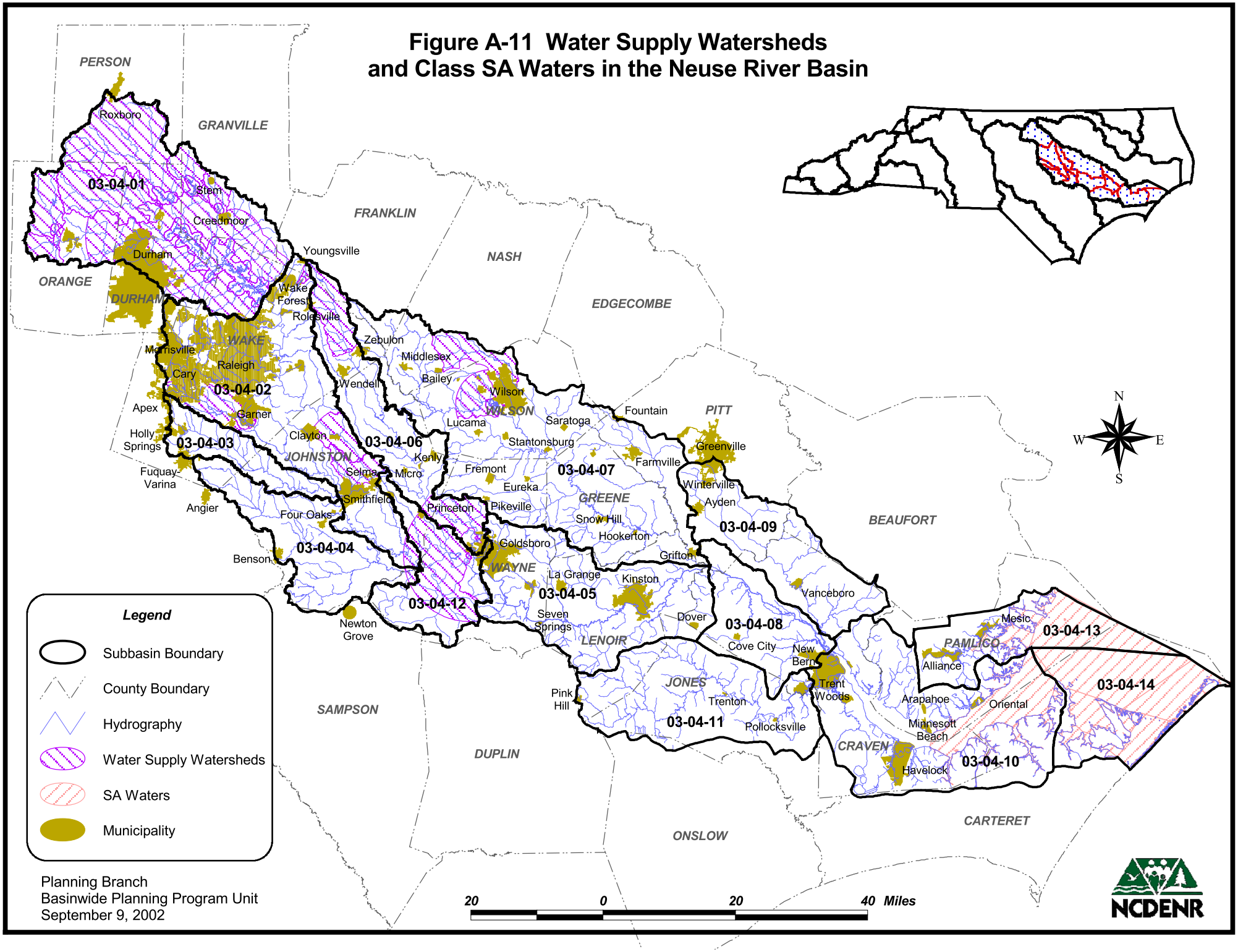
Basinwide Planning Program Unit
September 9, 2002

Figure A-11 Water Supply Watersheds and Class SA Waters in the Neuse River Basin



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Shellfish Harvesting

There are 332,457 acres of estuarine waters classified for shellfish harvesting (Figure A-11) in the Neuse River basin. The best uses of Class SA waters are for shellfishing for market purposes and any other usage specified by the "SB" or "SC" classification. Fecal coliform bacteria (see page 92) in Class SA waters shall meet the current sanitary and bacteriological standards as adopted by the Commission for Health Services. Domestic wastewater discharges are not allowed, and there are provisions for stormwater controls. Refer to 15A NCAC 2B .0221 for specifics on water quality standards in Class SA waters.

Nutrient Sensitive Waters

All waters in the Neuse River basin have a supplemental classification of Nutrient Sensitive Waters (NSW). Nutrient sensitive waters (NSW) is a supplemental classification that the Environmental Management Commission may apply to surface waters that are experiencing or are subject to growths of microscopic or macroscopic vegetation that can impact the aquatic community. Nutrient strategies are developed to control these growths. For more information on NSW waters and nutrient strategies in the Neuse River basin, refer to page 64.

Pending and Recent Reclassifications in the Neuse River Basin

In response to a request from the public, Austin Creek (Wake County) was reclassified from WS-III NSW to C NSW, and Tuckers Lake (Johnston County) was reclassified from C NSW to B NSW in 1996. In 1997, a segment of the Neuse River in Johnston County was reclassified from WS-V NSW to WS-IV NSW. The following waters are in the process of being reclassified as a result of requests from the public: Fantasy Lake (Wake County) WS-II NSW to WS-II CA NSW, upper Neuse River (Wake County) C NSW to WS-IV NSW and WS-IV CA NSW, and a segment of the Neuse River in Lenoir County from C NSW to WS-IV NSW.

3.3 DWQ Water Quality Monitoring Programs in the Neuse 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 Neuse 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 Neuse 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.

DWQ monitoring programs for the Neuse River Basin include:

- Benthic Macroinvertebrates (Section 3.3.1)
- Fish Assessments (Section 3.3.2)
- Aquatic Toxicity Monitoring (Section 3.3.3)
- Lake Assessment (Section 3.3.4)
- Ambient Monitoring System (Section 3.3.5)

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 75 for more detailed information.

<u>Overview of Benthic Macroinvertebrate Data</u>

Appendix II lists all the benthic macroinvertebrate collections in the Neuse River basin between 1983 and 2000, giving site location, collection date, taxa richness, biotic index values and bioclassifications. There were 117 benthic samples collected during this assessment period. Table A-18 lists the most recent bioclassifications (by subbasin) for all benthos sites in the Neuse River basin. Most of the streams listed as "Not Rated" are swamp streams in the lower subbasins. 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. Many streams also ceased flowing during the summer drought of 2000.

3.3.2 Fish Assessments

Historical studies of fish communities in the Neuse River basin were conducted primarily by the North Carolina Wildlife Resources Commission (NCWRC) in the 1960s and late 1970s. Approximately 102 species have been collected from the Neuse River basin in North Carolina. Several streams were sampled by DWQ during the past basinwide planning cycle (1994), and two samples were collected in 1999. Scores are assigned to these samples using the North Carolina Index of Biotic Integrity (NCIBI). The NCIBI uses a cumulative assessment of twelve 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.

Table A-18 Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent rating for each site) in the Neuse River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
03-04-01	2	7	4	5	1	0	19
03-04-02	0	4	8	11	8	16	47
03-04-03	0	0	2	0	0	0	2
03-04-04	0	0	1	1	0	0	2
03-04-05	0	2	2	4	1	0	9
03-04-06	0	1	3	0	0	0	4
03-04-07	0	0	5	8	1	0	14
03-04-08	0	0	0	1	0	1	2
03-04-09	0	0	0	1	1	4	6
03-04-10	0	0	0	0	0	3	3
03-04-11	0	0	0	1	0	7	8
03-04-12	0	0	1	0	0	0	1
Total (#)	**2**	**14**	**26**	**32**	**12**	**31**	**117**
Total (%)	**1.7**	**14.5**	**22.2**	**27.4**	**10.3**	**26.5**	100

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). Work began in 1998 to develop a fish community boat sampling method that could be used in nonwadeable coastal plain streams. Plans are to sample 10-15 reference sites with the boat method once it is finalized. As with other biological monitoring programs, many years of reference site data will be needed before solid criteria can be developed to evaluate biological integrity of large streams and rivers using the fish community assessment. Refer to page 75 for further information.

Overview of Fish Community Data

Appendix II lists all of the fish community collections in the Neuse River basin between 1990 and 1999, giving site location, collection date and NCIBI rating. Fish community samples have been collected at 31 sites in eight of the Neuse River subbasins during this assessment period. Table A-19 lists the most recent ratings since 1990, by subbasin, for all fish community sites.

Table A-19 Summary of NCIBI Categories for All Freshwater Fish Community Sites (using the most recent rating for each site) in the Neuse River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
03-04-01	6	3	1	0	0	0	10
03-04-02	3	0	1	1	0	0	5
03-04-05	0	0	0	0	0	5	5
03-04-06	0	0	2	0	0	0	2
03-04-07	1	0	0	0	0	3	4
03-04-08	0	0	0	0	0	1	1
03-04-09	0	0	0	0	0	1	1
03-04-11	0	0	0	0	0	3	3
Total (#)	**10**	**3**	**4**	**1**	**0**	**13**	**31**
Total (%)	**32**	**9.7**	**13**	**3.2**	**0**	**42**	100

Neuse River Basin Fish Kills

DWQ has systematically tracked reported fish kill events across the state since 1996. From 1996 to 2000, DWQ field investigators reported 71 fish kill events in the Neuse River basin. Several of these fish kills were extensive. Total fish mortality was under 100,000 in 1996 and 1997, just over 100,000 in 1999, and almost 500,000 in 2000. The 37 and over 600,000 mortality in 2001 suggest that fish kills continue to be of concern in the Neuse River basin. Refer to Figure A-12 for a summary of fish kills in the Neuse River basin. Many of the fish kills occurred in the Neuse River Estuary. The extent to which fish kills are related to land use activities is not known. Excessive nutrient loading to the estuary creates eutrophic conditions, lowers dissolved oxygen and may activate harmful algal blooms. For more information on fish kills in North Carolina, refer to http://www.esb.enr.state.nc.us/Fishkill/2000killrep.pdf.

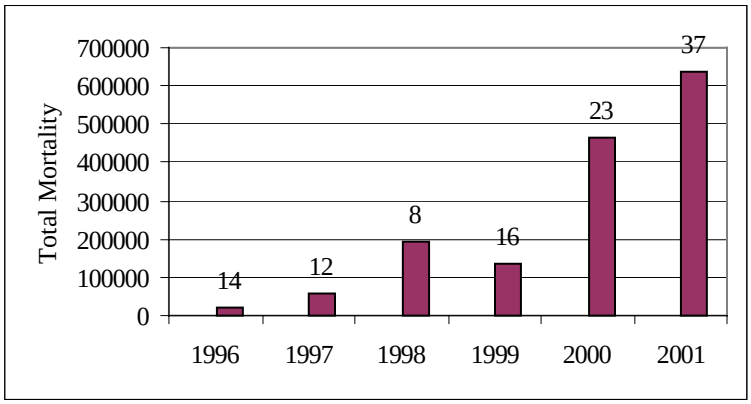

Figure A-12 Neuse River Basin Fish Kill Summary 1996-2001
(Number above bar represents number of reported events.)

Overview of Fish Tissue Sampling

Fish tissue surveys were conducted by DWQ at two stations within the basin from 1994 to 2000. These surveys were conducted as part of special mercury contamination assessments in the eastern part of the state and during routine basinwide assessments.

The majority of fish tissue samples collected from the Neuse River basin in 1994 and 2000 contained metal and organic contaminants at undetectable levels or at levels less than the EPA, Food and Drug Administration, and State of North Carolina consumption criteria. More detailed information regarding these sampling events and streams can be found in the appropriate subbasin chapter in Section B.

Elevated mercury concentrations were most often detected in largemouth bass and bowfin. These two species are at the top of the food chain and are most often associated with mercury bioaccumulation in fish tissue in North Carolina. For more information on this issue, refer to page 93.

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. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

Seventy-two NPDES permits in the Neuse River basin currently require whole effluent toxicity (WET) testing. Forty-five permits have a WET limit; the other facilities have episodic discharges, and their permits specify monitoring but with no limit.

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 1993, the compliance rate has stabilized at approximately 90-95 percent. Figure A-13 summaries whole effluent toxicity monitoring compliance in the Neuse River basin from 1987 to 1999. Facilities with toxicity problems during the most recent two-year review period are discussed in the subbasin chapters in Section B.

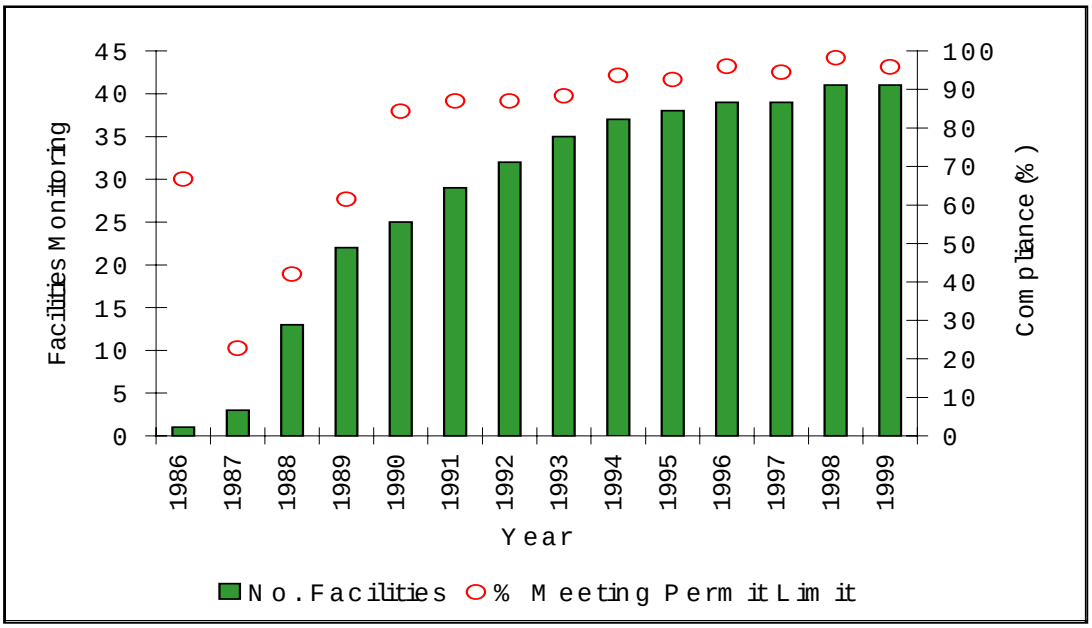

Figure A-13 Summary of Compliance with Aquatic Toxicity Tests in the Neuse River Basin

3.3.4 Lakes Assessment Program

Nineteen lakes in the Neuse River basin were sampled as part of the Lakes Assessment Program in summer of 1999. Because of laboratory quality assurance issues with chlorophyll *a* analyses, no trophic status has been assigned to lakes in the Neuse River basin. Lakes with noted water quality impacts are discussed in the appropriate subbasin chapter in Section B. Summary information on reservoirs in the Neuse River basin is presented in Table A-4.

3.3.5 Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collections of physical and chemical water quality data. North Carolina has more than 420 water chemistry monitoring stations statewide, including 59 stations in the Neuse River basin. The location of these stations is shown on individual subbasin maps in Section B. The Lower Neuse Basin Association (page 220) also has ambient monitoring stations that increase the number of stream miles monitored in the Neuse River basin. Notable ambient water quality parameters are discussed in the subbasin chapters. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html for more detailed analysis of ambient water quality monitoring data.

3.3.6 Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section

The Shellfish Sanitation and Recreational Water Quality Section of the Division of Environmental Health is responsible for monitoring and classifying coastal waters as to their suitability for shellfish harvesting for human consumption and inspection and certification of shellfish and crustacea processing plants. The section also administers the recreational beach

monitoring program and posts advisories, under the guidance of the State Health Director, for those waters not suitable for bodily contact activities.

The Shellfish Sanitation Program is conducted in accordance with the guidelines set by the Interstate Shellfish Sanitation Conference (ISSC) contained in the *National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish Model Ordinance*. The NSSP is administered by the US Food and Drug Administration (FDA). Classifications of coastal waters for shellfish harvesting are done by means of a Sanitary Survey which includes: a shoreline survey of sources of pollution, a hydrographic and meteorological survey, and a bacteriological survey of growing waters. Sanitary Surveys are conducted of all potential shellfish growing areas in coastal North Carolina and recommendations are made to the Division of Marine Fisheries of which areas should be closed for shellfish harvesting.

The Recreational Beach Monitoring Program determines the quality of coastal waters and beaches for suitability for bodily contact activities. Shoreline surveys of potential sources of pollution that could affect the area are also conducted. Swimming advisories are posted when bacteriological standards are exceeded or point source discharges are found.

Water samples are collected and analyzed for fecal coliform bacteria from numerous sampling stations located throughout the coastal area for both the shellfish and recreational programs. The recreational monitoring program also tests waters for *Escherichia coli*.

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 2000 § 303(d) List* (NCDENR-DWQ, May 2001). The next data solicitation period for the Neuse River is planned for fall 2004.

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.

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 rated *supporting and 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 fish consumption, aquatic life protection and secondary recreation (Class C for freshwater or SC for saltwater) 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. More specific methods are presented in Part C of this appendix.

In previous use support assessments, surface waters were rated fully supporting (FS), partially supporting (PS), not supporting (NS) and not rated (NR). 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. The 2002 Integrated Water Quality Monitoring and Assessment Report Guidance issued by the EPA requested that states no longer subdivide the impaired category. In agreement with this guidance, North Carolina no longer subdivides the impaired category and rates waters as Supporting, Impaired, Not Rated or No Data.

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.

Use support methods have been developed to assess 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, streams and lakes. 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., shellfish harvesting is only applied to Class SA waters). A full description of the classifications is

available in the DWQ document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina*. 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 use support rating of impairment. 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. 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 when water quality standards are 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 met.

3.5.3 Use Support Ratings for the Neuse River Basin

Aquatic Life/Secondary Recreation

The aquatic life/secondary recreation use support category is applied to all waters in North Carolina. Therefore, this category is applied to all 3,497 stream miles, 386,391 freshwater and estuarine acres, and the 21 miles of Atlantic coastline in the Neuse River basin. Table A-20 presents use support ratings by subbasin for all waters in the aquatic life/secondary recreation category.

Table A-20 Aquatic Life/Secondary Recreation Use Support Ratings for All Waters Listed by Subbasin (1995-2000)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-04-01	miles	321.4	32.3	6.0	107.3	467.1
	acres	14,320.4	0	0	41.2	14,361.6
03-04-02	miles	163.5	68.3	10.9	269.5	512.3
	acres	1,036.5	0	28.8	331.4	1,396.7
03-04-03	miles	49.0	1.4	0	67.3	117.7
	acres	0	0	0	98.0	98.0
03-04-04	miles	16.4	12.3	0	198.5	227.1
	acres	0	0	0	0	0
03-04-05	miles	81.1	17.6	17.9	244.9	361.5
	acres	0	0	0	8.0	8.0
03-04-06	miles	82.9	20.0	0	114.5	217.4
	acres	0	0	0	0	0
03-04-07	miles	146.0	75.9	38.3	395.6	655.9
	acres	510.5	0	0	39.3	549.8
03-04-08	miles	22.3	15.4	11.6	80.5	129.8
	acres*	0	426.5	0	0	426.5
03-04-09	miles	0	35.3	16.7	104.8	156.8
	acres	0	0	0	0	0
03-04-10	miles	0	0	12.7	187.0	199.6
	acres*	67,650.0	31,340.8	69.1	15,350.3	114,410.1
03-04-11	miles	0	0	120.1	175.8	295.8
	acres*	0	0	252.7	0	252.7
03-04-12	miles	24.8	0	0	127.6	152.4
	acres	0	0	0	0	0
03-04-13	miles	0	0	0	3.5	3.5
	acres*	64,244.0	0	0	19,224.0	83,468.9
03-04-14	miles	0	0	0	0	0
	acres*	171,418.8	0	0	0	171,418.8
	coast**	0.0	0.0	0.0	21.0	21.0
Total	miles	907.5	278.6	234.2	2,076.7	3,497.0
	acres	319,180.1	31,767.3	350.6	35,093.0	386,391.0

* Indicates saltwater acres; all other acres are freshwater impoundments.

** Indicates miles of Atlantic coastline in the Neuse River basin (not added to total mileage).

Approximately 36 percent of stream miles (1,248.9 miles) were monitored. Impaired stream miles (278.6 miles) accounted for 8.0 percent of all stream miles and 22.3 percent of monitored stream miles. Approximately 91 percent of estuarine and freshwater acres (350,323.6 acres) were monitored. There were 31,767.3 impaired estuarine acres that accounted for 8.2 percent of the total acres and 9.1 percent of monitored acres. There were no impaired freshwater acres. Table A-21 summarizes aquatic life/secondary recreation use support ratings for the entire basin.

Table A-21 Aquatic Life/Secondary Recreation Use Support Summary Information for Waters in the Neuse River Basin (2001)

Aquatic Life and Secondary Recreation Use Support Ratings	All Waters	Percent of All Waters	Monitored Waters	Percent of Monitored Waters
Supporting	**907.5** Miles **319,180.1** Acres	**26.0** **82.6**	**736.1** Miles **318,205.7** Acres	**58.9** **90.8**
Impaired	**278.6** Miles **31,767.3** Acres	**8.0** **8.2**	**278.6** Miles **31,767.3** Acres	**22.3** **9.1**
Not Rated	**234.2** Miles **350.6** Acres	**6.7** **<1**	**234.2** Miles **350.6** Acres	**18.8** **<1**
No Data**	**2,076.7** Miles **35,093.0** Acres	**59.4** **9.0**	**N/A** **N/A**	**N/A** **N/A**
TOTAL	**3,497.0** Miles **386,391.0** Acres	**100.0** **100.0**	**1,248.9*** Miles **350,323.6*** Acres	**100.0** **100.0**

Note: Acres are a combination of freshwater acres in upper subbasins and estuarine acres in lower subbasins.

* 35.7 percent of all stream miles and 90.7 percent of all acres were monitored.

** There are also 21 miles of Atlantic Coastline with No Data.

Fish Consumption

Like the aquatic life/secondary recreation use support category, the fish consumption category is also applied to all waters in the state. Approximately 2.2 percent of stream miles (69.0 miles) and 100 percent (20 coastline miles) in the Neuse River basin were monitored for the fish consumption use support category during this basinwide cycle. Fish consumption use support ratings are based on fish consumption advisories issued by the NC Department of Health and Human Services (NCDHHS). Refer to page 93 for more information on this issue. If a limited fish consumption advisory or a no consumption advisory is posted at the time of use support assessment, the water is rated impaired.

Table A-22 presents use support ratings by subbasin in the fish consumption use support category. Due to the above mentioned fish consumption advisory, all waters in the Neuse River basin are considered to be impaired for this use support category. A basinwide summary of current fish consumption use support ratings is presented in Table A-23.

Table A-22 Fish Consumption Use Support Ratings for All Waters Listed by Subbasin (1995-2000)

Subbasin	Units	Impaired	Total
03-04-01	miles	467.1	467.1
	acres	14,361.6	14,361.6
03-04-02	miles	512.3	512.3
	acres	1,369.7	1,369.7
03-04-03	miles	117.7	117.7
	acres	98.0	98.0
03-04-04	miles	227.1	227.1
	acres	0	0
03-04-05	miles	361.5	361.5
	acres	8.0	8.0
03-04-06	miles	217.4	217.4
	acres	0	0
03-04-07	miles	655.9	655.9
	acres	549.8	549.8
03-04-08	miles	129.8	129.8
	acres	426.5	426.5
03-04-09	miles	156.8	156.8
	acres	0	0
03-04-10	miles	199.6	199.6
	acres	114,410.1	114,410.1
03-04-11	miles	295.8	295.8
	acres	252.7	252.7
03-04-12	miles	152.4	152.4
	acres	0	0
03-04-13	miles	3.5	3.5
	acres	83,468.9	83,468.9
03-04-14	miles	0	0
	acres	171,418.8	171,418.8
	coast**	20.0	20.0
Total	miles	3,461.4	3,461.4
	acres	386,391.0	386,391.0

** Indicates miles of Atlantic coastline in the Neuse River basin (not added to total mileage).

Table A-23 Fish Consumption Use Support Summary Information for Waters in the Neuse River Basin (1999)

Fish Consumption	All Waters	Monitored Waters	Percent Monitored
Supporting	**0** Miles **0** Acres	**0** Miles **0** Acres	**0** **0**
Impaired	**3,461.4** Miles **386,391.0** Acres	**69** Miles **0** Acres	**1.9** **0**
Not Rated	**0** Miles **0** Acres	**0** Miles **0** Acres	**0** **0**
TOTAL	**3,461.4** Miles **386,391.0** Acres	**69** Miles **0** Acres	**1.9** **0**

Note: There are 21 miles of Atlantic coastline impaired monitored in this use support category not added to total mileage.

Primary Recreation

There are 93.1 stream miles, 370,643.9 freshwater and estuarine acres currently classified for primary recreation in the Neuse River basin. Table A-24 presents use support ratings by subbasin for all waters in the primary recreation use support category.

Approximately 31 percent of stream miles (28.4 miles) were monitored by DWQ. There were no stream miles impaired in the primary recreation use support category. Approximately 91.9 percent of freshwater and estuarine acres were monitored. There were no impaired acres in this use support category. Table A-25 summarizes primary recreation use support ratings for the entire basin.

Table A-24 Primary Recreation Use Support Ratings for All Waters Listed by Subbasin (1995-2000)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-04-01	miles	16.2	0	0	4.9	21.1
	acres	9,530.3	0	0	974.4	10,504.7
03-04-02	miles	12.2	0	0	14.6	26.7
	acres	90.6	0	0	216.6	307.2
03-04-03	miles	0	0	0	5.5	5.5
	acres	0	0	0	98.0	98.0
03-04-04	miles	0	0	0	5.4	5.4
	acres	0	0	0	0	0
03-04-05	miles	0	0	0	5.3	5.3
	acres	8.0	0	0	0.0	8.0
03-04-06	miles	0	0	0	7.4	7.4
	acres	0	0	0	0	0
03-04-07	miles	0	0	0	0.6	0.6
	acres	0	0	0	39.3	39.3
03-04-10	miles	0	0	0	13.8	13.8
	acres*	97,123.9	0	0	9,235.8	106,359.2
03-04-11	miles	0	0	0	1.2	1.2
	acres	252.7	0	0	0.0	252.7
03-04-12	miles	0	0	0	4.7	4.7
	acres*	0	0	0	0	0
03-04-13	miles	0	0	0	1.4	1.4
	acres*	73,243.0	0	0	8,413.1	81,656.1
03-04-14	miles	0	0	0	0	0
	acres*	160,749.9	0	0	10,668.9	171,418.8
	coast**	21.0	0	0	0.0	21.0
Total	miles	28.4	0	0	64.7	93.1
	acres	340,998.4	0	0	29,645.6	370,643.9

* Indicates saltwater acres; all other acres are freshwater impoundments.

** Indicates miles of Atlantic coastline in the Neuse River basin (not added to mileage total).

Table A-25 Primary Recreation Use Support Summary for Waters in the Neuse River Basin (1999)

Primary Recreation	All Waters	Monitored Waters	Percent of All Waters
Supporting	**28.4** Miles **344,338.4** Acres	**28.4** Miles **344,338.4** Acres	**30.5** **92.9**
Impaired	**0** Miles **0** Acres	**0** Miles **0** Acres	**0** **0**
No Data	**64.7** Miles **29,645.6** Acres	**N/A** Miles **N/A** Acres	**69.5** **7.1**
TOTAL	**93.1** Miles **370,643.9** Acres	**28.4** Miles **344,338.4** Acres	**100.0** **100.0**

Water Supply

There are 847.2 stream miles and 15,961.6 freshwater acres currently classified for water supply in the Neuse River basin. All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants. A basinwide summary of current water supply use support ratings is presented in Table A-26.

Table A-26 Water Supply Use Support Summary Information for Waters in the Neuse River Basin (2000)

Water Supply	All Waters	Monitored Waters	Percent Monitored
Supporting	**847.2** Miles **15,961.6** Acres	**0** Miles **0** Acres	**0** **0**
Impaired	**0** Miles **0** Acres	**0** Miles **0** Acres	**0** **0**
Not Rated	**0** Miles **0** Acres	**0** Miles **0** Acres	**0** **0**
TOTAL	**847.2** Miles **15,961.6** Acres	**0** Miles **0** Acres	**0** **0**

Shellfish Harvesting

There are 332,457.3 estuarine acres classified for shellfish harvesting (Class SA) in the Neuse River basin. All were monitored during the past five years by DEH Shellfish Sanitation (refer to page 52). Table A-27 presents use support ratings by subbasin for all waters in the shellfish harvesting use support category. Impaired estuarine acres accounted for 1.1 percent of the total estuarine acres in the shellfish harvesting use support category. A basinwide summary of current shellfish harvest use support ratings is presented in Table A-28.

Table A-27 Shellfish Harvesting Use Support Ratings for All Waters Listed by Subbasin (1995-2000)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-04-10	acres	76,114.5	3,267.9	0	0	79,382.4
03-04-13	acres	81,270.5	385.6	0	0	81,656.1
03-04-14	acres	171,361.7	57.1	0	0	171,418.8
Total	miles	328,746.7	3,710.6	0	0	332,457.3

Note: There are 1.4 and 10.2 miles supporting in subbasins 03-04-13 and 03-04-10 and 3.6 miles impaired in 03-04-10.

Table A-28 Shellfish Harvesting Use Support Summary Information for Waters in the Neuse River Basin

Shellfish Harvesting	Monitored Waters	Percent of Monitored
Supporting	**328,746.7** Acres	**98.9**
Impaired	**3,710.6** Acres	**1.1**
Not Rated	**0** Acres	**0**
TOTAL	**332,457.3** Acres	**100**

Impaired Waters

Table A-29 presents impaired waters (in all categories) in the Neuse River basin that were monitored by DWQ within the last five years. The use support category for which a water is impaired is indicated in the table. Descriptions of impaired segments, as well as problem parameters, are outlined in Appendix III. Management strategies for each water are discussed in detail in the appropriate subbasin chapter. Maps showing current use support ratings for waters in the Neuse River basin are presented in each subbasin chapter in Section B.

Table A-29 Monitored Impaired Waters within the Neuse River Basin (as of 2000)[1]

Waterbody	Chapter in Section B	Page #	Classification	Miles	Acres	Use Support Category
Ellerbe Creek	1	100	C NSW	11.0	0.0	Aquatic Life/Sec. Rec
Flat River	1	100	WS-IV NSW	1.1	0.0	Aquatic Life/Sec. Rec
Knap of Reeds Creek	1	100	WS-IV NSW	5.2	0.0	Aquatic Life/Sec. Rec
Lick Creek	1	100	WS-IV NSW	7.2	0.0	Aquatic Life/Sec. Rec
Little Lick Creek	1	100	WS-IV NSW	7.8	0.0	Aquatic Life/Sec. Rec
Black Creek	2	112	C NSW	3.6	0.0	Aquatic Life/Sec. Rec
Crabtree Creek	2	112	C NSW	16.0	0.0	Aquatic Life/Sec. Rec
Hare Snipe Creek	2	112	B NSW	4.5	0.0	Aquatic Life/Sec. Rec
Little Creek	2	112	C NSW	11.4	0.0	Aquatic Life/Sec. Rec
Marsh Creek	2	112	C NSW	6.2	0.0	Aquatic Life/Sec. Rec
Mine Creek	2	112	C NSW	4.7	0.0	Aquatic Life/Sec. Rec
Perry Creek	2	112	B NSW	4.9	0.0	Aquatic Life/Sec. Rec
Pigeon House Branch	2	112	C NSW	2.9	0.0	Aquatic Life/Sec. Rec
Richlands Creek	2	112	C NSW	4.7	0.0	Aquatic Life/Sec. Rec
Swift Creek	2	112	WS-III NSW	7.9	0.0	Aquatic Life/Sec. Rec
Toms Creek	2	112	C NSW	1.5	0.0	Aquatic Life/Sec. Rec
Middle Creek	3	126	C NSW	1.4	0.0	Aquatic Life/Sec. Rec
Black	4	131	C NSW	2.0	0.0	Aquatic Life/Sec. Rec
Hannah Creek	4	131	C NSW	10.3	0.0	Aquatic Life/Sec. Rec
Neuse River	5	137	C NSW	63.2	0.0	Fish Consumption
Stoney Creek	5	137	C NSW	10.7	0.0	Aquatic Life/Sec. Rec
Walnut Creek	5	137	C NSW	6.9	0.0	Aquatic Life/Sec. Rec
Little River	6	143	WS-IV NSW	20.0	0.0	Aquatic Life/Sec. Rec
Nahunta Swamp	7	150	C Sw NSW	27.1	0.0	Aquatic Life/Sec. Rec
Hominy Swamp	7	150	C Sw NSW	9.9	0.0	Aquatic Life/Sec. Rec
Little Contentnea Creek	7	150	C Sw NSW	34.9	0.0	Aquatic Life/Sec. Rec
Core Creek	8	158	C Sw NSW	15.4	0.0	Aquatic Life/Sec. Rec
Neuse River	8	158	SC Sw NSW	0.0	426.5	Aquatic Life/Sec. Rec
Swift Creek	9	164	C Sw NSW	22.4	0.0	Aquatic Life/Sec. Rec
Clayroot Swamp	9	164	C Sw NSW	12.9	0.0	Aquatic Life/Sec. Rec
Neuse River	10	171	SC/SB Sw NSW	0.0	30,330.9	Aquatic Life/Sec. Rec
Trent River	10	171	SB Sw NSW	0.0	1,009.9	Aquatic Life/Sec. Rec
Neuse River	10	171	SA NSW	0.0	165.6	Shellfish Harvesting
Adams Creek and Tributaries	10	171	SA NSW	0.0	841.5	Shellfish Harvesting
Clubfoot Creek and Tributaries	10	171	SA NSW	0.0	747.1	Shellfish Harvesting
South River and Tributaries	10	171	SA NSW	0.0	784.6	Shellfish Harvesting
Broad Creek and Tributaries	10	171	SA NSW	0.0	412.1	Shellfish Harvesting
Dawson Creek	10	171	SA NSW	0.0	122.1	Shellfish Harvesting
Whittaker Creek	10	171	SA NSW	0.0	96.1	Shellfish Harvesting

Pierce Creek	10	171	SA NSW	0.0	50.7	Shellfish Harvesting
Orchard Creek	10	171	SA NSW	0.0	37.1	Shellfish Harvesting
Bright Creek	10	171	SA NSW	0.0	10.9	Shellfish Harvesting
Neuse River	12	184	C NSW	5.8	0.0	Fish Consumption
Bay River	13	189	SA NSW	0.0	100.0	Shellfish Harvesting
Harper Creek	13	189	SA NSW	0.0	32.5	Shellfish Harvesting
Bear Creek	13	189	SA NSW	0.0	199.9	Shellfish Harvesting
Bennett Creek	13	189	SA NSW	0.0	15.7	Shellfish Harvesting
Gale Creek	13	189	SA NSW	0.0	29.4	Shellfish Harvesting
Bills Creek	13	189	SA NSW	0.0	8.1	Shellfish Harvesting
Pamlico Sound	14	194	SA NSW	0.0	12.5	Shellfish Harvesting
Golden Creek	14	194	SA NSW	0.0	9.7	Shellfish Harvesting
Thorofare	14	194	SA NSW	0.0	34.9	Shellfish Harvesting
Atlantic Ocean	14	194	SB NSW	21.0	0.0	Fish Consumption

* Although all waters in the basin are considered impaired for the fish consumption use support category, only the Neuse River (69 miles) and the Atlantic coastline (21 miles) were monitored (see page 93).