NEUSE RIVER BASINWIDE WATER QUALITY PLAN

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This document was approved and endorsed by the NC Environmental Management Commission on July 11, 2002 to be used as a guide by the NC Division of Water Quality in carrying out its Water Quality Program duties and responsibilities in the Chowan River basin. This plan is the second five-year update to the Neuse River Basinwide Water Quality Plan approved by the NC Environmental Management Commission in March 1993.

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North Carolina's Basinwide Approach to Water Quality Management

Basinwide water quality planning is a nonregulatory watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the NC Division of Water Quality (DWQ) for each of the seventeen major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by the DWQ, their implementation and the protection of water quality entails the coordinated efforts of many agencies, local governments and stakeholders in the state. The first basinwide plan for the Neuse River basin was completed in 1993 and the second in 1998.

This document is the third five-year update of the *Neuse River Basinwide Water Quality Plan*. The format of this plan was revised in response to comments received during the first and second planning cycles. DWQ replaced much of the general information in the first plan with more detailed information specific to the Neuse River basin. A greater emphasis was placed on identifying causes and sources of pollution for individual streams in order to facilitate local restoration efforts.

DWQ considered comments from four public workshops held in the basin and subsequent discussions with local resource agency staff and citizens during draft plan development. This input will help guide continuing DWQ activities in the basin.

Goals of the Basinwide Approach

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters yet allow for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Better evaluate cumulative effects of pollution.
- Improve public awareness and involvement.

Neuse River Basin Overview

The Neuse River originates in north central North Carolina in Person and Orange counties and flows southeasterly until it reaches tidal waters near Streets Ferry upstream of New Bern. At New Bern, the river broadens dramatically and changes from a free-flowing river to a tidal estuary that eventually flows into the Pamlico Sound. The Neuse River basin is the third largest river basin in North Carolina and is one of only four major river basins whose boundaries are located entirely within the state.

From 1982 to 1997 urban and built-up land cover increased by 227,000 acres. Uncultivated cropland and pastureland also increased by 60,000 acres. Forest and cultivated cropland cover significantly decreased by 128,000 and 180,000 acres, respectively. Most land cover change is accounted for in the upper Neuse hydrologic unit that includes rapidly growing areas in Wake, Durham and Johnston counties.

The Neuse River basin encompasses all or portions of 18 counties and 74 municipalities. The overall population of the basin based on Triangle J Council of Governments analysis is 1,353,617, with approximately 211 persons/square mile. Stoney Creek (subbasin 03-04-05) is the most densely populated local watershed with 2,573 persons/square mile. Fifty-four percent of the basin population is located in 10 percent of the basin land area. The watersheds with the highest population densities are near Raleigh, Durham, Goldsboro, Kinston, New Bern and Wilson.

Populations of counties that are wholly or partly contained within the basin increased by over 414,000 people between 1900 and 2000. Durham, Johnston and Wake are growing the fastest in the upper basin, with Pitt County growing the fastest in the lower basin. The county populations are expected to grow by more than 867,000 by 2020 to almost three million people. With the increased population there will be increased drinking water demands and wastewater discharges. There will also be loss of natural areas and increases in impervious surfaces associated with construction of new homes and businesses.

There are 3,497 freshwater stream miles, 16,414 acres of freshwater reservoirs and lakes (Table A-4), 369,977 estuarine acres, and 21 miles of Atlantic coastline in the Neuse River basin. There are also countless miles of unmapped small perennial, intermittent and ephemeral streams. The lower Neuse River basin contains extensive wetland communities also. The basin starts in the eastern Piedmont physiographic region with about two-thirds of the basin in the Coastal Plain.

Assessment of Water Quality in the Neuse River Basin

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 Appendix III.

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.

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.

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. 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 1 summarizes aquatic life/secondary recreation use support ratings for the entire basin.

Table 1 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). 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 2.

Table 2 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. 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 3 summarizes primary recreation use support ratings for the entire basin.

Table 3 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 4.

Table 4 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). 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 5.

Table 5 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 6 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 6 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).

Recommended Management Strategies for Restoring Impaired Waters

The long-range mission of basinwide planning is to provide a means of addressing the complex problem of planning for increased development and economic growth while maintaining, protecting and enhancing water quality and intended uses of the Neuse River basin's surface waters.

Within this basinwide plan, DWQ presents management strategies and recommendations for those waters considered to be impaired or that exhibit some notable water quality problem. Major water quality problems in the basin include habitat degradation, algal blooms, low dissolved oxygen (affecting aquatic life), mercury in fish tissue (affecting fish consumption) and fecal coliform bacteria contamination (affecting shellfish harvesting). Habitat degradation, including sedimentation, streambed scour and streambank erosion, is primarily attributed to nonpoint source pollution (NPS). Sources of nonpoint source pollution include runoff from construction sites, agricultural lands and urban areas, and hydromodification.

For streams degraded by point source pollution, the plan presents a management strategy to reduce the impacts from that pollutant source. The task of quantifying nonpoint sources of pollution and developing management strategies for these impaired waters is very resource intensive. This task is overwhelming, given the current limited resources of DWQ, other agencies (e.g., Division of Land Resources, Division of Soil and Water Conservation, Cooperative Extension Service, etc.) and local governments.

DWQ plans to further evaluate impaired waters in the Neuse River basin in conjunction with other agencies that deal with nonpoint source pollution issues and develop management strategies for a portion of these impaired waters for the next *Neuse River Basinwide Water Quality Plan* (2007).

Addressing Waters on the State's 303(d) List

For the next several years, addressing water quality impairment in waters that are on the state's 303(d) list will be a DWQ priority. Section 303(d) of the federal Clean Water Act requires states to develop a list of waters not meeting water quality standards or which have impaired uses. The waters in the Neuse River basin that are on this list are discussed in the individual subbasin descriptions in Section B. States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. EPA issued guidance in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list within 8-13 years.

There are approximately 2,387 impaired stream miles on the 2000 303(d) list in NC. The rigorous and demanding task of developing TMDLs for each listed water during a 13-year time frame will require the focus of many resources. It will be a priority for North Carolina's water quality programs over the next several years to develop TMDLs for 303(d) listed waters.

Challenges Related to Achieving Water Quality Improvements

To achieve the goal of restoring impaired waters throughout the basin, DWQ will need to work more closely with other state agencies and stakeholders to identify and control pollutants. The costs of restoration will be high, but several programs exist to provide funding for restoration efforts. These programs include the Clean Water Management Trust Fund, the NC Agricultural Cost Share Program, the Wetlands Restoration Program and the federally funded Conservation Reserve Enhancement Program.

With increased development occurring, there will be significant challenges ahead in balancing economic growth with the protection of water quality in this basin. Point source impacts on surface waters can be measured and addressed through the basinwide planning process. Nonpoint sources of pollution can be identified through the basinwide plan, but actions to address these impacts must be taken at the local level. Such actions should include: development and enforcement of local erosion control ordinances; requirement of stormwater best management practices for existing and new development; development and enforcement of buffer ordinances; and land use planning that assesses impacts on natural resources. This basinwide plan presents many water quality initiatives and accomplishments that are underway within the basin. These actions provide a foundation on which future initiatives can be built.

Section A

General Basinwide Information

Section A - Chapter 1
Introduction to Basinwide Water Quality Planning

1.1 What is Basinwide Water Quality Planning?

Basinwide water quality planning is a nonregulatory, watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the NC Division of Water Quality (DWQ) for each of the seventeen major river basins in the state (Figure A-1 and Table A-1). Preparation of a basinwide water quality plan is a five-year process, which is broken down into three phases (Table A-2). While these plans are prepared by the DWQ, their implementation and the protection of water quality entails the coordinated efforts of many agencies, local governments and stakeholder groups in the state. The first cycle of plans was completed in 1998, but each plan is updated at five-year intervals.

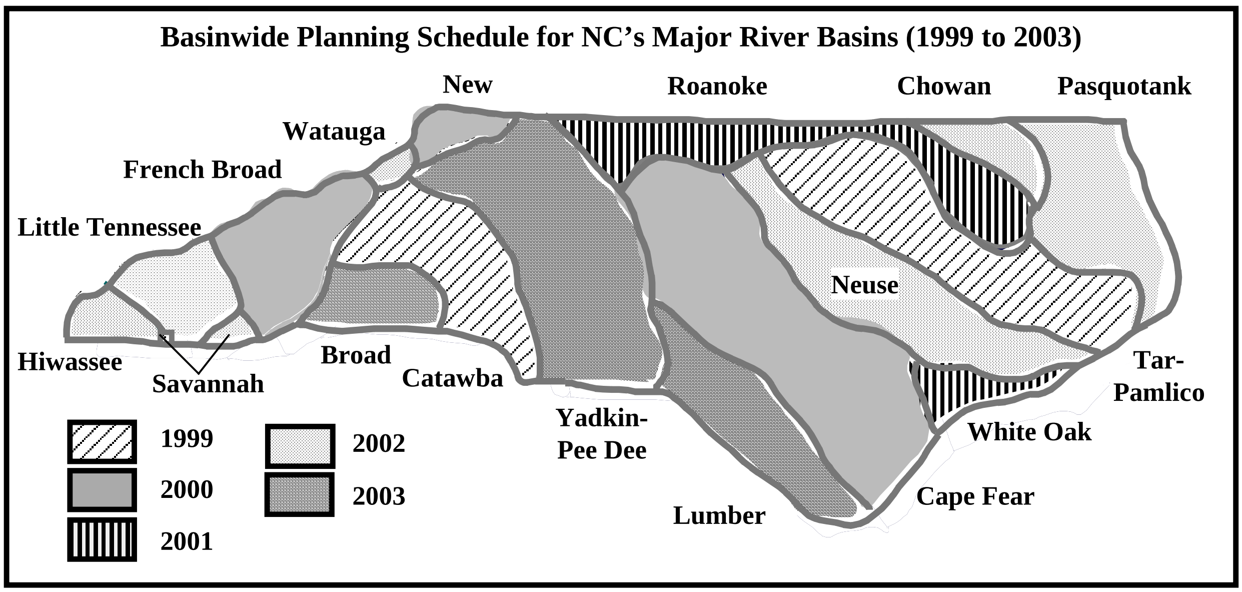


Figure A-1 Basinwide Planning Schedule (1999 to 2003)

1.2 Goals of Basinwide Water Quality Planning

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters yet allow for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Better evaluate cumulative effects of pollution.
- Improve public awareness and involvement.

Table A-1 Schedule for Second Cycle of Basinwide Planning (1998 to 2003)

Basin	DWQ Biological Data Collection	River Basin Public Workshops	Public Mtgs. and Draft Out For Review	Final Plan Receives EMC Approval	Begin NPDES Permit Issuance
Neuse	**Summer 2000**	**6/2001**	**5/2002**	**7/2002**	**1/2003**
Lumber	Summer 2001	12/2002	9/2003	12/2003	7/2004
Tar-Pamlico	Summer 97	6/1998	4/1999	7/1999	1/2000
Catawba	Summer 97	2/1999	10/1999	12/1999	3/2000
French Broad	Summer 97	5/1999	2/2000	5/2000	8/2000
New	Summer 98	6/1999	4/2000	7/2000	11/2000
Cape Fear	Summer 98	7/1999	4/2000	7/2000	12/2000
Roanoke	Summer 99	4/2000	2/2001	7/2001	1/2002
White Oak	Summer 99	10/2000	7/2001	9/2001	6/2002
Savannah	Summer 99	10/2000	12/2001	3/2002	8/2002
Watauga	Summer 99	10/2000	12/2001	2/2002	9/2002
Little Tennessee	Summer 99	3/2001	12/2001	4/2002	10/2002
Hiwassee	Summer 99	10/2000	12/2001	3/2002	8/2002
Chowan	Summer 2000	3/2001	5/2002	7/2002	11/2002
Pasquotank	Summer 2000	3/2001	5/2002	7/2002	12/2002
Broad	Summer 2000	11/2001	11/2002	2/2003	7/2003
Yadkin Pee-Dee	Summer 2001	4/2002	1/2003	3/2003	9/2003

Note: A basinwide plan was completed for all 17 basins during the first cycle (1993 to 1998).

Table A-2 Five-Year Process for Development of an Individual Basinwide Plan

Years 1 - 2 **Water Quality Data Collection and Identification of Goals and Issues**	• Identify sampling needs • Conduct biological monitoring activities • Conduct special studies and other water quality sampling activities • Coordinate with local stakeholders and other agencies to continue to implement goals within current basinwide plan
Years 2 - 3 **Data Analysis and Public Workshops**	• Gather and analyze data from sampling activities • Develop use support ratings • Conduct special studies and other water quality sampling activities • Conduct public workshops to establish goals and objectives and identify and prioritize issues for the next basin cycle • Develop preliminary pollution control strategies • Coordinate with local stakeholders and other agencies
Years 3 - 5 **Preparation of Draft Basinwide Plan, Public Review, Approval of Plan, Issue NPDES Permits and Begin Implementation of Plan**	• Develop draft basinwide plan based on water quality data, use support ratings, and recommended pollution control strategies • Circulate draft basinwide plan for review and present draft plan at public meetings • Revise plan after public review period • Submit plan to Environmental Management Commission for approval • Issue NPDES permits • Coordinate with other agencies and local interest groups to prioritize implementation actions • Conduct special studies and other water quality sampling activities

1.3 Major Components of the Basinwide Plan

Each basinwide plan is subdivided into four major sections. The format provides general basinwide information, information by each major watershed, and descriptions of water quality protection initiatives.

Section A: Basinwide Information

- Introduces the basinwide planning approach used by the state.
- Provides an overview of the river basin including: hydrology, land use, local government jurisdictions, population and growth trends, natural resources, wastewater discharges, animal operations and water usage.
- Presents general water quality information including summaries of water quality monitoring programs and use support ratings in the basin.

Section B: Subbasin Information

- Summarizes recommendations from previous basin plan, achievements made, what wasn't achieved and why, current priority issues and concerns, impaired waters, and goals and recommendations for the next five years by subbasin.

Section C: Current and Future Initiatives

- Presents current and future water quality initiatives and success stories by federal, state and local agencies, and corporate, citizen and academic efforts.
- Describes DWQ goals and initiatives beyond the five-year planning cycle for the basin.

Appendices

- Lists NPDES dischargers and individual stormwater permits.
- Describes water quality data collected by DWQ, use support methodology and 303(d) listing methodology.
- Provides workshop summaries, points of contact, and a glossary of terms and acronyms.

1.4 Benefits of Basinwide Water Quality Planning

Basinwide planning and management benefits water quality by:

- *Focusing resources* on one river basin at a time.
- *Using sound ecological planning and fostering comprehensive NPDES* permitting by working on a watershed scale.
- *Ensuring better consistency and equitability* by clearly defining the program's long-term goals and approaches regarding permits and water quality improvement strategies.
- *Fostering public participation* to increase involvement and awareness about water quality.
- *Integrating and coordinating programs and agencies* to improve implementation of point and nonpoint source pollution reduction strategies.

1.5 How to Get Involved

To assure that basinwide plans are accurately written and effectively implemented, it is important for citizens and other local stakeholders to participate in the planning process during:

- Local Workshops: (Prior to the preparation of draft basinwide plans.) DWQ staff present information about basinwide planning and the basin's water quality. Participants can ask questions, share concerns, and discuss potential solutions to water quality issues in the basin.
- Public Meetings: (After the draft plan is prepared.) DWQ staff discuss the draft plan and its major recommendations, seeking public comments and questions.
- Public Comment Period: (After the draft plan is prepared). The comment period is at least thirty days in length. Draft plans are made available on-line or by request.

1.6 Other References

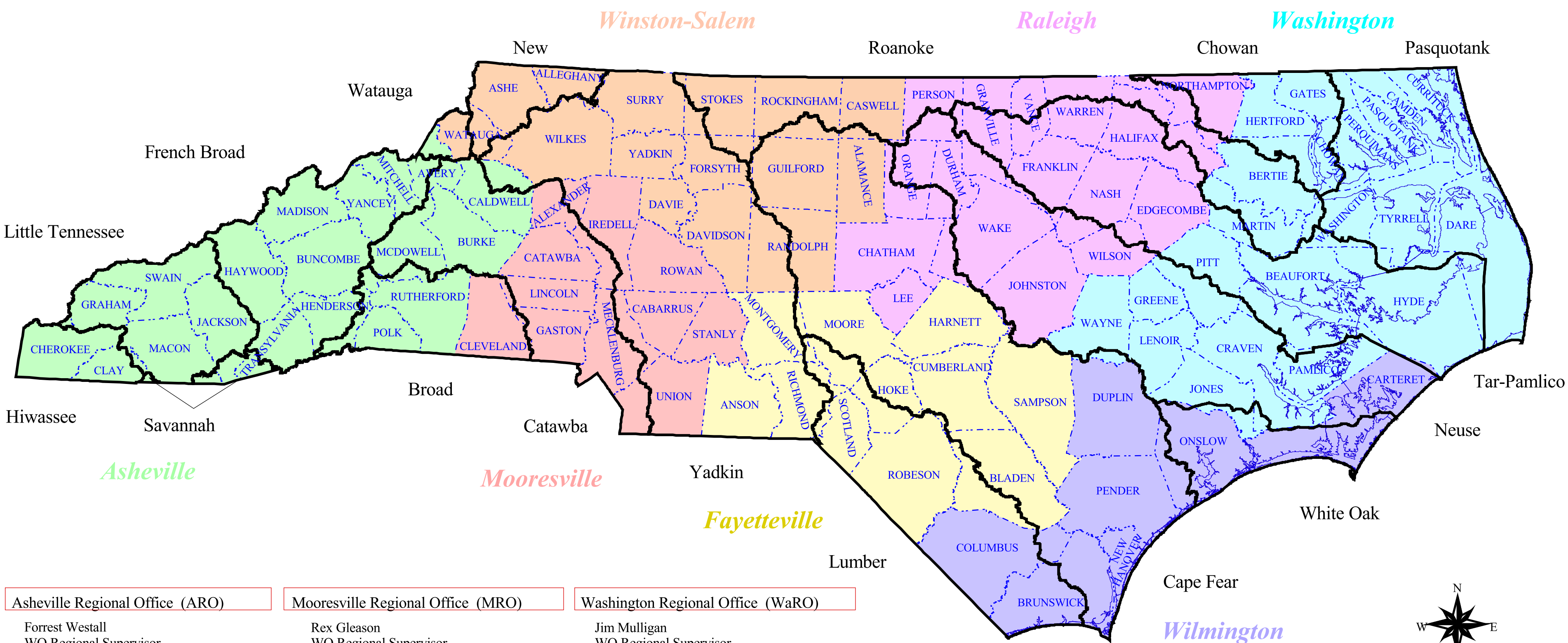
There are several reference documents and websites that provide additional information about basinwide planning and the basin's water quality:

- *Neuse River Basinwide Assessment Report*. November 2000. This technical report presents physical, chemical and biological data collected in the Neuse River basin. 257 pages.
- *Neuse River Basinwide Water Quality Management Plan*. March 1993. This first basinwide plan for the Neuse River basin presents water quality data, information and recommended management strategies for the first five-year cycle. 164 pages.
- *Neuse River Basinwide Water Quality Management Plan*. December 1998. This second basinwide plan for the Neuse River basin presents water quality data, information and recommended management strategies for the second five-year cycle. 212 pages.
- *A Citizen's Guide to Water Quality Management in North Carolina*. August 2000. This document includes general information about water quality issues and programs to address these issues. It is intended to be an informational document on water quality. 156 pages.
- *NC Basinwide Wetlands and Riparian Restoration Plan for the Neuse River Basin*. August 1998. DWQ NC Wetlands Restoration Program. 76 pages.
- *North Carolina's Basinwide Approach to Water Quality Management: Program Description*. Creager, C.S. and J.P. Baker. 1991. DWQ Water Quality Section. Raleigh, NC.
- NC Division of Water Quality Environmental Sciences Branch website at http://www.esb.enr.state.nc.us/.

1.7 Division of Water Quality Functions and Locations

For more information on the above documents, DWQ activities or contacts, please visit http://h2o.enr.state.nc.us/basinwide/ or call (919) 733-5083 and ask for the basin planner responsible for your basin of interest. Feel free to contact the appropriate Regional Office for additional information (Figure A-2). For general questions about the Department of Environment and Natural Resources, contact the Customer Service Center at 1-877-623-6748.

Figure A-2 North Carolina Department of Environment and Natural Resources
Division of Water Quality Regional Offices



Asheville Regional Office (ARO)

Forrest Westall
WQ Regional Supervisor
59 Woodfin Place
Asheville, NC 28801
COURIER 12-59-01
Phone: (828) 251-6208
Fax: (828) 251-6452

Avery	Haywood	Polk
Buncombe	Henderson	Rutherford
Burke	Jackson	Swain
Caldwell	Macon	Transylvania
Cherokee	Madison	Yancey
Clay	McDowell	
Graham	Mitchell	

Mooresville Regional Office (MRO)

Rex Gleason
WQ Regional Supervisor
919 North Main Street
Mooresville, NC 28115
COURIER 09-08-06
Phone: (704) 663-1699
Fax: (704) 663-6040

Alexander	Lincoln
Cabarrus	Mecklenburg
Catawba	Rowan
Cleveland	Stanly
Gaston	Union
Iredell	

Washington Regional Office (WaRO)

Jim Mulligan
WQ Regional Supervisor
943 Washington Square Mall
Washington, NC 27889
COURIER 16-04-01
Phone: (252) 946-6481
Fax: (252) 946-9215

Beaufort	Gates	Pamlico
Bertie	Greene	Pasquotank
Camden	Hertford	Perquimans
Chowan	Hyde	Pitt
Craven	Jones	Tyrrell
Currituck	Lenoir	Washington
Dare	Martin	Wayne

Winston-Salem Regional Office (WSRO)

Larry Coble
WQ Regional Supervisor
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Winston-Salem, NC 27107
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Alamance	Forsyth	Watauga
Alleghany	Guilford	Wilkes
Ashe	Randolph	Yadkin
Caswell	Rockingham	
Davidson	Stokes	
Davie	Surry	

Central Office

DENR
DIVISION OF WATER QUALITY
WATER QUALITY SECTION
1617 MAIL SERVICE CENTER
RALEIGH NC 27699-1617
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Anson	Moore
Bladen	Richmond
Cumberland	Robeson
Harnett	Sampson
Hoke	Scotland
Montgomery	

Raleigh Regional Office (RRO)

Ken Schuster
WQ Regional Supervisor
3800 Barrett Drive
Raleigh, NC 27609
INTEROFFICE
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Fax: (919) 571-4718

Chatham	Johnston	Vance
Durham	Lee	Wake
Edgecombe	Nash	Warren
Franklin	Northampton	Wilson
Granville	Orange	
Halifax	Person	

Wilmington Regional Office (WiRO)

Rick Shiver
WQ Regional Supervisor
127 Cardinal Drive Extension
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COURIER 04-16-33
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Brunswick	New Hanover
Carteret	Onslow
Columbus	Pender
Duplin	

NCDENR

Planning Branch
Planning & Assessment Unit
September 1, 1999

Section A - Chapter 2
Neuse River Basin Overview

2.1 General Overview

The Neuse River basin is the third largest river basin in North Carolina and is one of only four river basins whose boundaries are located entirely within the state. The Neuse River originates in north central North Carolina in Person and Orange counties and flows southeasterly until it reaches tidal waters near Streets Ferry upstream of New Bern. At New Bern, the river broadens dramatically and changes from a free-flowing river to a tidal estuary that eventually flows into the Pamlico Sound (Figure A-3). Major tributaries of the Neuse River include the Eno and Flat Rivers, Crabtree Creek, Swift Creek, Little River, Contentnea Creek and Trent River.

Neuse River Basin Statistics

Total Area: 6,235 sq. miles
Freshwater Stream Miles: 3,497
Freshwater Lakes Acres: 16,414
Estuarine Acres: 369,977
Coastline Miles: 21
No. of Counties: 18
No. of Municipalities: 74
No. of Subbasins: 14
Population (2000): 1,353,617*
Pop. Density (2000): 211 persons/sq. mi.*

* Based on Triangle J Council of Governments analysis of 2000 Census Data (page 18).

The most populated areas are located in and around the cities of Raleigh, Durham, Hillsborough, Cary, Apex and Wake Forest, and around the other larger municipalities in the basin such as Goldsboro, Wilson, Greenville, Kinston, New Bern and Havelock. The overall population density is 211 persons per square mile versus an estimated statewide average of 139 persons per square mile.

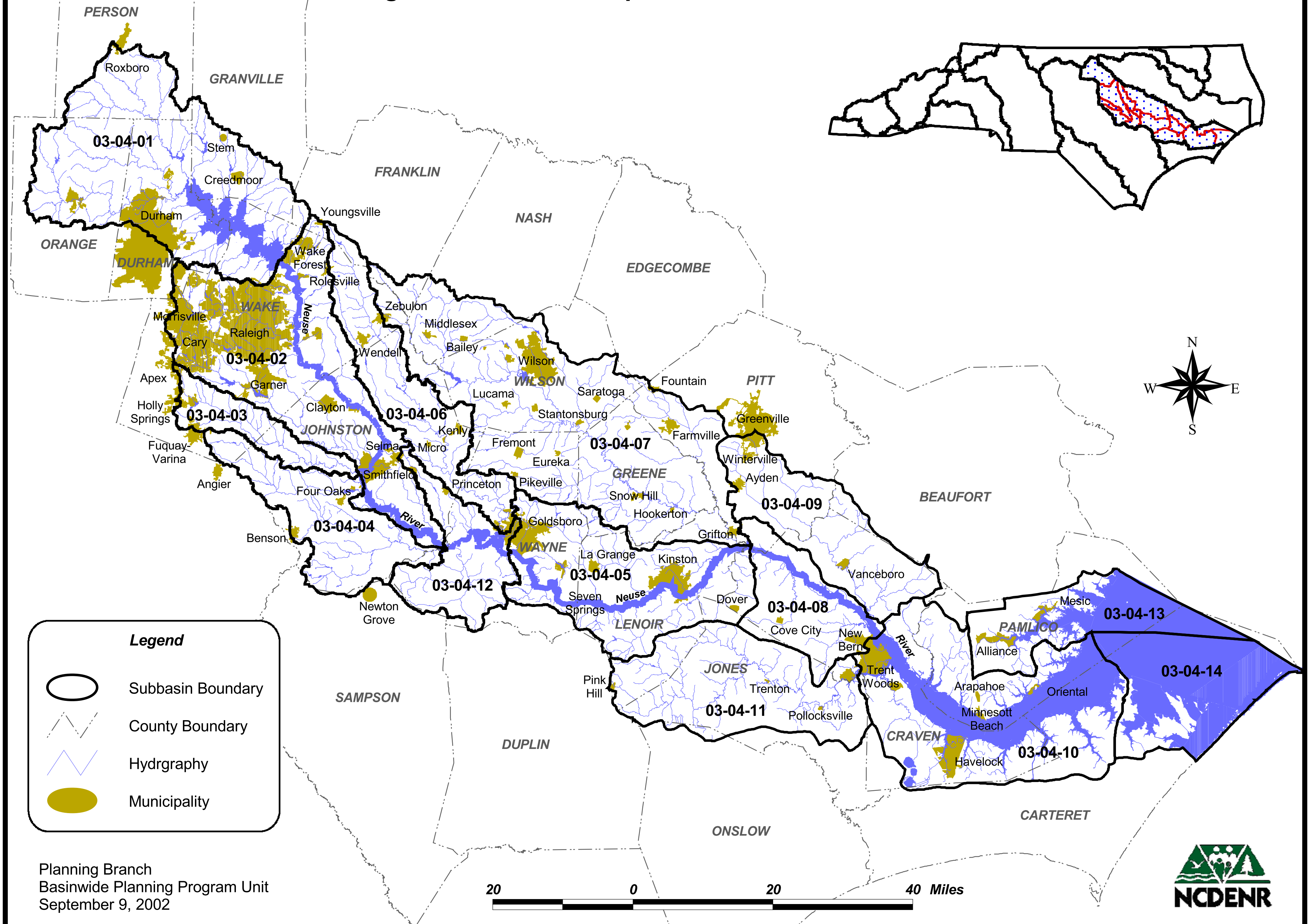
Fifty-six percent of the land in the basin is forested, and about 23 percent is in cultivated cropland. Tobacco, peanuts, cotton and soybeans are among the most commonly grown. Only eight percent of the land falls into the urban/built-up category (CGIA, 1997). Despite the large amount of cultivated cropland and the relatively small amount of urban area, the basin has seen a significant decrease (-180,000 acres) in cultivated cropland and forest and increase (+227,000 acres) in developed areas over the past 15 years (USDA, 2001).

2.2 Surface Water Hydrology

2.2.1 Watershed Descriptions

DWQ has a two-tiered system in which the state is divided into 17 major river basins with each basin further subdivided into subbasins. The Neuse River basin is divided into 14 subbasins (6-digit DWQ subbasins) (Figure A-3). Maps of each subbasin are included in Section B. DWQ and many other state agencies in North Carolina use this two-tiered system to identify watersheds for many different programs. Most federal government agencies, including the US Geological Survey (USGS) and the Natural Resources Conservation Service (NRCS), use a different system of defining watersheds.

Figure A-3 General Map of the Neuse River Basin



Under the federal system, the Neuse River basin is made up of hydrologic areas referred to as hydrologic units (USGS 8-digit hydrologic units). The Neuse River basin is made up of four whole hydrologic units: the Upper Neuse, Middle Neuse, Contentnea and Lower Neuse. The lower part of the basin also contains portions of the Pamlico and Bogue-Core Sounds hydrologic units. Hydrologic units are further divided into smaller watershed units (14-digit hydrologic units) that are used for smaller scale planning like that done by NCWRP (page 203). There are 201 watershed units in the basin. Table A-3 compares the three systems.

2.2.2 Hydrologic Features

There are 3,497 freshwater stream miles, 16,414 acres of freshwater reservoirs and lakes (Table A-4), 369,977 estuarine acres, and 21 miles of Atlantic coastline in the Neuse River basin. There are also countless miles of unmapped small perennial, intermittent and ephemeral streams. The lower Neuse River basin contains extensive wetland communities also. The basin starts in the eastern Piedmont physiographic region with about two-thirds of the basin in the Coastal Plain.

Streams in the Piedmont are typically low gradient with sluggish pools separated by riffles with occasional small rapids. Piedmont soils are highly erodible and are underlain by fractured rock formations that have limited water storage capacity. Piedmont streams tend to have low summer flows and limited ability to assimilate oxygen-consuming wastes. There are no natural lakes in the Piedmont. There are several significant reservoirs that serve as water supplies and flood control structures. There are many old millponds and beaver impoundments scattered across watersheds in the region.

Streams in the Coastal Plain are slow-moving blackwater streams, low-lying swamps and productive estuarine waters. The Coastal Plain is flat and the larger waterbodies are meandering and often lined with swamps and bottomland hardwoods. The swamp streams often stop flowing in the summer and are stained by tannic acid. These streams have limited ability to assimilate oxygen-consuming wastes. Swamp streams often have naturally low dissolved oxygen and pH. Coastal Plain soils are deep sands that have a high groundwater storage capacity. Because of the flat topography and high groundwater supply, there are few reservoirs in the Coastal Plain. Natural lakes include the remnants of bay lakes in the lower Coastal Plain.

There are 19 major reservoirs in the Neuse River basin. Most of them are located in the upper portion of the basin. The largest is Falls of the Neuse (Falls Lake) which is managed by the US Army Corps of Engineers for flood control and is the City of Raleigh water supply. In addition to general protection of aquatic life and secondary recreation, six lakes are classified for primary recreation and 14 are designated drinking water supplies (Table A-4).

Table A-3 Hydrologic Subdivisions in the Neuse River Basin

Watershed Name and Major Tributaries	DWQ Subbasin 6-digit Codes	USGS 8-digit Hydrologic Units	USGS 14-digit Hydrologic Units Local Watersheds*
Upper Neuse		03020201	
Falls Lake and Little, Eno and Flat Rivers	03-04-01		010010, 060010, 020020, 050040, 010030, 030030, 065030, 010040, 040020, 020040, 065010, 020010, 030020, 0650040, 010020, 060020, 065050, 010050, 030040, 050010, 010010, 020030, 050030, 050020, 030010, 030050, 060030
Crabtree Creek and Swift Creek	03-04-02		070060, 070110, 0110040, 080020, 0110010, 0100040, 070070, 100020, 100050, 070090, 100030, 110070, 080010, 090010, 110050, 070100, 110020, 140020, 070080, 100010, 110060, 070120, 110030, 140010
Middle Creek and Bass Lake	03-04-03		100010, 120020, 120030
Black Creek and Hannah Creek	03-04-04		130010, 130020, 130030, 150010, 150020, 150050, 150030, 150040
Little River and Buffalo Creek	03-04-06		180010, 180070, 180040, 180050, 180060, 200010, 180020, 190010, 200020, 180030, 180080
Neuse River	03-04-12		160010, 170020, 170030, 200030, 170040, 200040, 170010, 170060, 170050
Middle Neuse		03020202	
Bear Creek and Stone Creek	03-04-05		010010, 030030, 020030, 040010, 040020, 020030, 060040, 030020, 070010, 020020, 010021, 060030, 050020, 060020, 030010, 020010, 050030, 010040, 040030, 060010, 030040, 010020, 010030, 050040, 010022, 050010, 070020, 010050
Core Creek	03-04-08		090020, 080020, 080010, 100020, 090080, 100010
Swift Creek and Clayroot Swamp	03-04-09		090010, 090030, 090040, 090050, 090055, 090060, 090070
Contentnea		03020203	
Contentnea Creek and Little Contentnea Creek	03-04-07		010010, 010020, 020010, 020020, 020030, 020040, 020050,030010, 030020, 030030, 030040, 040010, 040020, 040030, 040040, 050010, 050020, 050030, 050040, 050050, 050060, 060010, 060020, 060030, 060040, 060040, 060050, 070010, 070020, 070030, 070040, 070050
Lower Neuse		03020204	
Slocum Creek	03-04-10		020010, 020020, 020030, 020040, 020050, 020060, 030010, 030020, 030030, 030040, 030050, 040010, 050010, 050020, 050030, 050040, 050050, 060010, 060020, 070010
Trent River	03-04-11		010010, 010020, 010021, 010030, 010031, 010040, 010050, 01051, 010060, 010070, 010071, 010080, 010100
Pamlico Sound		03020105	
Pamlico Sound Bay River	03-04-13		010010, 010020, 010030, 010040, 020010, 020020, 020030, 090012
Bogue-Core Sounds		03020106	
Core Sound West Bay	03-04-14		050010, 050050, 050060, 050070

* Numbers from the 8-digit and 14-digit column make the full 14-digit HU.

Table A-4 Statistics for Major Lakes in the Neuse River Basin

Subbasin/Lake	County	Classification*	Surface Area (ac)	Mean Depth (ft)	Volume (X 10^6 m^3)	Watershed (mi^2)
03-04-01						
Lake Michie	Durham	WS-III NSW CA	541.1	26.2	15.6	169.9
Little River Reservoir	Durham	WS-II NSW CA	528.8	24.6	18.0	97.7
Lake Butner	Granville	WS-II NSW CA	373.1	29.5	1.4	30.1
Lake Rogers	Granville	WS-II NSW CA	140.8	8.5	0.5	17.4
Lake Ben Johnson	Orange	WS-II NSW CA	29.7	4.9	0.02	64.9
Lake Orange	Orange	WS-II NSW CA	155.7	13.1	0.3	10.0
Corporation Lake	Orange	WS-II NSW CA	27.2	3.3	0.9	40.9
Falls of the Neuse Reservoir	Wake	WS-III NSW CA	12,490.7	16.4	176.6	769.9
03-04-02						
Lake Benson	Wake	WS-III NSW CA	439.8	9.8	3.6	64.9
Lake Wheeler	Wake	WS-III NSW	551.0	13.1	7.6	28.2
Big Lake	Wake	B NSW	61.8	6.6	0.1	6.9
Reedy Creek Lake	Wake	B NSW	19.8	6.6	0.1	4.2
Sycamore Lake	Wake	B NSW	22.2	23.0	0.2	9.7
Apex Reservoir	Wake	WS-III NSW	74.1	9.8	0.3	2.3
Lake Crabtree	Wake	B NSW	518.9	6.6	0.5	51.4
03-04-05						
Cliffs of the Neuse Lake	Wayne	B NSW	9.9	29.5	0.1	0.4
03-04-07						
Lake Wilson	Wilson	WS-III NSW	81.5	4.9	0.7	40.2
Toisnot Reservoir	Wilson	WS-III NSW CA	9.9	4.9	0.1	50.0
Wiggins Mill Reservoir	Wilson	WS-III NSW CA	200.1	1.6	0.6	237.1

* Refer to page 44 for more information.

2.2.3 Minimum Streamflow

One of the purposes of the Dam Safety Law is to ensure maintenance of minimum streamflows below dams. Conditions may be placed on dam operations specifying mandatory minimum releases in order to maintain adequate quantity and quality of water in the length of a stream affected by an impoundment. The Division of Water Resources, in conjunction with the Wildlife Resources Commission, recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The Division of Land Resources issues the permits.

The US Army Corps of Engineers operates Falls Lake dam (subbasin 03-04-01) in Wake County on the Neuse River. The drainage area is 769.9 square miles and has minimum release requirements of 65 cfs (cubic feet/second) from November to March and 100 cfs from April to October. The target flow below the dam at Clayton is 184 cfs from November to March and 254 cfs from April to October. During extreme drought conditions the flows may be lower.

The City of Wilson operates Buckhorn Reservoir dam (subbasin 03-04-07) on Contentnea Creek. Minimum release requirements are 7.6 cfs when water supply storage is above 70 percent. When water supply storage is below 70 percent and above 50 percent, 5.3 cfs minimum flow is required. Below 50 percent of water supply storage, a 1.4 cfs minimum flow is required.

Bass Lake (subbasin 03-04-02) operated by the Town of Holly Springs on Basal Creek has a minimum release of 5.2 cfs or inflow, whichever is less.

Presentwood Lakes No. 1 and No. 2 (subbasin 03-04-02) in Cary on Crabtree Creek have a minimum release of 0.2 cfs or inflow, whichever is less, from June to February and 0.4 cfs or inflow, whichever is less, from March to May.

Little River dam at Orange Factory (subbasin 03-04-01) in Durham County has a minimum release of 6 cfs from December to May and 2 cfs from June to November. A minimum release of 0.64 cfs is required when normal pool elevation is less than 70 percent of usable storage capacity.

Minimum flows on the Eno River are complicated and determined by two different methods. Table A-5 summarizes withdrawals and instream flow requirements for the portion of the Eno River above Durham.

Table A-5 Maximum Allowable Surface Water Withdrawals and Instream Flow Requirements for the Western Eno River (NCDENR-DWR, October 2001)

	Percent of Storage Remaining at Lake Orange	Allowable Surface Water Withdrawal (MGD)			Instream Flow Requirement at Hillsborough Gage (MGD)		
		Town of Hillsborough †	Orange-Alamance	Piedmont Minerals	From Lake Orange	From West Fork Eno Reservoir	Total Flow at Hillsborough Gage
	> 100	*†	*	**	1.10	0.65	1.75
Stage 1	100 - 80	1.51 †	0.82	0.43	1.10	0.65	1.75
Stage 2	80 - 60	1.36 †	0.74	0.38	0.65	0.65	1.30
Stage 3	60 - 50	1.28 †	0.70	0.36	0.45	0.65	1.10
Stage 4	50 - 40	1.28 †	0.70	0.32	0.45	0.65	1.10
Stage 5	40 - 30	1.13 †	0.62	0.19	0	0.65	0.65
Stage 6	<= 30	0.68 †	0.37	0	0	0.65	0.65

Notes:

† Allowable withdrawals for Hillsborough shown above do not include withdrawals of water supply releases from West Fork Eno Reservoir.

* - Adjusted to reflect outside source agreement for Hillsborough and Orange-Alamance.
- Excess withdrawals from Eno River based on outside source agreement may be made when flows at the Eno River at Hillsborough Gage are 10 cubic feet per second (cfs) and above, regardless of water level in Lake Orange. Maximum withdrawals shall be limited to the total of the contract amount and the allocated amount.
- A low flow period will begin on the 7th consecutive day of the average daily flow at the Hillsborough Gage dropping below 10 cfs. On the 4th day, the Orange County Engineer will request that affected parties prepare for a low flow period.
- When flows are between 10 cfs and 3 cfs at the Hillsborough Gage during a low flow period, withdrawals from the Eno River shall be limited to the Stage 1 amount shown above (100-80 percent of storage remaining), regardless of water level in Lake Orange.
- When flows are below 3 cfs at the Hillsborough Gage during a low flow period, withdrawals shall be limited to amounts shown above for percent of storage remaining at Lake Orange.
- A low flow period will be terminated when average daily flow at the Hillsborough Gage registers 10 cfs or greater for a period of 7 consecutive days. The Orange County Engineer will notify affected parties when the low flow period is terminated.

** For Piedmont Minerals: When flows at the Hillsborough Gage are 14 cfs and above, withdrawals from the Eno River will be limited to 900,000 gallons per day (GPD). Between 14 cfs and 4 cfs, withdrawals will be limited to 430,000 GPD, regardless of water level in Lake Orange. Below 4 cfs, withdrawals will be limited to amounts shown above for percent of storage remaining.

2.2.4 Water Withdrawals

Prior to 1999, North Carolina required water users to register their water withdrawals with the Division of Water Resources (DWR) only if the amount was 1,000,000 gallons or more of surface water or groundwater per day. In 1999, the registration threshold for all water users except agriculture was lowered to 100,000 gallons per day.

There are 176 registered water withdrawals in the Neuse River basin not including those associated with the 78 public water systems discussed below. Fifty-one of these are surface water withdrawals. Excluding the public water systems or power generating facilities, there is a cumulative permitted capacity to withdraw 192 MGD of water. For more information on water withdrawals, visit http://www.dwr.ehnr.state.nc.us/ or call DWR at (919) 733-4064.

2.2.5 Interbasin Transfers

In addition to water withdrawals (discussed above), water users in North Carolina are also required to register surface water transfers with the Division of Water Resources if the amount is 100,000 gallons per day or more. In addition, persons wishing to transfer two million gallons per day (MGD) or more, or increase an existing transfer by 25 percent or more, must first obtain a certificate from the Environmental Management Commission (G.S. 143-215.22I). The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolina*, on file in the Office of the Secretary of State. These boundaries differ from the 17 major river basins delineated by DWQ. The 8-digit hydrologic unit boundaries (Table A-3) correspond to these basins within the Neuse River basin. Table A-6 summarizes IBTs involving the Neuse River basin.

In determining whether a certificate should be issued, the state must determine that the overall benefits of a transfer outweigh the potential impacts. Factors used to determine whether a certificate should be issued include:

- the necessity, reasonableness and beneficial effects of the transfer;
- the detrimental effects on the source and receiving basins, including effects on water supply needs, wastewater assimilation, water quality, fish and wildlife habitat, hydroelectric power generation, navigation and recreation;
- the cumulative effect of existing transfers or water uses in the source basin;
- reasonable alternatives to the proposed transfer; and
- any other facts and circumstances necessary to evaluate the transfer request.

A provision of the interbasin transfer law requires that an environmental assessment or environmental impact statement be prepared in accordance with the State Environmental Policy Act as supporting documentation for a transfer petition. For more information on water withdrawals, visit http://www.ncwater.org or call DWR at (919) 733-4064.

Table A-6 Estimated Interbasin Transfers in the Neuse River Basin (2000)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD)
Cary/Apex	Cary/Apex	Haw River	Neuse River	12.1
Cary/Apex	Morrisville	Haw River	Neuse River	< 0.1
Dunn	Benson	Cape Fear River	Neuse River	1.2
Durham	Durham	Neuse River	Haw River	18.7
Franklin County	Youngsville	Tar River	Neuse River	< 0.1
Johnston County	Fuquay-Varina	Neuse River	Cape Fear River	0.25
Orange-Alamance W.S.	Orange-Alamance W.S.	Neuse River	Haw River	0.5
Roxboro	Roxboro	Roanoke River	Neuse River	< 0.1
Zebulon	Zebulon	Neuse River	Contentnea Creek	0.8

2.2.6 Water Supply

The following is summarized from the North Carolina Water Supply Plan developed by the Division of Water Resources (DWR) for the Neuse River basin (NCDENR-DWR, January 2001). The information is compiled from Local Water Supply Plans submitted to DWR by 78 public water systems.

Total water use in the Neuse River basin is reported to be approximately 191 MGD. Residential demand accounted for 79 MGD. Public water systems supplied 82 MGD from surface water and 30 MGD from groundwater. Self-supplied water accounted for 77 MGD. For more information or to view local water supply plans, visit http://www.dwr.ehnr.state.nc.us/ or call DWR at (919) 733-4064.

2.3 Population and Growth Trends

Below are three different ways of presenting population data for the Neuse River basin. Population data presented by county allow for analysis of projected growth trends in the basin based on Office of State Planning information (April and May 2001). Data presented by municipality summarizes information on past growth of large urban areas in the basin. The data developed by Triangle J Council of Governments allow for 2000 population data to be presented by watershed units and by subbasin. While the three different sets of information cannot be directly compared, general conclusions are apparent by looking at the information. Counties with the highest expected growth are associated with the largest municipal areas and the most densely populated watersheds in the basin.

2.3.1 County Population and Growth Trends

Table A-7 shows the projected population for 2020 and the change in growth between 2000 and 2020 for counties that are wholly or partly contained within the basin. Since river basin boundaries do not coincide with county boundaries, these numbers are not directly applicable to the Neuse River basin. This information is intended to present an estimate of expected population growth in counties that have some land area in the Neuse River basin.

Table A-7 Past and Projected Population (1990, 2000, 2020) and Population Change by County

County	Percent of County in Basin ♦	1990	2000	Estimated Population 2020	Estimated Pop Change 1990-2000	Estimated Pop Change 2000-2020
Beaufort	2	42,283	44,958	48,755	2,675	3,797
Carteret	50	52,407	59,383	70,365	6,976	10,982
Craven	95	81,812	91,436	105,982	9,624	14,546
Durham	73	181,844	223,314	312,144	41,470	88,830
Franklin	10	36,414	47,260	69,994	10,846	22,734
Granville	25	38,341	48,498	68,600	10,157	20,102
Greene	100	15,384	18,974	25,799	3,590	6,825
Johnston	98	81,306	121,965	210,178	40,659	88,213
Jones	81	9,361	10,381	11,910	1,020	1,529
Lenoir	99	57,274	59,648	62,096	2,374	2,448
Nash	20	76,677	87,420	107,475	10,743	20,055
Orange	49	93,662	118,227	166,971	24,565	48,744
Pamlico	83	11,368	12,934	15,095	1,566	2,161
Person	32	30,180	35,623	45,510	5,443	9,887
Pitt	42	108,480	133,798	187,000	25,318	53,202
Wake	85	426,311	627,846	1,071,768	201,535	443,922
Wayne	91	104,666	113,329	127,945	8,663	14,616
Wilson	81	66,061	73,814	88,418	7,753	14,604
Subtotal		1,513,831	1,928,808	2,796,005	414,977	867,197

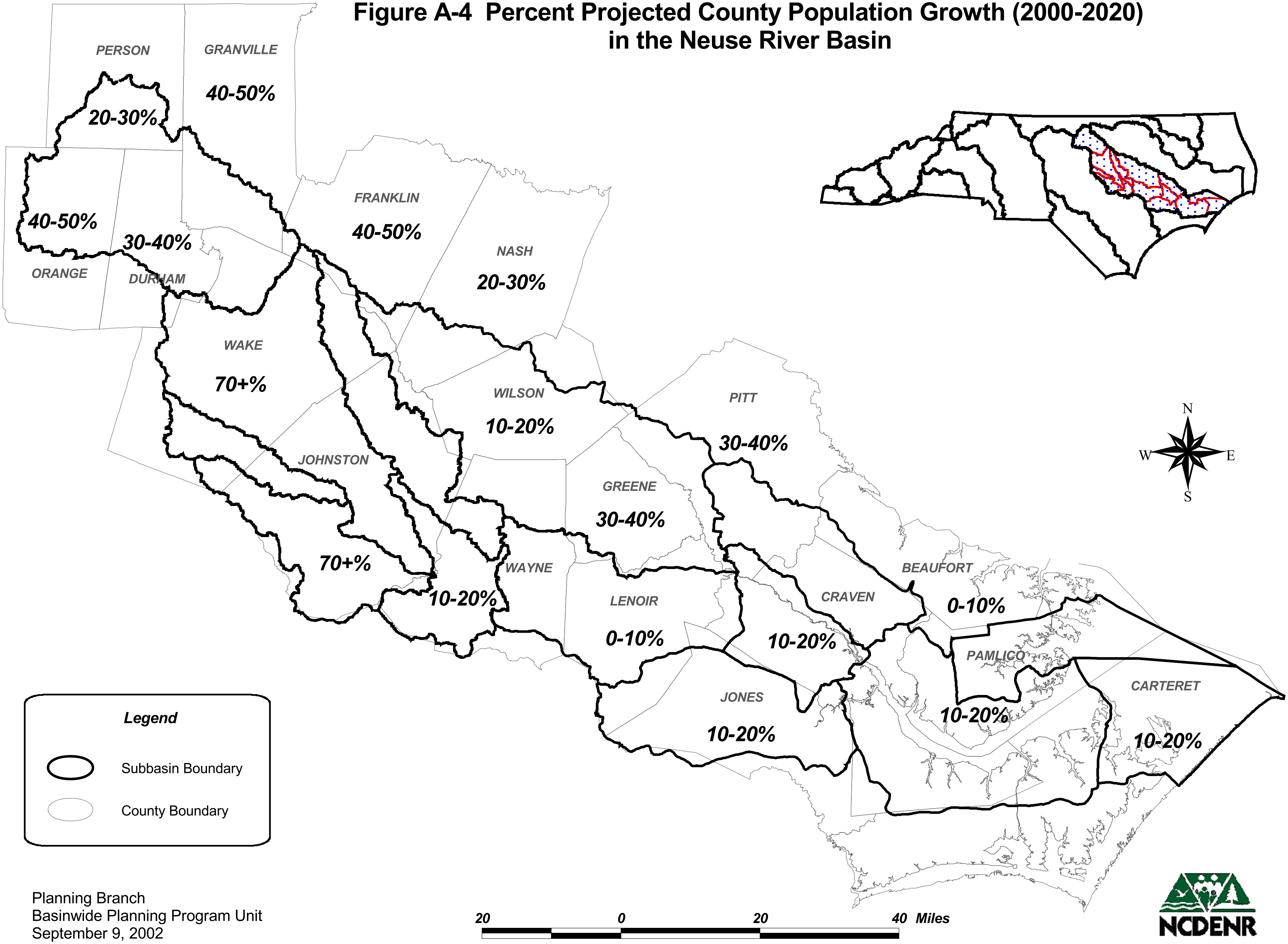
♦ Source: North Carolina Center for Geographic Information and Analysis

Note: The numbers reported reflect county population; however, these counties are not entirely within the basin. The intent is to demonstrate growth for counties located wholly or partially within the basin.

Populations of counties that are wholly or partly contained within the basin increased by over 414,000 people between 1900 and 2000. Figure A-4 presents projected population growth by county (2000-2020) for the Neuse River basin based on information developed by Triangle J Council of Governments. Durham, Johnston and Wake are growing the fastest in the upper basin, with Pitt County growing the fastest in the lower basin. The county populations are expected to grow by more than 867,000 by 2020 to almost three million people. With the increased population there will be increased drinking water demands and wastewater discharges. There will also be loss of natural areas and increases in impervious surfaces associated with construction of new homes and businesses.

For more information on past, current and projected population estimates, contact the Office of State Planning at (919) 733-4131 or visit their website at http://www.ospl.state.nc.us/demog/.

Figure A-4 Percent Projected County Population Growth (2000-2020) in the Neuse River Basin



Planning Branch
Basinwide Planning Program Unit
September 9, 2002

NCDENR

2.3.2 Municipal Population and Growth Trends

Table A-8 presents population data from Office of State Planning for municipalities with populations greater than 2,000 persons, located wholly or partly within the basin. The highest urban population growth has occurred in the upper basin around Raleigh, Cary and Durham.

Table A-8 Population (1980, 1990, 2000) and Population Change for Municipalities Greater Than 2,000 Located Wholly or Partly in the Neuse River Basin

Municipality	County	Apr-80	Apr-90	Apr-2000	Percent Change (1980-90)	Percent Change (1990-2000)
Apex •	Wake	2,847	4,789	20,212	68.2	322.1
Ayden	Pitt	4,361	4,883	4,622	12.0	-5.3
Benson •	Johnston	2,792	3,044	2,923	9.0	-4.0
Cary •	Chatham, Wake	21,763	44,397	94,536	104.0	112.9
Clayton	Johnston	4,091	4,756	6,973	16.3	46.6
Creedmoor	Granville	1,641	1,506	2,232	-8.2	48.2
Durham •	Durham, Orange, Wake	101,149	136,612	187,035	35.1	36.9
Farmville	Pitt	4,707	4,446	4,302	-5.5	-3.2
Fuquay-Varina •	Wake	3,110	4,447	7,898	43.0	77.6
Garner	Wake	10,073	14,716	17,757	46.1	20.7
Goldsboro	Wayne	31,871	40,709	39,043	27.7	-4.1
Greenville •	Pitt	35,740	46,305	60,476	29.6	30.6
Grifton	Pitt	2,179	2,393	2,073	9.8	-13.4
Havelock	Craven	17,718	20,300	22,442	14.6	10.6
Hillsborough	Orange	3,019	4,263	5,446	41.2	27.8
Holly Springs •	Wake	688	1,024	9,192	48.8	797.7
Kinston	Lenoir	25,234	25,295	23,688	0.2	-6.4
Knightdale	Wake	985	1,884	5,958	91.3	216.2
La Grange	Lenoir	3,147	2,805	2,844	-10.9	1.4
Morrisville •	Durham, Wake	251	1,489	5,208	493.2	249.8
Mount Olive •	Duplin, Wayne	4,876	4,582	4,567	-6.0	-0.3
New Bern	Craven	14,557	17,363	23,128	19.3	33.2
Raleigh	Wake	150,255	212,092	276,093	41.2	30.2
River Bend	Craven	959	2,408	2,923	151.1	21.4
Roxboro •	Person	7,532	7,332	8,696	-2.7	18.6
Selma	Johnston	4,762	4,600	5,914	-3.4	28.6
Smithfield	Johnston	7,288	7,540	11,510	3.5	52.7
Trent Woods	Craven	1,177	2,366	4,192	101.0	77.2
Wake Forest	Wake	3,780	5,832	12,588	54.3	115.8
Wendell	Wake	2,222	2,921	4,247	31.5	45.4
Wilson	Wilson	34,424	36,930	44,405	7.3	20.2
Winterville	Pitt	2,052	3,069	4,791	49.6	56.1
Zebulon	Johnston, Wake	2,055	3,173	4,046	54.4	27.5

• - The numbers reported reflect municipality population; however, these municipalities are not entirely within the basin. The intent is to demonstrate growth for municipalities located wholly or partially within the basin.

Apex, Cary, Holly Springs, Knightdale, Morrisville and Wake Forest had very high growth rates. Raleigh and Durham also increased population substantially in the last ten years.

2.3.3 Basin Population and Population Density

Most population data are collected from within county or municipal boundaries. It is difficult to evaluate population and population density within watersheds using this information. Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. The Triangle J Council of Governments has used GIS to present 2000 census block data by watershed units (Figure A-5). This information is presented to summarize population and population density by each subbasin and for the entire basin.

The overall population of the basin based on Triangle J Council of Governments analysis is 1,353,617, with approximately 211 persons/square mile. Stoney Creek (subbasin 03-04-05) is the most densely populated local watershed with 2,573 persons/square mile. Fifty-four percent of the basin population is located in 10 percent of the basin land area. The watersheds with the highest population densities are near Raleigh, Durham, Goldsboro, Kinston, New Bern and Wilson.

2.4 Local Governments and Planning Jurisdictions in the Basin

The Neuse River basin encompasses all or portions of 18 counties and 74 municipalities. Table A-9 provides a listing of these municipalities, along with the regional planning jurisdiction (Council of Governments). Twelve municipalities are located in more than one major river basin.

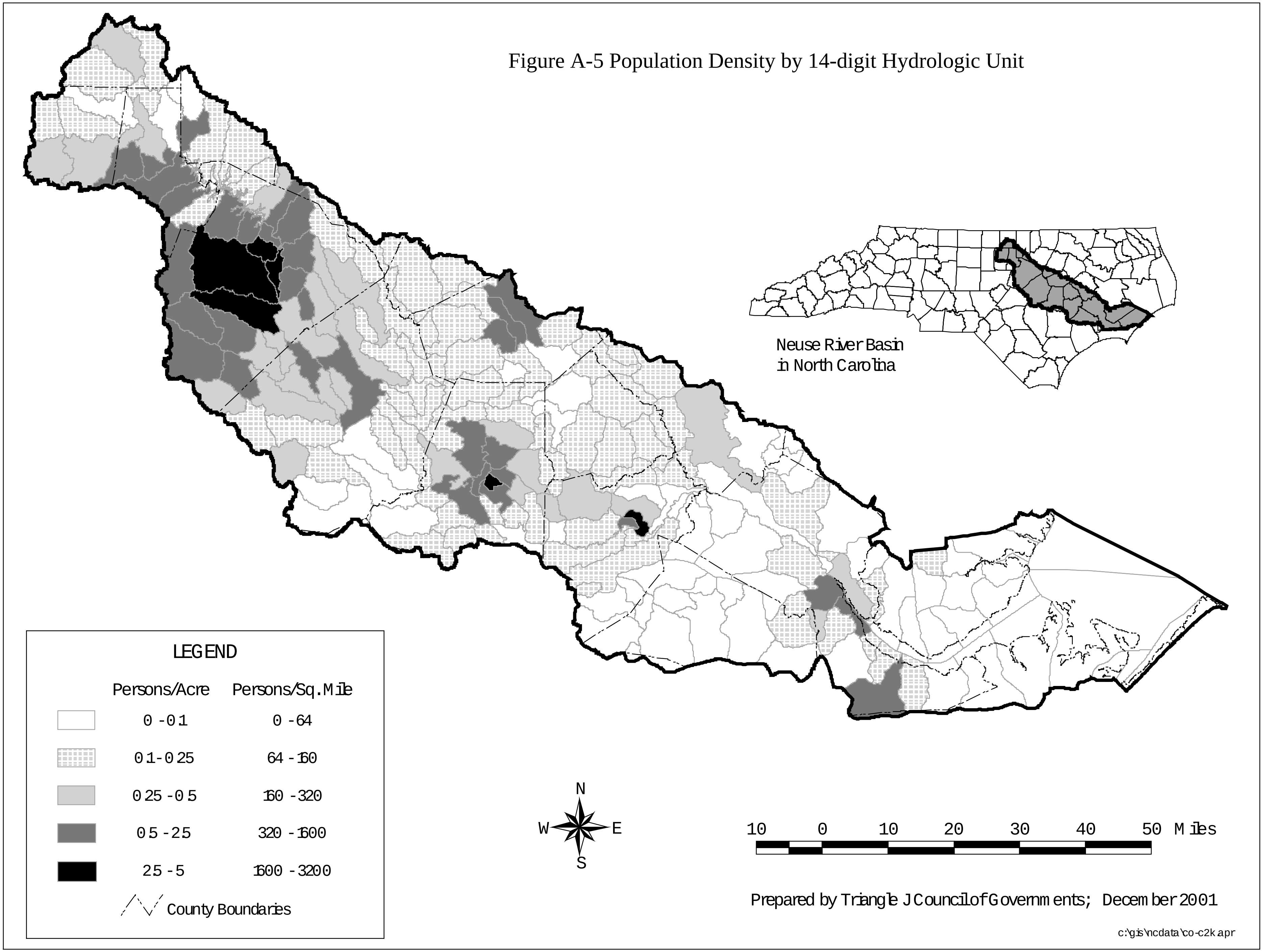


Figure A-5 Population Density by 14-digit Hydrologic Unit

Table A-9 Local Governments and Planning Units within the Neuse River Basin

County	Region	Municipalities
Beaufort	Q	None
Carteret	P	None
Craven	P	Bridgeton, Cove City, Dover, Havelock, New Bern, River Bend, Trent Woods, Vanceboro
Duplin	P	Mount Olive * ♦
Durham	J	Durham * ♦, Morrisville * ♦
Franklin	K	Youngsville ♦
Granville	K	Creedmoor, Stem
Greene	P	Hookerton, Snow Hill, Walstonburg
Johnston	J	Benson ♦, Clayton, Four Oaks, Kenly *, Micro, Pine Level, Princeton, Selma, Smithfield, Wilson's Mills, Zebulon *
Jones	P	Pollocksville, Trenton
Lenoir	P	Kinston, La Grange, Pink Hill
Nash	L	Bailey, Middlesex
Orange	J	Durham * ♦, Hillsborough
Pamlico	P	Alliance, Arapahoe, Bayboro, Grantsboro, Mesic, Minnesott Beach, Oriental, Stonewall, Vandemere
Person	K	Roxboro ♦
Pitt	Q	Ayden, Farmville, Fountain ♦, Greenville ♦, Grifton, Winterville
Wake	J	Apex ♦, Cary * ♦, Durham * ♦, Fuquay Varina ♦, Garner, Holly Springs ♦, Knightdale, Morrisville * ♦, Raleigh, Rolesville, Wake Forest, Wendell, Zebulon *
Wayne	P	Eureka, Fremont, Goldsboro, Mount Olive * ♦, Pikeville, Seven Springs, Walnut Creek
Wilson	L	Black Creek, Kenly *, Lucama, Saratoga, Sims, Stantonsburg, Wilson

* Located in more than one county.

♦ Located in more than one major river basin.

Note: Counties adjacent to and sharing a border with a river basin are not included as part of that basin if only a trace amount of the county (<2 percent) is located in that basin, unless a municipality is located in that county. (Note: Duplin County is included because of the municipality, Mount Olive. Also, Cary is located in Chatham County, which is not a county within the Neuse River basin.)

Region	Name	Location
J	Triangle J Council of Governments	Research Triangle Park
K	Kerr-Tar Regional Council of Governments	Henderson
L	Upper Coastal Plain Council of Governments	Rocky Mount
P	Eastern Carolina Council	New Bern
Q	Mid-East Commission	Washington

2.5 Land Cover

Land cover can be an important way to evaluate the effects of land use changes on water quality. Unfortunately, the tools and database to do this on a watershed scale are not yet available. Parts 2.5.1 and 2.5.2 below describe two different ways of presenting land cover in the Neuse River basin. The CGIA land cover information is useful in providing a snapshot of land cover in the basin from 1993 to 1995. This information is also available in a GIS format so it can be manipulated to present amounts of the different land covers by subbasin or at the watershed scale. The NRI land cover information is presented only at a larger scale (8-digit hydrologic unit), but the collection methods allow for between year comparisons. The two datasets cannot be compared to evaluate land cover data. This information is presented to provide a picture of the different land covers and some idea of change in land cover over time. In the future, it is hoped that land cover information like the GIS formatted dataset will be developed to make more meaningful assessments of the effects of land use changes on water quality. This dataset would also be useful in providing reliable and small-scale information on land cover changes that can be used in water quality monitoring, modeling and restoration efforts.

2.5.1 CGIA Land Cover

The North Carolina Corporate Geographic Database contains land cover information for the Neuse River basin based on satellite imagery from 1993-1995. The state's Center for Geographic Information and Analysis (CGIA) developed 24 categories of statewide land cover information. For the purposes of this report, those categories have been condensed into five broader categories as described in Table A-10. Figure A-6 provides an illustration of the relative amount of land area that falls into each major cover type for the Neuse River basin. Section B of this plan provides land cover data specific to each subbasin based on this information.

Table A-10 Description of Major CGIA Land Cover Categories

Land Cover Type	Land Cover Description
Urban	Greater than 50 percent coverage by synthetic land cover (built-upon area) and municipal areas.
Cultivated Cropland	Areas that are covered by crops that are cultivated in a distinguishable pattern.
Pasture/Managed Herbaceous	Areas used for the production of grass and other forage crops and other managed areas such as golf courses and cemeteries. Also includes upland herbaceous areas not characteristic of riverine and estuarine environments.
Forest/Wetland	Includes salt and freshwater marshes, hardwood swamps, shrublands and all kinds of forested areas (such as needleleaf evergreens, deciduous hardwoods).
Water	Areas of open surface water, areas of exposed rock, and areas of sand or silt adjacent to tidal waters and lakes.

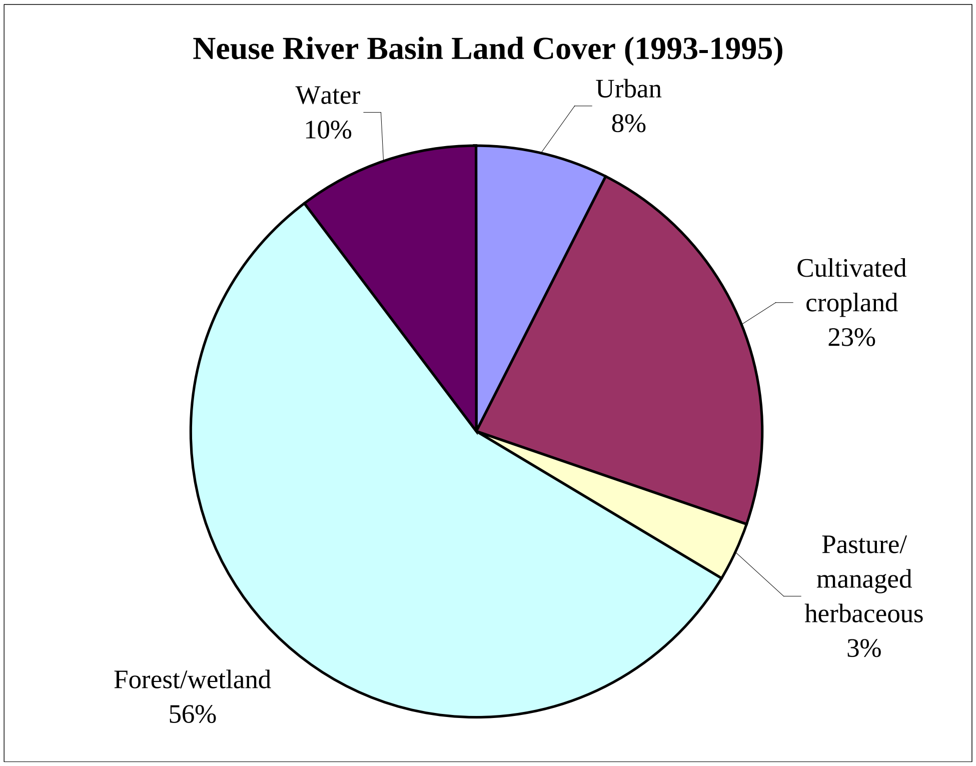


Figure A-6 Percentages within Major CGIA Land Cover Categories in the Neuse River Basin

2.5.2 NRI Land Cover Trends

Land cover information in this section is from the most current National Resources Inventory (NRI), as developed by the Natural Resources Conservation Service (USDA, updated June 2001). The National Resources Inventory (NRI) is a statistically based longitudinal survey that has been designed and implemented to assess conditions and trends of soil, water and related resources on the Nation's nonfederal rural lands. The NRI provides results that are nationally and temporally consistent for four points in time -- 1982, 1987, 1992 and 1997.

In general, NRI protocols and definitions remain fixed for each inventory year. However, part of the inventory process is that the previously recorded data are carefully reviewed as determinations are made for the new inventory year. For those cases where a protocol or definition needs to be modified, all historical data must be edited and reviewed on a point-by-point basis to make sure that data for all years are consistent and properly calibrated. The following excerpt from the *Summary Report: 1997 National Resources Inventory* provides guidance for use and interpretation of current NRI data:

> *"The 1997 NRI database has been designed for use in detecting significant changes in resource conditions relative to the years 1982, 1987, 1992 and 1997. All comparisons for two points in time should be made using the new 1997 NRI database. Comparisons made using data previously published for the 1982, 1987 or 1992 NRI may provide erroneous results because of changes in statistical estimation protocols, and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected."*

Table A-11 summarizes acreage and percentage of land cover from the 1997 NRI for the major watersheds within the basin, as defined by the USGS 8-digit hydrologic units (Table A-3), and compares the coverages to 1982 land cover. Definitions of the different land cover types are presented in Table A-12.

Data from 1982 are also provided for a comparison of change over fifteen years. During this period, urban and built-up land cover increased by 227,000 acres. Uncultivated cropland and pastureland also increased by 60,000 acres. Forest and cultivated cropland cover significantly decreased by 128,000 and 180,000 acres, respectively. Most land cover change is accounted for in the upper Neuse hydrologic unit that includes rapidly growing areas in Wake, Durham and Johnston counties. Figure A-7 presents changes in land cover between 1982 and 1997.

Table A-11 Land Cover in the Neuse River Basin by Major Watersheds – 1982 vs. 1997 (Source: USDA-NRCS, NRI, updated June 2001)

	MAJOR WATERSHED AREAS												
	Upper Neuse		Lower Neuse		Contentnea		Lower Neuse		1997 TOTALS		1982 TOTALS		% change
LAND COVER	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% TOTAL	Acres (1000s)	% TOTAL	since 1982
Cult. Crop	296.7	19.3	208.7	30.7	240.0	38.6	129.3	15.7	874.7	23.9	1054.4	28.8	-17.0
Uncult. Crop	25.4	1.7	16.3	2.4	8.8	1.4	3.4	0.4	53.9	1.5	13.1	0.4	311.5
Pasture	73.2	4.8	44.0	6.5	13.6	2.2	5.4	0.7	136.2	3.7	116.7	3.2	16.7
Forest	684.1	44.6	330.8	48.7	269.7	43.3	356.9	43.4	1641.5	44.9	1769.4	48.3	-7.2
Urban & Built-Up	349.7	22.8	47.7	7.0	48.1	7.7	35.5	4.3	481.0	13.1	254.1	6.9	89.3
Federal	5.8	0.4	2.9	0.4	0.0	0.0	75.1	9.1	83.8	2.3	75.1	2.0	11.6
Other	99.4	6.5	29.2	4.3	42.3	6.8	216.0	26.3	386.9	10.6	381.0	10.4	1.5
Totals	1534.3	100.0	679.6	100.0	622.5	100.0	821.6	100.0	3658.0	100.0	3663.8	100.0	
% of Total Basin		41.9		18.5		17.0		22.4		99.8			
SUBBASINS	03-04-01 03-04-03 03-04-06	03-04-02 03-04-04 03-04-12	03-04-05 03-04-08 03-04-09		03-04-07		03-04-10 03-04-11						
8-Digit Hydraulic Units	03020201		03020202		03020203		03020204						

* = Watershed areas as defined by the 8-Digit Hydraulic Units do not necessarily coincide with subbasin titles used by DWQ.

Source: USDA, Soil Conservation Service - 1982 and 1997 NRI

** 270 square miles of Neuse River subbasin 03-04-13 is contained in hydrologic unit 03020105.
The hydrologic unit 03020105 is discussed in the Tar-Pamlico River Basin Water Quality Plan.
336 square miles of Neuse River subbasin 03-04-14 is contained in hydrologic unit 03020106.
The hydrologic unit 03020106 is discussed in the White Oak River Basin Water Quality Plan.
It is not currently feasible to estimate the land use in these portions to include the Neuse land cover estimates.

Table A-12 Description of Land Cover Types
(Source: USDA-NRCS, NRI, updated June 2001)

Type	Description
Cultivated Cropland	Harvestable crops including row crops, small-grain and hay crops, nursery and orchard crops, and other specialty crops.
Uncultivated Cropland	Summer fallow or other cropland not planted.
Pastureland	Includes land that has a vegetative cover of grasses, legumes and/or forbs, regardless of whether or not it is being grazed by livestock.
Forestland	At least 10 percent stocked (a canopy cover of leaves and branches of 25 percent or greater) by single-stemmed trees of any size which will be at least 4 meters at maturity, and land bearing evidence of natural regeneration of tree cover. The minimum area for classification of forestland is 1 acre, and the area must be at least 1,000 feet wide.
Urban and Built-up Areas	Includes airports, playgrounds with permanent structures, cemeteries, public administration sites, commercial sites, railroad yards, construction sites, residences, golf courses, sanitary landfills, industrial sites, sewage treatment plants, institutional sites, water control structure spillways and parking lots. Includes highways, railroads and other transportation facilities if surrounded by other urban and built-up areas. Tracts of less than 10 acres that are completely surrounded by urban and built-up lands.
Other	*Rural Transportation*: Consists of all highways, roads, railroads and associated rights-of-way outside urban and built-up areas; private roads to farmsteads; logging roads; and other private roads (but not field lanes). *Small Water Areas*: Waterbodies less than 40 acres; streams less than 0.5 miles wide. *Census Water*: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than 0.5 miles in width. *Minor Land*: Lands that do not fall into one of the other categories.

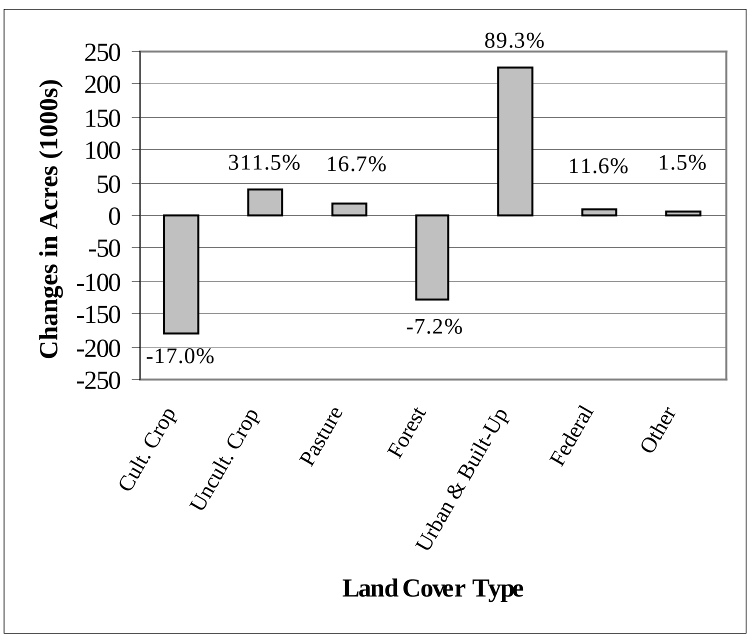


Figure A-7 Land Cover Changes from 1982 to 1997 for the Neuse River Basin
(Source: USDA-NRCS, NRI, updated June 2001)

2.6 NPDES Permits Summary

> ***The primary pollutants associated with point source discharges are:***
>
> * oxygen-consuming wastes,
> * nutrients,
> * color, and
> * toxic substances including chlorine, ammonia and metals.

Discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge are broadly referred to as 'point sources'. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems serving schools, commercial offices, residential subdivisions and individual homes. Stormwater point source discharges include stormwater collection systems for municipalities that serve populations greater than 100,000 and stormwater discharges associated with certain industrial activities. Point source dischargers in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit. Discharge permits are issued under the NPDES program, which is delegated to DWQ by the Environmental Protection Agency.

2.6.1 Permitted Wastewater Discharges

> ***Types of Wastewater Discharges***
>
> **Major Facilities**: Wastewater Treatment Plants with flows ≥1 MGD (million gallons per day); and some industrial facilities (depending on flow and potential impacts to public health and water quality).
>
> **Minor Facilities**: Facilities not defined as Major.
>
> **100% Domestic Waste**: Facilities that only treat domestic-type waste (from toilets, sinks, washers).
>
> **Municipal Facilities**: Public facilities that serve a municipality. Can treat waste from homes and industries.
>
> **Nonmunicipal Facilities**: Non-public facilities that provide treatment for domestic, industrial or commerical wastewater. This category includes wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation, and other facilities such as schools, subdivisions, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

Currently, there are 157 permitted wastewater discharges in the Neuse River basin. Table A-13 provides summary information (by type and subbasin) about the discharges. Various types of dischargers listed in the table are described in the inset box. A list of all facilities can be found in Appendix I. Facilities are mapped in each subbasin chapter in Section B. A location key to the facilities is provided at the beginning of Appendix I. Because the GIS data have not been updated as recently as the NPDES database, refer to Appendix I to determine the most current status of individual NPDES permit holders.

The majority of NPDES permitted wastewater flow into the waters of the Neuse River basin are from major municipal wastewater treatment plants. Nonmunicipal discharges also contribute substantial wastewater flow into the Neuse River basin. Facilities, large or small, where recent data show problems with a discharge are listed and discussed in each subbasin chapter in Section B.

Table A-13 Summary of NPDES Dischargers and Permitted Flows for the Neuse River Basin (as of 9/26/01)

	Neuse River Subbasin														
Facility Categories	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**Total**
Total Facilities	19	52	13	2	8	6	24	3	3	19	3	4	1	0	157
Total Permitted Flow (MGD)	26.99	87.35	17.15	1.5	15.66	0.91	21.24	32.44	0.25	11.20	0.4	12.88	0.0	0.0	227.97
Major Discharges	3	7	2	1	3	0	4	1	0	4	0	2	0	0	27
Total Permitted Flow (MGD)	26.5	85.88	16.4	1.5	14.85	0.0	20.2	32.0	0.0	10.2	0.0	12.2	0.0	0.0	219.73
Minor Discharges	16	45	11	1	5	6	20	2	3	15	3	2	1	0	130
Total Permitted Flow (MGD)	0.49	1.47	0.75	0.0	0.81	0.91	1.04	0.44	0.25	1.00	0.4	0.68	0.0	0.0	8.24
100% Domestic Waste	8	23	5	0	2	4	4	1	0	4	1	0	0	0	52
Total Permitted Flow (MGD)	0.31	1.36	0.25	0.0	0.02	0.28	0.06	0.02	0.0	0.84	0.33	0.0	0.0	0.0	3.47
Municipal Facilities	3	5	3	1	4	1	9	0	1	4	1	3	0	0	35
Total Permitted Flow (MGD)	26.5	80.8	16.9	1.5	12.04	0.63	21.15	0.0	0.25	6.75	0.07	11.48	0.0	0.0	178.07
Nonmunicipal Facilities	16	47	10	1	4	5	15	3	2	15	2	1	1	0	122
Total Permitted Flow (MGD)	0.49	6.55	0.25	0.0	3.62	0.28	0.09	32.44	0.0	4.45	0.33	1.4	0.0	0.0	49.90

2.6.2 Other NPDES Permits

Stormwater permits are granted in the form of general permits (which cover a wide variety of more common activities) or individual permits. Excluding construction stormwater general permits, there are 132 general stormwater permits and 15 individual stormwater permits (see Appendix I for a listing). Refer to Part 4.7 for more information on stormwater programs and permits.

2.7 Animal Operations

In 1992, the Environmental Management Commission adopted a rule modification (15A NCAC 2H.0217) establishing procedures for managing and reusing animal wastes from intensive livestock operations. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following size: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system. Figure A-8 displays general locations of animal operations in the Neuse River basin.

Key Animal Operation Legislation (1995-2000)

1995 Senate Bill 974 requires owners of swine facilities with 250 or more animals to hire a certified operator. Operators are required to attend a six-hour training course and pass an examination for certification. Senate Bill 1080 established buffer requirements for swine houses, lagoons and land application areas for farms sited after October 1, 1995.

1996 Senate Bill 1217 required all facilities (above threshold populations) to obtain coverage under a general permit, beginning in January 1997, for all new and expanding facilities. DWQ was directed to conduct annual inspections of all animal waste management facilities. Poultry facilities with 30,000+ birds and a liquid waste management system were required to hire a certified operator by January 1997 and facilities with dry litter animal waste management systems were required to develop an animal waste management plan by January 1998. The plan must address three specific items: 1) periodic testing of soils where waste is applied; 2) development of waste utilization plans; and 3) completion and maintenance of records on-site for three years. Additionally, anyone wishing to construct a new, or expand an existing, swine farm must notify all adjoining property owners.

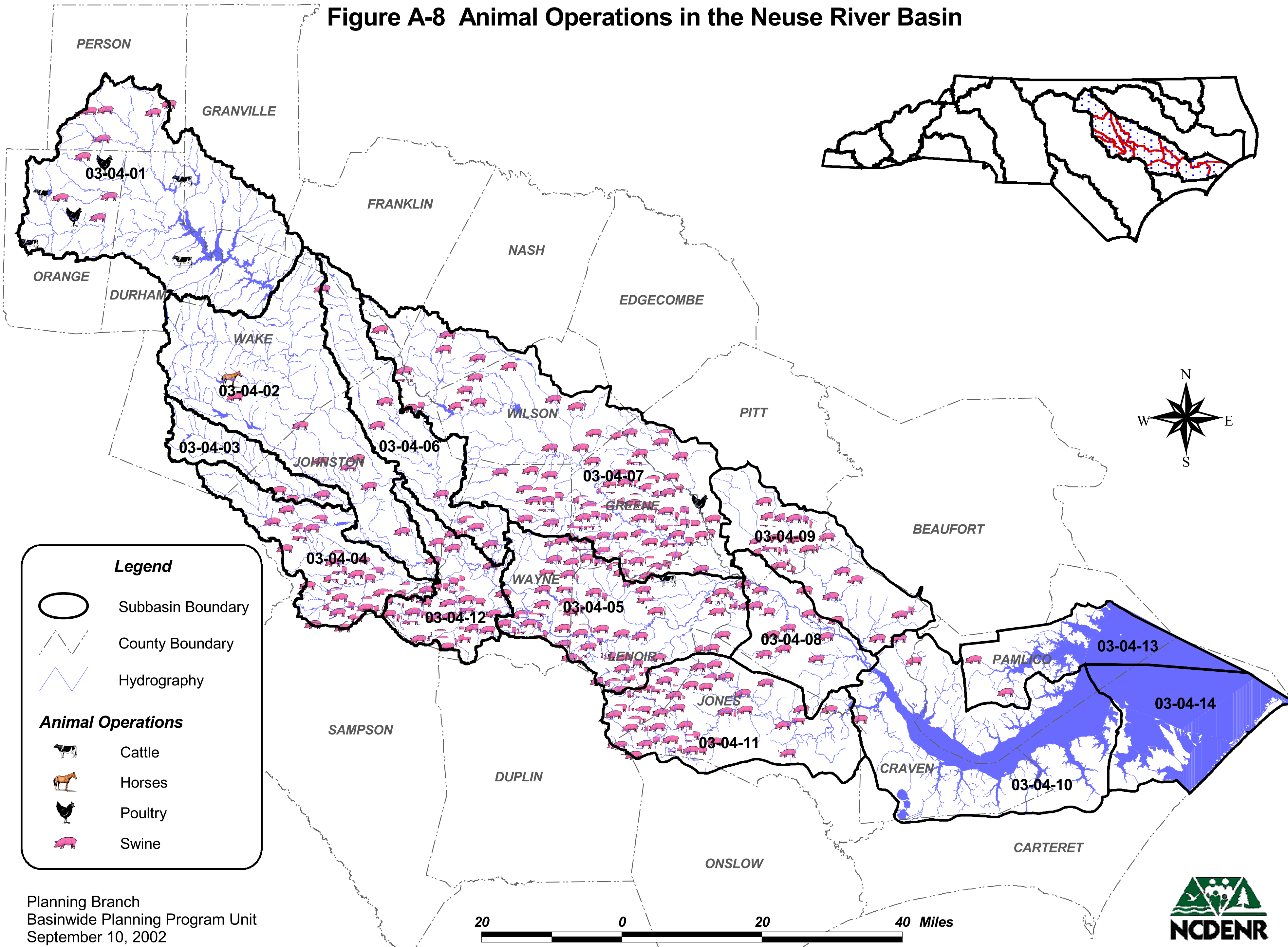
1997 House Bill 515 placed a moratorium on new or existing swine farm operations and allows counties to adopt zoning ordinances for swine farms with a design capacity of 600,000 pounds (SSLW) or more. In addition, owners of potential new and expanding operations are required to notify the county (manager or chair of commission) and local health department, as well as adjoining landowners. NCDENR was required to develop and adopt economically feasible odor control standards by March 1, 1999.

1998 House Bill 1480 extended the moratorium on construction or expansion of swine farms. The bill also requires owners of swine operations to register with DWQ any contractual relationship with an integrator.

1999 House Bill 1160 extended (again) the moratorium on new construction or expansion of swine farms, required NCDENR to develop an inventory of inactive lagoons. The Bill requires owners/operators of an animal waste treatment system to notify the public in the event of a discharge to surface waters of the state of 1,000 gallons or more of untreated wastewater.

2000 Attorney General Easley reached a landmark agreement with Smithfield Foods, Inc. to phase out hog lagoons and implement new technologies that will substantially reduce pollutants from hog farms. The agreement commits Smith field to phase out all anaerobic lagoon systems on 276 company-owned farms. Legislation will be required to phase out the remaining systems statewide within a 5-year period (State of Environment Report 2000).

Figure A-8 Animal Operations in the Neuse River Basin



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table A-14 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight as of January 2002. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in each subbasin.

Overall the majority of registered animal operations are found in the lower portion of the basin. Registered animal operations where recent data show problems are discussed in the appropriate subbasin chapter in Section B.

Steady State Live Weight (SSLW) is the result, in pounds, after a conversion factor has been applied to the number (head count) of swine, cattle or poultry on a farm. The conversion factors, which come from the US Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) guidelines, vary depending on the type of animals on the farm and the type of operation (for example, there are five types of hog farms). Since the amount of waste produced varies by hog size, SSLW is the best way to compare the sizes of the farms.

Between 1994 and 1998 there have been substantial increases in swine and poultry in the basin. In several areas, animal density is much greater than human populations. There has also been a decrease in dairy operations. Information on animal capacity by subbasin (Table A-15) was provided by the USDA.

Table A-14 Registered Animal Operations in the Neuse River Basin (as of 02/01/02)

Subbasin	Cattle			Poultry			Swine		
	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight
03-04-01	5	860	1,132,000	3	300,000	1,200,000	9	26,479	3,020,399
03-04-02	1	267	373,800				12	40,770	4,803,471
03-04-03							1	2,800	396,760
03-04-04							41	175,555	20,587,095
03-04-05	1	152	212,800				82	302,023	37,093,725
03-04-06							15	33,998	6,181,030
03-04-07							131	562,810	68,479,570
03-04-08							11	35,785	4,326,975
03-04-09							27	110,032	12,481,115
03-04-10							3	8,800	1,188,000
03-04-11							63	391,617	47,272,505
03-04-12				1	70,000	280,000	64	277,089	35,521,683
03-04-13							1	2,798	484,527
03-04-14							0		
TOTALS	**7**	**1,279**	**1,718,600**	**4**	**370,000**	**1,480,000**	**460**	**1,970,556**	**241,836,855**

Table A-15 Estimated Populations of Swine, Dairy and Poultry in the Neuse River Basin (1998 and 1994)

Subbasin	Total Swine Capacity		Swine Change	Total Dairy Capacity		Dairy Change	Poultry Capacity		Poultry Change
	1998	1994	94-98 (%)	1998	1994	94-98 (%)	1998	1994	94-98 (%)
03-04-01	13,249	14,960	-11	2,705	3,469	-22	405,575	289,675	40
03-04-02	24,297	19,905	22	706	706	0	429,439	279,064	54
03-04-03	4,550	5,893	-23	0	377	-100	138,032	138,000	0
03-04-04	175,037	91,124	92	0	0	0	985,640	747,260	32
03-04-05	595,186	339,331	75	818	1,044	-22	5,473,510	5,551,352	-1
03-04-06	38,415	17,709	117	214	214	0	478,607	449,264	7
03-04-07	634,346	354,066	79	220	422	-48	4,466,000	3,517,050	27
03-04-08	54,619	44,431	23	0	150	-100	471,000	480,000	-2
03-04-09	101,145	105,696	-4	0	0	0	130,300	130,300	0
03-04-10	17,152	17,565	-2	0	0	0	32,000	32,000	0
03-04-11	328,528	184,822	78	0	0	0	546,549	472,000	16
03-04-12									
03-04-13									
03-04-14									
TOTALS	1,986,524	1,195,502	66	4,663	6,382	-27	13,556,652	12,085,965	12
% of State Total	20%	22%		5%	5%		6%	7%	

2.8 Permitted Wetland and Stream Losses and Mitigation

DWQ tracks wetland and stream losses that are authorized through the issuance of a 401 Water Quality Certification. In addition to the permitted wetland and stream impacts that are tracked by DWQ, an unknown amount of wetland and stream losses also occurs because projects that affect less than one-third of an acre of wetland or less than 150 linear feet of stream are not required to receive written confirmation from DWQ, and therefore, might not be reported. The magnitude of unauthorized impacts to wetlands and streams is not known.

Over the past seven years (1995-2001), DWQ issued permits for approximately 2,900 acres of wetland fill and alteration activities that affected at least 67,000 linear feet of stream in the Neuse River basin. The Buckhorn Reservoir expansion (subbasin 03-04-07) accounted for 1,570 acres. A significant percentage of stream impacts statewide are associated with highway construction projects.

There were a total of 47.75 acres of wetland losses permitted by DWQ. Of the permitted losses, 35.64 acres were less than one acre in size. In the same period, there were 47,171 linear feet of stream impacts permitted. Of the permitted impacts, 14,954 linear feet were impacts of less than 150 feet in length. A total of 5,342 linear feet have been mitigated.

2.9 Natural Resources

2.9.1 Ecological Significance of the Neuse River Basin

The Neuse River basin contains many rare plants and animals. Nine animals associated with aquatic or wetland habitats are federally listed. Of these, the manatee, loggerhead, Atlantic ridley, piping plover and bald eagle are found primarily in estuarine habitats; whereas, the dwarf wedgemussel and the Tar River spinymussel occur in the Piedmont and upper Coastal Plain. Especially noteworthy are the number of state-listed mollusk species, nearly all of which are freshwater mussels.

2.9.2 Wetland Communities

Because the Neuse River spans two physiographic provinces - the coast and the lower Piedmont - the river basin contains a wide array of natural communities, both upland and wetland. The basin contains the full array of estuarine wetland communities, such as Salt Marsh, Brackish Marsh and Estuarine Fringe Loblolly Pine Forest. The basin also contains a few good examples of Tidal Freshwater Marsh, notably at the junction of the Trent and Neuse Rivers near New Bern. In addition, the northernmost Pine Savanna natural communities remaining in good condition are located in Croatan National Forest within the basin.

Nonriverine forested wetlands are prominent in the lower part of the basin. Pamlico County, in particular, contains high quality remnant stands of Nonriverine Swamp Forest and Nonriverine Wet Hardwood Forest. Often mixed with these nonriverine hardwood forests are communities of pocosin vegetation, such as Pond Pine Woodland, High Pocosin, Bay Forest and Low Pocosin. This association is especially notable in the Croatan National Forest.

A variety of riverine communities are represented in the basin, although they are not as mature and high quality as those in the Roanoke River basin. Examples of Cypress-Gum Swamp and Bottomland Hardwood communities are located on the Neuse floodplain upstream of New Bern in northwestern Craven County and below Smithfield in Johnston County. In the Piedmont, some of the best examples of Piedmont/Mountain Swamp Forest were destroyed by the creation of Falls Lake, but remnants of this rare natural community still exist in streams above the flooded portion of the lake.

2.9.3 Rare Aquatic and Wetland-Dwelling Animal Species

Table A-16 presents rare aquatic and wetland-dwelling species found in the Neuse River basin.

Table A-16 Rare Aquatic and Wetland-Dwelling Species (as of November 2000)

RARE AQUATIC ANIMALS			
		State Status	***Federal Status***
Mammal			
Trichechus manatus	Manatee	E	E
Reptile			
Alligator mississippiensis	American alligator	T	T(S/A)
Caretta caretta	Loggerhead	T	T
Lepidochelys kempii	Atlantic ridley	E	E
Malaclemys terrapin centrata	Carolina diamondback terrapin	SC	
Amphibian			
Necturus lewisi	Neuse River waterdog	SC	
Fish			
Acipenser brevirostrum	Shortnose sturgeon	E	E
Ambloplites cavifrons	Roanoke bass	SR	
Etheostoma collis pop 2	Carolina darter	SC	FSC
Lampetra aepyptera	Least brook lamprey	SC	
Lythrurus matutinus	Pinewoods shiner	SR	FSC
Notropis bifrenatus	Bridle shiner	SC	
Noturus furiosus pop 1	Carolina madtom	SC	
Mollusk			
Alasmidonta heterodon	Dwarf wedgemussel	E	LE
Alasmidonta undulata	Triangle floater	T	
Alasmidonta varicosa	Brook floater	E	FSC
Anodonta implicata	Alewife floater	T	
Elliptio lanceolata	Yellow lance	E	FSC
Elliptio marsupiobesa	Cape Fear spike	T	
Elliptio roanokensis	Roanoke slabshell	T	
Elliptio steinstansana	Tar River spinymussel	E	LE
Fusconaia masoni	Atlantic pigtoe	E*	FSC
Lampsilis cariosa	Yellow lampmussel	E*	FSC
Lampsilis radiata conspicua	Carolina fatmucket	T*	
Lampsilis radiata radiata	Eastern lampmussel	T*	
Lasmigona subviridis	Green floater	E	FSC
Ligumia nasuta	Eastern pondmussel	T*	
Somatogyrus virginicus	Panhandle pebblesnail	SR	FSC
Strophitus undulatus	Squawfoot	T	
Villosa constricta	Notched rainbow	SR	
Villosa delumbis	Eastern creekshell	SR	

Crustacean			
Orconectes carolinensis	North Carolina spiny crayfish	SR	
Insect			
Baetisca laurentina	a mayfly	SR	
Ceraclea tarsipunctata	a caddisfly	SR	
Dibusa angata	a caddisfly	SR	
Ephemerella berneri	a mayfly	SR	
Gomphus septima	Septima's clubtail	SR	FSC
Leptohyphes robacki	a mayfly	SR	
Matrioptila jeanae	a caddisfly	SR	
Psilotreta frontalis	a caddisfly	SR	
Shipsa rotunda	a stonefly	SR	
Tachopteryx thoreyi	Gray petaltail	SR	

Rare Species Listing Criteria

E =	Endangered (those species in danger of becoming extinct)
T =	Threatened (considered likely to become endangered within the foreseeable future)
SR =	Significantly Rare (those whose numbers are small and whose populations need monitoring)
SC =	Species of Special Concern
FSC =	Federal Species of Concern (those under consideration for listing under the Federal Endangered Species Act)

Rare Aquatic Animals – Vertebrates

The manatee is a sporadic visitor to estuarine waters in the basin. The species does not breed in the state, but individuals are sighted every few years, even as far inland as New Bern. The American alligator is present in the lower Neuse River basin, primarily in Croatan National Forest and Cherry Point Marine Corps Air Station. The American alligator is considered Threatened due to its similarity of appearance to other rare crocodilians. Loggerhead turtles nest along coastal beaches and forage in the ocean and in most of the sounds. Estuaries and tidal marshes are the preferred habitat for the other rare aquatic reptiles in the basin -- Carolina diamondback terrapin and Carolina salt marsh snake. An especially significant aquatic amphibian is the Neuse River waterdog, which is endemic to the Neuse and Tar systems in the upper Coastal Plain and lower Piedmont. Recent surveys indicate that its population is stable in the upper Neuse River basin. The lower Neuse River basin has not been evaluated.

Another aquatic vertebrate species endemic to North Carolina is the Carolina madtom. Like the Neuse River waterdog, this small fish lives only in the Neuse and Tar River basins. Among the other rare fishes in the Neuse River basin, the Roanoke bass and Carolina darter have restricted ranges, being limited mainly to the Piedmont and upper Coastal Plain of southern Virginia and North Carolina. The shortnose sturgeon moves from the ocean and estuaries into freshwater rivers to spawn between February and May. Juveniles may remain upriver for up to five years after birth before migrating to the ocean. Historically, shortnose sturgeon were widely reported from North Carolina rivers, but their numbers have declined greatly. Current distribution is not well known. Shortnose sturgeon can grow to over three feet in length and may live for up to 30 years.

<u>Rare Aquatic Animals – Mollusks</u>

Good water quality in the Neuse River basin is critical to the survival of a large number of rare freshwater mussels. Eighteen species of rare freshwater mussels, plus one rare snail (panhandle pebblesnail) are known from the Neuse River basin; and two species, the dwarf wedgemussel and Tar River spinymussel, are federally-listed as Endangered. The majority of the Neuse River basin mollusks, including the dwarf wedgemussel, inhabit small streams. Many of the larger rivers in the state, such as the mainstem of the Neuse River, no longer support populations of rare mussels. Most populations of the rare mollusk species occur in the Piedmont and upper Coastal Plain, in rapidly developing areas. The future of these populations is uncertain.

2.9.4 Significant Natural Heritage Areas in the Neuse River Basin

The North Carolina Natural Heritage Program (NHP) compiles the NC Department of Environment and Natural Resources' (NCDENR) list of Significant Natural Heritage Areas as required by the Nature Preserve Act (NCGS Chapter 113-A-164 of Article 9A). The list is based on the program's inventory of natural diversity in the state. Natural areas are evaluated on the basis of the occurrences of rare plant and animal species, rare or high quality natural communities, and geologic features. The global and statewide rarity of these elements and the quality of their occurrence at a site relative to other occurrences determine a site's significance rating. The sites included on this list are the best representatives of the natural diversity of North Carolina, and therefore, have priority for protection. Inclusion on the list does not imply that any protection or public access exists.

Figure A-9 shows the Significant Natural Heritage Areas in the Neuse River basin. Highlighted below are certain Significant Natural Heritage Areas known by the NHP as Significant Aquatic Habitats. They are stream segments or other bodies of water that contain significant natural resources, such as a high diversity of rare aquatic animal species. Also described in groups below are several natural areas that contribute to the maintenance of water quality in the Neuse River basin. More complete information on Significant Natural Heritage Areas and Aquatic Habitats may be obtained from the NHP. For more information, contact http://www.ils.unc.edu/parkproject/nhp/index.html.

The reaches of a stream identified by the NHP as Significant Aquatic Habitat only show the location of areas known for natural diversity. The impact from lands adjacent and upstream of these stream reaches will determine water quality and the viability of aquatic species.

<u>Eno River</u>

This river in Orange and Durham counties supports 14 rare animals: two fishes, one amphibian, eight mussels, one snail and two dragonflies. It contains the only currently known North Carolina population of the panhandle pebblesnail. Eno River State Park protects much of the land along the river, but protection is still needed for the land bordering the river's headwaters.

Flat River

Ten rare animal species - one fish, one amphibian and eight mussels - make their home in this river in Person and Durham counties. While the lower portions of the river are protected by NC State University's Hill Forest, protection is lacking for the lands along the upper portions of the river.

Swift Creek

This stream in southern Wake and Johnston counties contains 11 rare animals: one fish and ten mussels, including the federally endangered dwarf wedgemussel. Although there are several protected areas along the stream above Lake Wheeler, all of the rare animals live in the creek below Lake Benson, where there are no lands protected along the banks of the stream. Thus, protection efforts are greatly needed downstream of Lake Benson.

Turkey Creek

This stream in Nash and northwestern Wilson counties contains one rare amphibian and six rare mussel species, including the federally endangered dwarf wedgemussel. Though there is a protected site in its floodplain, there are no protected areas along the banks of the creek; thus, protection efforts are greatly needed.

Little River

The Neuse River basin contains two Little Rivers that contain rare species or communities. Beginning in Franklin County, the Little River that flows through Wake, Johnston and Wayne counties contains 12 rare animals: three fishes, one amphibian and eight mussels, including several populations of the federally endangered dwarf wedgemussel. The only protected site along the river is Mitchells Mill State Natural Area in Wake County. A reservoir, which will impact some of these rare species, will be constructed on the river downstream from Mitchells Mill State Natural Area. Aquatic species would benefit from protection efforts along the Little River.

Middle Creek

This tributary in southern Wake and Johnston counties contains 11 rare animals: two fishes, one amphibian and eight mussels, including the federally endangered dwarf wedgemussel. Most of the creek flows through private, unprotected lands.

Moccasin Creek

This stream runs along the boundaries of Wake, Franklin, Nash and Johnston counties and contains one rare amphibian and four rare mussel species, one of which is the federally endangered dwarf wedgemussel. Except for a very small nature preserve in Johnston County, there are no protected lands along this creek; thus, protection efforts are greatly needed.

Little River

The Little River of Durham and Orange counties is located in the headwaters of the Neuse River basin. The significant portion of the aquatic habitat originates as two separate forks in western Orange County, which join just after crossing the Orange/Durham county line. Rare species present in the aquatic habitat include: yellow lampmussel, Atlantic pigtoe, squawfoot, notched rainbow, Neuse River waterdog and Roanoke bass.

Contentnea Creek Aquatic Habitat

The section of Contentnea Creek that is most significant is located between Buckhorn Dam and Wiggin's Mill Reservoir. Known to occur in this high quality aquatic system are populations of the triangle floater, squawfoot, notched rainbow, Neuse River waterdog, pinewoods shiner and Carolina madtom.

Mill Creek Aquatic Habitat

Mill Creek is a small tributary of the Neuse River located in Johnston County, on the state's upper Coastal Plain. The significant aquatic habitat contains: the Carolina madtom, the Neuse River waterdog and large, reproducing populations of several non-listed mussel species.

Cedar Island Marshes; Cherry Point Piney Island; Jones Island; and Pamlico Point Marshes

These four sites collectively consist of thousands of acres of primarily brackish marsh where the Neuse River merges with Pamlico Sound. Large numbers of the rare and secretive black rail nest in these marshes, as do large numbers of other marsh birds. The first two sites, in Carteret County, are in federal ownership; whereas, most of the latter two sites, which are in Pamlico County, are in private ownership except for a portion of Pamlico Point owned by the NC Wildlife Resources Commission.

Sweetwater Creek Natural Area and Trent River/Brice Creek Marshes

These two natural areas lie in close proximity near the mouth of the Trent River near New Bern. Extensive examples of the uncommon wetland community, Tidal Freshwater Marsh, are present at the sites, and the former site contains the only known location of the globally rare Godfrey's sandwort in the state. Both sites are in private ownership and are in need of protection.

Neuse River Floodplain and Bluffs

This floodplain corridor, extending for approximately twenty air miles from New Bern upstream to Pitt County, consists mostly of swamp forests with a few marl outcrops present on vertical riverbanks. Progress has been made in protecting this natural area and the water quality of the Neuse. A few sections of the floodplain are owned by the NC Wildlife Resources Commission, and the North Carolina Coastal Land Trust has protected over 1,000 acres within the floodplain. There is one privately-owned Registered Natural Heritage Area as well. Protection is needed for this floodplain natural area.

Cliffs of the Neuse State Park

This relatively small state park protects about two miles of shoreline along the Neuse River in southeastern Wayne County. The park is best known for the natural communities of its high bluffs and wetlands, including bottomland hardwoods and cypress-gum swamp forests.

Neuse River/Brogden Bottomlands; Cowbone Oxbows; and Sage Pond/Neuse River Floodplain

These are the three most important sites in the floodplain of the Neuse River in southeastern Johnston County. The floodplain is remarkably wide (up to 4 miles) in this part of the basin. Even though much of the floodplain forests have been cut over, considerable acreage still remains in swamp and bottomland forest. This portion of the river contains several oxbow lakes, which are rare in North Carolina. No parts of this natural area are in public or otherwise protected ownership; thus, protection effort is greatly needed.

William B. Umstead State Park

This state park protects nearly 5,400 acres of forestland in the upper part of the Neuse River basin. Crabtree Creek flows for several miles through the park, which features bottomland hardwoods as well as several rhododendron bluffs along the creekbank.

Eno River State Park and Occoneechee Mountain

The state park protects more than eight miles of river frontage, mostly in various upland communities. Occoneechee Mountain is located upstream of the park, opposite the Town of Hillsborough. A portion of this monadnock, one of the highest hills in the eastern Piedmont, is managed by the Division of Parks and Recreation as a State Natural Area.

2.9.5 Fisheries

Since 1998, the NC Wildlife Resources Commission (NCWRC) has sampled the resident fish community using boat-mounted electrofishing gear at a number of locations in the Neuse River downstream of Goldsboro to New Bern as well as in its tributaries, Contentnea Creek and Trent River. Overall the number of species collected ranged from 11-29 with a mean of 20 species. At sites along the mainstem Neuse River, 16-26 species were collected, while at sites in Contentnea Creek and Trent River, 19-29 species and 11-26 species were collected, respectively. Freshwater fish species of recreational importance found in the Neuse River and tributaries included largemouth bass, bluegill, redear and redbreast sunfish, pumpkinseed, warmouth, black crappie, channel catfish, white catfish, blue catfish, flathead catfish, chain and redfin pickerel, and yellow and white perch. All of the species mentioned above except catfish are classified as inland game fish by the NCWRC. Nongame species commonly encountered included bowfin, common carp, longnose gar, pirate perch, satinfin shiner, V-lip redhorse, swallowtail shiner, silvery minnow and tessellated darter.

Largemouth bass and sunfish support popular fisheries year-round throughout the basin; however, peak fishing is in late spring and early summer. Anglers target black crappie in the late fall and early spring generally in the lower river and its tributaries. Yellow and white perch provide good fishing from late winter through the spring in the lower Neuse, in particular the Trent River. Channel, blue and flathead catfish provide additional angling opportunities throughout the year. Although large catfish (>20 lbs.) are common throughout the river and its major tributaries, much of the effort is concentrated from Goldsboro downstream to New Bern.

Anadromous species found within the Neuse River basin include striped bass, American shad, hickory shad, blueback herring and alewife. Although striped bass are caught year-round in the Neuse and Trent rivers near New Bern, these species mainly support seasonal fisheries as they migrate into freshwater reaches of the Neuse River to spawn each spring. From 1952 to 1998, spawning migrations of anadromous fish were impeded by Quaker Neck Dam, a low-head dam located near Goldsboro, and in most years spawning areas were limited to areas downstream of the dam. However, with the removal of Quaker Neck Dam in 1998, 74 miles of historical spawning habitat were restored. Anadromous species, in particular striped bass and American shad, now migrate upstream as far as Milburnie Dam near Raleigh, but the extent of upstream migration in a given year is highly dependent on river flows. Hickory shad, blueback herring and alewife are generally found from Goldsboro downstream to New Bern. In 2000, the Neuse River from Pitchkettle Creek upstream to Milburnie Dam in Craven, Pitt, Lenoir, Wayne, Johnston and Wake counties was designated by the NCWRC as Inland Primary Nursery Areas (15A NCAC 10C .0503).

Falls of the Neuse Reservoir is a 20,000-acre impoundment of the Neuse River located just north of Raleigh. This reservoir supports a highly valued largemouth bass fishery. During 2001, there were over 250 tournaments held for largemouth bass on this reservoir. Crappies are also a highly prized species for anglers on Falls of the Neuse Reservoir, along with channel catfish. Other species of interest include white bass, white perch and a variety of sunfish species.

2.9.6 Public Lands

As has been noted above, the Neuse River basin contains ecologically significant public lands in Eno River State Park, Cedar Island and other areas. In addition to Eno River State Park, Division of Parks and Recreation managed areas in the Neuse River basin include: William B. Umstead State Park, Waynesborough State Park, Cliffs of the Neuse State Park, Mitchell Mill State Natural Area and Occoneechee Mountain State Natural Area. The Wildlife Resources Commission manages Butner-Falls of Neuse Game Land, Caswell Farm Game Land, Cherry Farm Game Land, Goose Creek Game Land and Neuse River Game Land. State educational institution-owned land includes North Carolina State University's 1,700-acre Hill Demonstration Forest and Johnston Community College's 2,900-acre Howell Woods Environmental Learning Center. Camp Butner Training Site, owned by North Carolina National Guard, is a 4,000-acre training facility composed primarily of pine plantations and some quality natural areas, including Knap of Reeds Creek. The training facility is a large contiguous block of habitat relatively free of fragmentation – something increasingly rare in the North Carolina Piedmont; therefore, the Camp Butner (CBTS) is considered a significant natural resource.

Federally-owned land in the Neuse River basin includes both military and natural resource reservations. National Park Service owns Cape Lookout National Seashore, which includes Core Banks and Portsmouth Island. The US Fish and Wildlife Service manages Cedar Island National

Wildlife Refuge, while the US Army Corps of Engineers owns Falls Lake and land around the reservoir. State agencies, specifically the NC Wildlife Resources Commission and Division of Parks and Recreation, manage the land around Falls Lake for the Corps. The US Department of Defense owns Cherry Point, a Marine Corps Air Station with a number of large significant natural areas. A portion of the Croatan National Forest lies in the Neuse River basin, including most of the 9,000-acre Sheep Ridge Wilderness and a large part of the 8,000-acre Catfish Lake Wilderness. See Figure A-9 for the location of these state and federal public lands.

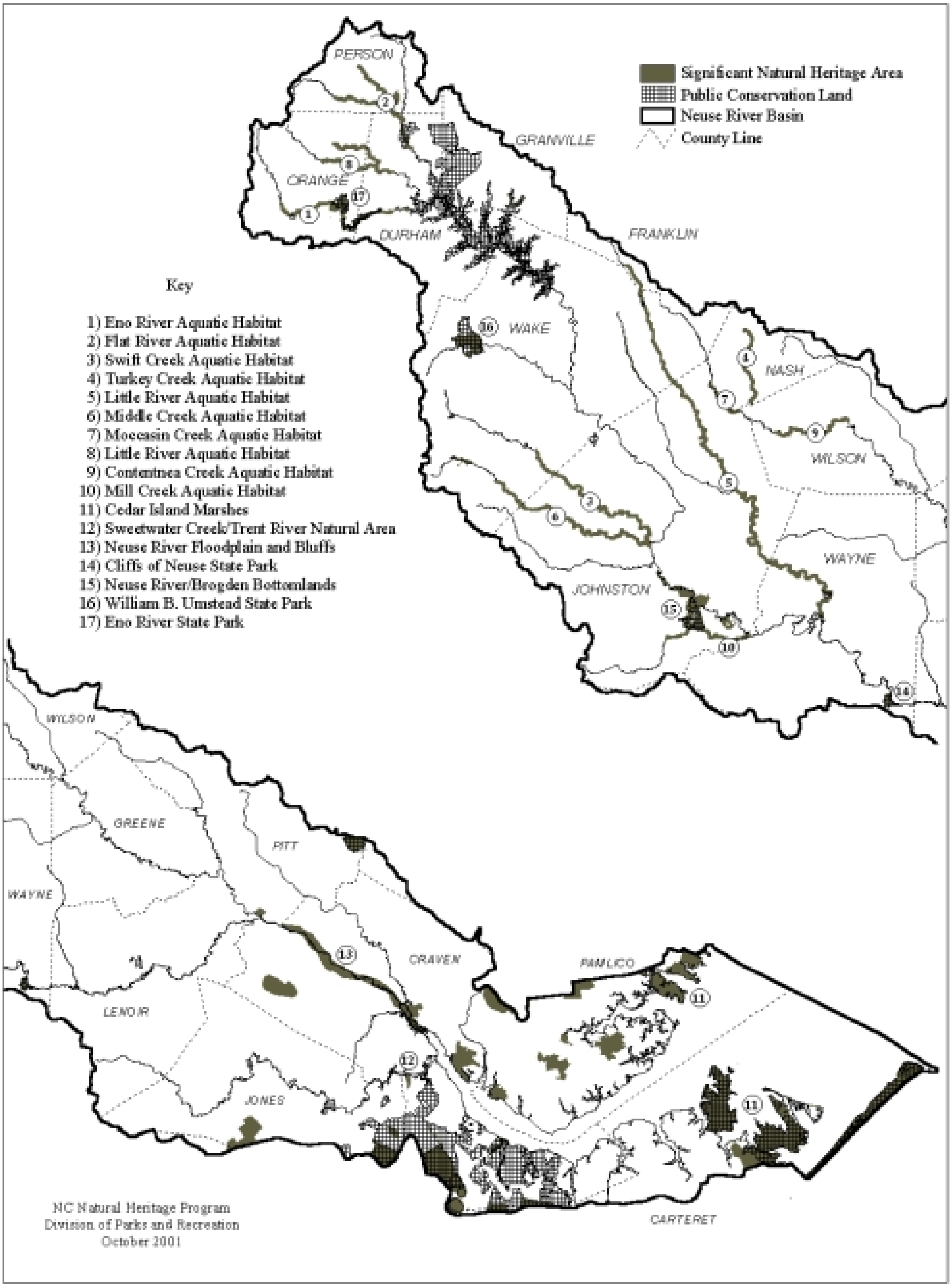


Figure A-9 Neuse River Basin Managed Lands and Significant Heritage Areas

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.

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.

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.

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)

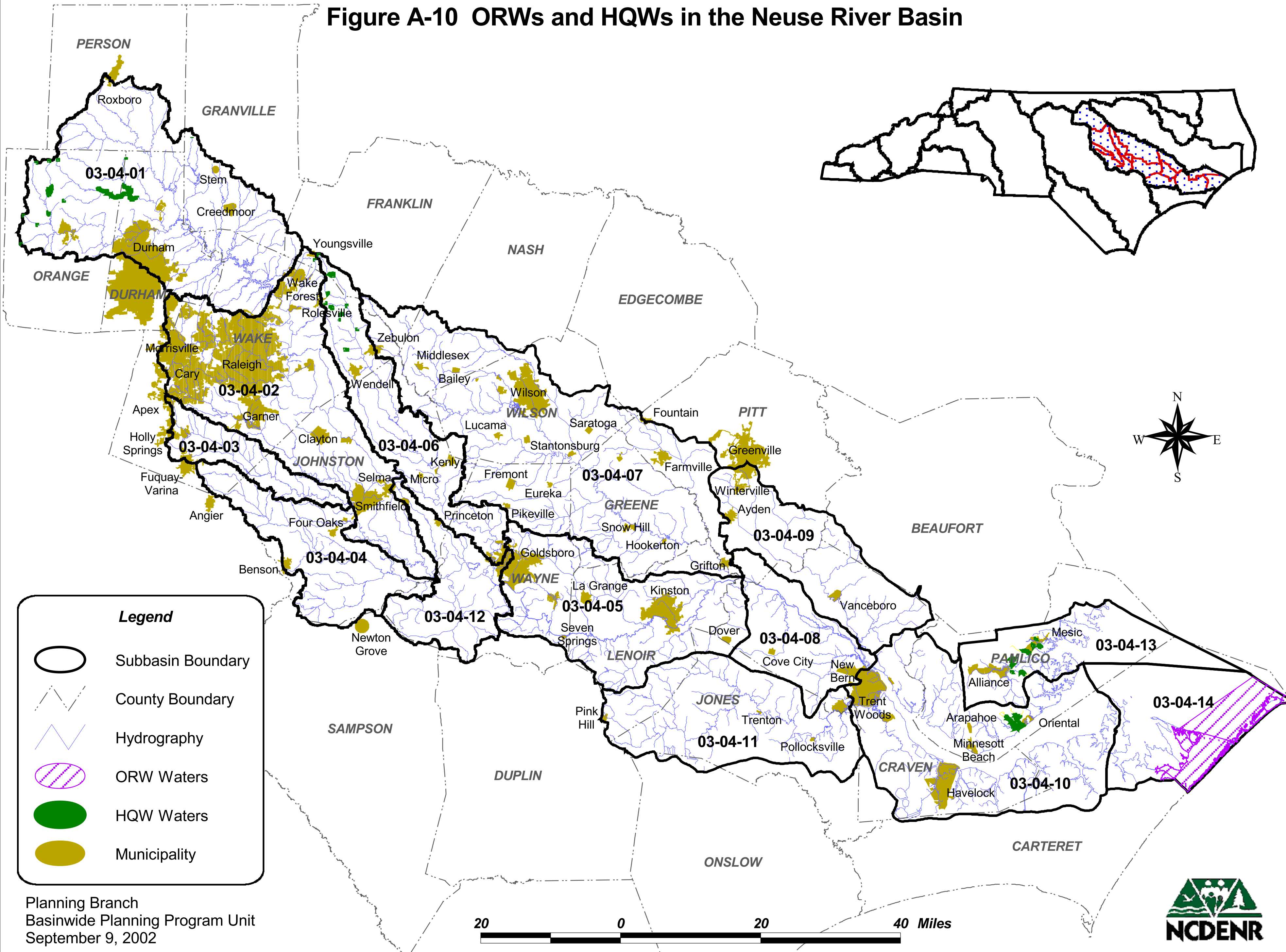
There are 10,951 freshwater acres, 27,230 estuarine acres, 78 stream miles, and 21 miles of Atlantic coastline classified for primary recreation in the Neuse River basin. Primary recreation is also a classified use of Class SA waters.

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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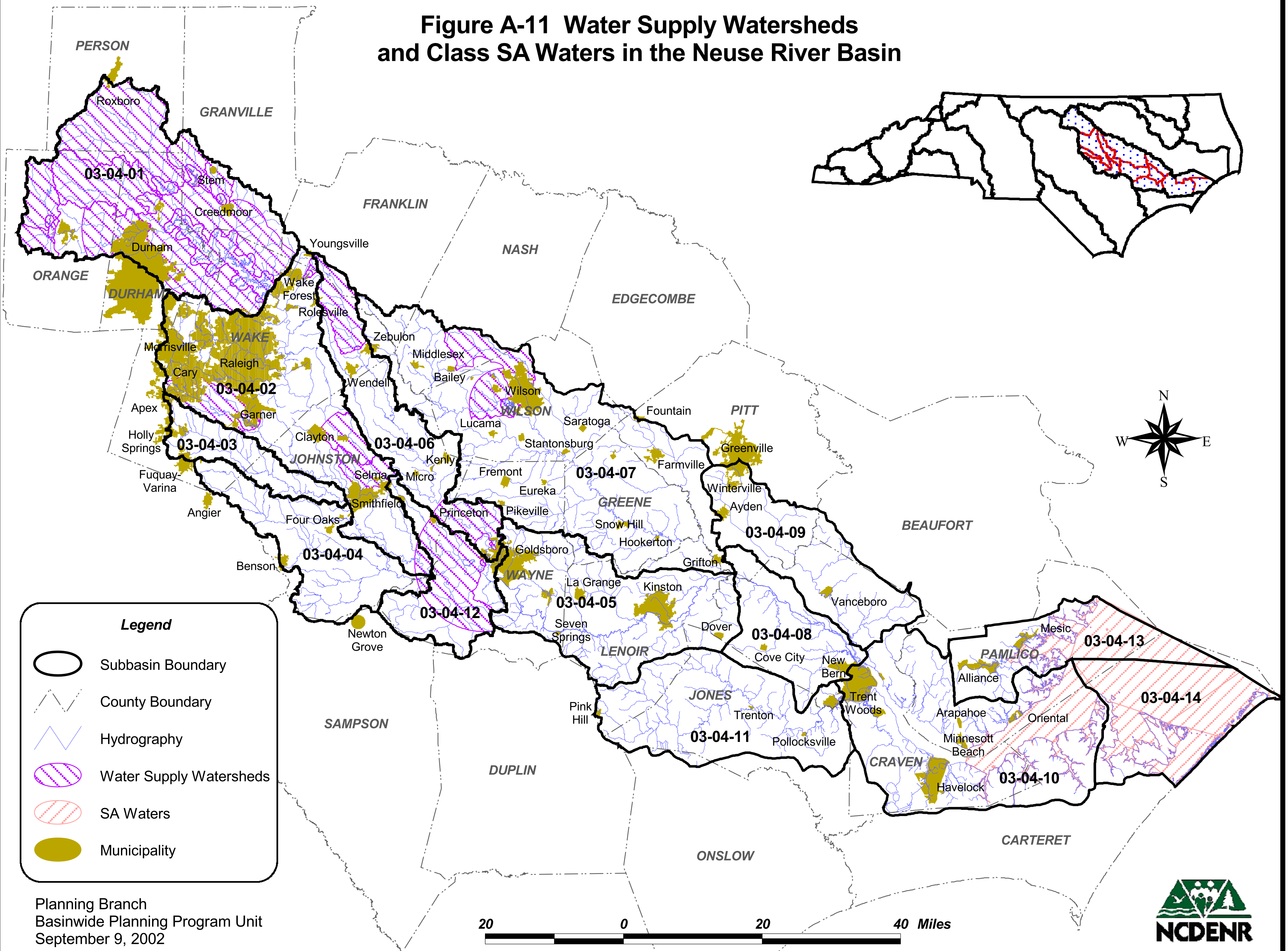
Basinwide Planning Program Unit
September 9, 2002

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.

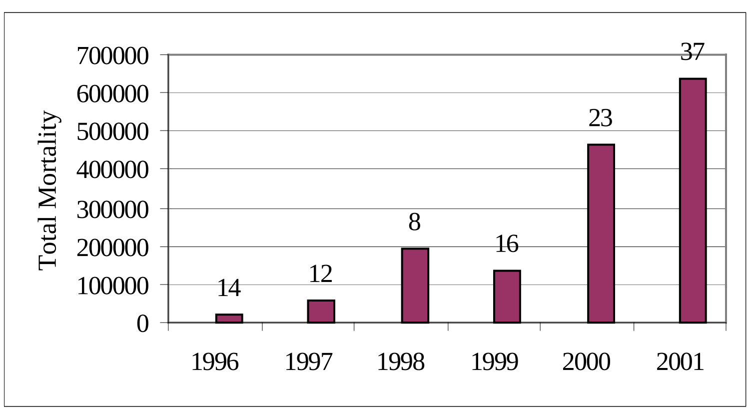


Figure A-12 Neuse River Basin Fish Kill Summary 1996-2001
(Number above bar represents number of reported events.)

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.

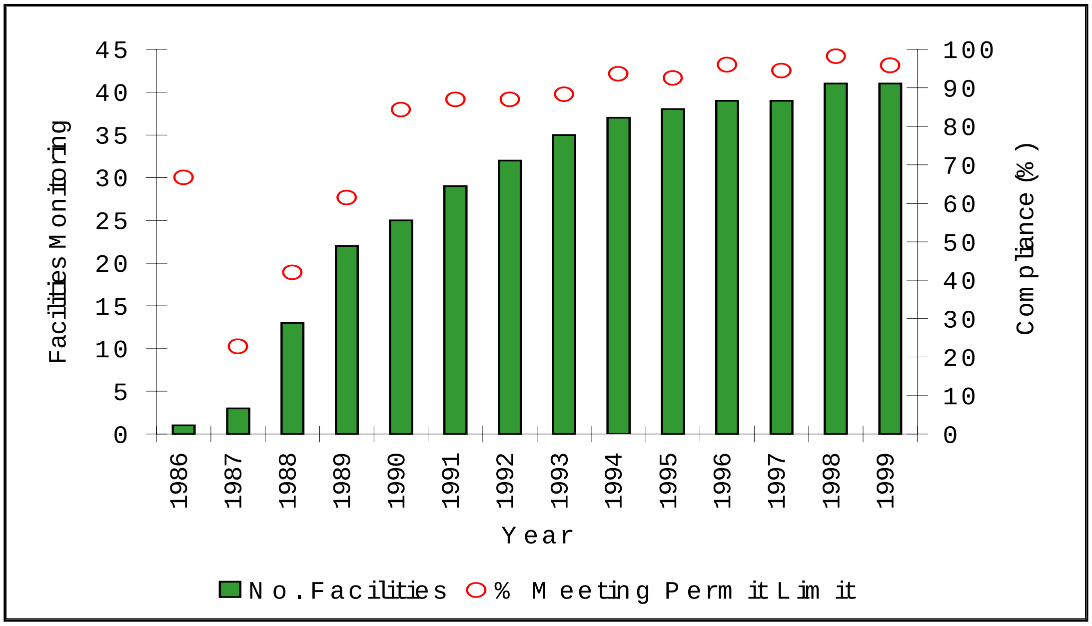


Figure A-13 Summary of Compliance with Aquatic Toxicity Tests in the Neuse River Basin

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

** 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).

Section A - Chapter 4
Water Quality Issues Related to Multiple Watersheds in the Neuse River Basin

4.1 Introduction

Parts 4.2 through 4.7 review the status of specific recommendations made for multiple watersheds in the 1998 Neuse River Basinwide Water Quality Plan. Current status and future recommendations are provided for each recommendation.

Parts 4.8 through 4.16 introduce new multiple watershed issues. These water quality issues were identified by DWQ regional and central office staff and by workshop participants. Recommendations are presented to help address these water quality issues.

Parts 4.17 through 4.21 discuss water quality problems that were commonly noted during the most recent use support assessment. Specific waters where these problems were observed are described in Section B. Current status and future recommendations are discussed for each water quality problem.

4.2 Neuse River Nutrient Sensitive Waters (NSW) Strategy

4.2.1 Introduction

Eutrophication became a water quality concern in the lower Neuse River basin in the late 1970s and early 1980s. Nuisance algal blooms prevalent in the upper estuary prompted investigations by DWQ. These investigations, as well as other studies, indicated that algal growth was being stimulated by excess nutrients entering the estuarine waters of the Neuse River. In 1988, a phosphate detergent ban was put in place and the lower Neuse River basin received the supplemental classification of nutrient sensitive waters (NSW). As part of this early NSW strategy, new and expanding NPDES discharges, as well as existing facilities with design flows greater than 0.05 MGD, were given a quarterly average phosphorus limit of 2 mg/l. Phosphorus loading was greatly reduced, and algal blooms in the river and freshwater portions of the estuary were reduced as a result of this action.

The 1993 Neuse River Basinwide Water Quality Plan recognized that eutrophication continued to be a water quality problem in the estuary below New Bern. Extensive fish kills in 1995 prompted further study of the problem. Low dissolved oxygen levels associated with algal blooms were determined to be a probable cause of many of the fish kills. Researchers also determined that the toxic dinoflagellate, *Pfiesteria piscida*, may have been responsible for many of the fish kills.

The algal blooms and correspondingly high levels of chlorophyll *a* prompted DWQ to place the Neuse River estuary on the 1994, 1996, 1998 and 2000 303(d) list of impaired waters. It was determined that control of nitrogen was needed to reduce the extent and duration of algal blooms.

In 1996, the NC Senate Select Committee on River Water Quality and Fish Kills sponsored a workshop with numerous scientists familiar with the Neuse River water quality problems. The group reached consensus that a 30 percent reduction in total nitrogen entering the estuary was a good starting goal. In 1996, the 30 percent reductions were put into law (Session Laws 1995, Section 572). The state funded the Neuse Modeling and Monitoring (MODMON) to quantitatively assess the interactions and pathways between nutrients, phytoplankton and dissolved oxygen in the estuary. A TMDL was developed to address the nitrogen overloading to the estuary. While the Neuse River estuary remains impaired, there have been reductions in nitrogen loading. The following sections discuss the TMDL and the current NSW strategy. For the complete NSW rules, visit http://h2o.enr.state.nc.us/admin/rules/#redbook. For the approved TMDL, visit http://h2o.enr.state.nc.us/tmdl/approved_TMDLS.htm.

4.2.2 Neuse River TMDL for Total Nitrogen

Current Status

The first phase of the TMDL for total nitrogen to the Neuse River estuary was conditionally approved by EPA in 1999. The second phase incorporates the latest tools from the Neuse River Modeling and Monitoring Project (MODMON) (page 72). This TMDL will address chlorophyll *a* as its endpoint but will seek to manage total nitrogen, which is the nutrient that has the best potential to limit excessive growth of algae, and thus, chlorophyll *a* in the estuary. Specifically, the TMDL target is to have less than 10 percent of chlorophyll *a* samples collected in the estuary over a specific time period to be over 40 µg/l. The TMDL will assess the amount of total nitrogen load reduction that is necessary to comply with this criterion. The draft of the second phase of the TMDL was completed in July 2001. The TMDL was approved by the EPA in March 2002.

2002 Recommendations

DWQ will use an adaptive management approach to implement the Neuse River estuary total nitrogen TMDL. Continued monitoring and model updates (page 72) will be used to evaluate the effectiveness of the TMDL and to make adjustments in the implementation strategy as needed to stem the eutrophication of the Neuse River estuary. The second phase of the TMDL model results and recent estuary monitoring indicate that the 30 percent total nitrogen load reduction from the 1991-1995 baseline is currently sufficient.

It is important that North Carolina does a conscientious job of achieving the 30 percent reduction. The Neuse River basin NSW strategies (discussed below) are scheduled to be fully implemented by 2003, and every effort should be made to meet that goal. Based on the range of results seen in the TMDL modeling, more than a 30 percent total nitrogen reduction may be needed in the future. This will be more evident as the adaptive management strategy proceeds. Specifically, the Neuse River should be monitored to determine if the 30 percent total nitrogen load reduction is achieved, and the estuary should be monitored to determine if the chlorophyll *a* criterion is met. This observed data may then be used in subsequent modeling efforts (presumably updates to existing estuary models) to update the expected reduction needed.

By making use of additional data and updating the models and analyses, DWQ and MODMON will be able to reduce the prediction uncertainty to narrow the range of total nitrogen load reduction that may be required. It is also important to note that no matter where the reduction target is set in this phase of the TMDL, the estuary will not be removed from the list of impaired waters until it meets its designated uses.

Reductions in nutrient inputs may take time to appear in measured loading, due to year-to-year variability in precipitation and flow. It may take more than five years to discern a 30 percent decrease in load.

4.2.3 Protection and Maintenance of Existing Forested Riparian Areas

Current Status

The purpose of the riparian buffer rule is to maintain the nutrient removal function of natural riparian areas along stream corridors. The riparian area that is to be maintained extends 50 feet from intermittent and perennial streams, lakes, ponds, sounds and estuaries, and oceans. This 50-foot area would consist of 30 feet of virtually undisturbed natural vegetation and 20 feet of grass, vegetation or trees that could be harvested to some extent. This rule does not apply to land uses in existence prior to the rule. DWQ received some funding to help staff the Raleigh and Washington Regional Offices to enforce the buffer rule.

2002 Recommendations

Because the buffer rule does not require existing land uses to establish or reestablish buffers, the rule will only help to prevent future increases in nitrogen reaching surface waters. DWQ will continue to enforce this rule to maintain existing nutrient removal functions of riparian buffers. It is also recommended that local governments in high growth areas adopt more stringent buffer rules that protect ephemeral streams as well. Local governments and individuals should also identify areas where buffers can be reestablished.

4.2.4 Wastewater Discharge Requirements

Current Status

The purpose of this rule was to set minimum nutrient control requirements for discharges to surface waters in the Neuse River basin. The Lower Neuse Basin Association (LNBA) (page 220) was formed with the goal of meeting the requirements of the rule as a community. To date, and with great effort and expenditure, the discharges have realized a 30 percent reduction of nitrogen into waters of the Neuse River basin while expanding in capacity. The point source dischargers have improved treatment operations, reduced flow and initiated reuse projects, and started formation of a compliance group.

Most or all of the large dischargers have evaluated their existing treatment facilities and undertaken or completed measures to improve their nutrient removal capabilities. These projects include process improvements at Raleigh and low-cost optimization under the LNBA project (Kinston-Peachtree and Northside, Benson, Contentnea MSD and LaGrange). New Bern is currently constructing a new 4.7 MGD facility designed for biological nutrient removal. As part of its current plant expansion, Goldsboro is constructing a wetlands treatment system to provide effluent polishing for a portion of its discharge.

Some facilities are choosing to reduce discharge flows, either in addition to or in lieu of treatment plant improvements, as a means of lowering nutrient discharges. Weyerhaeuser has reduced its flows by over 6 MGD (30 percent) since 1995. Several municipal permittees are actively pursuing reuse projects to divert their direct discharges away from the river. Among these are Raleigh, Cary, Goldsboro, Johnston County and New Bern.

Approximately 40 permittees expressed interest in joining a group compliance association as provided under the rule, and formation of the association is well underway. The dischargers are working toward creation of the association as a nonprofit corporation, and they have begun drafting an organization and bylaws. DWQ and the permittees have drafted a Memorandum of Agreement and an NPDES permit for the new association.

The summary below focuses on the 30 Neuse dischargers with the largest nitrogen allocations. Of the 108 facilities subject to the wastewater discharge rule, this group accounts for most of the allocation, hence, the potential nutrient impacts by point sources on the estuary.

- Three facilities (Raleigh, Goldsboro and Weyerhaeuser's New Bern mill) represent nearly half of the total point source allocation.
- In contrast, half of all the facilities covered under the rule account for only 1 percent of the total allocation combined.
- The top 30 facilities account for 95 percent of the point source allocation; this group is very nearly the same as the "large" discharger group defined in the rule.

Table A-30 shows that by the end of 2001 the group had already reduced its nitrogen discharges by nearly half (48 percent) from 1995 levels. This resulted in an equivalent 43 percent reduction at the estuary. Because they account for most of the point source nitrogen load to the estuary, the combined reductions for all dischargers in 2001 is already well beyond the mandated 30 percent.

Table A-30 Total Nitrogen Reductions by LNBA Members by 2002

	% TN Reduction Since 1995		**% of Permit Flow Discharged**	**% of TN Limit Discharged**	**% of Allocation to Estuary**
Dischargers	**At Outfall**	**At Estuary**			
Top 30	48.3	42.6	48.1	72.9	84.1
Upstream	34.9	34.9	39.7	48.4	48.4
Downstream	49.7	43.0	48.6	76.8	84.7

However, rapid growth in many areas causes corresponding increases in wastewater flows and nitrogen loading. Facilities that need to expand face the prospect of building highly advanced treatment facilities or purchasing additional allocation, or both. Either choice can be very expensive.

2002 Recommendations

Although the point sources have lowered their nitrogen load to the estuary below the allowable cap, the results show that the dischargers still must take additional steps in coming years to fully meet the intent of the rule.

Table A-30 also shows that the top 30 facilities discharged almost half (48 percent) of their permitted flows in 2001 but a greater portion (73 percent) of the permitted nitrogen. This indicates that treatment capabilities will require further improvement for the dischargers to meet nitrogen limits once flows reach the permitted levels. Consistent with this finding, the 2001 data show that approximately one third of the top 30 exceeded their future limits for nitrogen in that year.

Performance will improve somewhat as plant improvements, reuse systems and other projects already underway are completed. Further, most of these facilities plan to join the group compliance association, and individual performance will be less of an issue as the association's members work together to achieve the necessary reductions as a group.

4.2.5 Basinwide Stormwater Requirements

Current Status

With the goal of reducing nutrients from urbanized areas, the following cities and counties in the Neuse River basin are required to develop stormwater control programs: Cary, Durham, Garner, Goldsboro, Havelock, Kinston, New Bern, Raleigh, Smithfield, Wilson; and Durham, Johnston, Orange, Wake and Wayne counties. The program must include review of stormwater management plans for new development, protection of riparian buffers (see above), public education, removal of illegal discharges, and identification of stormwater retrofits. The stormwater management plans include limits on total nitrogen export and limits on peak flows. All programs have been approved by the Environmental Management Commission and are currently in place.

All local governments covered under the Neuse Stormwater Rule have adopted and are implementing programs to review new development activities to control stormwater runoff and resulting nitrogen inputs. New development must utilize appropriate design and BMPs to limit nitrogen loading to 3.6 pounds/acre/year. Since this program has only been in place a short period of time, the annual report only covers an eight-month window. Over this time, a number of local governments reported that minimal or no new development activities subject to the Neuse NSW rule were implemented in their jurisdictional areas. In part, this occurred because a number of development projects had already been approved locally prior to implementation of their stormwater programs and were not subject to the rules. Based on the estimates supplied in the initial reports for development subject to the Neuse stormwater rules, new development nitrogen loading was reduced by around 5,130 pounds (3,149 from BMPs installed and 2,161 from payments to the Wetland Restoration Program). NCWRP (page 203) is working with local communities to identify and implement restoration projects in the affected areas. Data submitted were variable and sometimes incomplete, so these numbers should be viewed as preliminary.

A large number of public education programs have been implemented in the various communities. These programs have included workshops, development of web sites, newsletters, brochures, storm drain stenciling, participation at school programs such as science fairs, field days, development of environmental fact sheets, and implementation of demonstration projects for stormwater control. A number of communities have also partnered with other agencies such as the NC Cooperative Extension Service and local Soil and Water Conservation Districts. A number of communities in the basin have also joined together to fund a mass media effort for public education.

All of the communities covered by these regulations have developed ordinances and programs locally that provide adequate authority for removal of illegal discharges. A number of communities have reported responses in this program that have removed pollution sources from the storm drainage system and from local waterbodies. Programs have either established or are developing databases to track these efforts.

Local governments have targeted a good number of viable retrofit sites in their jurisdictional areas. These sites will be made available to groups that may have funding to implement the retrofit activities for nitrogen reduction. In addition to the targeted retrofits, a few local governments reported activities completed or under way that have worked to reduce existing nitrogen loading. Major examples center on programs to buy out properties in floodplain areas and restore these areas to natural conditions for water quality improvements.

2002 Recommendations

DWQ will continue to assist local governments in developing stormwater programs and in identifying funding sources. It is recommended that local governments in the Neuse River basin identify funding sources to implement stormwater retrofits in developed areas that would further reduce nutrient delivery to the estuary. Local governments must also submit annual reports to DWQ so progress in the implementation of the basinwide stormwater rules can be tracked and evaluated.

4.2.6 Agricultural Nitrogen Reduction Strategy

Current Status

The agricultural rule provides each farmer with the option of becoming part of a collective local strategy for implementing best management practices on their land or to implement standard best management practices as specified in the rule.

Under the first option, the local strategy would be coordinated by a group of agency representatives and farmers who would target practices where cost-effective reductions could be achieved. A multiagency basin oversight committee (BOC) will oversee the local strategies and the methods for accounting for nutrient reductions.

The BOC is made up of eight individuals appointed by the Secretary of the Department of Environment and Natural Resources (NCDENR). BOC membership includes federal and state agencies, institutions and interest groups designated in the rule. The BOC includes representatives from DWQ, Division of Soil and Water Conservation (DSWC), Natural Resources Conservation Service (USDA-NRCS), North Carolina Department of Agriculture (NCDA), North Carolina Cooperative Extension Service (NCCES), agricultural community, scientific community and environmental community. Responsibilities of the BOC include developing a method to track and account for net nitrogen reductions from agricultural operations in the basin, approving local nitrogen reduction strategies, and presenting annual reports to the EMC on the progress toward reaching the goal.

The BOC and 17 Local Advisory Committees (LACs) were established to implement the Neuse agricultural rule and to assist farmers to comply with the rule. Representatives from DSWC, NCDA, local NRCS and NCCES, and local farmers make up the LACs. Each of the 17 county-level LACs is made up of seven or more individuals representing local agricultural agencies and farmers. Responsibilities of LACs include conducting farmer sign-up, establishing county agricultural baseline, developing local nitrogen reduction strategy, and preparing annual progress report.

Community meetings about the Neuse agricultural rule were held in 17 counties in the basin with assistance from the NCCES. A fact sheet about the rule was developed and distributed to all counties within the basin. Both agricultural and mass media publications targeting farmers in the Neuse River basin carried announcements about the sign-up process. The LACs successfully conducted a sign-up process for farmers between 1998 to 1999 with assistance from DSWC. Approximately 800,000 acres of cropland (of the estimated 1,000,000) in the Neuse River basin representing about 3,400 farmers were enrolled in the local option between 1998 to 1999.

The Nitrogen Loss Evaluation Worksheet (NLEW) was developed to meet the requirement of a scientifically valid accountability method for nitrogen reduction. The NLEW tool was developed to serve a five-fold purpose:

1. Estimate nitrogen loading from agricultural sources into the Neuse River during the baseline period of 1991-1995.
2. Distribute goals for nitrogen reduction to local entities.
3. Facilitate local BMP planning and implementation.
4. Track implemented BMPs.
5. Account for reduction in nitrogen losses due to the implementation of BMPs throughout the basin.

In March 2000, the EMC approved the accountability process of which NLEW is the critical part. Two major training sessions were provided in central locations for the upper and lower basin. Over 200 county agency staff and farmer LAC members attended.

The county agricultural baseline has been developed using the NLEW tool. The baseline has been reported to and examined by the BOC and reported to the EMC. To verify the county baseline numbers, a statistical sampling project in the Neuse River basin was funded. The primary results of this study were reported to BOC in February 2002. Early information indicates that the baseline figures are high. The BOC will compare this statistical analysis and work with LACs to make any needed adjustments to county baseline estimates.

NLEW is also used to calculate the local nitrogen reduction strategy. This strategy is a consensus determination by the LAC. It is based on the types and amount of the approved BMPs that they believe can be implemented before the deadline that would collectively produce the required 30 percent reduction from their baseline number. The LACs determined which practices would be most acceptable to participating farmers and to predict the number of acres to which they felt these practices could be applied. Table A-31 summarizes the BMP implementation goals from the approved local nitrogen reduction strategy.

Table A-31	BMP Implementation Goals for all 17 Neuse Basin LACs to Achieve 30 Percent Reduction in Agriculture Nitrogen

BMPs	Acreage (ac)
20' vegetated buffer	1,100
30' vegetated buffer	700
20' forested buffer	270
50' riparian buffer	2,000
Cover Crop	5,200
Nutrient management	280,000
Water control structure	42,000

The LACs have submitted their first annual report. Based on an incomplete progress report, Table A-32 presents BMPs that have already been installed.

Table A-32	Progress Reported by LACs as of March 5, 2002 Towards Meeting the Neuse Basin BMP Implementation Goal

BMPs	Acreage (ac)	Percent Towards Goal
20' vegetated buffer	125	11%
30' vegetated buffer	460	66%
20' forested buffer	0	0%
50' riparian buffer	870	44%
Cover Crop	0	0%
Nutrient management	35,000	13%
Water control structure	12,000	29%

2002 Recommendations
DWQ and the other designated agencies will continue to implement the agricultural component of the Neuse River basin NSW strategy. DWQ will continue to work with all agencies and interest groups involved to reduce nitrogen loading from agricultural lands in the Neuse River basin.

4.2.7 Nutrient Management

Current Status
This rule affects landowners, leasees and commercial applicators that apply nutrients to 50 acres or more of residential, agricultural, commercial, recreational or industrial land. Each person has the option of successfully completing nutrient management training or developing nutrient management plans for the lands where they apply fertilizer.

Nutrient management training for agricultural producers has been scheduled in every county in the basin. Over 1,250 agricultural producers were trained in 2001. Two nutrient management training sessions for turf grass operations (aiming for commercial applicators) were conducted in June 2002. Over 200 commercial applicators registered for the training as well. Two nutrient management training sessions for container nursery operations will be held at the end of 2002. Table A-33 lists locations and attendance of nutrient management training sessions held thus far.

Table A-33 Number of Nutrient Training Sessions and Attendance by County

County	Number of Sessions	Total Attendance
Beaufort	1	20
Carteret	1	50
Craven	1	65
Durham	1	20
Franklin	1	60
Granville	1	50
Green	2	125
Johnston	1	65
Jones	1	60
Lenoir	2	100
Nash	1	60
Orange	1	25
Pamlico	1	50
Person	1	75
Pitt	1	60
Wilson	1	65
Wake	1	50
Wayne	4	250
Total	23	1,250

2002 Recommendations
DWQ will continue to work with NCCES to provide training. It is recommended that DWQ work with local governments and industry to provide nutrient management training to homeowners and other interested parties.

4.2.8 Neuse River Modeling and Monitoring (MODMON) Project

Current Status
The Neuse Estuary Eutrophication Model (NEEM) and the Neuse Estuary Bayesian Ecological Response Model (Neu-BERN) are two models that have been developed through the MODMON

project. Predictions from these models will be used for development and implementation of the Neuse River estuary total nitrogen TMDL.

2002 Recommendations

Because an adaptive management strategy will be used in implementing the Neuse River estuary TMDL, DWQ recommends continuation of MODMON so changes in water quality can be assessed and adjustments to the implementation strategy can continue to be made.

4.3 Use Restoration Waters (URW) Approach

Current Status

DWQ has developed a conceptual strategy to manage watersheds with nonpoint source impairments as determined through the use support designations. In July 1998, the state Environmental Management Commission approved the Use Restoration Waters (URW) Program concept which will target all NPS impaired waters in the state using a two-part approach. As envisioned, this concept will apply to all watersheds that are impaired. The program will catalyze voluntary efforts of stakeholder groups in impaired watersheds to restore those waters by providing various incentives and other support. Simultaneously, the program will develop a set of mandatory requirements for NPS pollution categories for locations where local groups choose not to take responsibility for restoring their waters. This URW concept offers local governments an opportunity to implement site-specific projects at the local level as an incentive ("the carrot"). If the EMC is not satisfied with the progress made towards use restoration by local committees, impairment based rules will become mandatory in those watersheds ("the stick"). These mandatory requirements may not be tailored to specific watersheds, but may apply more generically across the state or region.

2002 Recommendations

With more than 400 impaired waters on stream segments in the state, it is not realistic for DWQ to attempt to develop watershed specific restoration strategies for nonpoint source pollution. By involving the stakeholders in these watersheds, DWQ can catalyze large-scale restoration of impaired waters. One of the major implementation challenges of this new program will be educating public officials and stakeholders at the local level as to the nature and solutions to their impairments. To address this challenge, the state plans to develop a GIS-based program to help present information at a scale that is useful to local land management officials. Other incentives that the state might provide include seed grants and technical assistance, as well as retaining the authority to mandate regulations on stakeholders who are not willing to participate.

In cases where incentives and support do not result in effective watershed restoration strategies, mandatory management requirements would be implemented in the watershed. This is not the state’s preferred alternative, as it would add to state monitoring and enforcement workload. However, in areas where it is necessary, DWQ plans to implement such requirements. In the management area, DWQ would be assisted by regulatory staff from the Division of Coastal Management, Division of Environmental Health, Division of Land Resources and the Division of Marine Fisheries to insure compliance.

4.4 Implement Wetlands and Riparian Restoration Plans

Current Status

For the Neuse River Basin, the North Carolina Wetlands Restoration Program (page 203) has integrated information normally found separately in NCWRP Watershed Restoration Plans into this Basinwide Water Quality Plan. This river basin is the first for which NCWRP has integrated the Watershed Restoration Plan directly into a DWQ Basinwide Water Quality Plan. A separate version of the Watershed Restoration Plan for the Neuse will be available online at the NCWRP website by the fall of 2002. These plans identify Targeted Local Watersheds within which NCWRP will focus restoration efforts. NCWRP will be restoring more than 20 acres of wetlands and more than 20,000 linear feet of stream channel in the upper Neuse basin over the next three years.

2002 Recommendations

DWQ will continue to integrate NCWRP restoration planning efforts into the basinwide process. An overview of the program is presented on page 203, as well as Table C-2 listing all the Targeted Local Watersheds selected by the NCWRP, arranged by DWQ subbasins. This section also includes a description of the NCWRP Local Watershed Planning initiative. The NCWRP will continue to use a comprehensive, integrated watershed approach in the identification of high-priority local watersheds in North Carolina's river basins. Also, the NCWRP hopes to expand their Local Watershed Planning efforts into more areas of the state as additional compensatory mitigation resources become available.

4.5 Target Existing Funding Sources to Impaired Waters

Current Status

The Unified Watershed Assessment (UWA) was developed in 1998 and targeted the upper Neuse and Contentnea Creek watersheds among other watersheds in the state. NCWRP, Clean Water Act Section 319, Clean Water Management Trust Fund and agricultural cost share financial resources have targeted waters in these watersheds. Currently, waters on the 303(d) list are the primary targets for these financial resources. A summary of monies spent and descriptions of projects are presented in Section C.

2002 Recommendations

DWQ continues to recommend targeting of funds toward impaired streams. DWQ also encourages targeting of monetary resources where water quality impacts are noted but the waters have not degraded to the point of being impaired. A small amount of effort and funding can result in great water quality improvements in these waters and potentially prevent these waters from becoming impaired. These waters and noted impacts are specifically described in each subbasin chapter in Section B.

4.6 Biological Criteria for Assessment of Aquatic Life

4.6.1 Introduction

DWQ strives to properly evaluate the health of aquatic biological communities throughout the state. Swamp stream systems, small streams and estuarine waters have presented unique challenges for benthic macroinvertebrate evaluation, while nonwadeable waters and trout streams have done the same for fish community evaluations. This section discusses some of these challenges. Refer to Appendix II for further information.

4.6.2 Assessing Benthic Macroinvertebrates in Swamp Streams

Current Status
Extensive evaluation, conducted by DWQ, of swamp streams across eastern North Carolina suggests that different criteria must be used to assess the condition of water quality in these systems. Swamp streams are characterized by seasonally interrupted flows, lower dissolved oxygen and often lower pH. They also may have very complex braided channels and dark-colored water. Since 1995, benthic macroinvertebrates swamp sampling methods have been used at over 100 sites in the coastal plain of North Carolina, including more than 20 reference sites. Preliminary investigations indicate that there are at least five unique swamp ecoregions in the NC coastal plain, and each of these may require different biocriteria. The lowest "natural" diversity has been found in low-gradient streams (especially in the outer coastal plain) and in areas with poorly drained soils.

DWQ has developed draft biological criteria that may be used in the future to assign bioclassifications to these streams (as is currently done for other streams and rivers across the state). However, validation of the swamp criteria will require collecting data for several years from swamp stream reference sites. The criteria will remain in draft form until DWQ is better able to evaluate such things as: year-to-year variation at reference swamp sites, effects of flow interruption, variation among reference swamp sites, and the effect of small changes in pH on the benthic macroinvertebrate community. Other factors, such as whether the habitat evaluation can be improved and the role fisheries data should play in the evaluation, must also be resolved.

2002 Recommendations
While it may be difficult to assign use support ratings to these swamp streams, these data will be used to evaluate changes in a particular stream between dates or to evaluate effects of different land uses on water quality within a relatively uniform ecoregion.

4.6.3 Assessing Benthic Macroinvertebrate Communities in Small Streams

Current Status
The benthic macroinvertebrate community of small streams is naturally less diverse than the streams used to develop the current criteria for flowing freshwater streams. The benthic macroinvertebrate database is being evaluated, and a study to systematically look at small reference streams in different ecoregions is being developed with the goal of finding a way to evaluate water quality conditions in such small streams.

2002 Recommendations
DWQ will use this monitoring information to identify potential impacts to these waters even though a use support rating is not assigned. DWQ will continue to develop criteria to assess water quality in small streams.

4.6.4 Assessing Fish Communities

Current Status
Fish communities in most wadeable streams can be sampled by a crew of 2-4 persons using backpack electrofishers and following the DWQ Standard Operating Procedures. The data are evaluated using the North Carolina Index of Biotic Integrity (NCIBI) (NCDENR-DWQ, 2001). 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.

2002 Recommendations
In order to obtain data from nonwadeable coastal plain streams (that are difficult to evaluate using benthic macroinvertebrates), a fish community boat sampling method is being developed with the goal of expanding the geographic area that can be evaluated using fisheries data. This project may take many years to complete.

DWQ will continue to use this monitoring information to identify potential impacts to these waters even though a use support rating is not assigned.

4.7 DWQ Stormwater Programs

There are many different stormwater programs administered by DWQ. One or more of these programs affects many communities in the Neuse River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. Those programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include NPDES Phase I and II, coastal county stormwater requirements, HQW/ORW stormwater requirements, Neuse River basin NSW stormwater requirements (page 64) and requirements associated with the Water Supply Watershed Program. Local governments that are or may be affected by these programs are presented in Table A-34.

4.7.1 NPDES Phase I

Introduction
Phase I of the EPA stormwater program started with Amendments to the Clean Water Act (CWA) in 1990. Phase I required NPDES permit coverage to address stormwater runoff from medium and large stormwater sewer systems serving populations of 100,000 or more people. Phase I also had requirements for ten categories of industrial sources to be covered under stormwater permits. Industrial activities which require permitting are defined in categories ranging from sawmills and landfills to manufacturing plants and hazardous waste treatment,

storage or disposal facilities. Construction sites disturbing greater than five acres are also required to obtain an NPDES stormwater permit under Phase I of the EPA stormwater program.

Current Status
Currently, Durham and Raleigh have NPDES Phase I stormwater permits and have developed stormwater programs. There are currently 15 individual stormwater permits issued to facilities in the Neuse River basin. There are 429 facilities that have general permit coverage in the Neuse River basin. These facilities are mapped in each subbasin chapter in Section B and listed in Appendix I.

2002 Recommendations
DWQ recommends continued implementation of the current stormwater programs as well as implementation of the Phase II requirements. Just over 100 stream miles in the Neuse River basin are impaired at least in part because of runoff from urbanized areas. Development and implementation of local programs that go beyond the minimum requirements will be needed to restore aquatic life to these streams.

4.7.2 NPDES Phase II

Introduction
The Phase II stormwater program is an extension of the Phase I program that will include permit coverage for smaller municipalities and cover construction activities down to one acre. The local governments permitted under Phase II will be required to develop and implement a comprehensive stormwater management program that includes six minimum measures.

1) Public education and outreach on stormwater impacts.
2) Public involvement/participation.
3) Illicit discharge detection and elimination.
4) Construction site stormwater runoff control.
5) Post-construction stormwater management for new development and redevelopment.
6) Pollution prevention/good housekeeping for municipal operations.

Construction sites greater than one acre will also be required to obtain an NPDES stormwater permit under Phase II of the EPA stormwater program in addition to erosion and sedimentation control approvals.

Current Status
Ten municipalities and four counties (Table A-34) in the basin are automatically required (1990 US Census designated Urban Areas) to obtain a NPDES stormwater permit under the Phase II rules. Results of the 2000 US Census may expand coverage of automatically designated areas. These local governments will be required to submit applications for NPDES stormwater permits by March 2003. DWQ is currently developing criteria that will be used to determine whether other municipalities should be required to obtain a NPDES permit and how the program will be implemented. DWQ is also working to finalize state rules to implement the Phase II stormwater rules as required by the EPA.

2002 Recommendations
DWQ recommends that the local governments that will be permitted under Phase II proceed with permit applications and develop programs that can go beyond the six minimum measures. Just over 100 stream miles in the Neuse River basin are impaired at least in part because of runoff from urbanized areas. Implementation of Phase II as well as the other stormwater programs should help to reduce future impacts to streams in the basin. Local governments to the extent possible should identify sites for preservation or restoration. DWQ and other NCDENR agencies will continue to provide information on funding sources and technical assistance to support local government stormwater programs.

4.7.3 Neuse River Basin NSW Stormwater Requirements

Introduction
Because of the water quality problems in the Neuse estuary related to nutrient overloading, communities in the Neuse River basin (Table A-34) are required to develop stormwater programs to reduce nutrient delivery to surface waters. The program must include review of stormwater management plans for new development, public education, removal of illegal discharges, and identification of stormwater retrofits. The stormwater management plans include limits on total nitrogen export and limits on peak flows.

Current Status
All programs have been approved by the Environmental Management Commission and are currently in place. All local governments covered under the Neuse Stormwater Rule have adopted and are implementing programs to review new development activities to control stormwater runoff and resulting nitrogen inputs.

2002 Recommendations
Refer to page 64 for more information on this program and recommendations. Communities should integrate the NSW stormwater requirements with other stormwater programs, to the extent possible, in order to be more efficient and gain the most water quality benefits for protection of public health and aquatic life.

4.7.4 State Stormwater Program

Introduction
The State Stormwater Management Program was established in the late 1980s under the authority of the North Carolina Environmental Management Commission (EMC) and North Carolina General Statute 143-214.7. This program, codified in 15A NCAC 2H .1000, affects development activities that require either an Erosion and Sediment Control Plan (for disturbances of one or more acres) or a CAMA major permit within one of the twenty coastal counties and/or development draining to Outstanding Resource Waters (ORW) or High Quality Waters (HQW).

The State Stormwater Management Program requires developments to protect these sensitive waters by maintaining a low density of impervious surfaces, maintaining vegetative buffers, and transporting runoff through vegetative conveyances. Low density development thresholds vary from 12-30 percent built-upon area (impervious surface) depending on the classification of the receiving stream. If low density design criteria cannot be met, then high density development requires the installation of structural best management practices (BMP's) to collect and treat stormwater runoff from the project. High density BMP's must control the runoff from the 1 or 1.5-inch storm event (depending on the receiving stream classification) and remove 85 percent of the total suspended solids.

Current Status

Table A-34 shows the four coastal counties in the Neuse River basin where permits may be required under the state stormwater management program under CAMA or ORW stormwater rules. All development requiring an Erosion and Sediment Control Plan (for disturbances of one or more acres) must obtain a stormwater permit.

2002 Recommendations

DWQ will continue implementing the state stormwater program with the other NCDENR agencies and local governments. Local governments should develop local land use plans that minimize impervious surfaces in sensitive areas. Communities should integrate state stormwater program requirements, to the extent possible, with other stormwater programs in order to be more efficient and gain the most water quality benefits for protection of public health and aquatic life.

4.7.5 Water Supply Watershed Stormwater Rules

Introduction

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. The program attempts to minimize the impacts of stormwater runoff by utilizing low density development or stormwater treatment in high density areas.

Current Status

All communities in the Neuse River basin in water supply watersheds have EMC approved water supply watershed protection ordinances. Refer to page 44 for more information on classified water supply waters and watersheds in the Neuse River basin.

2002 Recommendations

DWQ recommends continued implementation of local water supply protection ordinances to ensure safe and economical treatment of drinking water. Communities should also integrate water supply protection ordinances with other stormwater programs, to the extent possible, in order to be more efficient and gain the most water quality benefits for both drinking water and aquatic life.

Table A-34 Communities in the Neuse River with Stormwater Requirements

	NPDES		Neuse NSW Stormwater Rules	Coastal Stormwater Rules	State Stormwater Program	Water Supply Watershed Stormwater Requirements
Local Government	Phase I	Phase II*				
Municipalities						
Apex		**X**				**X**
Cary		**X**	**X**			**X**
Clayton						**X**
Creedmoor						**X**
Durham	**X**	**X**	**X**			**X**
Garner		**X**	**X**			**X**
Goldsboro		**X**	**X**			**X**
Havelock		**X**	**X**	**X**		
Kinston			**X**			
New Bern		**X**	**X**	**X**		
Princeton						**X**
Raleigh	**X**	**X**	**X**			**X**
Rolesville						**X**
Roxboro						**X**
Selma						**X**
Smithfield		**X**	**X**			**X**
Stem						**X**
Wake Forest						**X**
Wilson		**X**	**X**			**X**
Counties						
Beaufort				**X**		
Carteret				**X**	**X**	
Craven				**X**		
Durham		**X**	**X**			**X**
Franklin						**X**
Granville						**X**
Johnston			**X**			**X**
Nash		**X**				**X**
Orange		**X**	**X**			**X**
Pamlico				**X**		
Person						**X**
Wake		**X**	**X**			**X**
Wayne		**X**	**X**			**X**
Wilson						**X**

* More local governments may be designated once designation criteria are developed in addition to those that may be automatically designated based on 2000 Census.

4.8 Protection and Restoration of Streams in Urbanized and Developing Watersheds

4.8.1 Introduction

Urbanization often has greater hydrologic effects than any other land use, as native vegetation is replaced with impervious surfaces in the form of paved roads, buildings, parking lots, and residential homes and driveways. Urbanization results in increased surface runoff and correspondingly earlier and higher peak flows after storms. Flooding frequency is also increased. These effects are compounded when small streams are channelized (straightened) or piped and storm sewer systems are installed to increase transport of drainage waters downstream. Bank scour from these frequent high flow events tends to enlarge streams and increases suspended sediment. Scouring also destroys the variety of habitat in streams leading to degradation of benthic macroinvertebrate populations and loss of fisheries (EPA, 1999). Most of the impacts are in terms of habitat degradation (page 89), but runoff from developed and developing areas can also carry toxic pollutants to a stream (NCDENR-DWQ, November 2001). For these streams to support aquatic life, good water quality and aquatic habitat must be maintained.

4.8.2 Current Status

Currently, in the Neuse River basin, there are over 100 miles of streams in urban areas that are impaired by stormwater runoff and the resultant combination of toxicity and habitat degradation. Streams around the high growth areas of the basin are, and will increasingly be, impacted by urban stormwater runoff as land use changes from agriculture and forest uses to urban and suburban land uses.

4.8.3 2002 Recommendations

Maintain Riparian Buffers

The presence of intact riparian buffers and/or wetlands in urban areas can lessen these impacts, and restoration of these watershed features should be considered where feasible; however, the amount of impervious cover should be limited as much as possible. Wide streets, huge cul-de-sacs, long driveways and sidewalks lining both sides of the street are all features of urban development that create excess impervious cover and consume natural areas.

Removing trees, shrubs and other vegetation to plant grass or place rock (also known as riprap) along the bank of a river or stream degrades water quality. Removing riparian vegetation eliminates habitat for aquatic macroinvertebrates that are food for trout and other fish. Rocks lining a bank absorb the sun's heat and warm the water. Some fish require cooler water temperatures as well as the higher levels of dissolved oxygen cooler water provides. Trees, shrubs and other native vegetation cool the water by shading it. Straightening a stream, clearing streambank vegetation, and lining the banks with grass or rock severely impact the habitat that aquatic insects and fish need to survive (WNCT, 1999).

Preserving the natural streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. Forested buffers in particular provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife. To obtain a free copy of DWQ's *Buffers for Clean Water* brochure, call (919) 733-5083, ext. 558.

Protect Headwater Streams

Many streams in a given river basin are only small trickles of water that emerge from the ground. A larger stream is formed at the confluence of these trickles. This constant merging eventually forms a large stream or river. Most monitoring of fresh surface waters evaluates these larger streams. The many miles of small trickles, collectively known as headwaters, are not directly monitored and in many instances are not even indicated on maps. However, impairment of headwater streams can (and does) impact the larger stream or river.

Headwater areas are found from the mountains to the coast along all river systems and drain all of the land in a river basin. Because of the small size of headwater streams, they are often overlooked during land use activities that impact water quality. All landowners can participate in the protection of headwaters by keeping small tributaries in mind when making land use management decisions on the areas they control. This includes activities such as retaining vegetated stream buffers and excluding cattle from streams. Local rural and urban planning initiatives should also consider impacts to headwater streams when land is being developed.

For a more detailed description of watershed hydrology, please refer to EPA's Watershed Academy website: http://www.epa.gov/OWOW/watershed/wacademy/acad2000/watershedmgt/principle1.html.

Reduce Impacts of Future Development

Areas adjacent to the high growth areas of the basin are at risk of having impaired biological communities. These biological communities are important to maintaining the ecological integrity in the Neuse River basin. These streams will be important as sources of benthic macroinvertebrates and fishes for reestablishment of biological communities in nearby streams that are recovering from past impacts or are being restored.

Proactive planning efforts at the local level are needed to assure that development is done in a manner that minimizes impacts to water quality. These planning efforts must find a balance among water quality protection, natural resource management and economic growth. Growth management requires planning for the needs of future population increases as well as developing and enforcing environmental protection measures. These actions are critical to water quality management and the quality of life for the residents of the basin.

Action should be taken at the local level to plan for new development in urban and rural areas. For more detailed information regarding recommendations for new development found in the text box (below), refer to EPA's website at www.epa.gov/owow/watershed/wacademy/acad2000/protection and the Center for Watershed Protection website at www.cwp.org. Additional public education is also needed in the Neuse River basin in order for citizens to understand the value of urban planning and stormwater management. DWQ recently developed a booklet that discusses actions individuals can take to reduce stormwater runoff and improve stormwater quality entitled *Improving Water Quality In Your Own Backyard*. To obtain a free copy, call (919) 733-5083, ext. 558.

To prevent further impairment to aquatic life in streams in urbanizing watersheds local governments should:

1. Identify waters that are threatened by development.
2. Protect streams beyond existing buffer regulations.
3. Implement stormwater BMPs during and after development.
4. Develop land use plans that minimize disturbance in sensitive areas of watersheds.
5. Minimize impervious surfaces including roads and parking lots.
6. Develop public outreach programs to educate citizens about stormwater runoff.

Establish Long–Term Restoration Plans for Impaired Streams

Many streams in existing urban areas have been impaired for a very long time. Because of the large amounts of established structures, it is generally considered to be too expensive to undertake a stream restoration project in many urban watersheds. These streams are important to ecosystem health, water quality in the basin, and to the quality of life in general. The following steps can be incorporated into a long-term redevelopment plan that will eventually provide opportunity for a stream restoration project.

1. Maintain good water quality and aquatic habitat of nearby unimpacted watersheds. Streams in these watersheds will be needed to establish reference conditions and as a source of aquatic life for repopulating restored streams.
2. Identify urban watersheds and encourage community groups, local business and industry to become involved in the long-term planning, fund raising and eventual restoration projects.
3. Target streamside properties that can be purchased or put into easement as the existing structures are removed to provide space for restoration of riparian areas.
4. When streamside properties are redeveloped, structures and parking lots should be sited to provide as much space as possible for restoration of stream channels and riparian areas.
5. Minimize impervious surfaces during redevelopment with the goal of having less impervious surface than was previously on the site.
6. Install BMPs that can hold and treat stormwater runoff from the site during and after redevelopment.
7. When enough stream reach has restoration opportunity, proceed with restoration projects.

Planning Recommendations for New Development

- Minimize number and width of residential streets.
- Minimize size of parking areas (angled parking and narrower slots).
- Place sidewalks on only one side of residential streets.
- Vegetate road right-of-ways, parking lot islands and highway dividers to increase infiltration.
- Plant and protect natural buffer zones along streams and tributaries.
- Minimize floodplain development.
- Protect and restore wetland / bog areas.

Although this process may take many years before urban stream water quality and aquatic habitat are restored, the end product will be an important feature of urban areas.

4.9 Shellfish Harvesting in Class SA Waters

Introduction

The 1997 Neuse River basin use support assessment rated approved shellfish harvesting waters as fully supporting (FS), conditionally approved waters as fully supporting but threatened (ST), and prohibited waters as partially supporting (PS) (page 52). In the 1997 assessment, there were 295,112 acres rated FS and 3,588 acres rated partially supporting (PS). Class SA acres were reported by the nine Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section (DEH SSRWQ) (page 52) growing areas (e.g., F2: Merrimon, 1,475 acres).

Current Status

DWQ and DEH SSRWQ are developing the database and expertise necessary to assess shellfish harvesting use support using a frequency of closure based approach. This database will allow DWQ to better assess the extent and duration of closures in Class SA waters. These tools are not available for use support determinations in Class SA waters for the 2002 Neuse River basin assessment. DWQ believed it important to identify frequency of closures in these waters, so an interim methodology was used based on existing databases and GIS shapefiles. There will likely be changes in reported acreages in future assessments using the permanent methods and tools that define areas and closure frequency.

For the 2002 Neuse River basin assessment, DWQ used an interim frequency of closures based method to assign use support ratings to Class SA waters. DWQ worked with DEH SSRWQ to determine the number of days and acreages that identified conditionally approved-open Class SA waters were closed to shellfish harvesting in the Neuse River basin during the assessment period (September 1, 1995 to August 31, 2000). For the one growing area with conditionally approved-open (CAO) Class SA waters, DEH SSRWQ and DWQ staff defined subareas (within the larger conditionally approved-open area) that were opened and closed at the same time. The number of days these conditionally approved-open waters were closed was determined using proclamation summary sheets and the original proclamations. The number of days that approved areas in the growing area were closed due to preemptive closures because of named storms was not counted. Refer to Table A-35 for a summary of Class SA waters use support ratings.

Table A-35 Interim Frequency of Closure Based Use Support Ratings

Percent of Time Closed within Basin Data Window	DEH SS Growing Area Classification	DWQ Use Support Rating
N/A	Approved*	Supporting
Closed ≤10 percent of data window	Portion of conditionally approved-open waters closed ≤10 percent	Supporting
Closed >10 percent of data window	Portion of conditionally approved-open waters closed >10 percent of data window	Impaired
N/A	Conditionally approved-closed waters and Prohibited/Restricted**	Impaired

* **Approved waters are closed only during extreme meteorological events (hurricanes).**

** CAC and P/R waters are rarely opened to shellfish harvesting.

2002 Recommendations

DWQ will continue to develop the tools necessary to make use support decisions in Class SA waters using a frequency of closures methodology. Refer to Appendix III for more information. Class SA waters are closed to shellfish harvesting because of bacterial contamination (page 92) or the presence of stormwater outfalls. BMPs for reducing bacterial delivery to shellfish harvesting waters are presented on page 92.

4.10 Impacted Streams in Agricultural Areas

Introduction

Impacts to streams from agricultural activities can include excessive nutrient loading, pesticide and herbicide contamination, bacterial contamination and sedimentation. In the coastal plain, many agricultural areas are ditched, thereby increasing the delivery of the contaminants to surface waters.

Current Status

There are over 115 stream miles that are currently impaired in areas where agriculture is the predominant land use, and biologists have noted impacts to streams related to nutrient loading and sedimentation. There has been a loss of approximately 180,000 acres of cultivated cropland in the Neuse River basin since 1982 (page 22). Much of this land has been converted into more intensive uses, such as urban and suburban areas.

2002 Recommendations

DWQ will identify streams where agricultural land use may be impacting water quality and aquatic habitat. This information will be related to local Division of Soil and Water Conservation (DSWC) and NRCS staff to investigate the agricultural impacts in these watersheds and to recommend BMPs to reduce impacts. DWQ recommends that funding and technical support for agricultural BMPs be continued. Refer to Appendix VI for agricultural nonpoint source agency contact information.

4.11 Confined Animal Operations

Introduction

Confined animal operations in North Carolina result in increased production efficiency, improved production economics, and a better industry support system. However, high animal concentration and accompanying high nutrient import into eastern NC counties also impose a serious environmental threat to water quality.

Current Status

Some portion of nitrogen in swine waste is emitted to the air as ammonia from hog houses, lagoons and sprayfields. The contribution of atmospheric deposition to nutrient budgets in natural systems has not been fully appreciated until recently. In a June 2000 report, *Deposition of Air Pollutants to the Great Waters – 3rd Report to Congress 2000 (1)*, the USEPA presented estimates for selected waterbodies of the portion of the total nitrogen (N) load that was due to atmospheric inputs. With the range varying between 5 and 38 percent, that for the Albemarle-

Pamlico Sounds was one of the highest at 38 percent. There is much uncertainty in calculating emissions from animal waste lagoons.

2002 Recommendations
DWQ recommends that the agricultural community work to research and implement best management practices to address the atmospheric deposition. See also page 64 for more information on the Neuse River basin NSW strategy.

4.12 Water Quality Problems Resulting from Hurricanes

Introduction
The Natural Resources Conservation Services' (NRCS) Emergency Watershed Protection (EWP) is responsible for emergency de-snagging (removal of piles of woody debris from stream and river channels) activities. The EWP program is intended to respond to watersheds impacted by natural disasters such as hurricanes, floods and fire. The purpose of the program is to restore watershed functions to predisaster conditions. Areas selected for debris removal are based on the amount and location of debris and the increased risk of flooding to improved property (including cropland) or public safety (primarily roads and bridges). Location maps and a description of all proposed work are sent to appropriate federal and state agencies for review and comment prior to contracting the work. The programs' intent is to consider environmental concerns.

Current Status
The activity of debris removal of is great interest to DWQ as the excessive removal of debris can impact the aquatic habitat and aquatic life within a stream reach. The decision to remove debris is made considering topography, proximity of improved property subject to damage, location of culverts, bridges and other restrictions, comparison of costs and benefits, and potential environmental impacts. NRCS, along with other state and federal agencies, are in the process of developing guidelines for debris removal that will improve the decision-making process with regard to eligibility and damage thresholds, as well as improving the standards and specifications for removing woody debris in a manner that leaves enough to provide suitable habitat. Debris removal under EWP is not intended to remove all debris from stream channels, only that which causes or may cause an increased risk of flooding or streambank erosion.

Woody debris is the predominant habitat for benthic macroinvertebrates in larger, slower-moving coastal stream and wetland systems. Therefore, removal of these snags removes the habitat available for aquatic life. If care is not taken in properly removing woody debris, the streambanks and streambed can be altered as well as causing moderate to severe habitat degradation.

2002 Recommendations
DWQ is aware of the need to remove obstructions to water flow, including snags, near bridges or other structures in emergency situations because of safety concerns, to reduce economic loss in the event of natural disasters, and to reduce the risk of flooding. NRCS has recently adopted an Interagency Coordination and Implementation Plan for the EWP program that allows for a direct and ongoing role for several agencies to play in the implementation process. The method in which snags are removed, the amount of debris that is removed, and the sites selected should all be chosen following a thorough review by the various agencies responsible for the

implementation of the EWP program. Local governments that receive additional funding for this type of activity should also implement the same management strategies as outlined in the EWP implementation plan to reduce impacts to water quality, aquatic habitat and aquatic life.

4.13 Addressing Waters on the State's 303(d) List

Introduction
Section 303(d) of the federal Clean Water Act requires states to develop a 303(d) list of waters not meeting water quality standards or which have impaired uses. States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. In the last few years, the TMDL program has received a great deal of attention as the result of a number of lawsuits filed across the country against EPA. These lawsuits argue that TMDLs have not adequately been developed for specific impaired waters. As a result of these lawsuits, EPA issued a guidance memorandum in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list. The schedules for TMDL development, according to this EPA memo, are to span 8-13 years.

Current Status
There are approximately 2,387 impaired stream miles on the 2000 303(d) list in NC. The rigorous and demanding task of developing TMDLs for each of these waters during an 8 to 13-year time frame will require the focus of much of the water quality program's resources. Therefore, it will be a priority for North Carolina's water quality programs over the next several years to develop TMDLs for 303(d) listed waters.

2002 Recommendations
For the next several years, addressing water quality impairment in waters that are on the state's 303(d) list will be a priority. The waters in the Neuse River basin that are on this list are presented in the individual subbasin descriptions in Section B. For information on listing requirements and approaches, refer to Appendix IV.

4.14 Sedimentation Pollution Control

Introduction
One of most commonly noted types of habitat degradation (page 89) in the Neuse River basin was as a result of sediment entering streams from adjacent land uses. The Sedimentation Pollution Control Act (SPCA) is administered by the NC Division of Land Resources. The Division of Land Resources (DLR) has the primary responsibility for assuring that erosion is minimized and sedimentation is reduced.

Current Status
As a result of new stormwater rules enacted by EPA in 1999, construction or land development activities that disturb one acre or more are required to obtain a NPDES stormwater permit. An erosion and sediment control plan must also be developed for these sites under the SPCA. Site disturbances of less than one acre are required to use BMPs, but a plan is not required.

Forestry activities in North Carolina are subject to regulation under the SPCA. However, a forestry operation in the Neuse River basin may be exempt from the permitting requirements if compliance with performance standards outlined in *Forest Practice Guidelines Related to Water Quality* (15NCAC 1I .201-.209) and General Statutes regarding stream obstruction (77-13 and 77-14) are maintained. Forestry activities in the Neuse River basin must also adhere to the riparian buffer protection rules (page 64). Extensive information regarding these performance standards and rules as they apply to forestry operations can be found on the NC Division of Forest Resources website at http://www.dfr.state.nc.us/managing/water_qual.htm.

Major Causes of Sedimentation in the Neuse River Basin

- Land clearing activities (construction and preparing land for planting crops)
- Streambank erosion
- Channelization

For agricultural activities which are not subject to the SPCA, sediment controls are carried out on a voluntary basis through programs administered by several different agencies. As part of the Neuse River NSW strategy (page 64), agriculture operations are required to address nutrients using BMPs. Many of these BMPs will also reduce sediment delivery into adjacent waters. (See Appendix VI for further information.)

In February 1999, the NC Sedimentation Control Commission adopted significant changes for strengthening the Erosion and Sedimentation Control Program. The following rule changes were filed as temporary rules, subject to approval by the Rules Review Commission and the NC General Assembly:

- Allows state and local erosion and sediment control programs to require a pre-construction conference when one is deemed necessary.
- Reduces the number of days allowed for establishment of ground cover from 30 working days to 15 working days and from 120 calendar days to 90 calendar days. (Stabilization must now be complete in 15 working days or 90 calendar days, whichever period is shorter.)
- Provides that no person may initiate a land-disturbing activity until notifying the agency that issued the plan approval of the date the activity will begin.
- Allows assessment penalties for significant violations upon initial issuance of a Notice of Violation (NOV).

Additionally, during its 1999 session, the NC General Assembly passed House Bill 1098 to strengthen the Sediment Pollution Control Act of 1973 (SPCA). The bill made the following changes to the Act:

- Increases the maximum civil penalty for violating the SPCA from $500 to $5000 per day.
- Provides that a person may be assessed a civil penalty from the date a violation is detected if the deadline stated in the Notice of Violation is not met.
- Provides that approval of an erosion control plan is conditioned on compliance with federal and state water quality laws, regulations and rules.
- Provides that any erosion control plan that involves using ditches for the purpose of de-watering or lowering the water table must be forwarded to the Director of DWQ.

- Amends the General Statutes governing licensing of general contractors to provide that the State Licensing Board for General Contractors shall test applicants' knowledge of requirements of the SPCA and rules adopted pursuant to the Act.
- Removes a cap on the percentage of administrative costs that may be recovered through plan review fees.

For information on North Carolina's Erosion and Sedimentation Control Program or to report erosion and sedimentation problems, visit the new website at http://www.dlr.enr.state.nc.us/ or you may call the NC Division of Land Resources, Land Quality Section at (919) 733-4574.

2002 Recommendations
DWQ will continue to work cooperatively with DLR and other agencies that administers sediment control and instream mining programs in order to maximize the effectiveness of the programs and to take appropriate enforcement action when necessary to protect or restore water quality. However, more voluntary implementation of BMPs is needed for activities that are not subject to these rules in order to substantially reduce the amount of widespread sedimentation present in the Neuse River basin. Public education is needed basinwide to educate landowners about the value of riparian vegetation along small tributaries and the impacts of sedimentation to aquatic life.

Funding is available for cost sharing with local governments that set up new erosion and sedimentation control programs or conduct their own training workshops. The Sediment Control Commission will provide 40 percent of the cost of starting a new local erosion and sedimentation control program for up to 18 months. Two municipalities or a municipality and county can develop a program together and split the match. It is recommended that local governments draft and implement local erosion and sedimentation control programs.

Funding is also available through numerous federal and state programs for farmers to restore and/or protect riparian buffer zones along fields or pastures, develop alternative watering sources for livestock, and fence animals out of streams (refer to Section C, Part 1.4.3). EPA's *Catalog of Federal Funding Sources for Watershed Protection* (Document 841-B-99-003) outlines some of these and other programs aimed at protecting water quality. A copy may be obtained by calling the National Center for Environmental Publications and Information at (800) 490-9198 or visit the website at http://www.epa.gov/OWOW/watershed/wacademy/fund.html. Local contacts for various state and local agencies are listed in Appendix VI.

4.15 Habitat Degradation

Introduction
Instream habitat degradation is identified in the use support summary (Appendix III) where there is a notable reduction in habitat diversity or a negative change in habitat. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour. Good instream habitat is necessary for aquatic life to survive and reproduce. Streams that typically show signs of habitat degradation are in watersheds that have a large amount of land-disturbing activities (construction, mining, timber harvest and agricultural activities) or a large percentage of impervious surfaces. A watershed in which most of the riparian vegetation has been removed from streams or channelization has

occurred also exhibits instream habitat degradation. Streams that receive a discharge quantity that is much greater than the natural flow in the stream often have degraded habitat as well.

Sedimentation is the process by which eroded soil is deposited into waters. Sediment that accumulates on the bottom of streams and rivers smothers fish habitat vital to reproduction and impacts aquatic insects that fish feed upon. Sediment filling rivers and streams decreases their storage volume and increases the frequency of floods (NCDENR-DLR, 1998). Suspended sediment can decrease primary productivity (photosynthesis) by shading sunlight from aquatic plants, affecting the overall productivity of a stream system. Suspended sediment also has several effects on various fish species including avoidance and redistribution, reduced feeding efficiency, and therefore, reduced growth by some species, respiratory impairment, reduced tolerance to diseases and toxicants, and increased physiological stress (Roell, June 1999). Suspended sediment also increases the cost of treating municipal drinking water.

Some Best Management Practices

Agriculture

- No till or conservation tillage practices
- Strip cropping and contour farming
- Leaving natural buffer areas around small streams and rivers

Construction

- Using phased grading/seeding plans
- Limiting time of exposure
- Planting temporary ground cover
- Using sediment basins and traps

Forestry

- Controlling runoff from logging roads
- Replanting vegetation on disturbed areas
- Leaving natural buffer areas around small streams and rivers

Bank erosion can add large amounts of sediment to a stream. High flows after rain events can remove soil from the streambank and deposits further downstream. During very high flow events entire streambanks can be eroded into streams. There are many places along the Neuse River where large portions of the riverbank fell as a result of high flows during and following Hurricane Floyd. When these banks began to fail, tons of sediment were washed into the river along with trees and other debris. Streambank erosion from smaller rain events is also common along many urban stream corridors.

Channelization refers to the physical alteration of naturally occurring stream and riverbeds. Increased flooding, bank erosion and channel instability often occur in downstream areas after channelization has occurred (McGarvey, 1996). Direct or immediate biological effects of channelization include injury and mortality of benthic macroinvertebrates, fish, shellfish/mussels and other wildlife populations, as well as habitat loss. Indirect biological effects include changes in benthic macroinvertebrate, fish and wildlife community structures, favoring species that are more tolerant of or better adapted to the altered habitat (McGarvey, 1996). Channelization also increases the efficiency that bacteria reach shellfish harvesting waters.

Lack of riparian areas can cause reductions in bank stability, nutrient and sediment removal efficiency and increases stream temperatures because of reduced shading. Aquatic habitat can be adversely affected because of the resultant higher temperatures and increased sediment.

Loss of pools and riffles results in loss of the two major aquatic habitat types in streams. High sediment loads can fill pools and bury riffles. For aquatic life to be supported, pools and riffles need to be present and stable in streams for long periods of time.

Loss of woody habitat from streams causes reductions in important aquatic habitat and processing of organic matter. Woody material from surrounding riparian areas provides aquatic habitat for many benthic macroinvertebrate species. Woody material forms debris dams that can be stable for many years in streams. These debris dams hold organic material in the stream longer and increases processing efficiency.

Streambed scour directly removes benthic macroinvertebrates from woody material and large rocks.

2002 Recommendations

Determining the cause and quantifying amounts of habitat degradation is very difficult in most cases. To assess instream habitat degradation in most streams would require extensive technical and monetary resources and perhaps even more resources to restore the stream. DWQ is working to develop a reliable habitat assessment methodology.

Although DWQ and other agencies are starting to address this issue, local efforts are needed to prevent further instream habitat degradation and to restore streams that have been impaired by activities that cause habitat degradation. As point sources become less of a source of water quality impairment, nonpoint sources that pollute water and cause habitat degradation will need to be addressed to further improve water quality in North Carolina's streams and rivers.

Erosion and sedimentation can be controlled during most land-disturbing activities by using appropriate BMPs. In fact, planning to minimize the (1) amount and (2) time the land is exposed can prevent substantial amounts of erosion. Land clearing activities that contribute to sedimentation in the Neuse River basin include: construction of homes and subdivisions as well as commercial and public buildings; plowing soil to plant crops; site preparation and harvest on timberlands; and road projects. Refer to (page 87) for information on North Carolina's Sedimentation Pollution Control Act.

Restoration or recovery of channelized streams may occur through natural processes or artificially induced ones. In general, streams that have not been excessively stressed by the channelization process can be expected to return to their original forms. However, streams that have been extensively altered may establish a new, artificial equilibrium (especially when the channelized streambed has been hardened). In such cases, the stream may enter a vicious cycle of erosion. Once the benefits of a channelization project become outweighed by the costs, both in money and environmental integrity, channel restoration efforts are likely to be taken (McGarvey, 1996).

4.16 Bacterial Contamination

Introduction
Fecal coliform bacteria are used as an indicator of contamination from warm-blooded animals. Waters containing high amounts of fecal coliform bacteria may also be carrying other more harmful bacteria and microorganisms that have the potential to cause disease. Bacteria can reach surface waters from point sources such as untreated or poorly treated wastewater and from nonpoint sources such as waste deposited on the ground from domesticated animals and wildlife. Waterfowl can also deposit bacteria directly into surface waters.

Increasing the sources of fecal coliform bacteria in watersheds such as more domesticated animals or failing septic systems will potentially increase the amount of bacteria that reach surface waters. Land-disturbing activities and increases in impervious surfaces in a watershed will also increase the efficiency of delivery (via runoff) of fecal coliform bacteria to surface waters. Drainage ditches also increase the efficiency of delivery of bacteria to surface waters.

Current Status
Many areas in the coastal region of the basin are impaired because of shellfish harvesting area closures. The closures are from bacterial contamination. There are also many waters that have high levels of fecal coliform bacteria associated mostly with stormwater runoff in urban areas. DWQ is currently developing TMDLs (see Appendix IV) for waters that are on the 303(d) list of impaired waters.

2002 Recommendations
Refer to page 84 for more information on efforts to evaluate the extent of bacterial contamination in coastal waters. DWQ will continue to monitor and report fecal coliform bacteria levels in monitored waters. DWQ will continue to develop TMDLs for waters that are impaired because of fecal coliform bacteria contamination.

4.17 Algal Blooms

Algal blooms have been a problem in lakes, reservoirs and estuaries that are overloaded with nutrients. Some algal blooms can be noxious and harmful if toxins are inhaled or body contact is made. Many types of algal blooms cause dissolved oxygen to be elevated during photosynthesis. When these algae die off or respire at night, dissolved oxygen can become very low. Many times low dissolved oxygen caused by algal die off can cause fish kills. In 2001, over 600,000 fish died in 37 reported kill events. Not all fish kill events are associated with algal blooms.

2002 Recommendations
Continued implementation of the Neuse River basin NSW strategy (page 64) will help to reduce the potential for fish kills in the Neuse River estuary.

4.18 Low Dissolved Oxygen

Maintaining an adequate amount of dissolved oxygen (DO) is critical to the survival of aquatic life and to the general health of surface waters. A number of factors influence DO concentrations including water temperature, depth and turbulence. Additionally, in the Neuse River basin, a large floodplain drainage system and flow management from upstream impoundments also influence DO. The dissolved oxygen water quality standard for Class C waters is "not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l". Swamp waters (Class C Sw) "may have lower values if caused by natural conditions" (NCDENR-DWQ, August 1, 2000).

Oxygen-consuming wastes such as decomposing organic matter and some chemicals can reduce dissolved oxygen levels in surface water through biological activity and chemical reactions. NPDES permits for wastewater discharges set limits on certain parameters in order to control the effects that oxygen depletion can have in receiving waters.

2002 Recommendations

For more information about oxygen-consuming wastes and what DWQ does to limit water quality impacts from these wastes, refer to *A Citizen's Guide to Water Quality Management in North Carolina*. This document is available online at http://h2o.enr.state.nc.us/basinwide/ or by calling (919) 733-5083.

4.19 Fish Tissue Contamination

4.19.1 Introduction

The NC Department of Health and Human Services (NCDHHS) has developed guidelines to advise people to what fish are safe to eat. DWQ considers uses of waters with a consumption advisory for one or more species of fish to be impaired. Elevated methylmercury levels have been found in shark, swordfish, king mackerel, tilefish, largemouth bass, bowfin (or blackfish), and chain pickerel (or jack). As of April 2002, these fish are under an advisory.

The presence and accumulation of mercury in North Carolina's aquatic environment are similar to contamination observed throughout the country. Mercury has a complex life in the environment, moving from the atmosphere to soil, to surface water and into biological organisms. Mercury circulates in the environment as a result of natural and human (anthropogenic) activities. A dominant pathway of mercury in the environment is through the atmosphere. Mercury that has been emitted from industrial and municipal stacks into the ambient air can circulate across the globe. At any point, mercury may then be deposited onto land and water. Once in the water, mercury can accumulate in fish tissue and humans. Mercury is also commonly found in wastewater. However, mercury in wastewater is typically not at levels that could be solely responsible for elevated levels in fish.

The NC Department of Health and Human Services issues fish consumption advisories for those fish species which have median and/or average methylmercury levels at 0.4 mg/kg or greater. These fish include shark, swordfish, king mackerel, tilefish as well as largemouth bass, bowfin (or blackfish) and chain pickerel (or jack) south and east of Interstate 85. As a result of these advisories, DWQ considers all waters in the Neuse River basin to be impaired in the fish consumption use support category. Refer to Appendix III for more information regarding use support ratings and assessment methodology.

4.19.2 Current Status

Specific Fish Consumption Advisories
Fish is an excellent source of protein and other nutrients. However, several varieties of saltwater and NC freshwater fish may contain high levels of mercury, which may pose a risk to human health. These guidelines will help you make healthy food choices.

Women of Childbearing Age (15-44 years), Pregnant Women, Nursing Women and Children under 15:

- Do not eat shark, swordfish, tilefish or king mackerel; or blackfish (bowfin), largemouth bass or jack fish (chain pickerel) caught in North Carolina waters south and east of Interstate 85. These fish are all high in mercury.
- Eat up to two meals* per week of other fish.

Other Women, Men and Children 15 years and older:

- Eat no more than one meal* per week of shark, swordfish, tilefish or king mackerel; or blackfish (bowfin), largemouth bass or jack fish (chain pickerel) caught in North Carolina waters south and east of Interstate 85. These fish are all high in mercury.
- Eat up to four meals* per week of other fish.

* A "meal" is 6 ounces of cooked fish for adults and children 15 years and older, and 2 ounces of cooked fish for younger children.

DWQ Mercury Workgroup
DWQ is committed to characterizing methylmercury exposure levels and determining if NPDES sources need to be controlled. DWQ formed an internal Mercury Workgroup to improve communication from all programs which directly affect mercury issues (i.e., Pretreatment, Environmental Sciences, Basinwide Planning, etc.). The workgroup meets as needed to share information and determine next steps in addressing mercury issues associated with the aquatic environment.

4.19.3 2002 Recommendations

Improved Ambient Sampling Techniques
DWQ aims to stay abreast of new technology and sampling techniques to ensure that water quality data are accurate, precise and of highest value. In 2000, DWQ started training water quality sampling staff on the new EPA Method 1631 technique. Current monitoring using a higher detection limit (EPA Method 245.1) has consistently yielded non-detected values, and DWQ aims to use the 1631 method to allow detection levels three orders of magnitude lower than EPA Method 245.1.

Regional Mercury Study
In an effort to better manage state waters that may have methylmercury issues, DWQ initiated a study through EPA 104(b)(3) funds. The study aims to provide information that may be used in water quality standard and TMDL development. The study goals include:

- determining levels of ambient mercury in the surface water system;
- estimating site-specific total mercury: methylmercury translators to evaluate water quality criteria;
- develop site-specific water to fish bioaccumulation factors; and
- determine levels of mercury in treatment plant effluent.

DWQ aims to complete this study in 2003, and results will be available to the public. For more information, contact the DWQ Planning Branch Modeling/TMDL Supervisor at (919) 733-5083.

DWQ will continue to host an internal workgroup to stay abreast of current mercury issues. The public has voiced concerns that DWQ should be working on the ecological components and consequences of mercury bioavailability to biota in these areas and the biogeochemical cycling and production of methylmercury from associated wetlands along these streams. Though the workgroup does not have a mandate to conduct research into mercury, the workgroup will better communicate its purpose and accomplishments to the public through periodic updates on the DWQ website.

DWQ will also provide interested members of the public with an overview of the new ambient monitoring sampling technique to gather feedback and insights on how DWQ can best accomplish its data collecting goals.

DWQ will continue to monitor concentrations of various contaminants in fish tissue across the state and will work to identify and reduce wastewater contributions of mercury to surface waters. The Division of Air Quality (DAQ) evaluates mercury levels in rainwater on a regular basis through the EPA Mercury Deposition Network. EPA continues to focus on nationwide mercury reductions from stack emissions and through pollution prevention efforts. Pollution prevention efforts are being investigated on a state and federal level to reduce mercury emissions.

Section B

Water Quality Data
and
Information by Subbasin

Section B - Chapter 1
Neuse River Subbasin 03-04-01
Eno River, Little River, Flat River and Falls Lake

1.1 Subbasin Overview

Subbasin 03-04-01 at a Glance

Land and Water Area

Total area:	772 mi^2
Land area:	740 mi^2
Water area:	32 mi^2

Population

2000 Est. Pop.:	208,310 people
Pop. Density:	270 persons / mi^2

Land Cover (percent)

Forest / Wetland:	72.6
Water:	2.7
Urban:	7.3
Cultivated Crop:	3.4
Pasture / Managed Herbaceous:	13.7

Counties

Durham, Granville, Orange, Person and Wake

Municipalities

Hillsborough, Butner, Creedmoor, Stem, Bahama, Durham, Roxboro and Raleigh

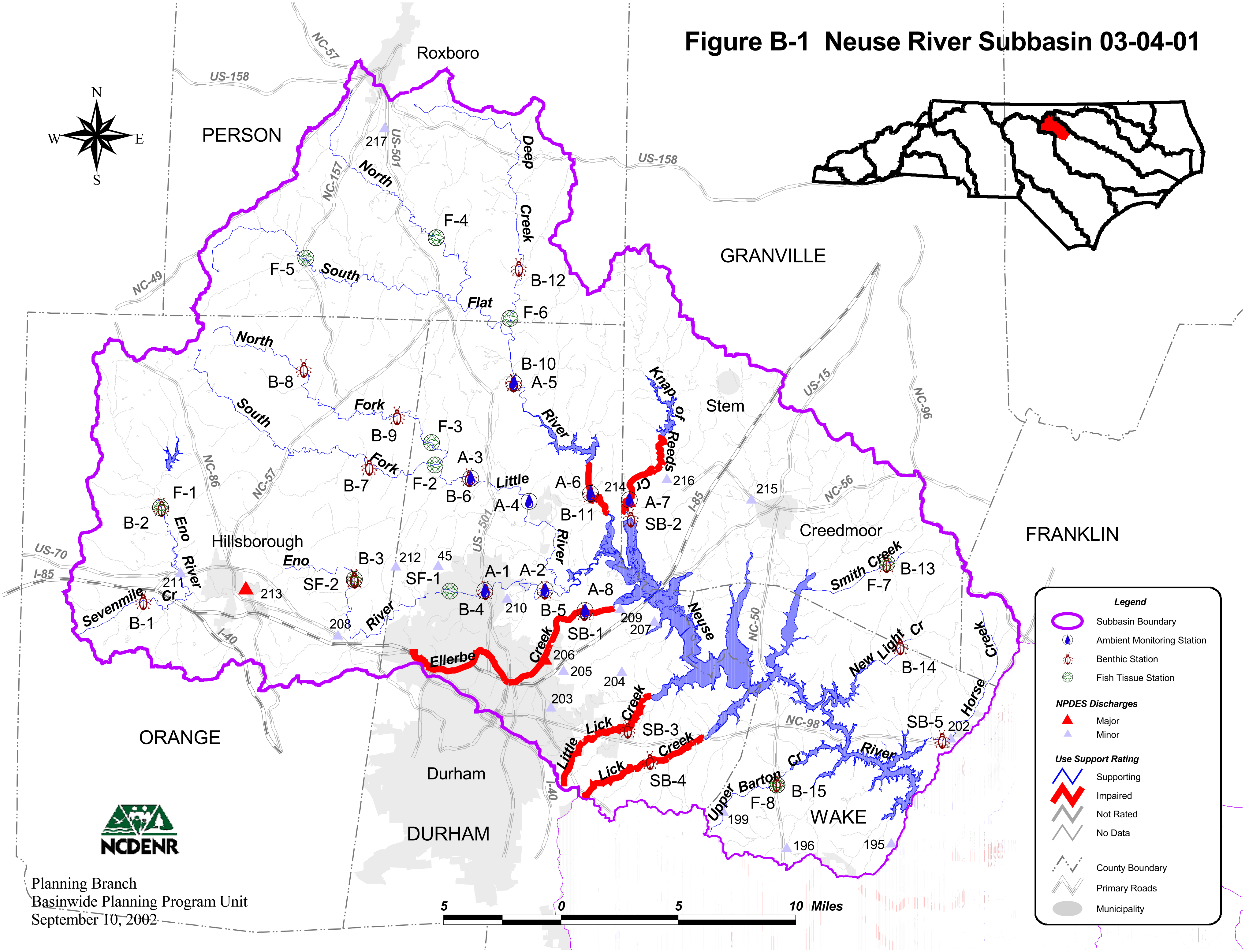
Population growth in this subbasin is concentrated around Durham, Hillsborough and North Raleigh. Population density is highest (320-1,600 persons/mi^2) in the watersheds in Durham and west and south into RTP. The northern areas of the subbasin are mostly in agricultural land use. Land cover is mostly forest and farmland except along the I-40/I-85 corridor. New development can be seen around Falls Lake and north of Durham.

There are 47,428 acres of managed public lands in this subbasin, mostly associated with Eno River State Park and the Falls of the Neuse Game Lands.

There are eight NPDES wastewater discharge permits in this subbasin with a total permitted flow of just over 26 MGD (Figure B-1). The largest are Hillsborough WWTP (3 MGD, map #213), Butner WWTP (3.5 MGD, map #216) and Durham North WWTP (20 MGD, map #206). There are also three individual NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on NPDES permit holders. Durham has a Phase I stormwater permit, and Durham and Wake counties will be required to develop stormwater programs under Phase II (page 76). Durham, Orange and Wake counties have also submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). Issues related to compliance with NPDES permit conditions are discussed below in Part 1.3 or Part 1.4 for impaired waters and in Part 1.5 for other waters. There are also 17 registered animal operations in this subbasin.

There were 15 benthic macroinvertebrate community samples and eight fish community samples (Figure B-1 and Table B-1) collected in 2000 as part of basinwide monitoring. Eight sites improved, seven sites remained the same, and three sites had lower bioclassifications. Five sites were monitored for the first time. There were also seven special study samples collected in the subbasin during the assessment period. Data were collected from eight ambient monitoring stations as well. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Figure B-1 Neuse River Subbasin 03-04-01



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-1 DWQ Monitoring Locations in Subbasin 03-04-01

Benthic Macroinvertebrate Community Monitoring Sites					
Map # [1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Sevenmile Cr[2]	Orange	SR 1120	Good	Good-Fair
B-2	Eno R[2]	Orange	SR 1336	Good-Fair	Good
B-3	Eno R[2]	Orange	SR 1569	Excellent	Excellent
B-4	Eno R[2]	Durham	US 15/501	Good	Excellent
B-5	Eno R[2]	Durham	SR 1004	Good	Good
B-6	Little R[2]	Durham	SR 1461	Good	Excellent
B-7	S Fk Little R	Orange	SR 1538	Good-Fair	Good
B-8	N Fk Little R	Orange	SR 1519	Fair	Good-Fair
B-9	N Fk Little R	Orange	SR 1538	Good	Good-Fair
B-10	Flat R[2]	Durham	S 1614	Excellent	Good
B-11	Flat R[2,3]	Durham	SR 1004	Fair	Fair
B-12	Deep Cr[2]	Person	SR 1715	Good	Good
B-13	Smith Cr[2]	Granville	SR 1710	Good-Fair	Good
B-14	New Light Cr	Wake	SR 1912	Good-Fair	Good
B-15	Upper Barton Cr[2]	Wake	NC 50	Good-Fair	Good-Fair
SB-1	Ellerbe Cr	Durham	SR 1636	Poor	Fair
SB-2	Knap of Reeds Cr	Durham	be WWTP	Fair	Fair
SB-3	L. Lick Cr	Durham	SR 1814	Poor	Poor
SB-4	Lick Cr	Durham	SR 1905	Fair	Fair
SB-5	Horse Cr	Wake	SR 1923	Fair	Fair

Fish Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
F-1	Eno R	Orange	SR 1336	---	Excellent
F-2	S Fk Little R	Durham	SR 1461	---	Excellent
F-3	N Fk Little R	Durham	SR 1461	---	Good
F-4	N Flat R	Person	SR 1715	---	Excellent
F-5	S Flat R	Person	NC 157	---	Good
F-6	Deep Cr[2]	Person	SR 1734	Excellent	Excellent
F-7	Smith Cr	Granville	SR 1710	Good	Good-Fair
F-8	Upper Barton Cr	Wake	NC 50	Good	Good
SF-1	Eno R	Durham	SR 1003	---	Excellent
SF-2	Eno R	Orange	SR 1519	---	Excellent

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Eno River	Durham	Near Durham	J0770000	none
A-2	Eno River	Durham	SR 1004	J0810000	none
A-3	Little River	Durham	SR 1461	J0820000	none
A-4	Little River	Durham	SR 1628	J0840000	none
A-5	Flat River	Durham	Near Quail Roost	J1070000	none
A-6	Flat River	Durham	SR 1004	J1100000	DO
A-7	Knap of Reeds Creek	Granville	Near Butner	J1210000	none
A-8	Ellerbe Creek	Durham	SR 1636	J1330000	none

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

Use support ratings are summarized in Part 1.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 1.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 1.4 below. Supporting waters with noted water quality impacts are discussed in Part 1.5 below. Water quality issues related to the entire subbasin are discussed in Part 1.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and for more information on supporting monitored waters.

1.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-01 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 188 stream miles (40 percent) and 13,346 freshwater acres (93 percent) monitored during this assessment period in the aquatic life and secondary recreation use support category. Approximately 33 (17 percent) of the monitored stream miles are impaired. The main cause of impairment in the subbasin was habitat degradation (page 89). Refer to Table B-2 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-3.

Table B-2 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-01

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	150.0 mi 13,465.9 ac	0	16.2 mi 9,530.3 ac	0
	All Waters	321.4 mi 14,320.4 ac	0	16.2 mi 9,530.3 ac	435.4 mi 14,361.6 ac
Impaired	Monitored	**32.3 mi**	0	0	0
	All Waters	32.3 mi	467.1 mi 14,361.6 ac	0	0
Not Rated	Monitored	6.0 mi	0	0	0
No Data	N/A	107.3 mi 41.2 ac	0	4.9 mi 974.4 ac	0
Total	Monitored	188.3 mi 13,345.9 ac	0	16.2 mi 9,530.3 ac	0
	All Waters	467.1 mi 14,361.6 ac	467.1 mi 14,361.6 ac	21.1 mi 10,504.7 ac	435.4 mi 14,361.6 ac
	Percent Monitored	40% mi 93% ac	0%	77% mi 91% ac	0%

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

Table B-3 Previously or Currently Impaired Waters in Subbasin 03-04-01

Name	1998 Status	2002 Status	2002 Use Support Category	Miles
Ellerbe Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	11.0
Flat River	Impaired	Impaired	Aquatic Life/Secondary Recreation	1.1
Knap of Reeds Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	5.2
Lick Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	7.2
Little Lick Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	7.8
New Light Creek	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
North Fork Little River	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
South Flat River	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
			Total 2002 Impaired Miles	**32.3**

1.3 Status and Recommendations of Previously Impaired Waters

1.3.1 Ellerbe Creek

1998 Recommendations
Ellerbe Creek was not supporting from the source to Falls Lake. It was recommended that a more detailed analysis of the watershed be done to evaluate restoration potential.

Current Status
Ellerbe Creek (11 miles) is currently impaired from the source to Falls Lake because of a Fair bioclassification at site SB-1. The ambient monitoring station (A-8) also detected elevated lead and zinc. Dissolved oxygen was occasionally below the water quality standard of 5 mg/l, and the geometric mean of fecal coliform bacteria was 198 colonies/100ml water. This creek is heavily impacted by urban runoff from Durham.

2002 Recommendations
DWQ will establish a biological monitoring station above the WWTP in order to monitor changes in the upper Ellerbe Creek watershed. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Ellerbe Creek. DWQ will continue to support the City of Durham stormwater programs.

The NCWRP has initiated a Local Watershed Plan (page 213) in the Ellerbe Creek watershed. The LWP seeks to identify all sources of nonpoint source pollution and, through a stakeholder process, will develop recommendations to improve water quality. Ellerbe Creek is also a NCWRP targeted local watershed (page 203).

The impaired biological community in Ellerbe Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

Current Water Quality Initiatives

The Ellerbe Creek Watershed Association (page 215) and Friends of South Ellerbe Creek (page 216) sponsor Stream Watch groups and have other important water quality initiatives in this watershed. There is also a Durham Soil and Water Conservation restoration project (page 212) on Goose Creek, a tributary of Ellerbe Creek in Durham.

1.3.2 Flat River below Lake Michie

1998 Recommendations

The Flat River below Lake Michie was partially supporting from the dam to Falls Lake. Low dissolved oxygen being released from the dam was noted as a potential cause of the impaired biological community. It was recommended that the City of Durham reevaluate release policies from the dam in order to restore the biological community.

Current Status

The Flat River (1.1 miles) is currently impaired from Lake Michie to Falls Lake because of a Fair bioclassification at site B-11. The ambient monitoring station (A-6) also detected dissolved oxygen below 5 mg/l in 12.8 percent of samples. Low dissolved oxygen (page 92) may be adversely impacting the biological community.

2002 Recommendations

DWQ will work with the City of Durham to evaluate low dissolved oxygen releases from the dam. As part of the 303(d) approach, a management strategy will be developed to ensure that low dissolved oxygen from Lake Michie does not adversely impact the biological community in the Flat River. DWQ will continue to monitor the segment below Lake Michie to evaluate any changes in dam operation.

1.3.3 Knap of Reeds Creek

1998 Recommendations

Knap of Reeds Creek was partially supporting from Lake Butner to Falls Lake. It was recommended that DWQ continue to monitor the creek to evaluate further improvements at the Butner WWTP, high copper levels and potential low dissolved oxygen releases from Lake Butner Dam.

Current Status

Knap of Reeds Creek (5.2 miles) is currently impaired from Lake Butner to Falls Lake because of a Fair bioclassification at site SB-2. The ambient monitoring station (A-7) also detected elevated manganese, and the geometric mean of fecal coliform bacteria was 151colonies/100ml water. Although copper was above the copper action level 10.1 percent of the time, the 90^{th} percentile was below 13 mg/l (refer to Appendix III, use support methods).

2002 Recommendations

As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Knap of Reeds Creek. DWQ will continue to monitor this segment to evaluate future improvements at the WWTP and upstream water quality. DWQ continues to recommend that Butner WWTP (map #216) improve plant operations and collection systems as needed to reduce the potential for negative water quality impacts to Knap of Reeds Creek.

1.3.4 Lick Creek

1998 Recommendations
Lick Creek was partially supporting from the source to Falls Lake. It was recommended that the City of Durham address stormwater impacts.

Current Status
Lick Creek (7.2 miles) is currently impaired from the source to Falls Lake because of a Poor bioclassification at site SB-4. This creek is heavily impacted by urban runoff from Durham. There was little vegetation in the riparian zone at the sample site; the stream was entrenched and had little aquatic habitat.

2002 Recommendations
DWQ will continue monitoring Lick Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Lick Creek. DWQ will continue to support the City of Durham stormwater programs. Because of the water quality problems noted above, Lick Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Lick Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

1.3.5 Little Lick Creek

1998 Recommendations
Little Lick Creek was not supporting from the source to Falls Lake. It was recommended that DWQ continue to monitor the stream to assess water quality after removal of three wastewater discharges and increases in urban stormwater impacts. It was recommended that the City of Durham address stormwater impacts.

Current Status
Little Lick Creek (7.8 miles) is currently impaired from the source to Falls Lake because of a Poor bioclassification at site SB-3. This creek is heavily impacted by urban runoff from Durham. Few riffles and many eroded streambanks were noted at the sample site.

2002 Recommendations
DWQ will continue monitoring Lick Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Lick Creek. DWQ will continue to support the City of Durham stormwater programs. Because of the water quality impairment noted above, Little Lick Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Little Lick Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

1.3.6 New Light Creek

1998 Recommendations
New Light Creek was partially supporting from the source to Falls Lake because of a Fair bioclassification. It was recommended that DWQ resample the stream.

Current Status
New Light Creek is supporting from the source to Falls Lake because of a Good bioclassification at site B-14. However, there were noted agricultural impacts to the stream including embedded riffles and eroded streambanks.

2002 Recommendations
DWQ will continue to monitor New Light Creek to evaluate potential impacts from agricultural operations (page 85) in the watershed as well as any future development. DWQ will contact Division of Soil and Water Conservation (DSWC) (page 202) to evaluate the potential for installation of agricultural BMPs that would protect water quality and aquatic habitat in New Light Creek. Because of the water quality impacts noted above, New Light Creek is a NCWRP targeted local watershed (page 203).

1.3.7 North Fork Little River

1998 Recommendations
The North Fork Little River was partially supporting from the source to SR 1519 because of a Fair bioclassification in 1995. There were no specific recommendations made for this segment.

Current Status
The North Fork Little River is currently supporting from the source to the Flat River because of a Good-Fair bioclassification at site B-8. Few pools and riffles and little aquatic habitat were noted at the sample site.

2002 Recommendations
DWQ will continue to monitor the North Fork Little River to evaluate potential impacts from future development or other land use changes in the watershed. North Fork Little River is HQW (page 43). All land-disturbing activities in this watershed should use BMPs to prevent further degradation. Restoration activities may be needed to return high water quality to this portion of the North Fork Little River. Because the North Fork Little River is HQW, in a water supply watershed and has noted water quality impacts, the NCWRP has targeted this local watershed (page 203). Triangle J Council of Governments has also prioritized this watershed for buffer protection.

Current Water Quality Initiatives
Durham County received $377,000 CWMTF (page 210) to acquire buffers along portions of the North Fork Little River (page 212).

1.3.8 South Flat River

1998 Recommendations
The South Flat River was partially supporting from the source to SR 1009 because of a Fair bioclassification in 1990. It was recommended that DWQ resample the stream.

Current Status
The South Flat River is currently supporting from the source to the Flat River because of a Good bioclassification at site F-5. There are indications of nutrient enrichment to the stream from surrounding land uses.

2002 Recommendations
DWQ will continue to monitor the South Flat River to evaluate potential impacts from agricultural operations (page 85) in the watershed as well as from any future development. DWQ will contact Division of Soil and Water Conservation (DSWC) (page 202) to evaluate the potential for installation of agricultural BMPs that would protect water quality and aquatic habitat in the South Flat River. Because the South Flat River is in a water supply watershed and has noted water quality impacts, the NCWRP has targeted this local watershed (page 203). Triangle J Council of Governments has also prioritized this watershed for buffer protection.

1.4 Status and Recommendations for Newly Impaired Waters

There are no newly impaired waters in subbasin 03-04-01. Refer to Part 1.5 below for information on waters with noted water quality impacts.

1.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement. Many of the waters discussed are water supplies (page 85) and are important resources to communities in subbasins 03-04-01 and 03-04-02.

1.5.1 Flat River above Lake Michie

Current Status and 2002 Recommendations
The Flat River above Lake Michie has a lower bioclassification than in 1995, however, is currently supporting based on a Good bioclassification at site B-10. DWQ will continue to monitor this segment to evaluate impacts of land use changes in this part of the watershed. Durham received a CWMTF (page 210) grant to preserve buffers and greenways on the North Flat River.

1.5.2 Corporation Lake and Lake Ben Johnson (Eno River)

Current Status and 2002 Recommendations

Corporation Lake is muddy and may be experiencing increases in nutrient loading which could increase the potential for algal blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Hillsborough should pursue measures to protect the watershed from land use activity that could increase nutrient loading. Hillsborough received a CWMTF (page 212) to acquire buffers on the West Fork Eno River above Corporation Lake and Lake Ben Johnson.

NCWRP (page 203) has initiated a project to restore 1,200 linear feet of Stillhouse Branch (page 213), a tributary of the Eno River, running through Hillsborough. Because of the noted water quality problems and ongoing water quality initiatives, the NCWRP has targeted this local watershed (page 203).

The Eno River Association (page 216) has prepared a riparian corridor conservation design for the Conservation Trust for North Carolina (page 218) that identifies preservation and restoration opportunities in the Eno River watershed.

1.5.3 Little River Reservoir

Current Status and 2002 Recommendations

The Little River Reservoir experiences periodic low dissolved oxygen (page 92) that may be related to elevated nutrient inputs increasing the potential for algal blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Durham should pursue measures to protect the watershed from land use activity that could increase nutrient loading.

1.5.4 Lake Rogers

Current Status and 2002 Recommendations

Lake Rogers experiences elevated nutrient inputs increasing potential for algae blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Creedmoor should pursue measures to protect the watershed from land use activity that could increase nutrient loading.

The City of Creedmoor has a CWMTF grant to acquire buffers on Lake Rogers (page 212). NCWRP has initiated a Local Watershed Plan (page 203) in the Lake Rogers watershed as well. Because of the noted water quality problems, NCWRP has targeted this local watershed (page 203).

1.5.5 Falls of the Neuse Reservoir (Falls Lake)

Current Status and 2002 Recommendations

The upper part of the reservoir is periodically muddy and nutrient levels are unchanged from previous monitoring. Algal biomass was high in 1999. Low dissolved oxygen (page 92) in mid-reservoir and low mean Secchi depths (measure of clarity) indicate that the Falls Lake Reservoir experiences some water quality problems that are related to nutrient loading (algal activity) and sediment loading from the surrounding watershed. DWQ will continue to monitor the lake to evaluate any future degradation in water quality. The City of Raleigh should pursue measures to protect the watershed from land use activity that could increase nutrient and sediment loading.

1.6 Additional Water Quality Issues Within Subbasin 03-04-01

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

1.6.1 Water Quality Threats to Streams in Urbanizing Watersheds

Many of the streams in this subbasin that are not already impaired from urban stormwater runoff are threatened by development pressure throughout this subbasin. In order to prevent aquatic habitat degradation and impaired biological communities, protection measures must be put in place immediately. Refer to page 81 for a description of urban stream water quality problems and recommendations for reducing impacts and restoring water quality.

1.6.2 Upper Neuse Watershed Management Plan

The Upper Neuse River Basin Association (page 217) has developed a watershed management plan that would help protect all waters in subbasin 03-04-01 from the increasing potential for sediment and nutrient impacts.

Section B - Chapter 2

Neuse River Subbasin 03-04-02

Crabtree Creek, Walnut Creek, Swift Creek and Marks Creek

2.1 Subbasin Overview

Subbasin 03-04-02 at a Glance

Land and Water Area

Total area:	726 mi^2
Land area:	724 mi^2
Water area:	2mi^2

Population Statistics

2000 Est. Pop.:	547,580 people
Pop. Density:	808 persons / mi^2

Land Cover (percent)

Forest / Wetland:	53.5
Surface Water:	0.7
Urban:	29.5
Cultivated Crop:	13.1
Pasture / Managed Herbaceous:	3.0

Counties

Durham, Franklin, Johnston and Wake

Municipalities

Raleigh, Wake Forest, Cary, Garner, Clayton, Smithfield and Knightdale

Population growth in this subbasin is one of the highest in the state. Population density is the highest in the basin (1,600-3,200 persons/mi^2). The largest urbanized area is in the northern portion of the subbasin around Raleigh and Cary. New development can be seen in all areas of the subbasin, but especially along the I-40/Hwy 70 corridors and US 64 corridor.

There are 19,345 acres of managed public lands in this subbasin, with Umstead Park and Schenk Forest being the largest. There are also smaller parks and several greenways in this subbasin.

There are 52 NPDES wastewater discharge permits in this subbasin with a permitted flow of 87 MGD (Figure B-2). The largest are Raleigh Neuse WWTP (60 MGD, map #154), Central Johnston WWTP (4.5 MGD, map #96), Cary North WWTP (12 MGD, map #172), Little Creek WWTP (1.9 MGD, map #129) and Wake Forest WWTP (2.4 MGD, map #191). There are also five individual NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. Raleigh has a Phase I stormwater permit, and Cary, Apex, Garner, Durham County and Wake County will be required to develop a stormwater program under Phase II (page 76). Smithfield and Johnston County, and the above communities, have also submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). Issues related to compliance with permit conditions are discussed below in Part 2.3 or Part 2.4 for impaired waters and in Part 2.5 for other waters. There are also nine registered animal operations in this subbasin.

There were 17 benthic macroinvertebrate community samples and five fish community samples (Figure B-2 and Table B-4) collected in 2000 as part of basinwide monitoring. Six sites improved, 13 sites remained the same, and two sites had lower bioclassifications. One site was monitored for the first time. There were also 30 special study samples collected in the subbasin during the assessment period. Data were collected from nine ambient monitoring stations as well.

Figure B-2 Neuse River Subbasin 03-04-02

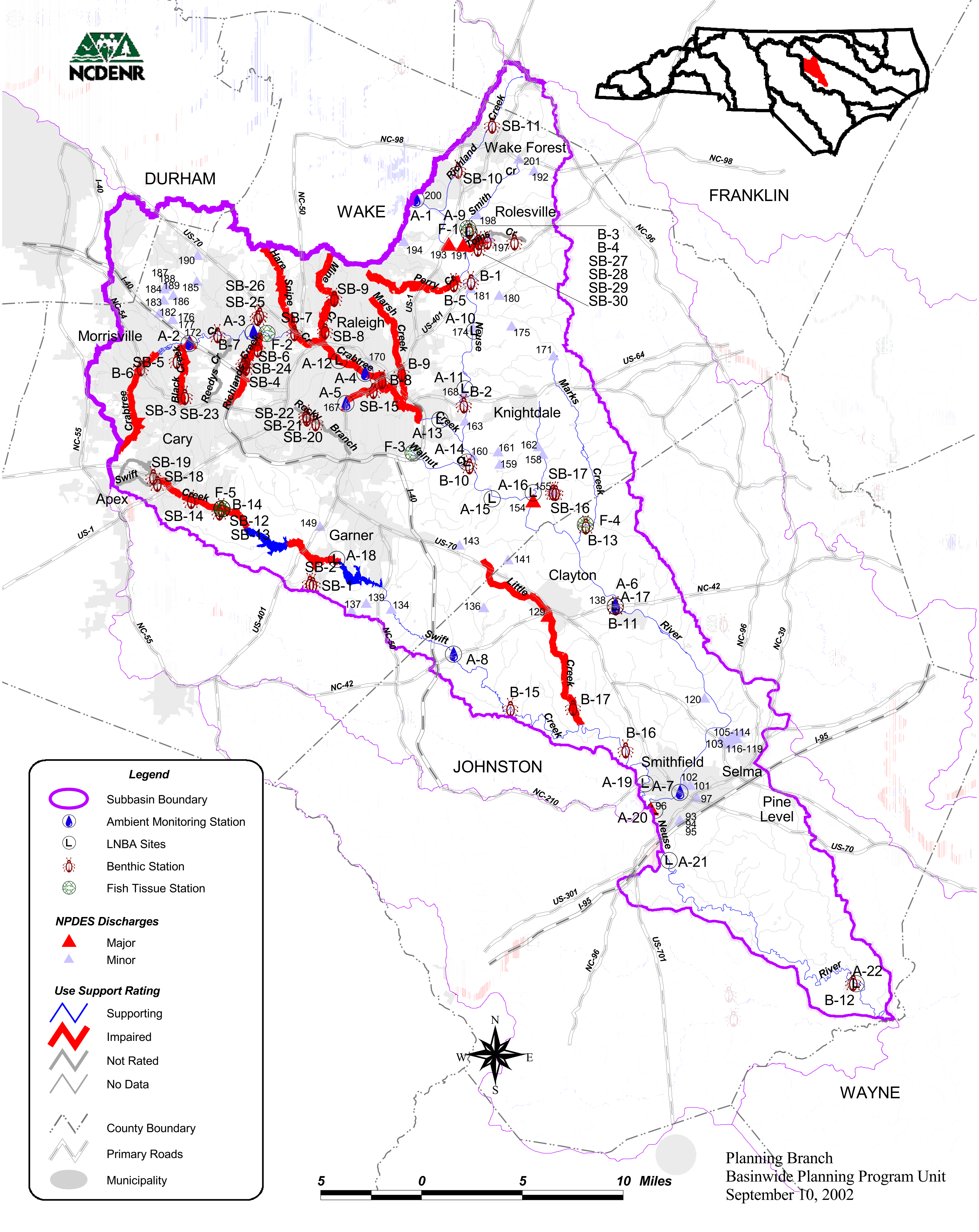


Table B-4 DWQ Monitoring Locations in Subbasin 03-04-02

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Neuse R[2]	Wake	US 401	Good-Fair	Good-Fair
B-2	Neuse R[2]	Wake	US 64	Good-Fair	Good-Fair
B-3	Smith Cr[2]	Wake	SR 2045	Good-Fair	Fair
B-4	Toms Cr[2]	Wake	SR 2044	Fair	Fair
B-5	Perry Cr	Wake	SR 2006	Fair	Fair
B-6	Crabtree Cr[2]	Wake	NC 54	Poor	Poor
B-7	Crabtree Cr[2]	Wake	Umstead Park	Good-Fair	Good-Fair
B-8	Crabtree Cr[2]	Wake	US 1	Fair	Fair
B-9	Marsh Cr[2]	Wake	near US 1	Fair	Poor
B-10	Walnut Cr[2]	Wake	SR 2551	Fair	Good-Fair
B-11	Neuse R[2]	Johnston	NC 42	Good-Fair	Good
B-12	Neuse R[2]	Johnston	SR1201	Good	Good
B-13	Marks Cr[2]	Johnston	SR 1714	Good-Fair	Good-Fair
B-14	Swift Cr[2]	Wake	SR 1152	Fair	Fair
B-15	Swift Cr	Johnston	SR 1555	Good-Fair	Good-Fair
B-16	Swift Cr[2]	Johnston	SR 1501	Good	Good
B-17	Little Cr[2]	Johnston	SR 1562	Fair	Fair
SB-1	UT Swift Cr	Wake	Developed area	---	Poor
SB-2	UT SwiftCr	Wake	Control site	---	Good
SB-3	Swift CR	Wake	ab US 1 in MacGregor Center in park	---	Poor
SB-4	Richlands Cr	Wake	off Reedy Creek Rd; Raleigh	---	Fair
SB-5	Black Cr	Wake	Weston Parkway	---	Fair
SB-6	Richlands Cr	Wake	SR 1649	---	Fair
SB-7	Haresnipe Cr	Wake	US 70; nr Crabtree	---	Poor
SB-8	Mine Cr	Wake	Off N Hills Dr; Raleigh	---	Poor
SB-9	MineCr	Wake	1 mile ab lake	---	Fair
SB-10	Richland Cr	Wake	US 1	---	Good-Fair
SB-11	Richland Cr	Wake	SR 1931	---	Good-Fair
SB-12	Speight Cr	Wake	SR 1385	---	Not Rated
SB-13	Swift CR	Wake	SR 1152; Holly Springs Rd	---	Fair
SB-14	Swift CR	Wake	SR 1300; Hemlock Bluffs	---	Poor
SB-15	Pigeon House Cr	Wake	Fenton St; Raleigh	---	Poor
SB-16	UT Poplar Cr	Wake	ab WWTP nr SR 2509	---	Not Rated
SB-17	UT Poplar Cr	Wake	ab SR 2509	---	Not Rated
SB-18	Swift CR	Wake	McKenan Rd ab Williams Cr	---	Not Rated
SB-19	Williams Cr	Wake	ab US 64 in MacGregor West	---	Not Rated
SB-20	Rocky Br	Wake	nr Pullen Road	---	Not Rated
SB-21	Rocky Br	Wake	Dan Allen Drive	---	Not Rated
SB-22	RockyBr	Wake	Gorman Street	---	Not Rated
SB-23	Swift CR	Wake	ab US 1 in MacGregor Center in park	---	Not Rated

SB-24	Reedy Cr	Wake	Umstead State Park	---	Not Rated
SB-25	UT Turkey Cr	Wake	be Delta Ridge; at temporary road crossing	---	Not Rated
SB-26	UT TurkeyCr	Wake	ab Delta Ridge	---	Not Rated
SB-27	UT Toms Cr	Wake	SR 2044	---	Not Rated
SB-28	Toms Cr	Wake	off powerline trail	---	Not Rated
SB-30	Toms Cr	Wake	Toms Cr above the package plant discharge for Deerchase sbdivision on Kimbel Rd	---	Not Rated

Fish Community Monitoring Sites

Map #[1]	Waterbody	County	Location	1995	2000
F-1	Smith Cr	Wake	SR 2045	Good-Fair	Excellent
F-2	Crabtree Cr	Wake	SR 1664	---	Excellent
F-3	Walnut Cr[2]	Wake	SR 2544	Fair	Good-Fair
F-4	Marks Cr[2]	Johnston	SR 1714	Good	Excellent
F-5	Swift Cr	Wake	SR 1152	Poor	Fair/Good-Fair

Ambient Monitoring Sites

Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[3]
A-1	Neuse River	Wake	nr Falls Lake	J1890000	none
A-2	Crabtree Creek	Wake	SR 1795	J2850000	none
A-3	Crabtree Creek	Wake	SR 1649	J3000000	none
A-4	Crabtree Creek	Wake	SR 2000	J3251000	none
A-5	Pigeon House Cr	Wake	Dortch St	J3300000	none
A-6	Neuse River	Johnston	SR 1004	J4170000	none
A-7	Neuse River	Johnston	Smithfield	J4370000	none
A-8	Swift Cr	Johnston	NC 42	J4510000	none
A-9[4]	Smith Creek	Wake	SR 2045	J2230000	none
A-10[4]	Neuse River	Wake	SR 2215	J2330000	none
A-11[4]	Neuse River	Wake	Milburnie Dam	J2360000	none
A-12[4]	Crabtree Creek	Wake	Lassiter Mill Dam	J3210000	none
A-13[4]	Crabtree Creek	Wake	New Hope Road	J3470000	none
A-14[4]	Walnut Creek	Wake	SR2551	J3970000	none
A-15[4]	Neuse River	Wake	SR 2555	J4050000	none
A-16[4]	Poplar Creek	Wake	SR 2049	J4080000	none
A-17[4]	Neuse River	Johnston	NC 42	J4170000	none
A-18[4]	Swift Creek	Wake	SR 1152	J4414000	DO
A-19[4]	Swift Creek	Johnston	NC 210	J4590000	none
A-20[4]	Middle Creek	Johnston	Near Smithfield	J5030000	none
A-21[4]	Black Creek	Johnston	Near Smithfield	J5190000	none
A-22[4]	Neuse River	Johnston	SR 1201	J5250000	none

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

[4] LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Use support ratings are summarized in Part 2.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 2.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 2.4 below. Supporting waters with noted water quality impacts are discussed in Part 2.5 below. Water quality issues related to the entire subbasin are discussed in Part 2.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

2.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-02 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

There were 243 stream miles (47 percent) and 1,065 reservoir acres (95 percent) monitored during this assessment period in the aquatic life and secondary recreation use support category. Approximately 68 (28 percent) of the monitored stream miles are impaired. Refer to Table B-5 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-6.

Table B-5 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-02

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	163.5 mi 1,036.5 ac	0	12.2 mi 90.6 ac	0
	All Waters	163.5 mi 1,036.5 ac	0	12.2 mi 90.6 ac	130.8 mi 1,089.5 ac
Impaired	Monitored	**68.3 mi**	0	0	0
	All Waters	68.3 mi	512.3 mi 1,396.7 ac	0	0
Not Rated	Monitored	10.9 mi 28.8 ac	0	0	0
No Data	N/A (No Data)	269.5 mi 331.4 ac	0	14.6 mi 216.6 ac	0
Total	Monitored	242.8 mi 1,065.3 ac	0	12.2 mi 90.6 ac	0
	All Waters	512.3 mi 1,396.7 ac	512.3 mi 1,396.7 ac	26.7 mi 307.2 ac	130.8 mi 1,089.5 ac
	Percent Monitored	47.4% mi 76.3% ac	0%	45.7% mi 29.5% ac	0%

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

Table B-6 Previously or Currently Impaired Waters in Subbasin 03-04-02

Name	1998 Status	2002 Status	Use Support Category	Miles
Black Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	3.6
Crabtree Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	16.0
Hare Snipe Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	4.5
Little Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	11.4
Marsh Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	6.2
Mine Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	4.7
Perry Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	4.9
Pigeon House Branch	Impaired	Impaired	Aquatic Life/Secondary Recreation	2.9
Richlands Creek	Supporting	Impaired	Aquatic Life/Secondary Recreation	4.7
Swift Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	7.9
Toms Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	1.5
Walnut Creek	Impaired	Supporting/Not Rated	Aquatic Life/Secondary Recreation	N/A
			Total 2002 Impaired Miles	**68.3**

2.3 Status and Recommendations of Previously Impaired Waters

2.3.1 Black Creek

1998 Recommendations

Black Creek was partially supporting from the source to Crabtree Creek. It was recommended that the City of Raleigh address urban runoff impacts to this stream.

Current Status

Black Creek (3.6 miles) is currently impaired because of a Fair bioclassification at site SB-5. Habitat degradation from urban runoff is a likely cause of impairment.

2002 Recommendations

DWQ will continue monitoring Black Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Black Creek. Because of the water quality impairment noted above, Black Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Black Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.2 Crabtree Creek

1998 Recommendations

Crabtree Creek was not supporting from the source to I-40 and partially supporting and fully supporting from Highway 70 to the Neuse River. It was recommended that Cary and Raleigh address the stormwater impacts to Crabtree Creek. Development has continued in the Crabtree Creek watershed.

Current Status

Crabtree Creek (5.1 miles) from the source to Lake Crabtree is currently impaired because of a Poor bioclassification at site B-6. This segment is affected by urban runoff from Cary. From the Cary WWTP outfall to Hair Snipe Creek (14 miles), the creek is supporting because of a Good-Fair and Excellent bioclassifications at two sites in Umstead State Park (B-7 and F-2) indicating recovery of water quality through the undeveloped parkland. These sites are downstream of Cary WWTP and Crabtree Lake. The ambient monitoring station (A-3) in the park detected elevated turbidity and iron, indicating erosion of soils most likely from upstream construction sites and streambank erosion. From Hair Snipe Creek to 2.8 miles upstream of the Neuse River (10.9 miles), Crabtree Creek is impaired because of a Fair bioclassification at site B-8. This segment drains the highly urbanized watersheds of Raleigh. The ambient monitoring station (A-4) also detected elevated turbidity and iron. All the monitored tributaries to Crabtree Creek received Poor or Fair bioclassifications. Habitat degradation (page 89) is a likely cause of the impaired biological communities in these segments of Crabtree Creek.

2002 Recommendations
DWQ will continue monitoring Crabtree Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Crabtree Creek. DWQ will continue to support the City of Raleigh stormwater programs. Because of the water quality impairment noted above, Crabtree Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Crabtree Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

As can be seen by the water quality improvement in Umstead Park, undisturbed land with little impervious surface area can help to maintain aquatic habitats and the integrity of the biological community.

Current Water Quality Initiatives
The City of Raleigh has established the Capital Area Greenway (page 214) on segments of Crabtree Creek that will help to preserve buffers along the mainstem of the creek and provide recreational opportunities.

The Neuse River Foundation (page 214) has been monitoring the mouth of Crabtree Creek to investigate sediment and nutrient loading from the Crabtree Creek watershed into the Neuse River.

2.3.3 Hair Snipe Creek

1998 Recommendations
Hair Snipe Creek was partially supporting from the source to Crabtree Creek. It was recommended that the City of Raleigh address urban runoff impacts to this stream.

Current Status
The bioclassification of Hair Snipe Creek has dropped to Poor at site SB-7, indicating increased impacts from urban runoff. Hair Snipe Creek (4.5 miles) is currently impaired because of the Poor bioclassification, likely because of habitat degradation and urban runoff.

2002 Recommendations
DWQ will continue monitoring Hair Snipe Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Hair Snipe Creek. Because of the water quality impairment noted above, Hair Snipe Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Hair Snipe Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.4 Little Creek

1998 Recommendations
Little Creek was partially supporting from the source to Swift Creek. It was recommended that a more detailed study of the watershed be undertaken to determine possible causes of impairment.

Current Status
Little Creek (11.4 miles) is currently impaired because of a Fair bioclassification at site B-17. This stream has a noted lack of habitat, but may be improving as indicated by the presence of more intolerant macroinvertebrates than in previous monitoring. Little Creek drains the rapidly urbanizing watershed west of Clayton and may be impacted by development in the area.

2002 Recommendations
Little Creek watershed is under high development pressure. Sedimentation and erosion control plans should be followed during construction to minimize impacts to Little Creek and its tributaries. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Little Creek. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.5 Marsh Creek

1998 Recommendations
Marsh Creek was not supporting from the source to Crabtree Creek. It was recommended that the City of Raleigh address urban runoff impacts to this stream.

Current Status
The bioclassification of Marsh Creek has dropped to Poor at site B-9, indicating increased impacts from urban runoff. Marsh Creek (6.2 miles) is currently impaired because of the Poor bioclassification most likely because of habitat degradation from urban runoff.

2002 Recommendations
DWQ will continue monitoring Marsh Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Marsh Creek. Because of the water quality impairment noted above, Marsh Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Marsh Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.6 Mine Creek

1998 Recommendations
Upper Mine Creek was partially supporting, and Lower Mine Creek to Crabtree Creek was not supporting. It was recommended that the City of Raleigh address urban runoff impacts to this stream.

Current Status
Mine Creek (4.7 miles) from source to Crabtree Creek is currently impaired because of Poor and Fair bioclassifications at sites SB-8 and SB-9. Habitat degradation from urban runoff is the most likely cause of impairment in this stream.

2002 Recommendations
DWQ will continue monitoring Mine Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Mine Creek. Because of the water quality impairment noted above, Mine Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Mine Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.7 Perry Creek

1998 Recommendations
Perry Creek was partially supporting from the source to the Neuse River. No specific recommendations were made for Perry Creek in the 1998 basinwide plan.

Current Status
Perry Creek (4.9 miles) is currently impaired because of a Fair bioclassification at site B-5. Habitat degradation from urban runoff is the most likely cause of impairment.

2002 Recommendations
Perry Creek is in an urbanizing area of Wake County. DWQ will continue monitoring Mine Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Perry Creek. Because of the water quality impairment noted above, Perry Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Perry Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.8 Pigeon House Branch

1998 Recommendations
Pigeon House Branch was not supporting from the source to Crabtree Creek. It was recommended that the City of Raleigh address urban runoff impacts to this stream.

Current Status
Pigeon House Branch (2.9 miles) is currently impaired because of a Poor bioclassification at site SB-15. Habitat degradation from urban runoff is the most likely cause of impairment. At the ambient monitoring station (A-5), the geometric mean of fecal coliform bacteria was 900 colonies/100ml water. This stream drains downtown Raleigh and is under parking lots or large roadways for much of its length.

2002 Recommendations
DWQ will continue monitoring Pigeon House Branch. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Pigeon House Branch. Because of the water quality impairment noted above, Pigeon House Branch is a NCWRP targeted local watershed (page 203).

The impaired biological community in Pigeon House Branch is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.3.9 Swift Creek (including Williams Creek)

1998 Recommendations
Upper Swift Creek and Williams Creek were not supporting from their sources to Lake Wheeler. Swift Creek was partially supporting from Lake Wheeler to Lake Benson and fully supporting to the Neuse River. It was recommended that no new discharges be permitted into the creek.

Current Status
Upper Swift Creek and Williams Creek are currently not rated because these segments are too small to assign bioclassifications. Swift Creek (5.5 miles) from the confluence with Williams Creek to Lake Wheeler is currently impaired because of Poor and Fair bioclassifications at sites SB-3 and B-14.

Between Lake Wheeler and Lake Benson (2.4 miles), Swift Creek is also impaired because dissolved oxygen (site A-18) was below 4 mg/l in 10.1 percent of samples. Swift Creek is being investigated by the Watershed Assessment and Restoration Project (WARP) (page 213). Above Lake Wheeler, Swift Creek is adversely impacted by stormwater runoff from urban and developing areas of Raleigh and Cary.

2002 Recommendations
DWQ will continue monitoring Swift Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment

in Swift Creek. DWQ will use the information in the WARP report on Swift Creek to develop recommendations to restore water quality in Swift Creek.

The impaired biological community in Swift Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

Lower Swift Creek, below the Lake Wheeler Dam, is being studied for preservation by the Triangle Land Conservancy. Because of the water quality impairment noted above and the preservation efforts, lower Swift Creek is a NCWRP targeted local watershed (page 203).

Current Water Quality Initiatives
There is Wake County Parks and Recreation and CWMTF restoration project (page 218) in the Swift Creek watershed. The Triangle Land Conservancy (page 219) has prepared a conservation assessment for the Conservation Trust for North Carolina (page 218) that identifies preservation and restoration opportunities in Swift Creek and the adjacent Neuse River watershed.

2.3.10 Toms Creek

1998 Recommendations
Toms Creek was partially supporting from the source to the Neuse River. No specific recommendations were made for Toms Creek in the 1998 basinwide plan.

Current Status
Toms Creek (1.5 miles) from Browns Lake to the Neuse River is currently impaired because of a Fair bioclassification at site B-4. Toms Creek was investigated by the Watershed Assessment and Restoration Project (WARP) (page 213) in 2001. The watershed assessment was valuable in defining the extent of impairment in Toms Creek and in determining the causes of impairment. Extensive monitoring completed during the project determined that high chlorine levels in the Deerchase WWTP (map #197) discharge and habitat degradation from high stormwater flows in the lower part of the creek are responsible for the impairment.

2002 Recommendations
In order to restore the biological community in Toms Creek, the discharger problems need to be addressed, and then aquatic habitat will need to be restored below the dam at Browns Lake. DWQ will work with Deerchase WWTP to reduce impacts to Toms Creek related to the discharge. Current NSW riparian buffer rules (page 64) and the NSW and NPDES Phase II (page 76) stormwater rules need to be fully enforced to prevent increased habitat degradation in Toms Creek. Because of the water quality impairment noted above and the current assessment efforts, Toms Creek is a NCWRP targeted local watershed (page 203).

2.3.11 Walnut Creek

1998 Recommendations

Walnut Creek was partially supporting from Lake Johnson to Lake Raleigh and from I-440 to the Neuse River. The segment between these was not supporting. It was recommended that no new discharges be permitted into the creek.

Current Status

Increases in bioclassification to Good-Fair at two sites below Lake Raleigh (B-10 and F-3) indicate some improvement in water quality lower on Walnut Creek. This segment is currently supporting because of the increased bioclassifications; however, there was noted habitat degradation with infrequent pools and riffles and indications of scour from high storm flows. The segments above I-440 are currently not rated because there was no monitoring, and the area drains heavily urbanized portions of Cary and Raleigh. Past benthic macroinvertebrate bioclassifications have been Poor upstream of site F-3. Upper Walnut Creek is heavily impacted from urban runoff.

2002 Recommendations

Although water quality in Walnut Creek appears to be improving in the lower segments, the watershed drains urbanized and urbanizing areas of Raleigh and Cary and the potential for degradation of instream habitat is very high. DWQ will reestablish a biological monitoring station above Lake Raleigh and Lake Johnson to better assess impacts from stormwater runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

There are currently two NCWRP restoration projects ongoing in the Walnut Creek watershed (page 213) designed to stabilize streambanks and reduce sedimentation. Because of the water quality impairment noted above and the current restoration projects, Walnut Creek is a NCWRP targeted local watershed (page 203).

2.4 Status and Recommendations for Newly Impaired Waters

2.4.1 Richlands Creek

Current Status

Richlands Creek was fully supporting but threatened in 1998, but is currently impaired (4.7 miles) because of two Fair bioclassifications in 1996 at sites SB-4 and SB-6. Habitat degradation from urban runoff is the most likely cause of impairment. Intensive grading and road building activity in this watershed, related to construction of the Raleigh Entertainment and Sports Arena (RESA), is likely to have increased habitat degradation.

2002 Recommendations

DWQ will continue monitoring Richlands Creek. As part of the 303(d)-list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Richlands Creek. The NCWRP is initiating a riparian buffer restoration and streambank stabilization project on Richlands Creek at the RESA. Because of the water quality impairment noted above and the current restoration efforts, Richlands Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Richlands Creek is typical of streams that run through urban areas. As with Crabtree Creek and the other creeks draining urban Raleigh and Cary, great efforts will be needed to reduce impacts from urban runoff. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

2.5.1 Reedy Creek

Current Status and 2002 Recommendations
Reedy Creek was not rated in 1998 and is currently not rated. Site SB-24 did not meet the necessary criteria to assign a bioclassification. The watershed drains urbanizing portions of Raleigh. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

2.5.2 Rocky Branch

Current Status and 2002 Recommendations
Rocky Branch is currently not rated. Sites SB-20, 21 and 22 did not meet the necessary criteria to assign bioclassifications. The watershed is in a heavily urbanized area of west Raleigh and runs through NCSU campus. Stream habitat is degraded, and the benthic macroinvertebrate community is heavily impacted from urban runoff. The stream is currently undergoing a large-scale restoration project funded in part by CWMTF (page 210).

2.5.3 Lake Crabtree

Current Status and 2002 Recommendations
Lake Crabtree has constantly high turbidity, most likely from urban runoff and development in the watershed. The watershed drains urban Cary and Raleigh-Durham International Airport. Lake Crabtree may actually help downstream water quality by processing sediment and nutrients and reducing turbidity. There was a blue green algal bloom in the lake in August 1999. DWQ will continue to monitor the lake to evaluate any future degradation in water quality.

Lake Crabtree (518 ac) is classified for and is supporting primary recreation based on a lake assessment completed in summer of 2000. Fecal coliform bacteria levels were well below the water quality standard for primary recreation.

2.5.4 Reedy Creek Lake, Big Lake and Sycamore Lake

<u>*Current Status and 2002 Recommendations*</u>
Reedy Creek Lake, Big Lake and Sycamore Lake have had problems with *Hydrilla*. The watersheds drain mostly forested areas of Umstead State Park. There are indications of increased nutrient loading to the lakes as development increases in the watershed areas just outside of the park boundaries. DWQ will continue to monitor these lakes to evaluate any future degradation in water quality that may be associated with development in these watersheds.

2.5.5 Apex Lake

<u>*Current Status and 2002 Recommendations*</u>
Apex Lake watershed has undergone dramatic development since 1995. Nutrient and sediment loading to the lake are increasing as a result of this development. Because of the rapid changes in land use in this watershed, DWQ will continue to monitor this lake to evaluate any future degradation in water quality that may be associated with development.

2.5.6 Lake Wheeler

<u>*Current Status and 2002 Recommendations*</u>
Lake Wheeler is an important recreational lake as well as a future Raleigh water supply. There are safety and pollution concerns related to the use of powerboats on the lake. There have been high levels of manganese detected in the lake, and *Hydrilla* infestations have also been a problem. Because of the rapid changes in land use in this watershed, DWQ will continue to monitor this lake to evaluate any future degradation in water quality that may be associated with development.

2.5.7 Lake Benson

<u>*Current Status and 2002 Recommendations*</u>
Lake Benson is a future Raleigh water supply. There have been high levels of manganese detected in the lake, and *Hydrilla* infestations have also been a problem. Because of the rapid changes in land use in this watershed, DWQ will continue to monitor this lake to evaluate any future degradation in water quality that may be associated with development.

2.5.8 Marks Creek

<u>*Current Status and 2002 Recommendations*</u>
Marks Creek is in rapidly developing areas of Wake and Johnston counties. There was logging noted at sites B-13 and F-4. Adherence to and enforcement of riparian buffer and stormwater rules will help to protect Marks Creek as this watershed is developed. Because of the water quality impacts noted above, the increasing development pressure and the availability of a conservation assessment in the watershed, Marks Creek is a NCWRP targeted local watershed (page 203).

The Triangle Land Conservancy (page 219) has prepared a conservation assessment for the Conservation Trust for North Carolina (page 218) that identifies preservation and restoration opportunities in Marks Creek and the adjacent Neuse River watershed (page 214).

2.5.9 Neuse River Bottomlands

Current Status and 2002 Recommendations

This section of the Neuse River is currently supporting based on a Good bioclassification at site B-12. This segment of the Neuse River is the best watershed for preservation in the upper Neuse River basin. More than 50 percent of the entire basin population live upstream of this site. This area has extensive wetlands and will be an important area to preserve to protect downstream water quality. The Neuse River floodplain broadens out to four miles wide through this area as it transitions from the piedmont to the coastal plain. This watershed has several Natural Heritage sites and has been prioritized by Johnston County as its most impressive natural area. The NCWRP has targeted this local watershed (page 203).

2.5.10 Richland Creek

Current Status and 2002 Recommendations

Richland Creek is in a rapidly developing area near Wake Forest. Two sites on Richland Creek had Good-Fair bioclassifications. Adherence to and enforcement of riparian buffer and stormwater rules will help to protect Richland Creek as this watershed is developed. Because of the increasing development pressure, this watershed is a NCWRP targeted local watershed (page 203).

2.6 Additional Water Quality Issues Within Subbasin 03-04-02

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

2.6.1 Water Quality Threats to Streams in Urbanizing Watersheds

Most of the streams in this subbasin that are not already impaired from urban stormwater runoff are threatened by development pressure throughout this subbasin. In order to prevent aquatic habitat degradation and impaired biological communities, protection measures must be put in place immediately. Refer to page 81 for a description of urban stream water quality problems and recommendations for reducing impacts to and restoring water quality in these waters.

2.6.2 Wake County Watershed Task Force

Local governments have increasingly become involved in water quality issues within their jurisdictions. Wake County is centered in one of the most intensely developed subbasins in North Carolina. Wake County is engaged in a process to protect and restore water quality to streams in the county (page 218).

Section B - Chapter 3
Neuse River Subbasin 03-04-03
Middle Creek

3.1 Subbasin Overview

Subbasin 03-04-03 at a Glance

Land and Water Area

Total area:	131 mi^2
Land area:	131 mi^2
Water area:	0 mi^2

Population Statistics

2000 Est. Pop.:	50,991 people
Pop. Density:	persons / mi^2

Land Cover (percent)

Forest / Wetland:	57.3
Surface Water:	1.1
Urban:	22.0
Cultivated Crop:	17.6
Pasture / Managed Herbaceous:	1.9

Counties

Johnston and Wake

Municipalities

Holly Springs, Apex and Fuquay-Varina

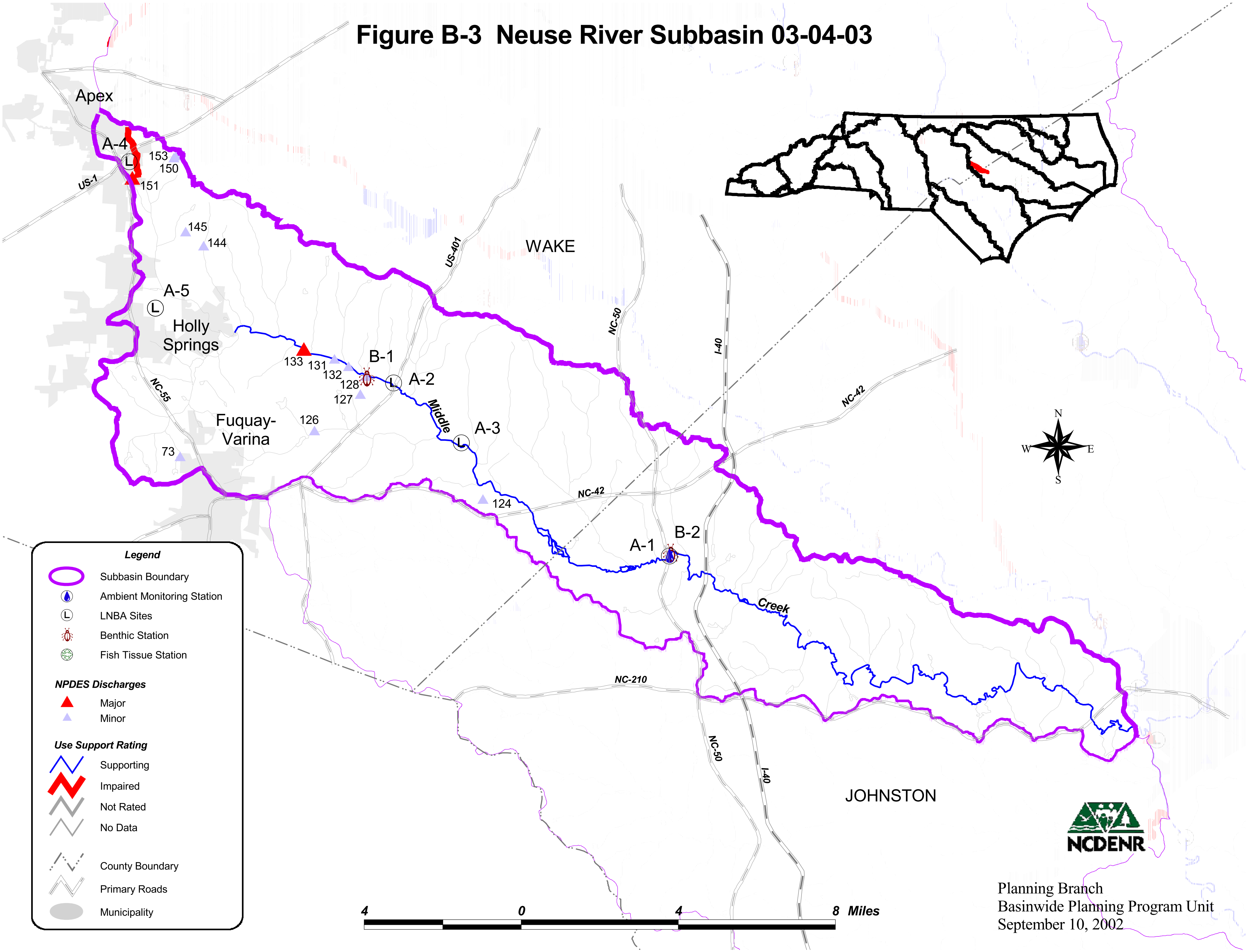
Population growth in the subbasin is concentrated around the rapidly growing communities of Apex and Holly Springs in the northern portions of the subbasin. Population density is highest (320-1,600 persons/mi^2) in the northern portions of the subbasin. Growth is also high between Fuquay-Varina and Smithfield. Most of the development is occurring on land previously in agriculture land use.

There are 469 acres of managed public lands in this subbasin. The largest is a farm easement owned by the Triangle Land Conservancy (page 219).

There are eight NPDES wastewater discharge permits in this subbasin with a total permitted flow of 17 MGD (Figure B-3). The largest are Apex WWTP (3.6 MGD, map #151) and Cary South WWTP (12.8 MGD, map #133). There is also one individual NPDES stormwater permit in the subbasin. Refer to Appendix I for identification and more information on NPDES permit holders. Wake County will be required to develop a stormwater program under Phase II (page 76). Johnston and Wake counties have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). There are also four registered animal operations in this subbasin.

There were two benthic macroinvertebrate community samples (Figure B-3 and Table B-7) collected in 2000 as part of basinwide monitoring. One site improved and one site had the same bioclassification. Data were collected from one ambient monitoring station as well. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Figure B-3 Neuse River Subbasin 03-04-03



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-7 DWQ Monitoring Locations in Subbasin 03-04-03

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Middle Cr [2]	Wake	SR 1375	Fair	Good-Fair
B-2	Middle Cr [2]	Wake	NC 50	Good-Fair	Good-Fair

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Middle Cr	Johnston	NC 50	J5000000	none
A-2[4]	Middle Cr	Wake	US 401	J4870000	none
A-3[4]	Middle Cr	Wake	SR 1006	J4980000	none
A-4[4]	Middle Cr	Wake	Nr Apex	J4610000	DO
A-5[4]	Middle Cr	Wake	Sunset Lake	J4690000	none

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

[4] LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 3.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 3.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 3.4 below. Supporting waters with noted water quality impacts are discussed in Part 3.5 below. Water quality issues related to the entire subbasin are discussed in Part 3.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and for more information on supporting monitored waters.

3.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-03 were assigned for aquatic life and secondary recreation and fish consumption. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 50 stream miles (43 percent) monitored during this assessment period. All but 1.4 miles of monitored waters are supporting. Refer to Table B-8 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-9.

Table B-8 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-03

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation
Supporting	Monitored	49.0 mi	0	0
	All Waters	49.0 mi	0	0
Impaired	Monitored	**1.4 mi**	0	0
	All Waters	1.4 mi	117.7 mi 98.0 ac	0
Not Rated	Monitored	0	0	0
No Data	N/A	67.3 mi 98.0 ac	0	5.5 mi 98.0 ac
Total	Monitored	50.4 mi	0	0
	All Waters	117.7 mi 98.0 ac	117.7 mi 98.0 ac	5.5 mi 98.0 ac
	Percent Monitored	43% mi	0%	0%

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

Table B-9 Previously or Currently Impaired Waters in Subbasin 03-04-03

Name	1998 Status	2002 Status	Use Support Category	Miles
Middle Creek	Supporting	Impaired	Aquatic Life/Secondary Recreation	1.4
			Total 2002 Impaired Miles	**1.4**

3.3 Status and Recommendations of Previously Impaired Waters

There were no impaired streams identified in the 1998 basin plan in this subbasin.

3.4 Status and Recommendations of Waters Newly Impaired Waters

3.4.1 Middle Creek

Current Status

Middle Creek is currently supporting with Good-Fair bioclassifications at sites B-1 and B-2 (Figure B-3). Upper Middle Creek (1.4 miles) is currently impaired because dissolved oxygen (site A-4) was below 4 mg/l in 16 percent of samples. Increasing development with streambank erosion was noted, as well as indications of nutrient enrichment. Cary WWTP (map #133) and Apex WWTP (map #151) have had past aquatic toxicity failures. Cary WWTP had two aquatic toxicity fails in 2000.

2002 Recommendations

DWQ will work with the discharges to remedy toxicity problems. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality. DWQ will also attempt to determine the source of the low dissolved oxygen levels in the upper watershed. Apex received a CWMTF grant to make WWTP upgrades. Because of the water quality impacts noted above and the increasing development pressure, Middle Creek is a NCWRP targeted local watershed (page 203).

3.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

3.5.1 Terrible Creek

Current Status and 2002 Recommendations

Terrible Creek is currently not rated. The Fuquay-Varina WWTP (map #126) has had past aquatic toxicity failures. DWQ will work with the town to remedy the toxicity problems.

3.6 Additional Water Quality Issues Within Subbasin 03-04-03

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

3.6.1 Water Quality Threats to Streams in Urbanizing Watersheds

Most of the streams in the Wake County portion of the subbasin will be increasingly threatened by development pressure. In order to prevent aquatic habitat degradation and impaired biological communities, protection measures must be put in place immediately. Refer to page 81 for a description of urban stream water quality problems and recommendations for reducing impacts to and restoring water quality in these waters.

Section B - Chapter 4
Neuse River Subbasin 03-04-04
Hannah Creek and Mill Creek

4.1 Subbasin Overview

Subbasin 03-04-04 at a Glance

Land and Water Area

Total area:	277 mi^2
Land area:	277 mi^2
Water area:	0 mi^2

Population Statistics

2000 Est. Pop.:	31,658 people
Pop. Density:	108 persons/mi^2

Land Cover (percent)

Forest/Wetland:	50.1
Surface Water:	1.1
Urban:	1.9
Cultivated Cropland:	45.9
Pasture/ Managed Herbaceous:	0.2

Counties

Johnston and Wake

Municipalities

Benson and Four Oaks

Population growth in this subbasin is concentrated on the I-95 corridor between Benson and Smithfield. The northern part of the subbasin is in agriculture land use. There are 2,741 acres of managed public lands in this subbasin mostly associated with Howell Woods at Johnston Community College near the confluence with Hannah Creek and Mill Creek.

The Benson WWTP (1.5 MGD, map #87) is the only NPDES wastewater discharge permitted in this subbasin (Figure B-4). There are no individual NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on NPDES permit holders. Wake County will be required to develop a stormwater program under Phase II (page 76). Johnston and Wake counties have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). There are also 39 registered animal operations in this subbasin.

There were two benthic macroinvertebrate community samples (Figure B-4 and Table B-9) collected in 2000 as part of basinwide monitoring. Both sites remained the same. Refer to *2001 Neuse River Basinwide Assessment Report* http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Use support ratings are summarized in Part 4.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 4.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 4.4 below. Water quality issues related to the entire subbasin are discussed in Part 4.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-4 Neuse River Subbasin 03-04-04

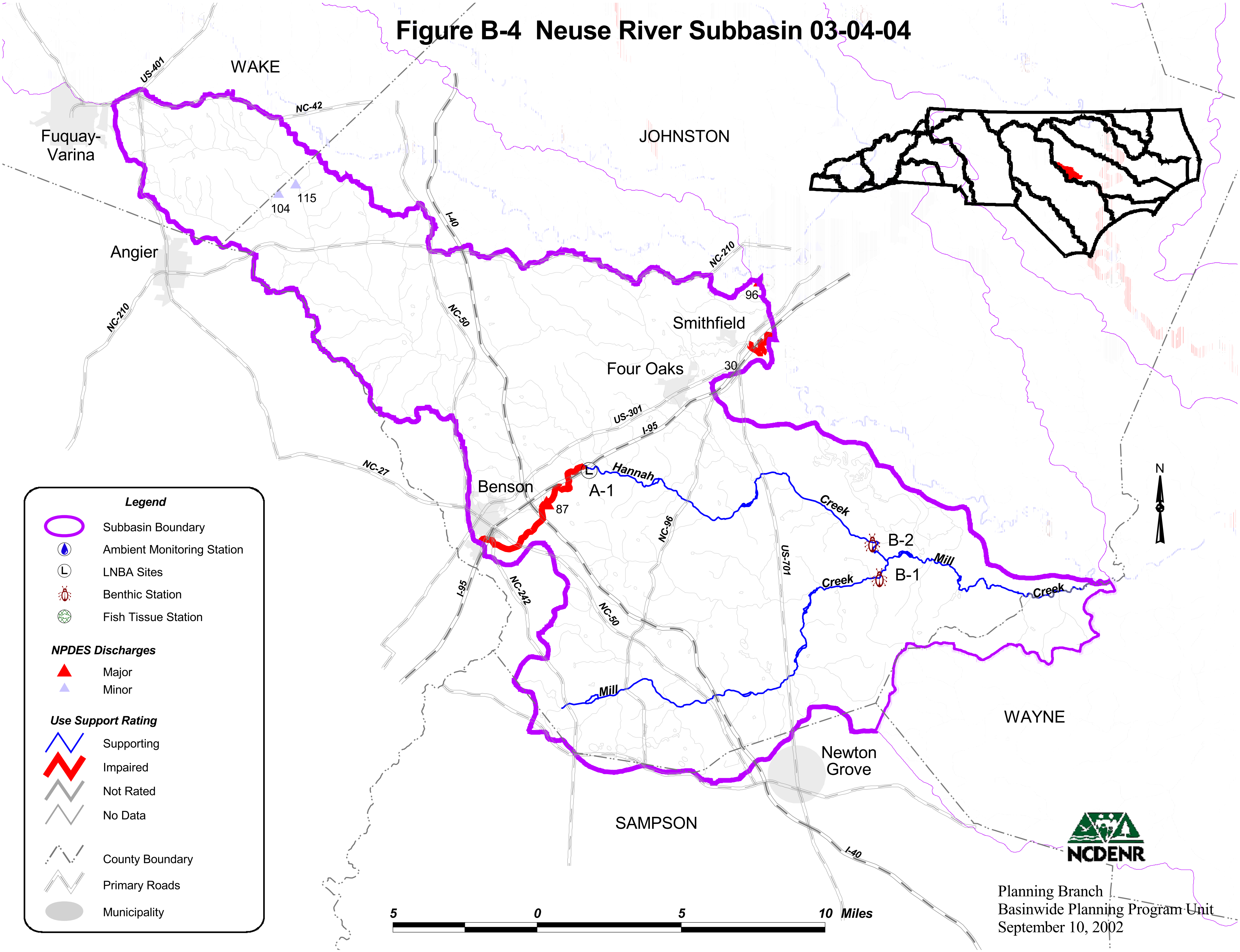


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Table B-10 DWQ Monitoring Locations in Subbasin 03-04-04

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Mill Cr	Johnston	SR 1009	Good-Fair	Good-Fair
B-2	Hannah Cr[2]	Johnston	SR 1009	Good-Fair	Fair
B-2	Hannah Cr[2]	Johnston	SR 1009	Good-Fair	Fair

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1[4]	Hannah Cr	Johnston	I-95	J5400000	DO

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

[4] LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

4.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-04 were assigned for aquatic life and secondary recreation, fish consumption and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

There were 28.6 stream miles (12.5 percent) monitored during this assessment period. Approximately 12 (43 percent) of the monitored stream miles are impaired. Refer to Table B-11 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-12.

Table B-11 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-04

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	16.4 mi	0	0	0
	All Waters	16.4 mi	0	0	4.7 mi
Impaired	Monitored	**12.3** mi	0	0	0
	All Waters	12.3 mi	227.1 mi	0	0
Not Rated	Monitored	0	0	0	0
No Data	N/A	198.5 mi	0	5.4 mi	0
Total	Monitored	28.6 mi	0	0	0
	All Waters	227.1 mi	227.1 mi	5.4 mi	4.7 mi
	Percent Monitored	12.5% mi	0%	0%	0%

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

Table B-12 Previously or Currently Impaired Waters in Subbasin 03-04-04

Name	1998 Status	2002 Status	Use Support Category	Miles
Black Creek	Supporting	Impaired	Aquatic Life/Secondary Recreation	2.0
Hannah Creek	Supporting	Impaired	Aquatic Life/Secondary Recreation	10.3
			Total 2002 Impaired Miles	**12.3**

4.3 Status and Recommendations of Previously Impaired Waters

There were no impaired streams identified in the 1998 basin plan in this subbasin.

4.4 Status and Recommendations of Waters Newly Impaired Waters

4.4.1 Black Creek

Current Status

Black Creek (2.0 miles) from the dam at Holts Lake to the Neuse River is currently impaired because dissolved oxygen was below 4 mg/l in 19 percent of samples.

2002 Recommendations
DWQ and LNBA (page 220) will continue to monitor the site to detect any water quality changes.

4.4.2 Hannah Creek

Current Status
Hannah Creek is currently supporting with a Good-Fair bioclassification at site B-2 from a 2001 resample. Low dissolved oxygen during summer months may be responsible for the bioclassifications dropping to Fair in the 2000 samples.

Upper Hannah Creek (10.3 miles) is currently impaired because dissolved oxygen (site A-1) was below 4 mg/l in 48 percent of samples. This segment includes the Benson WWTP discharge. The Benson WWTP (map #87) has had past aquatic toxicity failures. Instream habitat is sparse in the creek.

2002 Recommendations
DWQ and LNBA (page 220) will continue to monitor the site to detect any water quality changes. DWQ will work with Benson to remedy toxicity problems and to determine the source of low dissolved oxygen in Hannah Creek.

4.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired or were monitored but not rated. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

4.5.1 Mill Creek

Current Status and 2002 Recommendations
Mill Creek is currently supporting with a Good-Fair bioclassification at site B-1. There is currently little development in this watershed and population density is 0-64 people/square mile. The NCWRP has a project in this watershed (page 215) and has targeted this local watershed (page 203).

Section B - Chapter 5
Neuse River Subbasin 03-04-05
Neuse River, Stoney Creek, Bear Creek, Falling Creek and Mosley Creek

5.1 Subbasin Overview

Subbasin 03-04-05 at a Glance

Land and Water Area

Total area:	499 mi^2
Land area:	496 mi^2
Water area:	3 mi^2

Population Statistics

2000 Est. Pop.:	102,518 people
Pop. Density:	206 person / mi^2

Land Cover (percent)

Forest / Wetland:	51.6
Surface Water:	0.8
Urban:	8.2
Cultivated Crop:	36.5
Pasture / Managed Herbaceous:	2.9

Counties

Craven, Greene, Jones, Lenoir and Wayne

Municipalities

Goldsboro and Kinston

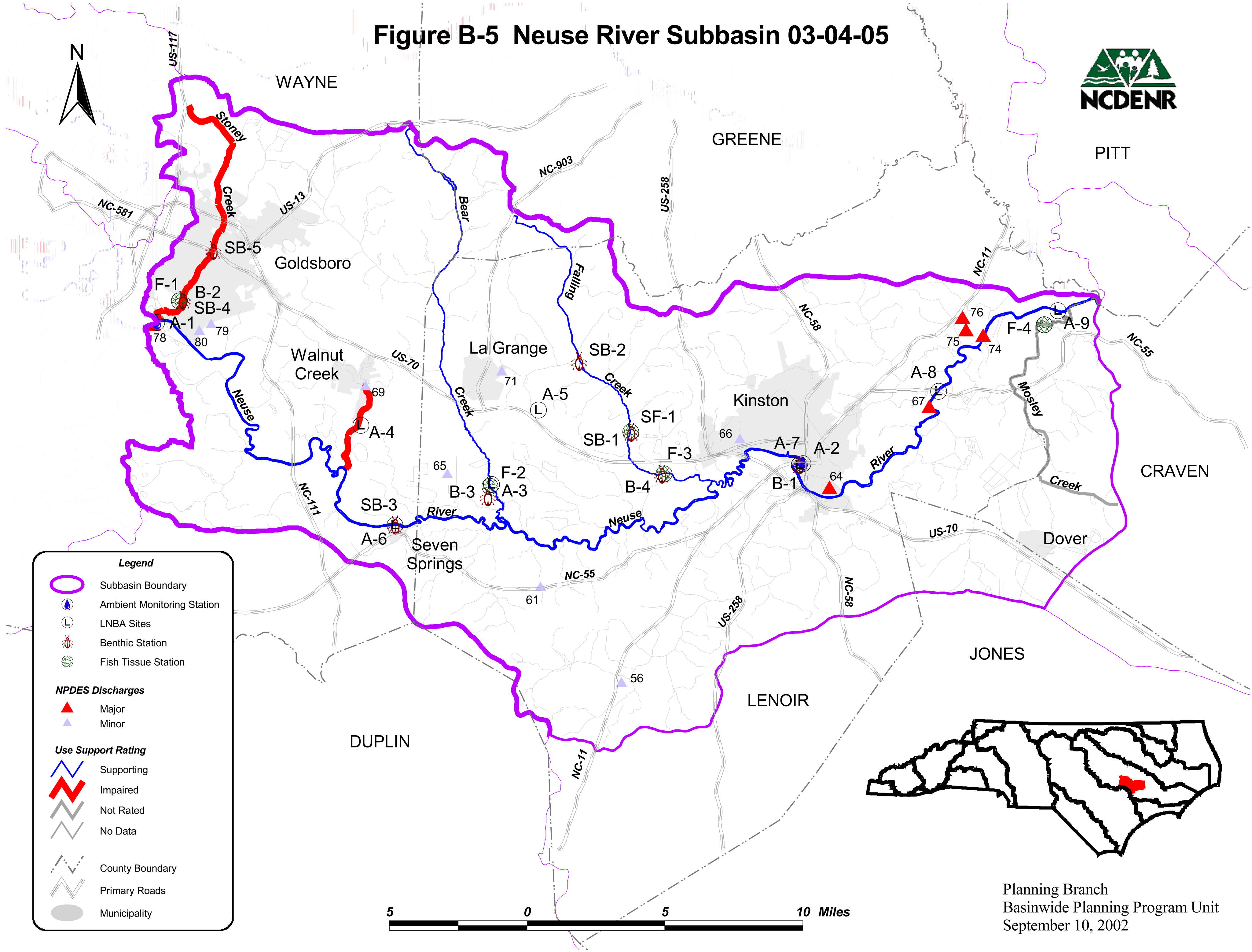
Population growth in this subbasin is near Goldsboro and Kinston. Population density is highest (320-1,600 persons/mi^2) in the watersheds around Goldsboro. The most densely populated watershed in the basin is Stoney Creek near Seymour Johnson Air Force Base. The northern part of the subbasin is in agriculture land use.

There are 1,480 acres of managed public lands in this subbasin with the Cliffs of Neuse State Park and Caswell Farm Game Land near Kinston being the largest.

There are nine NPDES wastewater discharge permits in this subbasin with a total permitted flow of 15.6 MGD (Figure B-5). The largest are Kinston Northside WWTP (4.5 MGD, map #67) and Kinston Peachtree WWTP (6.7 MGD, map #64). There is also one individual NPDES stormwater permit in the subbasin. Refer to Appendix I for identification and more information on NPDES permit holders. Kinston, Goldsboro and Wayne County are to develop a stormwater program under Phase II (page 76) and have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). There are also 96 registered animal operations in this subbasin.

There were four benthic macroinvertebrate community samples (Figure B-5 and Table B-13) collected in 2000 as part of basinwide monitoring. One site remained the same, and two sites had a lower bioclassification. The four fish community sites were not rated, as biocriteria are being developed (page 75) to assess these swampy streams. There were also five special study samples collected in the subbasin during the assessment period. Data were also collected from two ambient stations. Fish tissue samples were collected from the Neuse River at Kinston and Goldsboro. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Figure B-5 Neuse River Subbasin 03-04-05



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Basinwide Planning Program Unit
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Table B-13 DWQ Monitoring Locations in Subbasin 03-04-05

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Neuse R	Lenoir	NC 58	Good	Good
B-2	Stoney Cr	Wayne	SR 1920	Poor	Fair
B-3	Bear Cr	Lenoir	SR 1311	Fair	Good-Fair
B-4	Falling Cr	Lenoir	SR 1519	Good-Fair	Fair
SB-1	Falling Cr	Lenoir	SR 1546	---	Poor
SB-2	Falling Cr	Lenoir	SR 1001	---	Good-Fair
SB-3	Neuse R	Lenoir	SR 1731	---	Good
SB-4	Stoney Cr	Wayne	SR 1920	---	Fair
SB-5	Stoney Cr	Wayne	Ashton St. Park	---	Fair
Fish Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
F-1	Stoney Cr	Wayne	SR 1920	Not rated	Not rated
F-2	Bear Cr[2]	Lenoir	SR 1311	Not rated	Not rated
F-3	Falling Cr	Lenoir	SR 1340	Not rated	Not rated
F-4	Moseley Cr[2]	Craven	SR 1475	Not rated	Not rated
SF-1	Falling Cr	Lenoir	SR 1546	---	Not rated
Fish Tissue Monitoring Sites					
T-1	Neuse R	Lenoir	at Kinston	---	---
Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Neuse River	Wayne	SR 1915	J5970000	none
A-2	Neuse River	Lenoir	NC 11B	J6150000	none
A-3[4]	Bear Creek	Lenoir	SR 1311	J6044500	none
A-4[4]	Walnut Creek	Wayne	SR 1730	J6010950	DO
A-5[4]	Mosley Creek	Lenoir	SR 1327	J6055000	none
A-6[4]	Neuse River	Wayne	SR 1731	J6024000	none
A-7[4]	Neuse River	Lenoir	NC 11	J6150000	none
A-8[4]	Neuse River	Lenoir	NC 55	J6250000	none
A-9[4]	Neuse River	Lenoir	SR 1803	J6370000	none

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

[4] LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 5.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 5.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 5.4 below. Water quality issues related to the entire subbasin are discussed in Part 5.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category.

5.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-05 were assigned for aquatic life and secondary recreation, fish consumption and primary recreation. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 117 stream miles (32 percent) monitored during this assessment period. Approximately 18 (15 percent) of the monitored stream miles are impaired. Refer to Table B-14 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-15.

Table B-14 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-05

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation
Supporting	Monitored	81.1 mi	0	8.0 ac
	All Waters	81.1 mi	0	8.0 ac
Impaired	Monitored	**17.6 mi**	**63.2 mi**	0
	All Waters	17.6 mi	361.5 mi 8 ac	0
Not Rated	Monitored	17.9 mi	0	0
No Data	N/A	244.9 mi 8 ac	0	5.3 mi
Total	Monitored	116.6 mi	63.2 mi	8.0 ac
	All Waters	361.5 mi 8 ac	361.5 mi 8 ac	5.3 mi 8.0 ac
	Percent Monitored	32.3% mi 0% ac	18% mi 0%	0% mi 100% ac

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

Table B-15 Previously or Currently Impaired Waters in Subbasin 03-04-05

Name	1998 Status	2002 Status	Use Support Category	Miles
Bear Creek	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
Stoney Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	10.7
Walnut Creek	Not Rated	Impaired	Aquatic Life/Secondary Recreation	6.9
Neuse River	Supporting	Impaired	Fish Consumption	63.2
			Total 2002 Impaired Miles	**80.8**

5.3 Status and Recommendations of Previously Impaired Waters

5.3.1 Bear Creek

1998 Recommendations
Bear Creek was partially supporting from the source to the Neuse River. It was recommended that a more detailed study of the watershed be undertaken to determine possible causes of impairment.

Current Status
Bear Creek from the source to the Neuse River is currently supporting with a Good-Fair bioclassification at site B-3. Good instream habitat was noted, and the area was mostly forested at the sample site. The upper watershed also has some agricultural land use. Changes in bioclassification between samples may be primarily related to low conditions.

2002 Recommendations
DWQ will continue to monitor Bear Creek to assess future impacts related to land use changes in the watershed.

5.3.2 Stoney Creek

1998 Recommendations
Stoney Creek was partially supporting from the source to the Neuse River. There were no specific recommendations made in the 1998 basin plan.

Current Status
Stoney Creek from the source to the Neuse River (10.7 miles) is currently impaired because of three Fair bioclassifications at sites B-2, SB-4 and SB-5. Good instream habitat was noted, although there are some breaks in the riparian zone near Seymour Johnson Air Force Base. The stream drains a large and very densely populated area of Goldsboro, but water quality appears to be improving slightly.

2002 Recommendations
DWQ will continue to monitor Stoney Creek to evaluate impacts of development in the Goldsboro area. As part of the 303(d) list approach, DWQ will begin the process of identifying

problem parameters that may be causing biological impairment in Stoney Creek. The Watershed Assessment and Restoration Project is currently doing a detailed assessment of Stoney Creek to define the extent of water quality problems and narrow the possible causes. Because of the water quality impairment noted above and the current assessment project, Stoney Creek is a NCWRP targeted local watershed (page 203).

Goldsboro and Seymour Johnson should consider water quality impacts to Stoney Creek and prevent potential water quality problems by installing and maintaining BMPs during and after development. Refer to (page 81) for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

5.4 Status and Recommendations of Waters Newly Impaired Waters

5.4.1 Neuse River

Current Status

The Neuse River (63.2 miles) from the City of Goldsboro water supply intake to the subbasin boundary of 03-04-05 and 03-04-08 is currently impaired in the fish consumption use support category. Fish tissue samples were collected near Goldsboro and Kinston, and there is statewide fish consumption advisory for bowfin. One large-mouth bass exceeded the FDA action level. Refer to page 93 for more information on this issue.

The Neuse River (63 miles) in subbasin 03-04-05 is currently supporting aquatic life and secondary recreation based on a Good bioclassifications at sites B-1 and SB-3. Massive bank erosion was noted, and there was little riparian vegetation at the B-1 sample site. Many tributary watersheds in the subbasin are in agricultural land use, and development and urban runoff may be impacting the river near Goldsboro and Kinston. Low dissolved oxygen detected at ambient monitoring stations near Goldsboro and Kinston may be the result of the large volume of discharges in this segment of the river and swamp drainage.

2002 Recommendations

DWQ will continue to monitor fish tissue in the Neuse River basin to assess changes in levels and to evaluate levels of other contaminants in fish tissue. Refer to page 93 for more information on this issue.

In order to maintain the historically Good bioclassification in this segment of the Neuse River, DWQ recommends continued improvements to the WWTPs and consideration of water quality impacts during development and other intensive land uses. Refer to (page 81) for a description of urban stream problems and recommendations for reducing impacts and restoring water quality. Continued implementation of the Neuse NSW strategy (page 64) should help to minimize water quality impacts to this segment of the Neuse River.

The Neuse River and tributaries (Falling Creek and Briery Run) near Kinston have indications of nonpoint source pollution impacts. NCWRP has a stream restoration project in Falling Creek, and the six local watersheds in this area are targeted for restoration (page 203).

5.4.2 Walnut Creek

Current Status
Walnut Creek (3.6 miles) is currently impaired because dissolved oxygen (site A-4) was below 4 mg/l in 32.5 percent of samples. This segment includes the Village WWTP (map #69). There could also be some influence of swamp waters in this watershed

2002 Recommendations
DWQ and LNBA (page 220) will continue to monitor the site to detect any water quality changes. DWQ will work with the Village WWTP to determine the source of low dissolved oxygen in Walnut Creek.

5.5 Additional Water Quality Issues Within Subbasin 03-04-05

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

5.5.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. Refer to page 86 for more information on this issue.

Section B - Chapter 6
Neuse River Subbasin 03-04-06
Little River and Buffalo Creek

6.1 Subbasin Overview

Subbasin 03-04-06 at a Glance

Land and Water Area
Total area: 317 mi^2
Land area: 317 mi^2
Water area: 0 mi^2

Population Statistics
2000 Est. Pop.: 54,160 people
Pop. Density: 172 persons/mi^2

Land Cover (percent)
Forest/Wetland: 59.4
Surface Water: 0.8
Urban: 3.2
Cultivated Crop: 33.0
Pasture/
Managed Herbaceous: 3.7

Municipalities
Rolesville, Zebulon, Wendell and Goldsboro

Counties
Franklin, Johnston, Wake, Wayne and Wilson

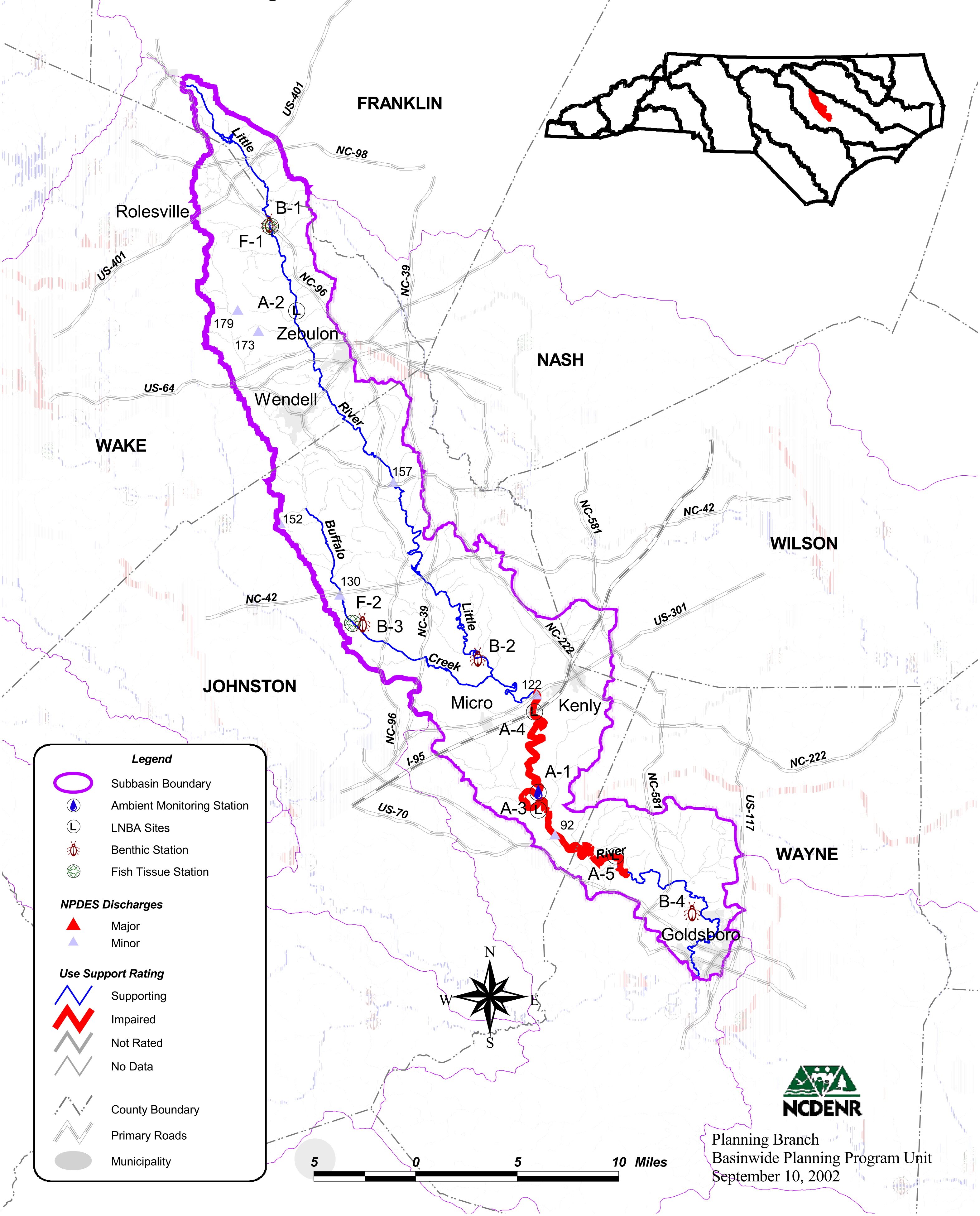
Population growth in the subbasin is increasing near Wendell and Zebulon in eastern Wake County and near Goldsboro in Wayne County. Population density is highest (320-1,600 persons/mi^2) in the lower portion of the subbasin, near Goldsboro.

There are 2,047 acres of managed public lands in this subbasin including land around the Little River Reservoir in the upper portion of the subbasin and the Claridge Forest Center near Goldsboro.

There are six NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.9 MGD (Figure B-6). There is also one individual NPDES stormwater permit in the subbasin. Wayne and Wake counties will be required to develop a stormwater program under Phase II (page 76). Johnston County and the above counties have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). There are also 11 registered animal operations in this subbasin.

There were four benthic macroinvertebrate community samples and two fish community samples (Figure B-6 and Table B-16) collected in 2000 as part of basinwide monitoring. Two sites remained the same; two sites increased in bioclassification, and two sites had a lower bioclassification. Lower bioclassifications at the fish community sites may have been related to recent hurricanes. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Figure B-6 Neuse River Subbasin 03-04-06



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-16 DWQ Monitoring Locations in Subbasin 03-04-06

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Little River[2]	Wake	NC 96	Good-Fair	Good-Fair
B-2	Little River[2]	Johnston	SR 2130	Good-Fair	Good
B-3	Buffalo Cr	Johnston	SR 1941	Fair (1991)	Good-Fair
B-4	Little R[2]	Wayne	NC 581	Good-Fair	Good-Fair

Fish Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
F-1	Little R	Wake	NC 96	Good	Good-Fair
F-2	Buffalo Cr	Johnston	SR 1941	Excellent	Good-Fair

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Little River	Johnston	Near Princeton	J5850000	none
A-2[4]	Little River	Wake	SR 2333	J5620000	none
A-3[4]	Little River	Johnston	US 301	J5690000	DO
A-4[4]	Little River	Johnston	I 95	J5730000	DO
A-5[4]	Little River	Wayne	SR 1234	J5900000	DO
A-6[4]	Little River	Wayne	Nr Asylum	J5950000	none

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

4 LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 6.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 6.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 6.4 below. Water quality issues related to the entire subbasin are discussed in Part 6.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

6.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-06 were assigned for aquatic life and secondary recreation, fish consumption and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

There were 103 stream miles (47 percent) monitored during this assessment period. Approximately 20 (19 percent) of the monitored stream miles are impaired. Refer to Table B-17 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-18.

Table B-17 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-06

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	82.9 mi	0	0	0
	All Waters	82.9 mi	0	0	120.4 mi
Impaired	Monitored	**20.0**	0	0	0
	All Waters	20.0	217.4 mi	0	0
Not Rated	Monitored	0	0	0	0
No Data	N/A	114.5 mi	0	7.4 mi	0
Total	Monitored	102.9 mi	0	0	0
	All Waters	217.4 mi	217.4 mi	7.4 mi	120.4 mi
	Percent Monitored	47% mi	0%	0%	0%

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

Table B-18 Previously or Currently Impaired Waters in Subbasin 03-04-06

Name	1998 Status	2002 Status	Use Support Category	Miles
Little River	Supporting	Impaired	Aquatic Life/Secondary Recreation	20.0
Buffalo Creek	Impaired	Supporting/Not Rated	Aquatic Life/Secondary Recreation	N/A
			Total 2002 Impaired Miles	**20.0**

6.3 Status and Recommendations of Previously Impaired Waters

6.3.1 Buffalo Creek

<u>1998 Recommendations</u>
Buffalo Creek was partially supporting from the source to the Little River. It was recommended that a more detailed study of the watershed be undertaken to determine possible causes of impairment and that the creek be resampled.

<u>Current Status</u>
Buffalo Creek (15 miles) from the Wendell Lake to the Little River is currently supporting with Good-Fair bioclassifications at sites B-3 and F-2. There was a drop in bioclassification for the fish community because of a decrease in diversity. Good instream habitat was noted although some hurricane impacts were also noted. The upper watershed is in the rapidly developing area of eastern Wake County.

<u>2002 Recommendations</u>
DWQ will continue to monitor Buffalo Creek to assess future impacts related to development in the upper watershed. Communities in eastern Wake County should consider water quality impacts to Buffalo Creek during development and utilize BMPs to minimize these impacts during and after development activities. Refer to (page 81) for a description of urban stream problems and recommendations for reducing impacts and restoring water quality. Because of the water quality impacts noted above and the rapid development, Buffalo Creek is a NCWRP targeted local watershed (page 203).

6.4 Status and Recommendations of Waters Newly Impaired Waters

6.4.1 Little River

<u>Current Status 2002 Recommendations</u>
The Little River (20 miles from Buffalo Creek to NC581) is currently impaired because dissolved oxygen was below 4 mg/l in 16.3 percent (site A-3), 17.5 percent (site A-4) and 10.0 percent (site A-5) of samples at these sites.

The Little River is currently supporting based on Good-Fair bioclassifications in the upper and lower watershed and a Good bioclassification in the middle segment. Several rare invertebrate species were collected at the upper site with good instream habitat noted. The fish community here may have been impacted by recent hurricanes. The middle site had infrequent pools and riffles. This segment also contains large numbers of rare mussels and aquatic insects. There is noted long-term decline in water quality at the lower site. No mussels were collected although dead shells were observed. Rare aquatic insects were not collected at this site. Recent silt deposition was noted at this site as well.

The upper watershed drains the rapidly developing area of eastern Wake County. The lower watershed is near Goldsboro.

2002 Recommendations

DWQ and LNBA (page 220) will continue to monitor the Little River to assess impacts related to land use changes and to determine the source of the low dissolved oxygen. Because of the rare species in the Little River, this watershed should be targeted for land acquisition to protect the riparian area beyond the 50-foot required buffer (page 64). Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality. Wake County Parks and Recreation has received a CWMTF grant to establish greenways on portions of the Little River. Because of the water quality impacts noted above and the increasing development pressure, parts of the Little River are NCWRP targeted local watersheds (page 203).

6.5 Additional Water Quality Issues Within Subbasin 03-04-06

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

6.5.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. For more information on this issue, refer to page 86.

Section B - Chapter 7
Neuse River Subbasin 03-04-07
Contentnea Creek, Little Contentnea Creek, Hominy Swamp and Nahunta Swamp

7.1 Subbasin Overview

Subbasin 03-04-07 at a Glance

Land and Water Area

Total area:	1,007 mi^2
Land area:	1,007 mi^2
Water area:	0 mi^2

Population Statistics

2000 Est. Pop.:	136,377 people
Pop. Density:	135 persons/mi^2

Land Cover (percent)

Forest/Wetland:	52.9
Surface Water:	0.6
Urban:	4.1
Cultivated Crop:	39.8
Pasture/ Managed Herbaceous:	2.6

Counties

Franklin, Greene, Johnston, Lenoir, Nash, Pitt, Wake, Wayne and Wilson Counties

Municipalities

Zebulon, Wilson and Farmville

Population growth in the subbasin is concentrated around Wilson in the middle part of the subbasin and the western portion near Zebulon. Population density is highest around Zebulon (320-1,600 persons/mi^2). There are 766 acres of managed public lands in this subbasin mostly associated with Wilson Parks and Recreation Land on Moccasin Creek above Buckhorn Reservoir.

There are 23 NPDES wastewater discharge permits in this subbasin with a total permitted flow of 21.2 MGD (Figure B-7). The largest are Wilson WWTP (12 MGD, map #140), Contentnea Sewerage District WWTP (2.8 MGD, map #83), Farmville Town WWTP (3.5 MGD, map #123) and Little Creek WWTP (1.8 MGD, map #169). There is also one individual NPDES stormwater permit in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. Wilson, Nash County and Wayne County will be required to develop a stormwater program under Phase II (page 76). Johnston County has submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater rules (page 64). There are also 146 registered animal operations in this subbasin.

There were eight benthic macroinvertebrate community samples and four fish community samples (Figure B-7 and Table B-19) collected in 2000 as part of basinwide monitoring. Four sites remained the same, and one site increased in bioclassification. Four sites were sampled for the first time. Three of the fish community sites and one benthic community site were not rated, as biocriteria are being developed (page 75) to assess these swampy streams. There were also nine special study samples collected in the subbasin during the assessment period. Data were also collected from four ambient stations. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

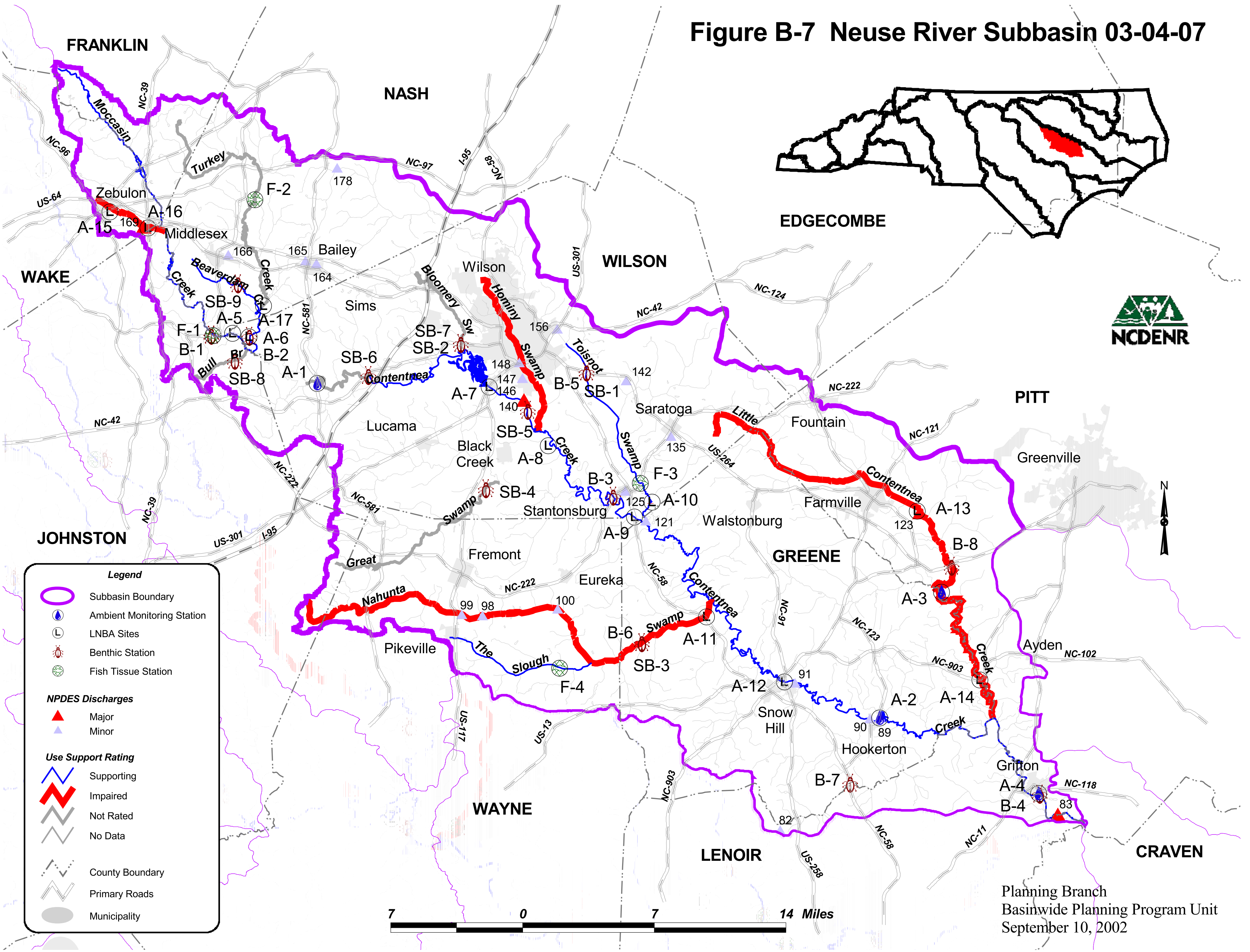


Figure B-7 Neuse River Subbasin 03-04-07

Table B-19 DWQ Monitoring Locations in Subbasin 03-04-07

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Moccasin Cr[2]	Johnston	NC 231	Good-Fair	Good-Fair
B-2	Turkey Cr	Nash	SR 1109	---	Fair
B-3	Contentnea Cr[2]	Wilson	NC 222/NC58	Fair	Good-Fair
B-4	Contentnea Cr[2]	Pitt	SR 1800	Good-Fair	Good-Fair
B-5	Toisnot Swp	Wilson	US 264	---	Fair
B-6	Nanhunta Swp[2]	Greene	SR 1058	Fair	Fair
B-7	Wheat Swamp Cr	Lenoir	NC 58	---	Not Rated
B-8	Little Contentnea Cr	Pitt	US 264A	---	Fair
SB-1	Toisnot Swp	Wilson	US 264	---	Fair
SB-2	Bloomery Swp	Wilson	NC 42	---	Poor
SB-3	Nanhunta Swp[2]	Greene	SR 1058	---	Fair
SB-4	Great Swp	Wilson	SR 1634	---	Poor
SB-5	Contentnea Cr[2]	Wilson	SR 1606	---	Fair
SB-6	Contentnea Cr[2]	Wilson	NC 42	---	Good-Fair
SB-7	Bloomery Swp	Wilson	NC 42	---	Good-Fair
SB-8	Bull Br	Johnston	SR 2110	---	Not Rated
SB-9	Beaverdam Cr	Nash	SR 1111	---	Fair

Fish Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
F-1	Moccasin Cr[2]	Johnston	NC 231	Excellent	Excellent
F-2	Turkey Cr	Nash	SR 1131	---	Not rated
F-3	Toisnot Swp	Wilson	NC 222	Not rated	Not rated
F-4	The Slough	Wayne	SR 1535	Not rated	Not rated

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Contentnea Cr	Wilson	Near Lucama	J6740000	none
A-2	Contentnea Cr	Greene	NC 123	J7450000	none
A-3	Little Contentnea Cr	Pitt	SR 1125	J7739550	none
A-4	Contentnea Cr	Pitt	SR 1800	J7810000	none
A-5[4]	Moccasin Cr	Wilson	SR 1131	J6500000	none
A-6[4]	Turkey Cr	Wilson	SR 1128	J6700000	DO
A-7[4]	Contentnea Cr	Wilson	US 301	J6764000	none
A-8[4]	Contentnea Cr	Wilson	SR 1622	J6890000	none
A-9[4]	Contentnea Cr	Wilson	NC 58	J7210000	none
A-10[4]	Toisnot Swamp	Wilson	Nr Stantonburg	J7240000	none
A-11[4]	Nahunta Swamp	Greene	NC 58	J7325000	none
A-12[4]	Contentnea Cr	Greene	US 13	J7330000	none
A-13[4]	Little Contentnea Cr	Pitt	SR 1218	J7690000	none
A-14[4]	Little Contentnea Cr	Pitt	SR 1110	J7740000	none
A-15[4]	Little Creek	Wake	NC 97	J6410000	DO
A-16[4]	Little Creek	Wake	NC 39	J6450000	DO
A-17[4]	Turkey Creek	Nash	SR 1101	J6680000	DO

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

4 LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 7.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 7.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 7.4 below. Supporting waters with noted water quality impacts are discussed in Part 7.5 below. Water quality issues related to the entire subbasin are discussed in Part 7.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

7.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-07 were assigned for aquatic life and secondary recreation, fish consumption and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

There were 250 stream miles (38 percent) monitored during this assessment period. Approximately 76 (30 percent) of the monitored stream miles are impaired. Refer to Table B-20 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-21.

Table B-20 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-07

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	146.0 mi 510.5 ac	0	0	0
	All Waters	146.0 mi 510.5 ac	0	0	62.6 mi 510.5 ac
Impaired	Monitored	**75.9 mi**	0	0	0
	All Waters	75.9 mi	655.9 mi 549.8 ac	0	0
Not Rated	Monitored	38.3 mi	0	0	0
No Data	N/A	395.3 mi 39.3 ac	0	0.6 mi 39.3 ac	0
Total	Monitored	250.4 mi 510.5 ac	0	0	0
	All Waters	655.9 mi 549.8 ac	655.9 mi 549.8 ac	0.6 mi 39.3 ac	62.6 mi 510.5 ac
	Percent Monitored	38% mi 92.9% ac	0%	0%	0%

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

Table B-21 Previously or Currently Impaired Waters in Subbasin 03-04-07

Name	1998 Status	2002 Status	Use Support Category	Miles
Beaverdam Creek	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
Contentnea Creek	Impaired	Supporting/Not Rated	Aquatic Life/Secondary Recreation	N/A
Hominy Swamp	Impaired	Impaired	Aquatic Life/Secondary Recreation	9.9
Little Contentnea Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	34.9
Nahunta Swamp	Impaired	Impaired	Aquatic Life/Secondary Recreation	27.1
Little Creek	Not Rated	Impaired	Aquatic Life/Secondary Recreation	4.1
			Total 2002 Impaired Miles	**76.0**

7.3 Status and Recommendations of Previously Impaired Waters

7.3.1 Beaverdam Creek

1998 Recommendations
Beaverdam Creek was partially supporting from the source to Turkey Creek. It was recommended that DWQ continue monitoring to identify potential causes and sources of impairment.

Current Status
Beaverdam Creek is currently supporting because of a Good-Fair bioclassification at site SB-9. The stream was resampled in 2001 to confirm the previous bioclassification. The change in bioclassification may be related to low flow.

2002 Recommendations
DWQ will continue to monitor Beaverdam Creek to assess water quality changes.

7.3.2 Contentnea Creek

1998 Recommendations
Contentnea Creek was partially supporting from the Buckhorn Reservoir to the confluence with Toisnot Swamp. There were no specific recommendations made for this segment of Contentnea Creek in the 1998 basin plan.

Current Status
Contentnea Creek is currently supporting from Wiggins Mill dam to the confluence with the Neuse River. A resample just downstream of site SB-5 in 2001 was assigned a Good-Fair bioclassification. The Wilson WWTP, in this segment, had violations of BOD limits in 1999 that may have impacted the sample site. Habitat degradation from de-snagging was noted in the lower portion of Contentnea Creek.

The site between Buckhorn Reservoir and Wiggins Mill was Good-Fair in 1996, but ambient monitoring (A-1) indicated low dissolved oxygen in this segment and it is currently not rated.

2002 Recommendations
DWQ will continue to monitor Contentnea Creek to assess water quality changes and determine the cause of low dissolved oxygen at the ambient monitoring site A-1. DWQ will work with the Wilson WWTP to ensure the discharge minimizes water quality impacts to Contentnea Creek. Because of the water quality impacts noted above and the development in the watershed, Contentnea Creek near Wilson is a NCWRP targeted local watershed (page 203).

Current Water Quality Initiatives
The Hookerton WWTP has received CWMTF grant to make upgrades to the plant (page 215).

7.3.3 Hominy Swamp

1998 Recommendations
Hominy Swamp was not supporting from the source to Contentnea Creek. It was recommended that DWQ continue monitoring to identify potential causes and sources of impairment.

Current Status
Hominy Swamp (9.9 miles) is currently impaired because of Poor bioclassifications at two sites in 2001. The stream drains urban Wilson and, most likely, is impacted by urban nonpoint source runoff.

2002 Recommendations
DWQ will continue to monitor Hominy Swamp to assess water quality impacts from urban and developing areas in Wilson. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Hominy Swamp. NCWRP has a restoration project on Hominy Swamp Creek (page 215), as well as a grant focusing on the assessment of water quality problems and the development of a restoration plan for this local watershed. Because of the water quality impairment noted above and the restoration assessment, Hominy Swamp is a NCWRP targeted local watershed (page 203).

Wilson should consider water quality impacts to Hominy Swamp during development. Refer to (page 81) for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

Current Water Quality Initiatives
The City of Wilson received a CWMTF grant to make upgrades to the WWTP (page 215).

7.3.4 Little Contentnea Creek

1998 Recommendations
Little Contentnea Creek was partially supporting in 1998. There were no specific recommendations made in the 1998 basin plan.

Current Status
Little Contentnea Creek (34.9 miles) is currently impaired based on a Fair bioclassification at site B-8. There were good snag and bank habitats although the stream was channelized and there were no pools. The low bioclassification is reflective of problems in the upper watershed. Low dissolved oxygen may also be contributing to the impairment.

2002 Recommendations
DWQ will continue to monitor Little Contentnea Creek to determine probable causes of impairment. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Little Contentnea Creek. NCWRP, through a grant funded by EPA, is developing a methodology for assessing functional values for wetlands restoration projects. Fieldwork for this project is occurring within the Little Contentnea Creek watershed. Because of the water quality impairment noted above and the assessment work, Little Contentnea is a NCWRP targeted local watershed (page 203).

7.3.5 Nahunta Swamp

1998 Recommendations
Nahunta Swamp was partially supporting from the source to Contentnea Creek. It was recommended that DWQ continue monitoring to identify potential causes and sources of impairment.

Current Status
Nahunta Swamp (27.1 miles) is currently impaired because of Fair bioclassifications at sites B-6 and SB-3. Habitat degradation (page 89) is a likely cause of impairment. The sample site had good snag and root habitat, but was channelized with a narrow vegetated riparian zone, and streambank erosion was noted. The benthic macroinvertebrate community did not suggest organic or nutrient loading as a problem, although there are many animal operations upstream of the site.

2002 Recommendations
DWQ will continue to monitor Nahunta Swamp to assess water quality changes. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Nahunta Swamp. DWQ will contact the Division of Soil and Water Conservation (DSWC) to evaluate the potential for installation of agricultural BMPs that would protect water quality and aquatic habitat in Nahunta Swamp. Because of the water quality impairment noted above and the Soil and Water Conservation District project (see below), Nahunta Swamp is a NCWRP targeted local watershed (page 203).

Current Water Quality Initiatives
Wayne and Greene Counties Soil and Water Conservation Districts received funding for a Section 319 project to promote conservation tillage methods on land farmed for cotton in this primarily agricultural watershed, with the intention of reducing sediment and nutrient runoff.

7.4 Status and Recommendations of Waters Newly Impaired Waters

7.4.1 Little Creek

Current Status
Little Creek (4.1 miles) is currently impaired because dissolved oxygen (sites A-15 and A-16) was below 4 mg/l in 20.8 and 12.1 percent of samples. These sites are upstream and downstream of the Zebulon WWTP.

2002 Recommendations
DWQ and LNBA (page 220) will continue to monitor the site to detect any water quality changes. DWQ will work with the Zebulon WWTP and the Town of Zebulon to determine the sources of low dissolved oxygen in Little Creek.

7.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

7.5.1 Toisnot Swamp

Current Status and 2002 Recommendations
Toisnot Swamp is currently supporting based on a Good-Fair bioclassification assigned during 2001 resamples from NC 301 to Contentnea Creek. Habitat degradation (page 89) was noted with infrequent pools and channelized segments. Segments above NC 301 drain urban Wilson and are currently not rated. Nash Rocky Mount Southern High School (map #178) had violations of ammonia limits in 1998 in the upper part of Toisnot Swamp. DWQ will continue to work with the high school discharge to assure minimal water quality impacts.

Because Toisnot is a water supply watershed and has noted water quality impacts, Toisnot Swamp is a NCWRP targeted local watershed (page 203). Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

7.6 Additional Water Quality Issues Within Subbasin 03-04-07

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

7.6.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. For more information on this issue, refer to page 86.

Section B - Chapter 8
Neuse River Subbasin 03-04-08
Core Creek and Neuse River

8.1 Subbasin Overview

Subbasin 03-04-08 at a Glance

Land and Water Area

Total area:	231 mi^2
Land area:	229 mi^2
Water area:	2 mi^2

Population Statistics

2000 Est. Pop.:	11,097 people
Pop. Density:	48 persons / mi^2

Land Cover (percent)

Forest / Wetland:	67.3
Surface Water:	1.2
Urban:	3.9
Cultivated Crop:	26.3
Pasture / Managed Herbaceous:	1.2

Counties

Craven, Jones and Pitt

Municipalities

Cove City and New Bern

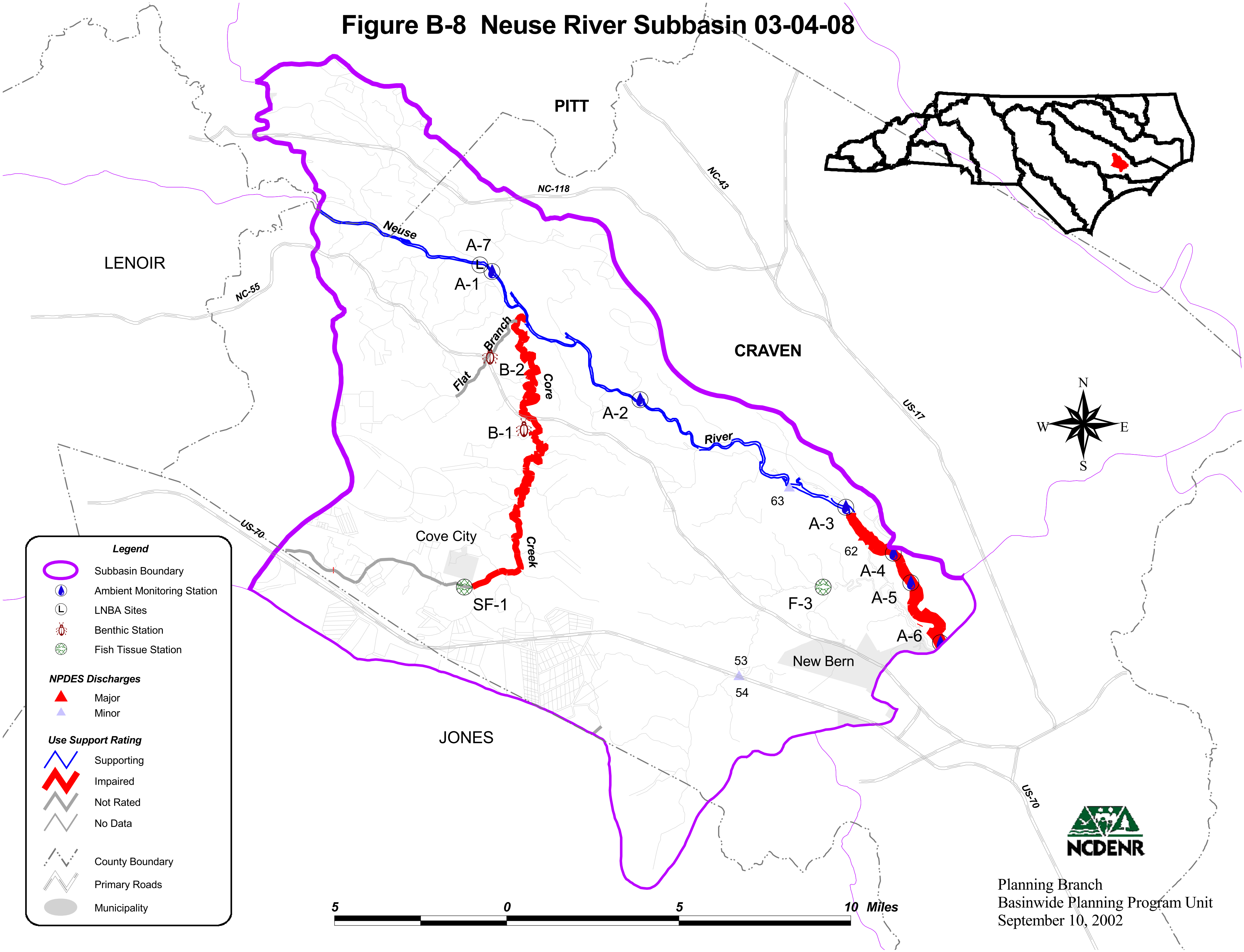
Population growth in the subbasin is concentrated around New Bern. Population density is also highest (320-1,600 persons/mi^2) around New Bern. Land use in most of the subbasin is agriculture with many channelized areas in the Core Creek watershed.

There are 2,893 acres of managed public lands in this subbasin. The largest areas are an easement owned by the North American Land Trust and Turkey Quarter Island owned by the North Carolina Coastal Land Trust.

There are three NPDES wastewater discharge permits in this subbasin with a total permitted flow of 32.4 MGD (Figure B-8). The largest is Weyerhauser New Bern Mill (32 MGD, map #62). Refer to Appendix I for identification and more information on individual NPDES permit holders. New Bern will be required to develop a stormwater program under Phase II (page 76) and has submitted a model stormwater ordinance as required by the Neuse NSW strategy stormwater rules (page 64). There are also 14 registered animal operations in this subbasin.

There were two benthic macroinvertebrate community samples (Figure B-8 and Table B-22) collected in 2000 as part of basinwide monitoring. One site increased in bioclassification, and one site was not rated as biocriteria are being developed (page 75) to assess these swampy streams. There was also one special study site (SB and SF) collected in the subbasin during the assessment period. Data were also collected from six ambient stations. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Figure B-8 Neuse River Subbasin 03-04-08



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-22 DWQ Monitoring Locations in Subbasin 03-04-08

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
B-1	Core Cr[2]	Craven	NC 55	Poor	Fair
B-2	Flat Swp	Craven	NC 55	---	Not rated

Fish Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
SF-1	Core Cr	Craven	SR 1001	---	Not rated

Phytoplankton Monitoring Sites					
P-1	Neuse R	Craven	SR 1400	---	---

Ambient Monitoring Sites					
Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[3]
A-1	Neuse River	Craven	SR 1470	J7850000	none
A-2	Neuse River	Craven	Lane Landing	J7860000	none
A-3	Neuse River	Craven	SR 1400	J7930000	none
A-4	Neuse River	Craven	nr Askin	J8250000	none
A-5	Neuse River	Craven	Channel Marker 64	J8270000	none
A-6	Neuse River	Craven	nr Washington Forks	J8290000	none
A-7[4]	Neuse River	Craven	SR 1470	J8500000	none

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; SF = fish community special study site; and P= phytoplankton monitoring site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

[4] LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 8.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 8.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 8.4 below. Water quality issues related to the entire subbasin are discussed in Part 8.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

8.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-08 were assigned for aquatic life and secondary recreation and fish consumption. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 49 stream miles (38 percent) and 427 estuarine acres (100 percent) monitored during this assessment period. Approximately 15 (31 percent) of the monitored stream miles and 427 (100 percent) estuarine acres are impaired. Refer to Table B-23 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-24.

Table B-23 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-08

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption
Supporting	Monitored	22.3 mi	0
	All Waters	22.3 mi	0
Impaired	Monitored	**15.4 mi** **426.5 ac**	0
	All Waters	15.4 mi 426.5 ac	129.8 mi 426.5 ac
Not Rated	Monitored	11.6 mi	0
No Data	N/A	80.3 mi	0
Total	Monitored	49.4 mi 426.5 ac	0
	All Waters	129.8 mi 426.5 ac	129.8 mi 426.5 ac
	Percent Monitored	38% mi 100% ac	0%

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

Table B-24 Previously or Currently Impaired Waters in Subbasin 03-04-08

Name	1998 Status	2002 Status	Use Support Category	mi/ac
Core Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	15.4 mi
Neuse River	Impaired	Impaired	Aquatic Life/Secondary Recreation	426.5 ac
			Total 2002 Impaired Miles	**15.4 mi**
			Total 2002 Impaired Acres	**426.5 ac**

8.3 Status and Recommendations of Previously Impaired Waters

8.3.1 Core Creek

1998 Recommendations
Core Creek was partially supporting from the source to the Neuse River. More sampling was recommended to evaluate impacts from nonpoint sources.

Current Status
Core Creek is currently impaired from Cove City to the Neuse River because of a Fair bioclassification at site B-1. Low dissolved oxygen and high conductivity have been observed at the sampling site during low flow conditions.

2002 Recommendations
DWQ will continue to monitor Core Creek to evaluate impacts from nonpoint sources in the watershed. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Core Creek. Because of the presence of significant natural areas, important fisheries habitat and the noted water quality impairment, Core Creek is a NCWRP targeted local watershed (page 203).

Current Water Quality Initiatives
There are two buffer acquisition projects and one restoration project funded through grants by CWMTF in this watershed (page 215).

8.3.2 Neuse River

Current Status and 2002 Recommendations
The eastern portion of the Neuse River (426 acres) in this subbasin is currently impaired and discussed in Section B, Chapter 10 with the rest of the Neuse River estuary that is impaired for the same reason (page 171).

8.4 Status and Recommendations of Waters Newly Impaired Waters

There are no newly impaired waters in subbasin 03-04-08.

8.5 Additional Water Quality Issues Within Subbasin 03-04-08

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

8.5.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. For more information on this issue, refer to page 86.

Section B - Chapter 9
Neuse River Subbasin 03-04-09
Swift Creek, Clayroot Swamp and Creeping Swamp

9.1 Subbasin Overview

Subbasin 03-04-09 at a Glance

Land and Water Area

Total area:	333 mi^2
Land area:	333 mi^2
Water area:	0 mi^2

Population Statistics

2000 Est. Pop.:	39,456 people
Pop. Density:	119 persons/mi^2

Land Cover (percent)

Forest/Wetland:	72.9
Surface Water:	0.3
Urban:	3.1
Cultivated Crop:	22.7
Pasture/ Managed Herbaceous:	1.0

Counties

Beaufort, Craven and Pitt

Municipalities

Greenville, Winterville, Vanceboro and Ayden

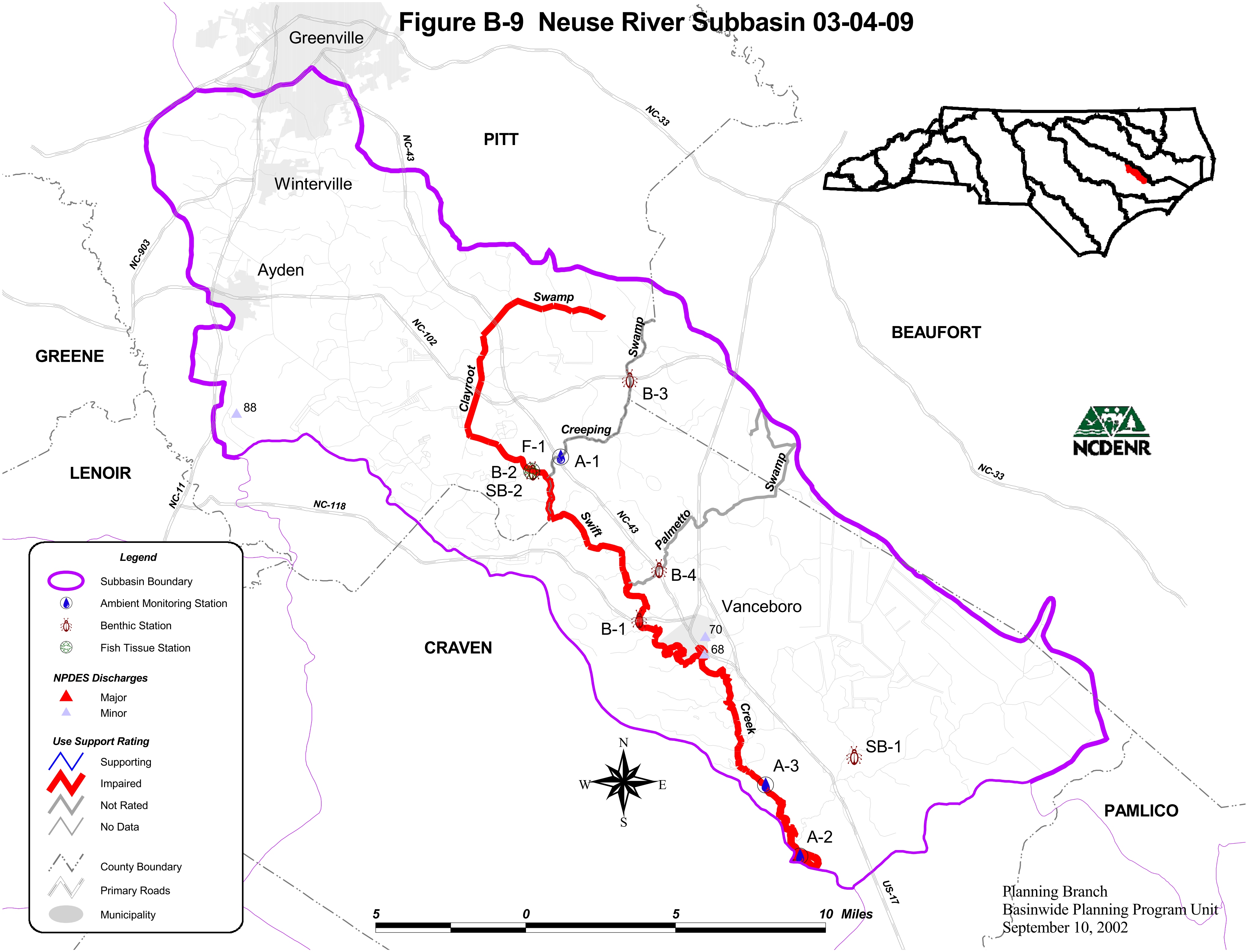
Population growth in the subbasin is concentrated around Greenville and Ayden in the northern portion of the subbasin and Vanceboro in the southern portion. Population density is highest (64-160 persons/mi^2) around Ayden. Overall development is not as intensive as in the northern subbasins. Land use in the subbasin is mostly agriculture with patchy forested areas. There are 43 acres of managed public lands in this subbasin associated with a small US Fish and Wildlife permanent easement on Creeping Swamp.

There are three NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.25 MGD (Figure B-9). There is also one individual NPDES stormwater permit in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. There are also 30 registered animal operations in this subbasin.

There were four benthic macroinvertebrate community samples and one fish community samples (Figure B-9 and Table B-25) collected in 2000 as part of basinwide monitoring. One site decreased in bioclassification, one site maintained the same bioclassification, and three sites were not rated as biocriteria are being developed (page 75) to assess these swampy streams. There were also two special study samples collected in the subbasin during the assessment period. Data were also collected from three ambient stations. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Use support ratings are summarized in Part 9.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 9.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 9.4 below. Water quality issues related to the entire subbasin are discussed in Part 9.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-9 Neuse River Subbasin 03-04-09



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-25 DWQ Monitoring Locations in Subbasin 03-04-09

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
B-1	Swift Cr[2]	Craven	NC 118	Fair	Fair
B-2	Clayroot Swp[2]	Pitt	SR 1941	Fair	Poor
B-3	Creeping Swp	Pitt	NC 102	---	Not Rated
B-4	Palmetto Swp	Craven	NC 43	---	Not Rated
SB-1	Fisher Swp	Craven	SR 1621	---	Not Rated
SB-2	Clayroot Swp	Craven	SR 1941	---	Not Rated

Fish Community Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**1995**	**2000**
F-1	Clayroot Swp[2]	Craven	SR 1941	Not Rated	Not Rated

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[3]**
A-1	Creeping	Craven	NC 43	J8150000	none
A-2	Swift Cr	Craven	nr Askin	J8210000	none
A-3	Swift Cr	Craven	NC 43	J8230000	none

[1] B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

[2] Historical data available at this site. Refer to Appendix II.

[3] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

9.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-09 were assigned for aquatic life and secondary recreation and fish consumption. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 52 stream miles (33 percent) monitored during this assessment period. Approximately 35 (67 percent) of the monitored stream miles are impaired. Refer to Table B-26 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-27.

Table B-26 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-09

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption
Supporting	Monitored	0	0
	All Waters	0	0
Impaired	Monitored	**35.3 mi**	0
	All Waters	35.3 mi	156.8 mi
Not Rated	Monitored	16.7 mi	0
No Data	N/A	104.8 mi	0
Total	Monitored	52 mi	0
	All Waters	156.8 mi	156.8 mi
	Percent Monitored	33% mi	0%

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

Table B-27 Previously or Currently Impaired Waters in Subbasin 03-04-09

Name	1998 Status	2002 Status	Use Support Category	Miles
Clayroot Swamp	Impaired	Impaired	Aquatic Life/Secondary Recreation	12.9
Creeping Swamp	Impaired	Not Rated	Aquatic Life/Secondary Recreation	N/A
Swift Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	22.4
			Total 2002 Impaired Miles	**35.3**

9.3 Status and Recommendations of Previously Impaired Waters

9.3.1 Clayroot Swamp

1998 Recommendations

Clayroot Swamp was not supporting from the source to Swift Creek. There were no specific recommendations in the 1998 basin plan, although impairment was attributed to nonpoint source pollution.

Current Status
Clayroot Swamp (12.9 miles) is currently impaired because of Poor and Fair bioclassifications at sites B-2 and F-1. Habitat degradation (page 89) is the most likely cause of impairment. Most of the watershed is in agricultural land use. Very little instream habitat and few pools were noted at the sample sites. Abundant periphyton growth indicates excess nutrient loading especially to the lower watershed. Sediment is also a noted problem in Clayroot Swamp.

2002 Recommendations
DWQ will continue to monitor Clayroot Swamp. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Clayroot Swamp. Because of the noted water quality impairment, Clayroot Swamp is a NCWRP targeted local watershed (page 203). Because most of the Clayroot Swamp watershed is in agricultural (page 85) land use, it is recommended that the Division of Soil and Water Conservation (page 202) evaluate the potential for implementation of appropriate BMPs to reduce nutrient and sediment loading.

9.3.2 Creeping Swamp

1998 Recommendations
Creeping Swamp was not supporting from the source to Clayroot Swamp. There were no specific recommendations in the 1998 basin plan, although impairment was attributed to nonpoint source pollution.

Current Status
Clayroot Swamp is currently not rated. Low pH and conductivity indicate that the stream is not as disturbed as nearby channelized streams. The watershed is mostly undisturbed swamp waters. Several benthic macroinvertebrates were collected in Creeping Swamp that were not collected in adjacent Clayroot Swamp.

2002 Recommendations
DWQ will continue monitoring Creeping Swamp. Creeping Swamp is one of the few large non-channelized areas in the eastern part of the state and may serve as a reference reach. Because of the undisturbed nature and potential restoration sites, Creeping Swamp is a NCWRP targeted local watershed (page 203).

9.3.3 Swift Creek

1998 Recommendations
Swift Creek was not supporting from the source to Palmetto Swamp and partially supporting from Palmetto Swamp to the Neuse River. There were no specific recommendations in the 1998 basin plan, although impairment was attributed to nonpoint source pollution.

Current Status
Swift Creek (22.4 miles) is currently impaired from Clayroot Swamp to the Neuse River because of a Fair bioclassification at B-1. Habitat degradation (page 89) is the most likely cause of impairment. There were few pools and a silty substrate was noted at the sample site. There are

large amounts of agricultural land in the upper Swift Creek watershed, and much of the creek has been channelized.

2002 Recommendations
DWQ will resample Swift during a more normal flow year to determine if high flows during the 2000 sampling affected bioclassification. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Swift Creek. Because upper Swift Creek watershed is in agricultural (page 85) land use, it is recommended that the Division of Soil and Water Conservation (DSWC) evaluate the potential for implementation of appropriate BMPs to reduce nutrient and sediment loading.

9.4 Status and Recommendations of Waters Newly Impaired Waters

There are no newly impaired waters in subbasin 03-04-09.

9.5 Additional Water Quality Issues Within Subbasin 03-04-09

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

9.5.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. For more information on this issue, refer to page 86.

Section B - Chapter 10
Neuse River Subbasin 03-04-10
Neuse River Estuary, South River, Trent River, Adams Creek and Broad River

10.1 Subbasin Overview

Subbasin 03-04-10 at a Glance

Land and Water Area

Total area:	402 mi^2
Land area:	519 mi^2
Water area:	183 mi^2

Population Statistics

2000 Est. Pop.:	77,504 people
Pop. Density:	110 persons/mi^2

Land Cover (percent)

Forest/Wetland:	56.2
Surface Water:	26.1
Urban:	6.3
Cultivated Crop:	10.5
Pasture/ Managed Herbaceous:	0.9

Counties

Carteret, Craven and Pamlico

Municipalities

New Bern and Havelock

Population growth in the subbasin is concentrated around New Bern at the head of the estuary and Havelock on the south side of the estuary. Population density is highest (320-1,600 persons/mi^2) near New Bern and Havelock.

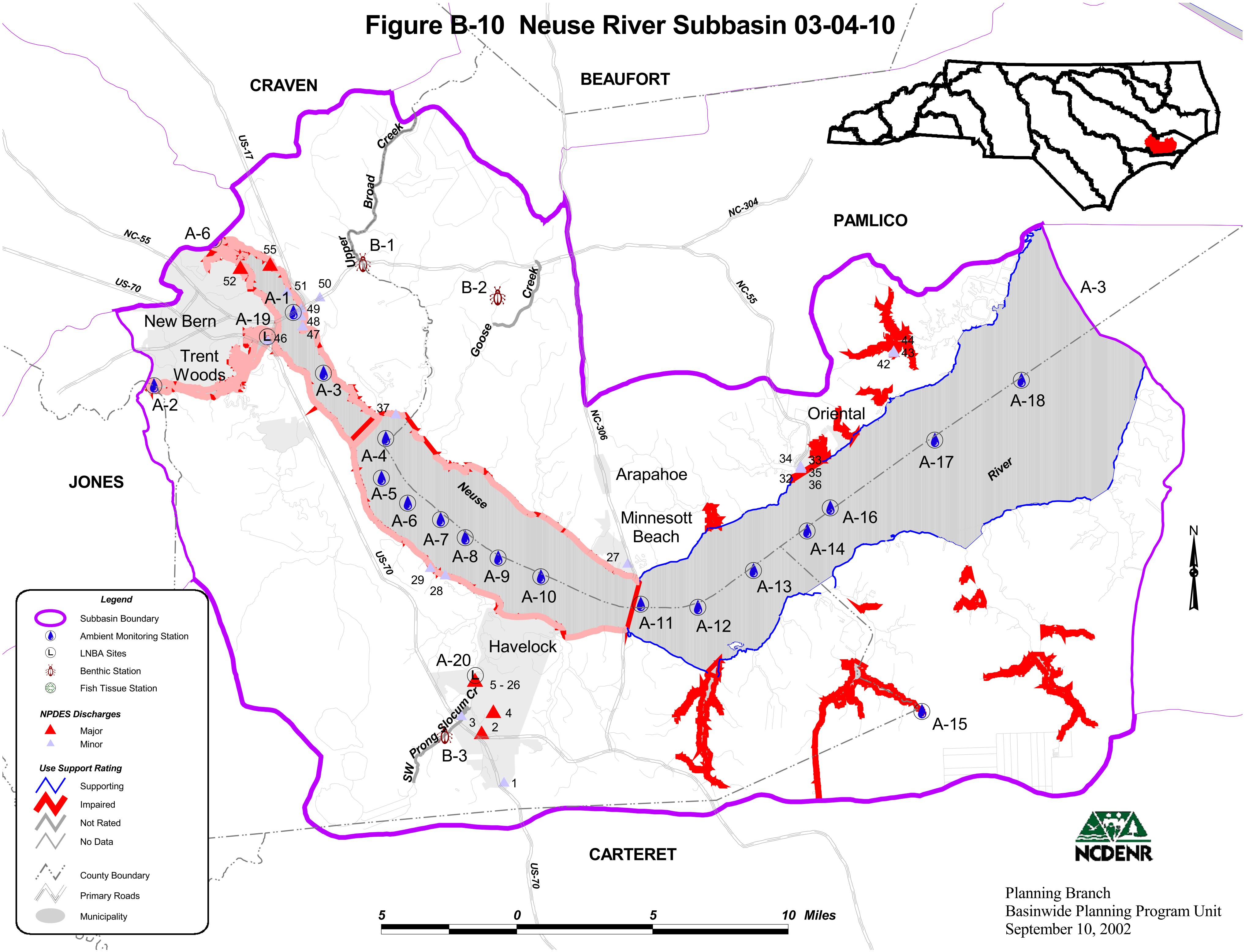
Land use in the subbasin is mostly forest and agriculture. There are 48,378 acres of managed public lands in this subbasin, mostly associated with the Croatan National Forest.

There are 19 NPDES wastewater discharge permits in this subbasin with a total permitted flow of 11.2 MGD (Figure B-10). The largest are Havelock WWTP (1.9 MGD, map #2) and New Bern WWTP (4.7 MGD, map #52). There is also one individual NPDES stormwater permit in the subbasin. New Bern and Havelock will be required to develop a stormwater program under Phase II (page 76) and have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater requirements (page 64). There are also three registered animal operations in this subbasin.

There were three benthic macroinvertebrate community samples (Figure B-10 and Table B-28) collected in 2000 as part of basinwide monitoring. All three sites were not rated, as biocriteria are being developed (page 75) to assess these swampy streams. There were also six phytoplankton monitoring sites collected in the subbasin during the assessment period. Data were also collected from 18 ambient stations. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

The Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section (page 52) has classified 73,101 acres as approved, 2,499 as conditionally approved-open, 373 acres as conditionally approved-closed, and 3,422 as prohibited /restricted (page 52).

Figure B-10 Neuse River Subbasin 03-04-10



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

Table B-28 DWQ Monitoring Locations in Subbasin 03-04-10

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
B-1	Upper Broad Cr	Craven	SR 1612/NC 55	---	Not Rated
B-2[2]	Goose Cr	Pamlico	SR 1100	Not Rated	Not Rated
B-3	SW Prong Slocum Cr	Craven	SR 1746	---	Not Rated

Phytoplankton Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
P-1	Neuse R	Craven	US 17	---	---
P-2	Neuse R	Craven	Broad Creek	---	---
P-3	Neuse R	Pamlico	Flanners Beach	---	---
P-4	Neuse R	Pamlico	Minnesott Beach	---	---
P-5	Neuse R	Pamlico	Oriental	---	---
P-6	Neuse R	Pamlico	Mouth of Neuse	---	---

Ambient Monitoring Sites					
Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[3]
A-1	Neuse River	Craven	US 17	J8570000	none
A-2	Trent River	Craven	nr Rhems	J8770000	none
A-3	Neuse River	Craven	Channel Marker 22	J8900800	none
A-4	Neuse River	Craven	Broad Cr nr Thurman	J8902500	none
A-5	Neuse River	Craven	Channel Marker 17	J8903500	none
A-6	Neuse River	Craven	Channel Marker 15	J8903600	none
A-7	Neuse River	Craven	Channel Marker 11	J8910000	none
A-8	Neuse River	Craven	nr Kennel Beach	J8920000	none
A-9	Neuse River	Craven	nr Arapahoe	J8925000	none
A-10	Neuse River	Craven	nr Cherry Point	J9431500	none
A-11	Neuse River	Pamlico	Channel Marker 9	J9530000	none
A-12	Neuse River	Craven	nr Pierce	J9540000	none
A-13	Neuse River	Craven	nr Janeiro	J9590000	none
A-14	Neuse River	Carteret	nr Merrimon	J9685000	none
A-15	Neuse River	Pamlico	nr Oriental	J9810000	none
A-16	Back Creek	Carteret	SR 1300	J9690000	none
A-17	Neuse River	Carteret	nr Cockle Point	J9860000	none
A-18	Neuse River	Carteret	nr Piney Point	J9900000	none
A-19[4]	Trent River	Craven	RR Bridge	J8870000	none
A-20[4]	Slocum Creek	Craven	Slocum Road	J9330000	none

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; SF = fish community special study site; and P= phytoplankton monitoring site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

4 LNBA Sites (page 220). Only dissolved oxygen, chlorophyll *a* and fecal coliform were analyzed.

Use support ratings are summarized in Part 10.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 10.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 10.4 below. Supporting waters with noted water quality impacts are discussed in Part 10.5 below. Water quality issues related to the entire subbasin are discussed in Part 10.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

10.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-10 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and shellfish harvesting. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 13 stream miles (3.4 percent) and 99,059 estuarine acres (86 percent) monitored during this assessment period. Approximately 31,480.2 (32 percent) of the monitored estuarine acres are impaired in the aquatic life/secondary recreation use support category. There are also 3,268 (4 percent) estuarine acres impaired in the shellfish harvesting use support category. Refer to Table B-29 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-30.

Table B-29 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-10

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Shellfish Harvesting
Supporting	Monitored	67,650 ac	0	97,123.7 ac	10.2 mi 76,329.77 ac
	All Waters	67,650 ac	0	97,123.7 ac	10.2 mi 76,329.77 ac
Impaired	Monitored	**31,340.8 ac**	0	0	**3.6 mi** **3,267.9 ac**
	All Waters	31,340.8 ac	199.6 mi 114,410.1 ac	0	3.6 mi 3,267.9 ac
Not Rated	Monitored	12.7 mi 69.1 ac	0	0	0
No Data	N/A	187.0 mi 15,350.3 ac	0	13.8 mi 9,235.3 ac	0
Total	Monitored	12.7 mi 99,059.3 ac	0	97,123.7 ac	13.8 mi 79,382.4 ac
	All Waters	199.6 mi 114,410.1 ac	199.6 mi 114,410.1 ac	13.8 mi 106,359.2 ac	13.8 mi 79,382.4 ac
	Percent Monitored	6.0% mi 86.5% ac	0%	91% ac	100% mi 100% ac

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

Table B-30 Previously or Currently Impaired Waters in Subbasin 03-04-10

Name	1998 Status	2002 Status	Use Support Category	Acres
Neuse River	Impaired	Impaired	Aquatic Life/Secondary Recreation	30,330.9
Trent River	Impaired	Impaired	Aquatic Life/Secondary Recreation	1,009.9
Neuse River		Impaired	Shellfish Harvesting	165.6
Adams Creek and Tributaries		Impaired	Shellfish Harvesting	841.5
Clubfoot Creek and Tributaries		Impaired	Shellfish Harvesting	747.2
South River and Tributaries		Impaired	Shellfish Harvesting	784.6
Broad River and Tributaries		Impaired	Shellfish Harvesting	412.1
Dawson Creek		Impaired	Shellfish Harvesting	122.1
Whittaker Creek		Impaired	Shellfish Harvesting	96.1
Pierce Creek		Impaired	Shellfish Harvesting	50.7
Orchard Creek		Impaired	Shellfish Harvesting	37.1
Bright Creek		Impaired	Shellfish Harvesting	10.9
			Total 2002 Impaired Acres	**34,608.7**

10.3 Status and Recommendations of Previously Impaired Waters

10.3.1 Neuse River and Trent River Estuaries

1998 Recommendations
The Neuse River was partially supporting from Streets Ferry to Minnesott Beach because of high chlorophyll *a* levels associated with overproduction of algae and subsequent low dissolved oxygen and fish kills. Over production of algae was associated with high nutrient loading from both point and nonpoint sources in the entire basin. It was recommended that the NSW strategy (page 64) be implemented to address the various sources of nutrients coming into the estuary.

Tributaries to the Neuse River upstream of Minnesott Beach including a portion of the Trent River, Upper Broad Creek, Goose Creek, Beard Creek, Slocum Creek and Hancock Creek were also included with the Neuse River mainstem segment described above. The estuarine portions of these tributaries were not directly monitored in the past five years but many exhibit the same water quality problems as described above because these waters are continuous with the Neuse River mainstem.

Current Status
The Neuse River (30,330.9 acres plus 1,009.9 acres of the Trent River) is currently impaired from Streets Ferry to Minnesott Beach. Thirteen ambient monitoring stations have been established in this segment of the Neuse River as part of MODMON (page 72). The Neuse Rapid Response Team, based in New Bern, has also been established to quickly investigate algal blooms and fish kills. Four phytoplankton monitoring stations have been established in this segment as well. Algal biovolumes have been in excess of 5,000 mm^3/m^3. Bottom dissolved

oxygen has regularly been below 5 mg/l, although it is not known to what extent this is driven by nutrient loading from point and nonpoint sources.

Point source wastewater discharges in The Lower Neuse Basin Association (page 220) have reported a 48 percent reduction in total nitrogen in discharges over the past four years. While this reduction of nutrient loading to the Neuse River is significant, nonpoint source management strategies are just getting underway (page 64). There have not been significant changes in nitrogen and phosphorus levels in this segment of the Neuse River. Because of the chronic overloading of nutrients into this segment of the Neuse River, there is much recycling of nutrients in the estuary, and it may be some time before current reductions in nutrient loading will be realized in terms of improved water quality.

2002 Recommendations

Continued monitoring and implementation of the Neuse River NSW strategy (page 64), as well as implementation of the Neuse total nitrogen TMDL (page 76), are recommended. Because of the complex nature of estuarine waters, longer periods of data collection and monitoring of management strategies will be needed before water quality goals are met.

Because of the water quality impairment noted above, portions of the Trent River and Brice Creek near New Bern are NCWRP targeted local watersheds (page 203).

Current Water Quality Initiatives

The City of New Bern WWTP has received a CWMTF grant to upgrade the WWTP (page 215).

10.3.2 Impaired Class SA Waters

Portions of Class SA waters were partially supporting in the 1998 basin plan because they were classified as prohibited to shellfish harvesting by DEH SS (page 52). No specific recommendations were made to address bacterial contamination in these waters in the 1998 basin plan. Because of changes in use support methodology, there are changes in acreages and areas that are impaired in the shellfish harvesting use support category. These waters are discussed below in part 10.4.

10.4 Status and Recommendations of Waters Newly Impaired Waters

10.4.1 Adams Creek, Clubfoot Creek, South River, Broad River, Dawson Creek, Whitaker Creek, Orchard Creek, Pierce Creek and Bright Creek

Current Status

Adams Creek and tributaries (841.5 ac), Clubfoot Creek and tributaries (747.2 ac), South River and tributaries (784.6 ac), Broad River and tributaries (412.1 ac), Dawson Creek (122.1 ac), Whitaker Creek (96.1 ac), Pierce Creek (50.7 ac), Orchard Creek (37.1 ac), and Bright Creek (10.9 ac) are currently impaired. These areas are prohibited or conditionally approved-closed because of bacteria levels (page 92) that do not meet approved area criteria.

Clear-cutting in the Clubfoot Creek watershed has been noted. There is also a large amount of agricultural land use in the watershed.

The South River and tributaries (2,288 ac) downstream of the above described area is conditionally approved-open to shellfish harvesting because bacteria levels do not always meet (page 92) approved area criteria. This area was temporarily closed 4.2 percent of the five-year assessment period and is currently supporting the shellfish harvesting use support category. Open Grounds Farm, adjacent to the South River, has recently removed cattle operations and installed flashboard risers on many ditches on the property. Both of these BMPs help reduce sources and delivery of bacterial contaminants to shellfish harvesting waters.

2002 Recommendations
DEH SS will continue to monitor bacteriological water quality in these waters. DWQ, DEH, DCM and DMF are currently developing tools to better track water quality changes, make use support decisions, and support research in shellfish harvesting waters of North Carolina (page 84).

Because of the water quality impairment noted above and the water quality initiatives noted below, South River and Adams Creek are NCWRP targeted local watersheds (page 203).

Current Water Quality Initiatives
The UNC Institute for Marine Science has received a CWMTF grant for a restoration project on Open Grounds Farm (page 215). There is also a Clean Water Act Section 319 project on Open Grounds Farm within the South River local watershed.

10.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

10.5.1 Slocum Creek

Current Status and 2002 Recommendations
The area of Slocum Creek adjacent to Cherry Point has been exposed to jet fuel spills over years of fueling operations at the base. The site is currently a Superfund site. There is also an accumulation of water treatment alum sludge from past operations. DWQ recommends not disturbing the sludge until such time as it can safely be removed and disposed of.

10.6 Additional Water Quality Issues Within Subbasin 03-04-10

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

10.6.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. Refer to page 86 for more information on this issue.

Section B - Chapter 11
Neuse River Subbasin 03-04-11
Jones, Lenoir and Onslow Counties

11.1 Subbasin Overview

Subbasin 03-04-11 at a Glance

Land and Water Area

Total area:	444 mi^2
Land area:	443 mi^2
Water area:	1 mi^2

Population

2000 Est. Pop.:	15,914 people
Pop. Density:	36 persons / mi^2

Land Cover (percent)

Forest / Wetland:	70.1
Water:	0.3
Urban:	1.5
Cultivated Crop:	24.7
Pasture / Managed Herbaceous:	2.4

Municipalities

Trenton and River Bend

Counties

Jones, Lenoir and Onslow

Population growth in the subbasin is concentrated to the west of New Bern. Population density is highest (60-320 persons/mi^2) south of New Bern. Land use in the subbasin is mostly forest and agriculture. There are 38,316 acres of managed public lands in this subbasin, mostly associated with the Croatan National Forest and the Hoffman State Forest.

There are three NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.4 MGD (Figure B-11). Refer to Appendix I for identification and more information on individual NPDES permit holders. There are also 64 registered animal operations in this subbasin.

There were eight benthic macroinvertebrate community samples and three fish community samples (Figure B-11 and Table B-31) collected in 2000 as part of basinwide monitoring. One site was Fair for the first time, and all other sites were not rated as biocriteria are being developed (page 75) to assess these swampy streams. Data were also collected from three ambient stations. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Use support ratings are summarized in Part 11.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 11.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 11.4 below. Supporting waters with noted water quality impacts are discussed in Part 11.5 below. Water quality issues related to the entire subbasin are discussed in Part 11.6, and NCWRP (page 203) targeted local watersheds are discussed in part 11.7. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-11 Neuse River Subbasin 03-04-11

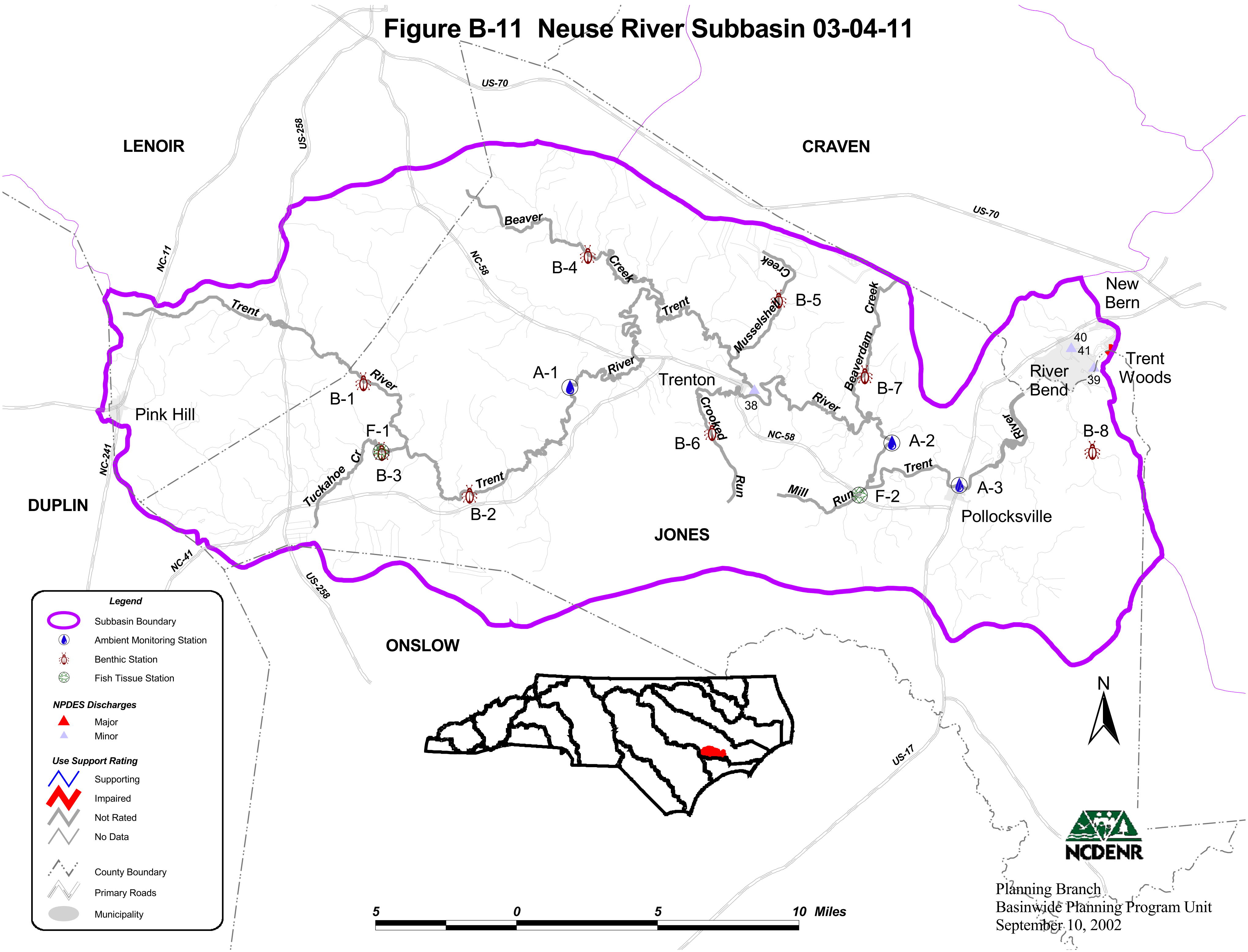


Table B-31 DWQ Monitoring Locations in Subbasin 03-04-11

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
B-1	Trent R	Jones	SR 1153	---	Not Rated
B-2	Trent R	Jones	Becks Bank, near Comfort	---	Fair
B-3	Tuckahoe Swp	Jones	SR 1142	---	Not Rated
B-4	Beaver Cr	Jones	SR 1315	Fair (1991)	Not Rated
B-5	Musselshell Cr	Jones	SR 1320	Not Rated	Not Rated
B-6	Crooked Run	Jones	SR 1123	---	Not Rated
B-7	Beaverdam Cr	Jones	SR 1002	Not Rated	Not Rated
B-8	Island Cr[2]	Jones	SR 1004	Not Rated	Not Rated

Fish Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
F-1	Tuckahoe Cr	Jones	SR 1142	---	Not Rated
F-2	Mill Run	Jones	NC 58	---	Not Rated
F-3	Island Cr[2]	Jones	SR 1004	Not Rated	Not Rated

Ambient Monitoring Sites					
Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[3]
A-1	Trent R	Jones	Near Trenton	J8690000	none
A-2	Trent R	Jones	SR 1121	J8720000	none
A-3	Trent R	Jones	Pollacksville	J8730000	none

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

11.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-11 were assigned for aquatic life and secondary recreation, fish consumption and primary recreation. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 120 stream miles (40.5 percent) and 253 estuarine acres (100 percent) monitored during this assessment period. Refer to Table B-32 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-33.

Table B-32 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-11

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation
Supporting	Monitored	0	0	0 mi 252.7 ac
	All Waters	0	0	0 mi 252.7 ac
Impaired	Monitored	**0**	0	0
	All Waters	0	295.8 mi 252.7 ac	0
Not Rated	Monitored	120.0 mi 252.7 ac	0	0
No Data	N/A	178.8 mi	0	1.2 mi 0 ac
Total	Monitored	120.0 mi 252.7 ac	0	0 mi 252.7 ac
	All Waters	295.8 mi 252.7 ac	295.8 mi 252.7 ac	1.2 mi 252.7 ac
	Percent Monitored	40.5% mi 100% ac	0%	0% mi 100% ac

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

Table B-33 Previously or Currently Impaired Waters in Subbasin 03-04-02

Name	1998 Status	2002 Status	Use Support Category	Miles
Trent River	Impaired	Not Rated	Aquatic Life/Secondary Recreation	N/A
Beaver Creek	Impaired	Not Rated	Aquatic Life/Secondary Recreation	N/A
			Total 2002 Impaired Miles	**0**

11.3 Status and Recommendations of Previously Impaired Waters

11.3.1 Trent River

1998 Recommendations
The Trent River was partially supporting from the source to the Neuse River. There were no specific recommendations made in the 1998 plan.

Current Status
The Trent River is currently not rated from the confluence with Tuckahoe Creek to the subbasin boundary. There are many animal operations above the site and algal growths were noted. The site is under stress and hurricane damage was also noted. Lower summer flows may be due to increases in agriculture water use.

2002 Recommendations
DWQ will investigate the potential for low flows to impact biological communities in the Trent River. Unusually low flows have prevented DWQ staff from resampling the Trent River. DWQ will continue to monitor the Trent River.

11.3.2 Beaver Creek

1998 Recommendations
Beaver Creek was partially supporting from the source to the Trent River. There were no specific recommendations made in the 1998 basin plan.

Current Status
Beaver Creek is currently not rated. Abundant periphyton growth was noted at site B-7. Conductivity was elevated and hurricane damage was noted. The biological community was very disturbed and appeared to be under stress.

2002 Recommendations
DWQ will continue to monitor Beaver Creek and continue to develop criteria that can be used to assign a bioclassification (page 92) for future monitoring.

11.4 Status and Recommendations of Waters Newly Impaired Waters

There are no newly impaired waters in subbasin 03-04-11. Refer to Part 11.5 below for information on waters with noted water quality impacts.

11.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

11.5.1 Musselshell Creek

Current Status and 2002 Recommendations
Musselshell Creek is currently not rated. Habitat degradation (page 89) was noted with infrequent pools, lack of instream habitat, little riparian area, eroding banks and channelized segments. There is extensive cotton farming in the watershed. DWQ will continue to monitor water quality in this creek to evaluate possible impacts from agriculture practices.

11.6 Additional Water Quality Issues Within Subbasin 03-04-11

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

11.6.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. Refer to page 86 for more information on this issue.

Section B - Chapter 12
Neuse River Subbasin 03-04-12
Neuse River

12.1 Subbasin Overview

Subbasin 03-04-12 at a Glance

Land and Water Area
Total area: 183 mi^2
Land area: 183 mi^2
Water area: 0 mi^2

Population Statistics
2000 Est. Pop.: 39,007 people
Pop. Density: 180 persons/mi^2

Land Cover (percent)
Forest/Wetland: 51.7
Surface Water: 1.1
Urban: 4.1
Cultivated Crop: 41.0
Pasture/ Managed Herbaceous: 2.1

Counties
Johnston and Wayne

Municipalities
Goldsboro and Princeton

Population growth in the subbasin is concentrated around Goldsboro. Land use in this subbasin is mostly agriculture except around Goldsboro. There are 837 acres of managed public lands in this subbasin mostly associated with the Cherry Farms Game Lands.

There are four NPDES wastewater discharge permits in this subbasin with a total permitted flow of 12.9 MGD (Figure B-12). The largest is the Goldsboro WWTP (10.8 MGD). Refer to Appendix I for identification and more information on individual NPDES permit holders. Goldsboro and Wayne County will be required to develop a stormwater program under Phase II (page 76) and have submitted model stormwater ordinances as required by the Neuse NSW strategy stormwater requirements (page 64). There are also 66 registered animal operations in this subbasin.

There was one benthic macroinvertebrate community sample (Figure B-12 and Table B-34) collected in 2000 as part of basinwide monitoring. This site was unchanged from previous bioclassifications. There were 21 fish tissue samples collected in the Neuse River at Goldsboro. None of the samples had metals above USEPA, USFDA and North Carolina criteria. Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Use support ratings are summarized in Part 12.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 12.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 12.4 below. Supporting waters with noted water quality impacts are discussed in Part 12.5 below. Water quality issues related to the entire subbasin are discussed in Part 12.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-12 Neuse River Subbasin 03-04-12

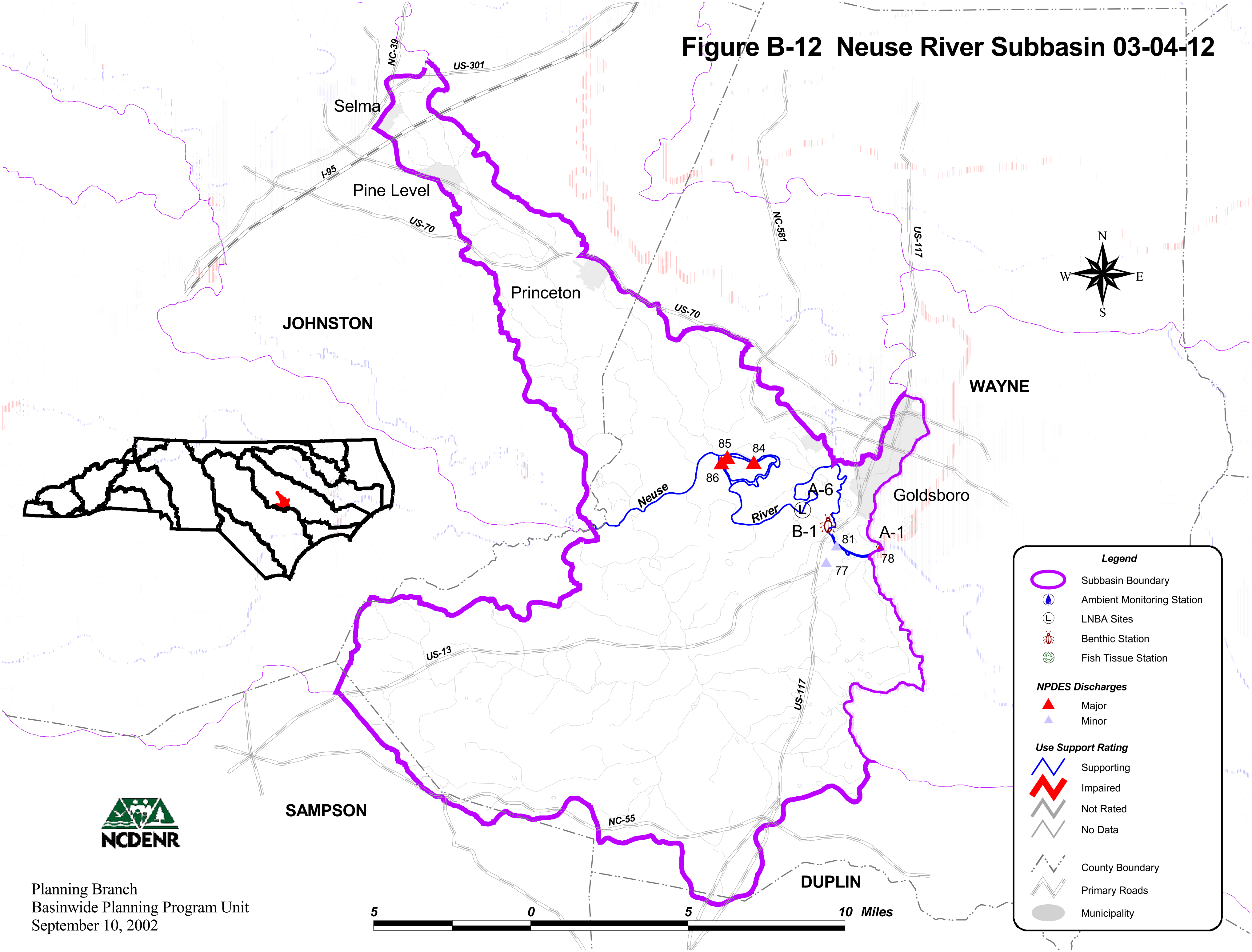


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Table B-34 DWQ Monitoring in Subbasin 03-04-12

Benthic Macroinvertebrate Community Monitoring Sites					
Map #[1]	Waterbody	County	Location	1995	2000
B-1	Neuse R[2]	Wayne	US 117	Good-Fair	Good-Fair
Ambient Monitoring Sites					
Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[3]
A-1	Neuse R	Wayne	SR 1915	J5970000	---

1 B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

2 Historical data available at this site. Refer to Appendix II.

3 Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

12.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-12 were assigned for aquatic life and secondary recreation, fish consumption and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

There were 24.8 stream miles (16 percent) monitored during this assessment period. None of the monitored stream miles are impaired. Refer to Table B-35 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-36.

Table B-35 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-12

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	24.8 mi	0	0	0
	All Waters	24.8 mi	0	0	93.3 mi
Impaired	Monitored	**0**	**5.8 mi**	0	0
	All Waters	0	152.4 mi	0	0
Not Rated	Monitored	0	0	0	0
No Data	N/A	127.6 mi	0	4.7 mi	0
Total	Monitored	24.8 mi	5.8 mi	0	0
	All Waters	152.4 mi	152.4 mi	4.7 mi	93.3 mi
	Percent Monitored	16.3% mi	3.8%	0% mi	0%

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

Table B-36 Previously or Currently Impaired Waters in Subbasin 03-04-12

Name	1998 Status	2002 Status	Use Support Category	Miles
Neuse River		Impaired	Fish Consumption	5.8
			Total 2002 Impaired Miles	**5.8**

12.3 Status and Recommendations of Previously Impaired Waters

There were no impaired streams identified in the 1998 basin plan in this subbasin.

12.4 Status and Recommendations of Waters Newly Impaired Waters

There are no newly impaired waters in subbasin 03-04-12. Refer to Part 12.5 below for information on waters with noted water quality impacts. Refer to page 93 for more information on fish consumption use support in the Neuse River.

12.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

12.5.1 Neuse River

Current Status and 2002 Recommendations

The Neuse River in this subbasin is currently supporting based on a Good-Fair bioclassification at site B-1. The Wayne County Genoa WWTP (map #81) and BMCA Goldsboro (map #77) have had past aquatic toxicity failures. DWQ will continue to work with these discharges to assure that water quality impacts are minimized.

12.6 Additional Water Quality Issues Within Subbasin 03-04-12

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

12.6.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. Refer to page 86 for more information on this issue.

13.1 Subbasin Overview

Subbasin 03-04-13 at a Glance

Land and Water Area
Total area: 277 mi^2
Land area: 145 mi^2
Water area: 132 mi^2

Population Statistics
2000 Est. Pop.: 5,469 people
Pop. Density: 20 persons/mi^2

Land Cover (percent)
Forest/Wetland: 33.6
Surface Water: 49.8
Urban: 4.0
Cultivated Crop: 12.2
Pasture/
Managed Herbaceous: 0.4

Counties
Carteret and Pamlico

Municipalities
Bayboro, Alliance, Stonewall and Mesic

Population growth in the subbasin is minimal. Land use in the subbasin is mostly agricultural. There are 933 acres of managed public lands in this subbasin, mostly associated with the Goose Creek Game Lands. There are also two registered animal operations in this subbasin.

There were no biological samples collected in this subbasin. There is one ambient monitoring station in this subbasin (Figure B-13 and Table B-37). Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

Shellfish Sanitation and Recreational Water Quality Section of the Division of Environmental Health (page 52) has classified 81,257 acres as approved and 198 acres as prohibited /restricted (page 84). The Bay River WWTP (map # 72) ceased discharge in 2000.

Use support ratings are summarized in Part 13.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 13.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 13.4 below. Water quality issues related to the entire subbasin are discussed in Part 13.5. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-13 Neuse River Subbasin 03-04-13

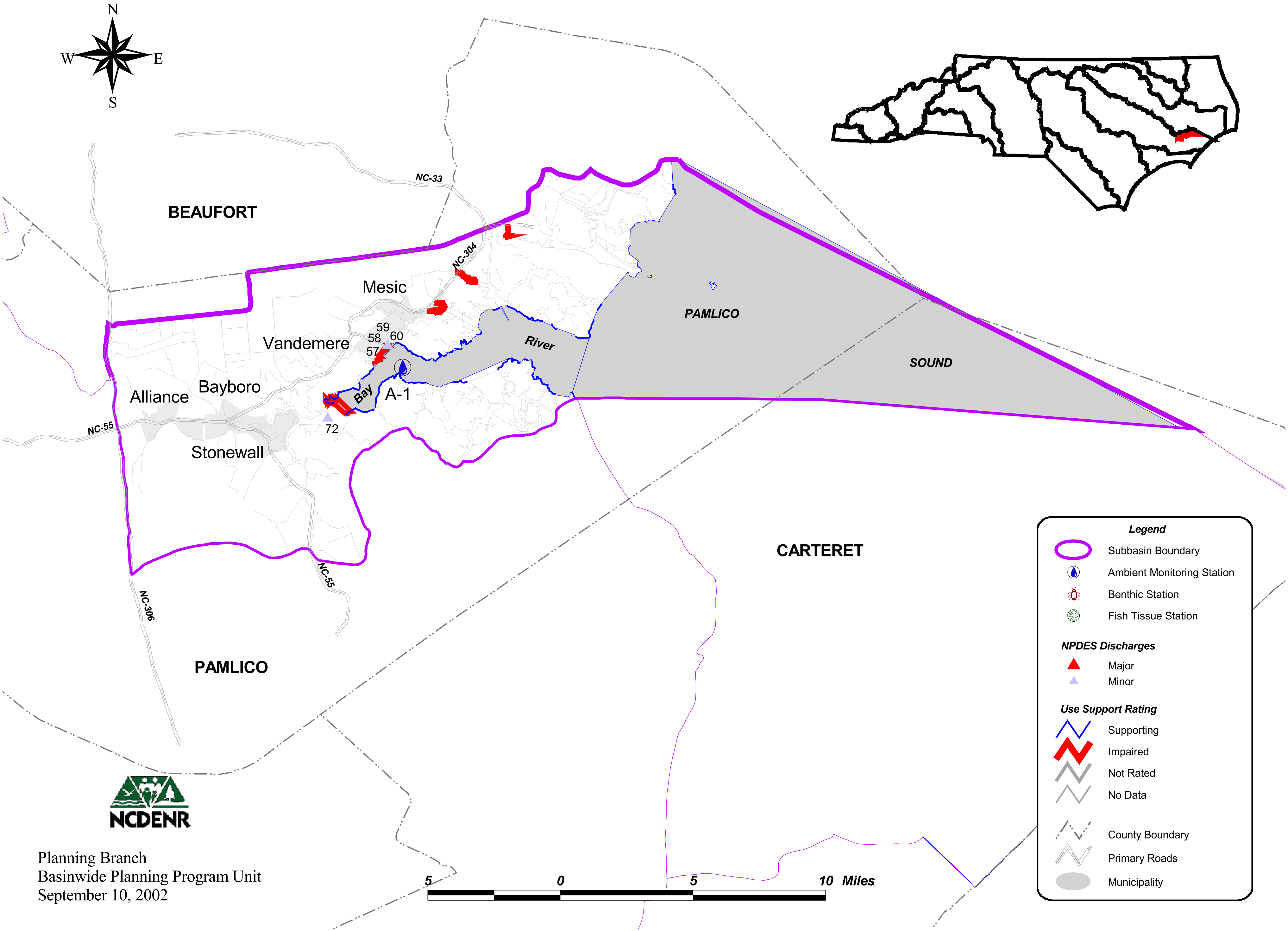

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Table B-37 DWQ Monitoring Locations in Subbasin 03-04-13

Ambient Monitoring Sites					
Map #[1]	**Waterbody**	**County**	**Location**	**Station #**	**Noted Parameters[2]**
A-1	Bay River	Pamlico	Channel Marker 5	J9950000	none

[1] A = ambient monitoring station

[2] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

13.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-13 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and shellfish harvesting. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93).

There were 62,244 estuarine acres (77 percent) monitored during this assessment period. Approximately 386 estuarine acres (<1 percent) are impaired in the shellfish harvesting use support category. Refer to Table B-38 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-39.

Table B-38 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-13

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Shellfish Harvesting
Supporting	Monitored	62,244.0 ac	0	73,243.0 ac	1.4 mi 81,270.5 ac
	All Waters	62,244.0 ac	0	73,243.0 ac	1.4 mi 81,270.5 ac
Impaired	**Monitored**	**0**	**0**	**0**	**385.6 ac**
	All Waters	0	3.5 mi 83,468.9 ac	0	385.6 ac
Not Rated	Monitored	0	0	0	0
No Data	N/A	3.5 mi 19,224.9 ac	0	1.4 mi 8,413.1 ac	0
Total	Monitored	62,244.0 ac	0	73,243.0 ac	1.4 mi 81,656.1 ac
	All Waters	3.5 mi 83,468.9 ac	3.5 mi 83,468.9 ac	1.4 mi 81,656.1 ac	1.4 mi 81,656.1 ac
	Percent Monitored	0% mi 77% ac	0%	0% mi 89.7% ac	100% mi 100% ac

Note: All waters include monitored, evaluated and waters with no basis.

Table B-39 Previously or Currently Impaired Waters in Subbasin 03-04-13

Name	1998 Status	2002 Status	Use Support Category	Acres
Bay River		Impaired	Shellfish Harvesting	100.0
Harper Creek		Impaired	Shellfish Harvesting	32.5
Bear Creek		Impaired	Shellfish Harvesting	199.9
Bennett Creek		Impaired	Shellfish Harvesting	15.7
Gale Creek		Impaired	Shellfish Harvesting	29.4
Bills Creek		Impaired	Shellfish Harvesting	8.1
			Total 2002 Impaired Acres	**385.6**

13.3 Status and Recommendations of Previously Impaired Waters

13.3.1 Impaired Class SA Waters

Portions of Class SA waters were partially supporting in the 1998 basin plan because they were classified as prohibited to shellfish harvesting by DEH SS (page 52). No specific recommendations were made to address bacterial contamination in these waters in the 1998 basin plan. Because of changes in use support methodology, there are changes in acreages and areas that are impaired in the shellfish harvesting use support category. These waters are discussed below in part 13.4.

13.4 Status and Recommendations of Waters Newly Impaired Waters

13.4.1 Bay River, Harper Creek, Bear Creek, Bennett Creek, Gale Creek and Bills Creek

Current Status
Bay River (100 ac), Harper Creek (32.5 ac), Bear Creek (199.9 ac), Bennett Creek (15.7 ac), Gale Creek (29.4 ac) and Bills Creek (8.1 ac) are impaired for shellfish harvesting. These areas are prohibited because of bacterial levels that do not meet approved area criteria (page 84). The Bay River Sewerage District ceased discharge in December 2000 in the upper portion of the Bay River.

2002 Recommendations
It is recommended that DEH SS evaluate the permanent closure line that was associated with the Bay River discharge to determine if shellfish can be harvested in the 100 acres of now prohibited Class SA waters in the Bay River. DEH SS and DWQ will pursue reclassification of portions of Bay River to Class SA if water quality and shellfish habitat can support the fishery.

DEH SS will continue to monitor bacteriological water quality in these waters. DWQ, DEH, DCM and DMF are currently developing tools to better track water quality changes, make use support decisions, and support research in shellfish harvesting waters of North Carolina (page 84).

13.5 Additional Water Quality Issues Within Subbasin 03-04-13

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

13.5.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. For more information on this issue, refer to page 86.

Section B - Chapter 14
Neuse River Subbasin 03-04-14
Carteret and Pamlico Counties

14.1 Water Quality Overview

Subbasin 03-04-14 at a Glance

Land and Water Area

Total area:	336 mi^2
Land area:	59 mi^2
Water area:	277 mi^2

Population Statistics

1990 Est. Pop.:	374 people
Pop. Density:	1.1 persons / mi^2

Land Cover (percent)

Forest / Wetland:	16.6
Surface Water:	81.0
Urban:	0.1
Cultivated Cropland:	1.4
Pasture / Managed Herbaceous:	0.1

Municipalities

Goldsboro and Kinston

Counties

Carteret and Pamlico

There is very little land area in this subbasin and no large communities. There are 24,617 acres of managed public lands in this subbasin, mostly associated with the Cedar Island National Wildlife Refuge.

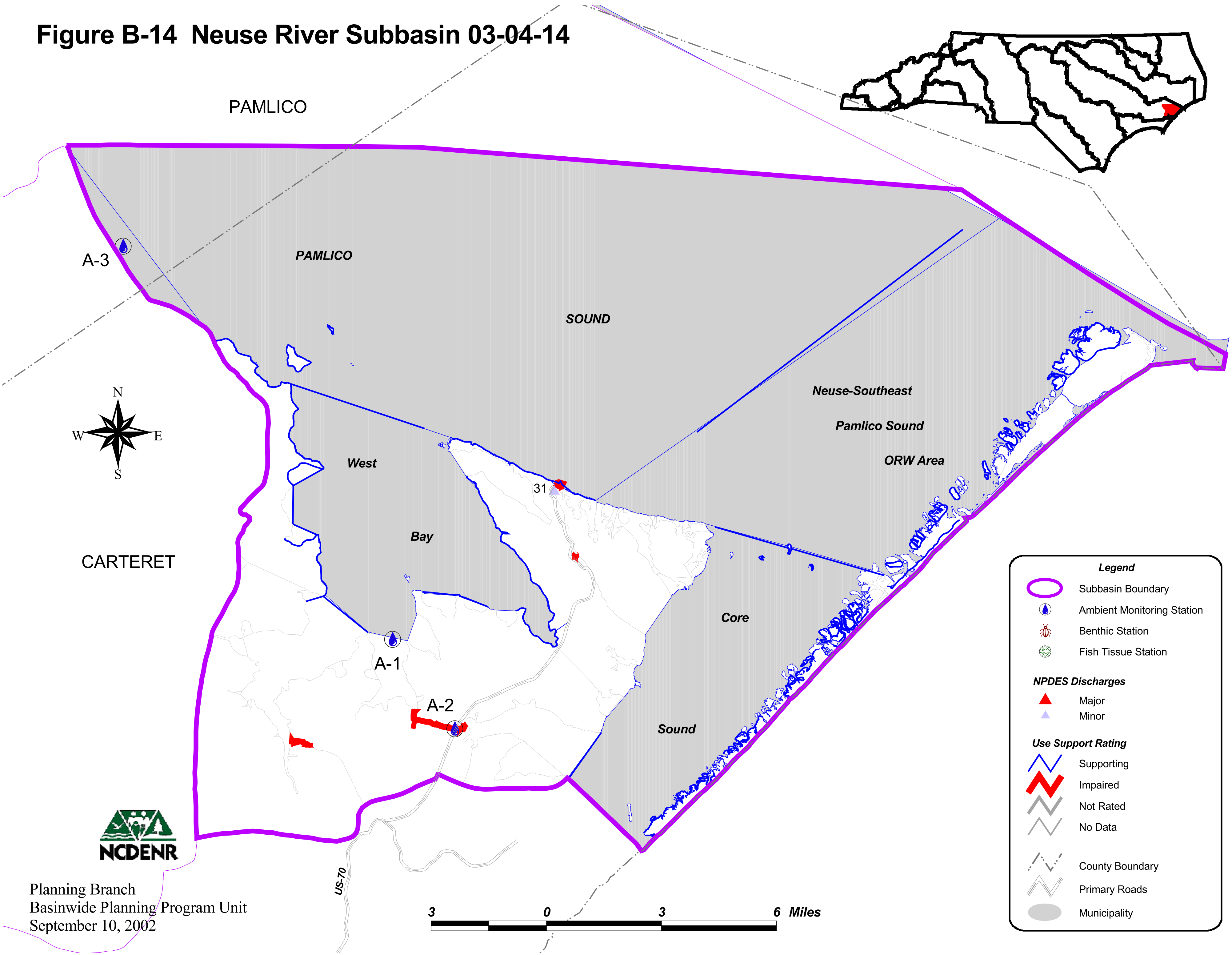
There are no NPDES wastewater discharge permits in this subbasin and no registered animal operations.

Data from three ambient monitoring stations were collected as part of the water quality assessment (Figure B-14 and Table B-40). Refer to *2001 Neuse River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Section A, Chapter 3 for more information on monitoring.

DEH SS (page 52) has classified 73,101 acres as approved, 2,499 as conditionally approved-open, 373 acres as conditionally approved-closed and 3,422 acres as prohibited /restricted.

Use support ratings are summarized in Part 14.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in 14.3 below. Current status and future recommendations for newly impaired waters are discussed in 14.4 below. Supporting waters with noted water quality impacts are discussed in Part 14.5 below. Water quality issues related to the entire subbasin are discussed in Part 14.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and more information on supporting monitored waters.

Figure B-14 Neuse River Subbasin 03-04-14



NCDENR

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Basinwide Planning Program Unit
September 10, 2002

Table B-40 DWQ Monitoring Locations in Subbasin 03-04-14

Ambient Monitoring Sites					
Map #[1]	Waterbody	County	Location	Station #	Noted Parameters[2]
A-1	Neuse River	Pamlico	Near Pamlico	J9930000	none
A-2	West Thorofare River	Carteret	Channel Marker 10	J9938000	none
A-3	Thorofare Canal	Carteret	NC 12	J9940000	none

[1] A = ambient monitoring station
[2] Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

14.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-14 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and shellfish harvesting. Based on ambient water quality data and land use information, all monitored waters in this subbasin (171,419 ac) are supporting aquatic life and secondary recreation. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). Twenty-one coastline miles are supporting primary recreation based on DEH monitoring of swimming areas (page 52). Fifty-seven acres are impaired for the shellfish harvesting use support category. Use support ratings are summarized in Table B-41 for monitored waters in subbasin 03-04-14. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-42.

Table B-41 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-14

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Shellfish Harvesting
Supporting	Monitored	171,418.8 ac	0	160,749.9 ac	171,361.7 ac
	All Waters	171,418.8 ac	0	160,749.9 ac	171,361.7 ac
Impaired	**Monitored**	**0**	**0**	**0**	**57.1 ac**
	All Waters	0	171,418.8 ac	0	**57.1 ac**
Not Rated	Monitored	0	0	0	0
No Data	N/A	0	0	10,668.9 ac	0
Total	Monitored	171,418.8 ac	0	160,749.9 ac	171,418.8 ac
	All Waters	171,418.8 ac	171,418.8 ac	171,418.8 ac	171,418.8 ac
	Percent Monitored	100% ac	0%	91% ac	100% ac

Note: All waters include monitored, evaluated and waters with no basis.
* 21 miles of Atlantic coastline not included in table.

Table B-42 Previously or Currently Impaired Waters in Subbasin 03-04-14

Name	1998 Status	2002 Status	Use Support Category	mi/ac
Pamlico Sound	Impaired	Impaired	Shellfish Harvesting	12.5 ac
Golden Creek	Impaired	Impaired	Shellfish Harvesting	9.7 ac
Thorofare	Impaired	Impaired	Shellfish Harvesting	34.9 ac
			Total 2002 Impaired Acres	**57.1**

14.3 Status and Recommendations of Previously Impaired Waters

14.3.1 Impaired Class SA Waters

Portions of Class SA waters were partially supporting in the 1998 basin plan because they were classified as prohibited to shellfish harvesting by DEH SS (page 52). No specific recommendations were made to address bacterial contamination in these waters in the 1998 basin plan. Because of changes in use support methodology, there are changes in acreages and areas that are impaired in the shellfish harvesting use support category. These waters are discussed below in part 10.4.

14.4 Status and Recommendations of Waters Newly Impaired Waters

14.4.1 Small Areas in Pamlico Sound, Golden Creek and Thorofare

Current Status
These waters (57.1 acres) are currently impaired in the shellfish harvesting use support category because they are permanently closed to shellfish harvesting.

The Thorofare and Golden Creek are likely closed due to persistent bacterial contamination from abundant wildlife in the area, as there is little development in this subbasin.

This small portion of Pamlico Sound near Cedar Island Ferry Harbor is DEH SS classified as prohibited and permanently closed to shellfish harvesting. The area remains permanently closed to shellfish harvesting because of the presence of the marina facility. There are no noted septic system problems for businesses located adjacent to this area.

2002 Recommendations
DEH SS will continue to monitor bacteriological water quality in these waters. DWQ, DEH, DCM and DMF are currently developing tools to better track water quality changes, make use support decisions, and support research in shellfish harvesting waters of North Carolina (page 84).

14.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

Current Status and Recommendations

The Atlantic coastline in this subbasin is impaired fish consumption because of a consumption advisory for king mackerel (page 93). There are no communities on the Atlantic coastline in this subbasin; therefore, stormwater outfalls and pumping have not been impacting primary recreation as in other areas on the coast.

14.6 Additional Water Quality Issues Within Subbasin 03-04-14

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

14.6.1 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitat so the biological community can recover.

Section C

Current and Future Water Quality Initiatives

Section C - Chapter 1
Current Water Quality Initiatives

1.1 Workshop Summaries

In June 2001, there were four workshops held by DWQ in the Neuse River basin at Durham, Raleigh, Goldsboro and New Bern. There were 134 people in attendance representing a variety of interests. Figure C-1 gives an estimation of groups/interests represented based on information recorded on attendance sheets.

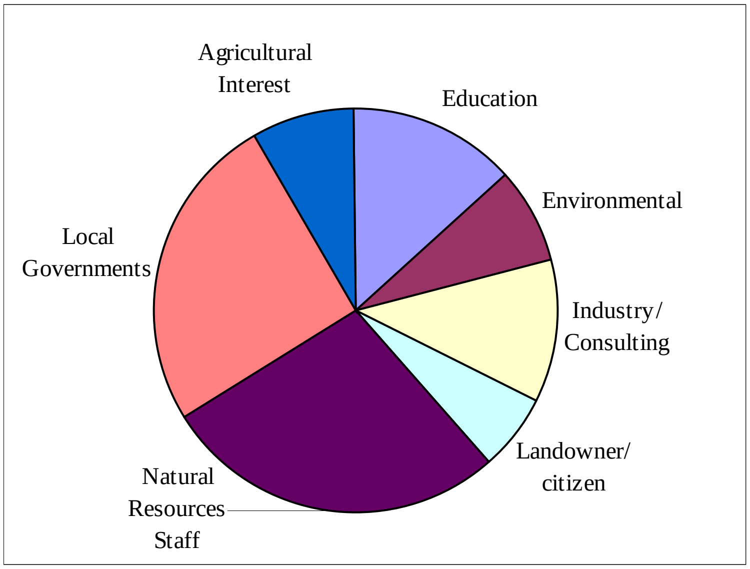


Figure C-1 Percent of Total Attendance by Various Interests at DWQ Water Quality Workshops in the Neuse River Basin (2001)

DWQ staff gave presentations about general water quality in the Neuse River basin, basinwide planning and the Wetlands Restoration Program. Participants at each workshop also gave brief presentations about local water quality initiatives. Workshop attendees were asked to discuss the following questions in small groups:

1. What are the main threats to water quality in the Neuse River basin?
2. Where are the problem areas or waters?
3. What recommendations do you have for addressing these problems/waters?
4. What local agencies or organizations should be involved in addressing the problems?

A detailed outline of each small group's discussion of these questions is available upon request. Good discussion was generated at each workshop, and all of the information was considered and, in some cases, incorporated into this draft plan. The most frequently cited threats to water quality identified by workshop participants are discussed below.

Important Issues Basinwide

The most important issues identified by workshop participants were related to development. Increasing development was a concern specifically identified as a problem for five specific streams in the upper basin. Losses of farm and forestland and increases in impervious surface, home fertilizer use and stormwater runoff were identified as a threat to water quality at all the workshops. Issues related to enforcement of existing rules and monitoring were also of concern at all workshops. Refer to Appendix V for summary tables from the workshops.

1.2 Federal Initiatives

1.2.1 Clean Water Act – Section 319 Program

Section 319 of the Clean Water Act provides grant money for nonpoint source demonstration projects. Approximately $1 million is available annually for demonstration and education projects across the state. Project proposals are reviewed and selected by the North Carolina Nonpoint Source Workgroup, made up of state and federal agencies involved in regulation or research associated with nonpoint source pollution. Information on the North Carolina Section 319 Grant Program, including application deadlines and requests for proposals, are available online at http://h2o.enr.state.nc.us/nps/bigpic.htm.

There are eight projects in the Neuse River basin that have been funded (federal Section 319 money must be matched with nonfederal dollars) through the Section 319 base program between 1994 and 2000.

Many projects sponsored through Section 319 funding have basinwide applications. Many are demonstration projects and educational programs that allow for the dissemination of information to the public through established programs such as through NC State University and the NC Cooperative Extension Service. Such programs include Upper, Middle and Lower Neuse Education Teams, which have been responsible for educating the public about impacts to water quality, as well as developing demonstration sites for water quality BMPs. Information on this program is available at http://www.neuse.ncsu.edu/.

Descriptions of the projects listed below and other Section 319 program information are available at http://h2o.enr.state.nc.us/nps/319.htm.

Table C-1 Projects Funded Through Clean Water Act Section 319

FY	Project Name	Agency	Project Area	Description
1999	Nahunta Swamp Watershed Conservation Tillage	Wayne & Greene SWCD	Nahunta Swamp area	Reduce sediments and nutrients in runoff from cotton farming
1999	Smith & Austin Stream Restoration and Riparian Buffer Project	Wake County SWCD	Smith and Austin Creeks, Wake County	Streambank stab., est. rip. buffers, stream monitoring, education
1999	Crabtree Creek Urban Planning Project	NC Cooperative Extension Service	Cary, NC	WQ monitoring of constructed wetlands, bioretention, BMPs
1997	Riparian Buffers and Controlled Drainage Evaluation	NCSU-Biol. & Ag. Eng.	Wayne County	Installation and monitoring of controlled drainage and riparian buffer BMPs
1996	Goose Creek Urban Stream Rehabilitation Project	Durham SWCD	Ellerbe Creek Watershed, Durham	Stream restoration, education
1995	Wetlands Restoration as Water Quality BMP	NC Cooperative Extension Service	Wetlands Reserve Program site, Craven County	Demonstrate and evaluate wetlands restoration for WQ benefits
1994	Open Ground Farms Demonstration Project	Carteret County SWCD	South Creek headwaters	Demonstrate Water Quality BMPs
1994	Farm and Home Assessment System	NC Coop. Ext. Service	Johnston County (ag. pilot area)	Educational program on environmental impacts

1.2.2 USDA – NRCS Environmental Quality Improvement Program (EQIP)

The Environmental Quality Incentives Program provides technical, educational and financial assistance to eligible farmers and ranchers to address soil, water and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with federal and state environmental laws and encourages environmental enhancement. The purposes of the program are achieved through the implementation of a conservation plan that includes structural, vegetative and land management practices on eligible land. Five to ten-year contracts are made with eligible producers. Cost share payments may be made to implement one or more eligible structural or vegetative practices, such as animal waste management facilities, terraces, filter strips, tree planting and permanent wildlife habitat. Incentive payments can be made to implement one or more land management practices, such as nutrient management, pest management and grazing land management.

Fifty percent of the funding available for this program will be targeted at natural resource concerns relating to livestock production. The program is carried out primarily in priority areas that may be watersheds, regions or multistate areas and for significant statewide natural resource concerns that are outside of geographic priority areas. EQIP's authorized budget of $1.3 billion is prorated at $200 million per year through the year 2002.

NRCS district contacts for the Neuse River basin are included on the nonpoint source contact sheet found in Appendix VI or visit the website at http://www.nc.nrcs.usda.gov/Programs/eqip.htm for more information.

1.3 State Initiatives

1.3.1 Albemarle-Pamlico National Estuary Program

The Albemarle-Pamlico National Estuary Program (APNEP), formerly known as the Albemarle-Pamlico Estuarine Study (APES), was among the first National Estuary Programs established by the EPA in 1987. The mission of the APNEP is to identify, restore and protect the significant resources of the Albemarle-Pamlico estuarine system. Unlike traditional regulatory approaches to environmental protection, the APNEP is a cooperative effort jointly sponsored by NCDENR and the EPA that targets a broad range of issues and engages local communities in the process.

The program focuses not just on improving water quality in the region's estuaries, but on maintaining the integrity of the whole system -- its chemical, physical and biological properties, as well as its economic, recreational and aesthetic values. Important components of the APNEP are the consideration of water quality, fisheries resources, land and water habitats, and the interaction of humans with the natural resources of the estuarine system. The APNEP is designed to encourage local communities to take responsibility for managing the resources in their respective jurisdictions.

Comprehensive Conservation and Management Plan

Since 1987, research generated by the APNEP has been instrumental to the development of a Comprehensive Conservation and Management Plan (CCMP). This plan is composed of recommendations for management strategies that address concerns in the Albemarle-Pamlico Sounds region and to protect the system's estuarine resources.

During the development of the CCMP, the APNEP was guided by a 95-member Management Conference that represented diverse interests. Four committees were responsible for identifying problems in the estuarine system, generating research where gaps in knowledge existed, increasing public awareness of environmental issues, and finding solutions to address those issues. As a result of these efforts, more is known about the Albemarle-Pamlico estuarine system than ever before.

CCMP Development Involved Diverse Interests Including:

- Federal and state government
- University researchers
- Environmental groups
- Agriculture representatives
- Forestry interests
- Industry representatives
- Developers
- Fishermen
- Local elected officials

One of the recommendations of the CCMP was to develop regional councils in each of the five major river basins of the Albemarle-Pamlico watershed for the purpose of fostering public input into the APNEP program. In 1995, an Executive Order was issued by the Governor of North Carolina calling for the creation of these regional councils. The Neuse River Basin Regional Council is highlighted below.

Currently, the APNEP is administered and staffed by DWQ; however, staff works closely with the EPA's Office of Water to implement the many objectives and key management actions contained in the APNEP's CCMP.

Neuse River Basin Regional Council

Each regional council is comprised of elected and appointed county and municipal officials, representatives from agriculture, silviculture, commercial and recreational fishing, conservation, environmental science, business/industry and tourism groups. Each council is charged with identifying and implementing a project that utilizes innovative or unique management strategies to address a priority watershed problem. Regional councils provide a forum for public, special interest and local government involvement in the APNEP.

For more information regarding the Albemarle-Pamlico National Estuary Program, visit the website at http://h2o.enr.state.nc.us/nep/.

1.3.2 NC Agriculture Cost Share Program

The North Carolina Agriculture Cost Share Program was established in 1984 to help reduce the sources of agricultural nonpoint source pollution to the state's waters. The program helps owners and renters of established agricultural operations improve their on-farm management by using Best Management Practices (BMPs). These BMPs include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential for surface and groundwater pollution. The Agriculture Cost Share Program is a voluntary program that reimburses farmers up to 75 percent of the cost of installing an approved BMP. The program is implemented by the Division of Soil and Water Conservation (DSWC). The cost share funds are paid to the farmer once the planned control measures and technical specifications are completed. The annual statewide budget for BMP cost sharing is approximately 6.9 million.

From 1993 to 2001, $6,345,236 was provided for projects in counties wholly or partially in the Neuse River basin. The projects affected over 162,000 acres and saved almost 510,000 tons of soil from erosion. Also, 1,729,107 pounds of nitrogen and 441,914 pounds of phosphorus were saved (NCDENR-DSWC, 2001, personal communication).

Soil and Water Conservation District contacts for the Neuse River basin are included in Appendix VI or visit the website at http://www.enr.state.nc.us/DSWC/files/acs.htm for more information.

1.3.3 Coastal Habitat Protection Plans

The North Carolina Fisheries Reform Act of 1997 requires the North Carolina Department of Environment and Natural Resources to prepare Coastal Habitat Protection Plans (CHPPs) for the "long-term enhancement of coastal fisheries associated with each coastal habitat…." The plans describe the fisheries, fishery habitats and water quality affecting coastal fisheries stocks in the eight river basins that drain to the coast of North Carolina. Although staff of the Division of Marine Fisheries (DMF) is responsible for actually writing the plans, DWQ and the Wildlife Resources Commission, as well as the Divisions of Coastal Management (DCM) and

Environmental Health (DEH), are heavily involved in the program. The Environmental Management, Coastal Resources and Marine Fisheries Commissions review and approve the plans, and those commissions are responsible for any new rules necessary for implementation of the plans.

The plans are organized by geographic area with 11 management units, including the Neuse River basin, that generally correspond with the DWQ Basinwide Planning Program units. A general source document includes regional and summary information. The management unit plans are specific to their areas, including detailed information and specific recommendations addressing conservation, habitat protection and enhancement, water quality improvement, research and monitoring, and administrative actions. A complete plan includes both the source document and the management unit plan. The first two area plans are underway in 2001: Chowan and Coastal Ocean.

For additional information about CHPPs, contact Mike Street by calling 1-800-682-2632 (in NC) or by e-mail at mike.street@ncmail.net. You may also visit the DMF website at http://www.ncfisheries.net/habitat/chpp1.htm.

1.3.4 North Carolina Wetlands Restoration Program

The North Carolina Wetlands Restoration Program (NCWRP) is a nonregulatory program responsible for implementing wetland and stream restoration projects throughout the state. The focus of the program is to improve watershed functions in the 17 river basins across the state by restoring wetlands, streams and riparian buffers within selected local watersheds. These vital watershed functions include water quality protection, floodwater retention, fisheries and wildlife habitat, and recreational opportunities. The NCWRP is not a grant program. Instead, the program funds local restoration projects directly through the Wetlands Restoration Fund.

Restoration sites are targeted through the development and use of Watershed Restoration Plans (formerly called "Basinwide Wetland and Riparian Restoration Plans"). The restoration plans are developed, in part, using information compiled in DWQ's Basinwide Water Quality Plans and Basinwide Assessment Reports. The NCWRP Plans evaluate resource data and existing water quality initiatives within local watersheds in order to select "Targeted Local Watersheds". Targeted Local Watersheds are areas with the greatest need and opportunity for stream and wetlands restoration efforts, and where NCWRP resources can be most efficiently focused for maximum restoration benefit. The NCWRP Watershed Restoration Plans are updated every five years, generally on the same timeline as DWQ's Basinwide Water Quality Plans.

The selection of Targeted Local Watersheds (at the scale of NRCS 14-digit Hydrologic Units, or HUs) does not necessarily restrict the location of NCWRP restoration project sites. However, these targeted HUs are given higher priority than non-targeted HUs in considering the selection of NCWRP candidate restoration project sites. Targeted Local Watersheds are simply local watersheds where stream, wetland and riparian buffer restoration projects will make the most sense in the context of overall watershed and wetlands protection.

The NCWRP is also working to develop comprehensive Local Watershed Plans within certain Targeted Local Watersheds identified in the Watershed Restoration Plans. These locally-based plans develop comprehensive watershed assessments to identify causes and sources of nonpoint source impairment. They also identify and prioritize wetland areas, stream reaches, riparian buffer areas and best management practices that will provide significant water quality improvement and other environmental benefits to local watersheds. The NCWRP will coordinate with local community groups, local governments and others to develop and implement these plans.

Selection of a watershed as a Targeted Local Watershed does not mean that a Local Watershed Plan will be initiated in that area. Local Watershed Plans are developed in areas that have extensive future mitigation needs, while Targeted Local Watersheds are selected as part of the NCWRP planning process for the Basinwide Watershed Restoration Plans.

The NCWRP also has two EPA grants focused in the Neuse basin. Through the Upper Neuse River Basin Association grant the NCWRP is developing a Watershed Management Plan for subbasin 03-04-01, as well as Local Watershed Plans for the Ellerbe Creek and Lake Rogers watersheds (also within subbasin 03-04-01). There is also currently a grant to develop a watershed assessment and restoration plan for the Hominy Swamp Creek watershed in Wilson. This grant has already produced a high-resolution land cover analysis for the watershed, as well as an assessment of factors contributing to water quality impairment in the upper portion of the watershed. Also, the NCWRP is currently in year one of the five-year post-construction monitoring of a 2,232-linear foot stream restoration project in a city park in Wilson.

The NCWRP can perform restoration projects cooperatively with other state or federal programs or environmental groups. For example, the NCWRP's efforts can complement projects funded through the Section 319 Program. Integrating wetlands or riparian area restoration components with Section 319-funded or proposed projects will often improve the overall water quality benefits of the project. The NCWRP actively seeks landowners within the Neuse River basin that have restorable wetland, riparian and stream sites.

For more information about the NCWRP and its Watershed Restoration Plans, please contact Hal Bryson at (919) 733-5208 or visit the DWQ website at http://h2o.enr.state.nc.us/ (click on Wetlands Restoration Program).

Table C-2 below lists the NCWRP's Targeted Local Watersheds [stream names and 14-digit HU codes] in the Neuse River basin. This table also indicates the pertinent factors that led to the selection of each Targeted Local Watershed. The Targeted Local Watersheds are selected on the basis of available data indicating the need and opportunity for local stream and wetlands restoration projects. Factors such as water quality problems, degraded aquatic habitat, cleared riparian buffers, significant natural areas or species, and increasing development pressures in the watershed are weighted heavily in determining these priority watersheds. Also, the presence of existing or planned water quality or habitat restoration projects in the same local watershed can be a significant factor in the choice of these watersheds. In some cases, NCWRP has used the water quality information alone (e.g., use impairment, potential increases in nonpoint source pollution) to support the selection of a specific Targeted Local Watershed. Targeted local watersheds are presented in Figure C-2.

Table C-2 Wetlands Restoration Program Targeted Local Watersheds (2002)

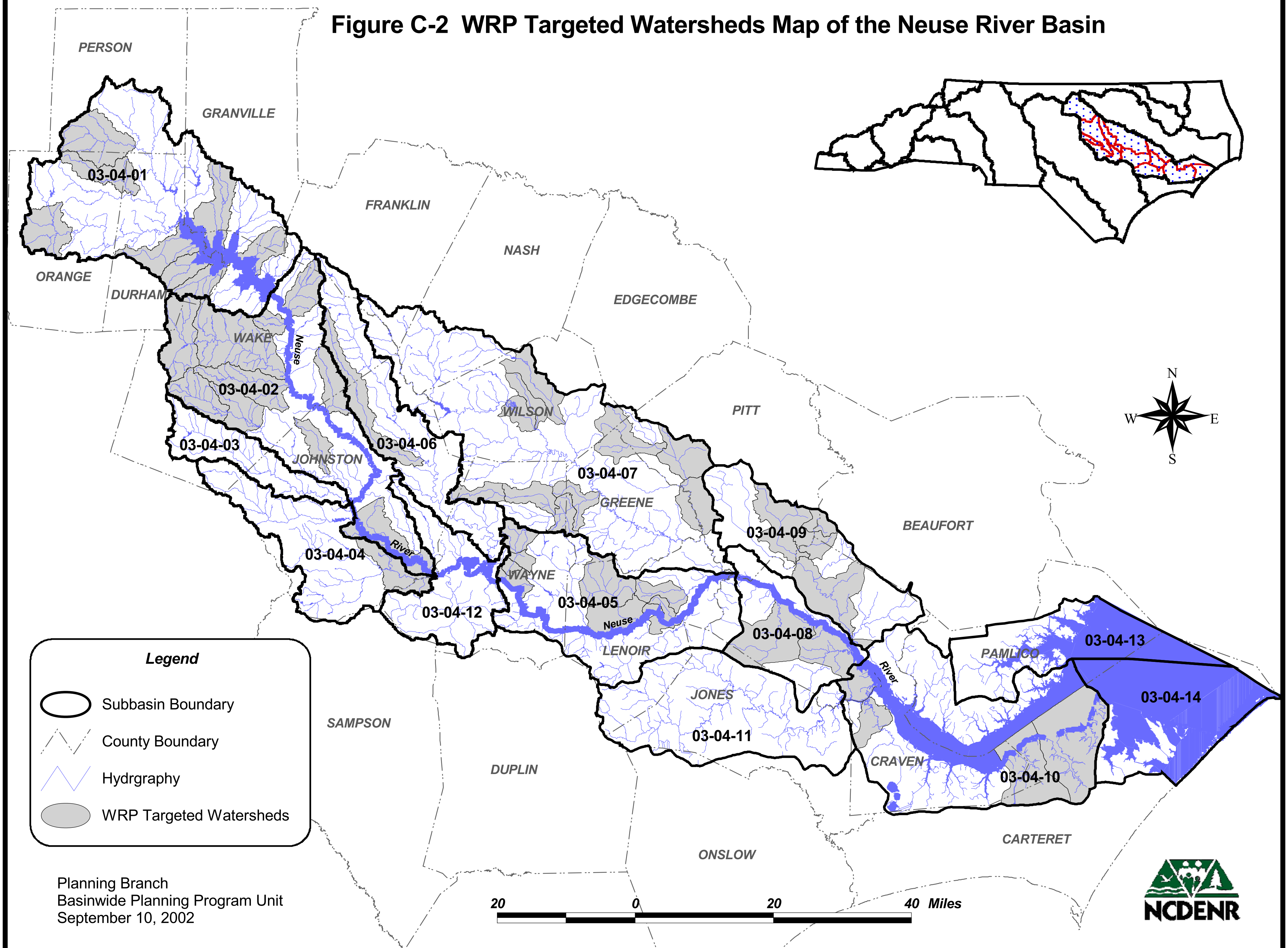
Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Muncipality (ies); Phase I or II	Local Resource Professional Recommendation
03-04-01	South Flat River 03020201010020			Y						
	North Fork Little River 03020201020010		Y	Y						
	West Eno 03020201030020			Y			Y	Y (NCWRP)		
	Ellerbe Creek 03020201050010	Y		Y					Y Durham	Y
	Little Lick Creek 03020201050020	Y		Y					Y Durham	Y
	Lick Creek 03020201050030	Y		Y					Y Durham	Y
	Lake Rogers 03020201060010			Y						Y
	New Light Creek 03020201065010			Y						
	Horse Creek 03020201065020			Y				Y (NCWRP)		Y
	Richland Creek (below Falls dam) 03020201070060									Y
03-04-02	Tom's Creek 03020201070070	Y	Y					Y (NCWRP)		
	Perry Creek 03020201070100	Y							Y Raleigh	
	Crabtree Creek 03020201080010	Y	Y					Y (NCWRP)	Y Raleigh, Cary	Y
	Crabtree Creek 03020201080020	Y					Y		Y Raleigh	Y
	Walnut Creek 03020201090010						Y	Y (NCWRP)	Y Raleigh	Y

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Muncipality (ies); Phase I or II	Local Resource Professional Recommendation
03-04-02 (cont.)	Mark's Creek 03020201100020						Y			Y
	Swift Creek 03020201110010	Y	Y	Y			Y	Y (WARP)	Y Cary	
	Swift Creek 03020201110020			Y			Y		Y Garner	
	Little Creek 03020201110050	Y								
	Neuse Bottomlands 03020201140010			Y						Y
03-04-03	(Upper) Middle Creek 03020201120010						Y	Y (CWMTF)	Y Apex	Y
03-04-04	Mill Creek 03020201150050							Y (NCWRP)		
03-04-05	Stoney Creek 03020202010010	Y						Y (CES)	Y Goldsboro	Y
	Stoney Creek 03020202010020	Y						Y (CES)	Y Goldsboro	Y
	Stoney Creek 03020202010021	Y						Y (CES)	Y Goldsboro	Y
	Stoney Creek 03020202010022	Y						Y (CES)	Y Goldsboro	Y
	Falling Creek 03020202040010							Y (NCWRP)		Y
	Neuse River 03020202040020								Y Kinston	Y
	Neuse River 03020202040030								Y Kinston	Y
	Neuse River 03020202050040								Y Kinston	Y
	Briery Run 03020202060020								Y Kinston	Y

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Muncipality (ies); Phase I or II	Local Resource Professional Recommendation
03-04-05 (cont.)	Neuse River 03020202060030						Y		Y Kinston	Y
03-04-06	(Upper) Little River 03020201180010			Y			Y			Y
	Little River 03020201180020			Y			Y			Y
	Buffalo Creek 03020201180050	Y								Y
03-04-07	Contentnea Creek 03020203020030			Y					Y Wilson	Y
	Hominy Swamp 03020203020040	Y						Y (NCWRP)	Y Wilson	Y
	Toisnot Swamp 03020203040020			Y					Y Wilson	Y
	Nahunta Swamp 03020203060010	Y	Y					Y (Section 319)		
	Nahunta Swamp 03020203060020	Y	Y				Y	Y (Section 319)		
	Nahunta Swamp 03020203060040	Y	Y					Y (Section 319)		
	Nahunta Swamp 03020203060050	Y	Y					Y (Section 319)		
	Little Contentnea 03020203070010	Y						Y (NCWRP)		Y
	Little Contentnea 03020203070030	Y						Y (NCWRP)		Y
	Little Contentnea 03020203070050	Y						Y (NCWRP)		Y
	Little Contentnea 03020203070040							Y (NCWRP)		Y

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Muncipality (ies); Phase I or II	Local Resource Professional Recommendation
03-04-08	Core Creek 3020202080010	Y					Y			Y
	Neuse River 3020202100020								Y New Bern	Y
03-04-09	Clayroot Swamp 3020202090030	Y	Y							
	Creeping Swamp 3020202090040									
	Creeping Swamp 3020202090050									
	Swift Creek 3020202090060	Y								Y
03-04-10	Lower Trent River 3020204020010								Y New Bern	Y
	Brice Creek 3020204020040								Y New Bern	Y
	Adams Creek 3020204050050	Y			Y		Y			
	South River 3020204070010	Y			Y		Y	Y (CWMTF)		Y

Figure C-2 WRP Targeted Watersheds Map of the Neuse River Basin



Planning Branch
Basinwide Planning Program Unit
September 10, 2002

1.3.5 Clean Water Management Trust Fund

The Clean Water Management Trust Fund offers approximately $40 million annually in grants for projects within the broadly focused areas of restoring and protecting state surface waters and establishing a network of riparian buffers and greenways. In the Neuse River basin, 33 projects have been funded for a total of $35,274,400 (Table C-3). For more information on the CWMTF or these grants, call (252) 830-3222 or visit the website at www.cwmtf.net.

Table C-3 Projects in the Neuse River Basin Funded by the Clean Water Management Trust Fund (as of 1/02)

Stream or Watershed	Project Lead	Project Type	Amount	Page
West Fork Eno River	Hillsborough	Acquisition-Buffers	$625,000	212
Subbasin 03-04-01	Triangle J COG	Planning	$59,000	212
Lake Rogers	City of Creedmoor	Acquisition-Buffers	$290,000	212
Eno River	Orange County	Acquisition-Buffers	$143,000	212
Goose Creek	Durham SWCD	Restoration	$30,000	212
North Fork Little River.	Durham Co.	Acquisition-Greenway	$377,000	212
	Raleigh	Acquisition-Greenway	$2,850,000	
	Johnston County	Wastewater	$3,800,000	
Swift Creek	Wake Co. Parks & Rec.	Restoration	$635,000	
Walnut Creek	NC State University	Restoration	$1,314,000	213
Toms & Smith Creeks	Wake Forest	Acquisition- Buffers	$1,128,000	214
Middle Creek	Apex	Wastewater	$478,000	
Neuse River	Smithfield	Construct a stormwater wetlands	$90,000	
	Holly Springs	Restoration	$1,040,000	
Stoney Creek	Goldsboro	Wastewater	$789,360	
	Goldsboro	Wastewater	$1,640,000	
	Kinston	Wastewater	$920,000	
Neuse River	Kinston	Wastewater	$2,429,000	
Big Ditch	Goldsboro	Construct stormwater wetlands	$1,800,000	
Little River	Wake Co. Parks & Rec.	Acquisition-Greenway	$350,000	
Hominy Swamp Creek	City of Wilson	Wastewater	$803,350	215
Contentnea Creek	Hookerton	Wastewater	$790,000	215
Moccasin	Contentnea	Cape Fear RC&D-Nash	$20,000	
Core Creek	Coastal Land Trust	Acquisition-Buffers	$378,200	215
	NC Coastal Land Trust	Easements	$263,000	
Core Creek	Craven County	Restoration	$1,300,000	215
Core Creek	Neuse R.	NC Coastal L Trust	$59,300	215
	Contentnea Metr.Sew. Distr.	Wastewater	$720,000	
South River	Open Grounds Farm/UNC Inst. of Marine Sci.	Restoration	$1,064,190	215
New Bern	Wastewater		$5,339,000	
Tryon Palace	Stormwater		$1,000,000	
Duck Creek (New Bern)	NCWRC	Acquisition - Buffers	$1,100,000	
	Pamlico County	Wastewater	$1,650,000	
Total			$35,274,400	

1.3.6 North Carolina Stream Watch

The realization that local residents are best suited to keep an eye on their nearby waterways is what prompted North Carolina to begin project Stream Watch. With Stream Watch, citizens groups "adopt" a waterway, or a portion of one, and act on its behalf. Stream Watchers become the adoptive parents of a stream and, as such, become its primary caretakers.

With the help of the Department of Environment and Natural Resources' Division of Water Resources, Stream Watchers become informed stewards, learning how to react to the changing stream conditions. Local efforts combined with state support allow North Carolina's 37,000 miles of waterways to be monitored by those with the best view--local residents. In the Neuse River basin, there are 56 different individuals or groups monitoring 61 different stream segments. For more information on Stream Watch, call (919) 715-5433 or visit http://www.ncwater.org/Education_and_Technical_Assistance/Stream_Watch/.

1.3.7 North Carolina Coastal Nonpoint Source Program

Section 6217 of the Federal 1990 Coastal Zone Act Reauthorization Amendments (CZARA) requires every state participating in the Coastal Zone Management Act program to develop a Coastal Nonpoint Pollution Control Program CNPCP). The purpose of this requirement, as stated in the Act, is to "strengthen the links between Federal and State coastal zone management and water quality management programs and to enhance State and local efforts to manage land use activities that degrade coastal waters and coastal habitats." To accomplish these goals, the federal agencies established 56 Management Measures that are to be used by each state to address the following nonpoint source pollution categories:

- *Agricultural Sources*
- *Forestry*
- *Urban Areas* (urban runoff; construction activities; existing development; on-site disposal systems; pollution prevention; and roads, highways and bridges)
- *Marinas and Recreational Boating* (siting and design; and marina and boat operation/maintenance)
- *Hydrologic Modification* (channelization and channel modification; dams; and streambank and shoreline erosion)
- *Wetlands, Riparian Areas and Vegetated Treatment Systems*

At the federal level, the CNPCP is administered jointly by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA). Within North Carolina, the state program, referred to as the Coastal Nonpoint Source Program (CNPSP), is administered by DWQ and the DCM. The state program currently has one full-time staff person located in the Nonpoint Source Planning Unit of DWQ.

The core of the state's CNPSP will be increased through communication and coordination between DWQ and key state agencies that have regulatory responsibilities for controlling nonpoint sources of pollution. This increased dialogue will be facilitated in part by the state's CNPSP Coordinator and will allow for identification of gaps, duplications, inadequacies or inefficiency of existing programs and policies. Responsibilities of the state program coordinator will include participation in the NPS Workgroup to represent coastal water quality interests. The workgroup is involved with the continual refinement of the Section 319 Grant Program and development of North Carolina's 2001 NPS Management Program Update. The CNPSP Coordinator will also participate in the development and implementation of the basinwide management plans for the coastal draining rivers; serve as a liaison between DWQ and DCM; and participate in the development of nonpoint source educational materials. For more information about this program, contact the Coastal Nonpoint Source Program Coordinator at (919) 733-5083 or visit http://h2o.enr.state.nc.us/nps/czara.htm.

1.4 Project Descriptions

1.4.1 West Fork Eno River (Subbasin 03-04-01)

The Town of Hillsborough received a CWMTF grant of $62,5000 to protect stream buffers and a 1999 grant of $196,000 to protect 62 acres bordering Corporation Lake.

1.4.2 Entire Subbasin (Subbasin 03-04-01)

Triangle J COG (page 219) received a CWMTF grant of $59,000 for watershed planning. The money has been used to support development of the Upper Neuse River Basin Watershed Management Plan (page 217).

1.4.3 Lake Rogers, (Subbasin 03-04-01)

City of Creedmoor received a CWMTF grant of $290,000 for acquisition of buffers. NCWRP has initiated a Local Watershed Plan in the Lake Rogers watershed, which will identify sources of nonpoint pollution and identify projects to improve water quality and degraded habitat.

1.4.4 Eno River (Subbasin 03-04-01)

Orange County received a CWMTF grant of $143,000 for acquisition of buffers.

1.4.5 Goose Creek (Subbasin 03-04-01)

Durham SWCD received a CWMTF grant of $30,000 and Section 319 monies for a restoration project on Goose Creek. The project has restored natural features into an existing channelized urban stream.

1.4.6 North Fork Little River (Subbasin 03-04-01)

Durham County received a CWMTF grant of $377,000 for acquisition of greenways in the North Fork Little River watershed.

1.4.7 Ellerbe Creek (Subbasin 03-04-01)

NCWRP has initiated a Local Watershed Plan in the Ellerbe Creek watershed, which will identify sources of nonpoint pollution and identify projects to improve water quality and degraded habitat.

Durham Central Park is a nonprofit organization that is constructing a park in central Durham. The plan includes restoration of a portion of a tributary to Ellerbe Creek and potential installation of stormwater BMPs.

1.4.8 Stillhouse Branch (Subbasin 03-04-01)

NCWRP has a 1,500-linear foot stream restoration project on Stillhouse Creek in Hillsborough scheduled for construction in the fall of 2002. This project is designed to incorporate 1.7 acres of riparian buffer restoration.

1.4.9 Walnut Creek Watershed (Subbasin 03-04-02)

The NCWRP has a 3,000-linear foot stream restoration project in design for Kentwood Park in Wake County. Construction is scheduled for fall of 2002. This project is designed to incorporate 5.5 acres of riparian buffer restoration.

A 2,500-linear foot stream restoration project in design for Chavis Park in Wake County is scheduled for construction in the fall of 2002. This project is designed to incorporate 4.6 acres of riparian buffer restoration.

A 1,200-linear foot stream restoration project being designed for Bertie Creek in Wake County is scheduled for construction in the fall of 2002. This project is intended to incorporate 2.2 acres of riparian buffer restoration.

These projects are on tributary streams to Walnut Creek and will reduce sediment and nutrient loads to receiving waters.

1.4.10 Rocky Branch (Subbasin 03-04-02)

NC State University is currently implementing a three-phase stream restoration project for Rocky Branch. Rocky Branch is a tributary that runs through the NC State Campus. The project is funded by CWMTF ($1,123,000), CWA Section 319 ($55,200), NCSU ($500,000), FEMA ($120,000) and NCDOT ($1,688,500). The project includes expansion of two roadway crossings and a greenway. Additional funding will be needed to complete the entire project. When finished, Rocky Branch will be an important research and recreational resource for NC State and Raleigh.

1.4.11 Toms Creek (Subbasin 03-04-02)

The Division of Water Quality, with financing from the CWMTF, conducted a detailed assessment of Toms Creek including review of existing data and a detailed study of the watershed. The study found that the creek is vulnerable to sediment inputs that impact aquatic habitat. The assessment also indicated toxic conditions below the Deerchase WWTP, most likely from excessive chlorine in the discharge. The assessment makes several recommendations designed to help prevent further degradation and restore water quality and aquatic habitat to the Toms Creek watershed.

The Town of Wake Forest has purchased buffers in portions of the Toms Creek watershed with a CWMTF grant.

1.4.12 Smith Creeks (Subbasin 03-04-02)

Wake Forest received a CWMTF grant of $1,128,000 for acquisition of buffers in the Smith Creek watershed.

The NCWRP has a 9,500-linear foot stream restoration project on Smith and Austin Creeks in Wake County in design and scheduled for construction in the fall of 2002. This project is designed to incorporate 32 acres of riparian buffer restoration. This project will decrease sediment and nutrient loading to the receiving waters, as well as provide a good example of restoration opportunities. Section 319 was also involved in this project.

1.4.13 Crabtree Creek (Subbasin 03-04-02)

Capital Area Greenway
The Capital Area Greenway is a system of public recreation trails located along rivers, creeks and streams, which provide for activities such as walking, jogging, hiking, fishing, picnicking and outdoor fun. The trails connect many of Raleigh's parks and, in many cases, complement the recreational activities at the parks. The Neuse River, Walnut and Crabtree Creeks and their tributaries are the framework of the Capital Area Greenway System. Many of the city's major ecological features can be experienced in their natural state along these water courses. A major goal of the Greenway Program is to establish a network of interconnected trails. For more information and a map of greenway trails, visit http://www.raleigh-nc.org/parks&rec/greenway/greenway.htm.

Pollutant Monitoring by NRF
This project is a joint effort between the Neuse River Basin Regional Council (page 201), the Neuse River Foundation (page 219) and the Albemarle-Pamlico National Estuary Program. The fieldwork was conducted by trained volunteers from the Neuse River Foundation, Inc. Volunteers took water samples once a week on the same day of the week, and at roughly the same time of day, as much as possible, at Crabtree Creek downstream of Raleigh. This project has been completed.

1.4.14 Marks Creek (Subbasin 03-04-02)

The Triangle Land Conservancy (page 219) has prepared a conservation assessment for the Conservation Trust for North Carolina (page 218) that identifies preservation and restoration opportunities in Marks Creek and the adjacent Neuse River watershed. The assessment recommends a regional approach to a greenway design along the Neuse River corridor with the primary goal of protecting water quality. Also recommended are protective measures for the tributary streams in the study area and voluntary protection of 400-foot buffers through easements and fee simple acquisition.

1.4.15 Hannah Creek (Subbasin 03-04-04)

The NCWRP has a restoration project on Hannah Creek at Howell Woods in Johnston County scheduled for construction during the summer of 2002. Twenty acres of wetlands are to be restored and 80 acres enhanced. The project will reduce nutrient loading to receiving waters.

1.4.16 Whitelace Creek (Subbasin 03-04-05)

The NCWRP has a restoration project on Whitelace Creek near Kinston that will be designed to provide 20 acres of riparian wetlands restoration, 10 acres of wetlands enhancement, 8,000 linear feet of stream restoration, and 10 acres of riparian buffer restoration. Construction is scheduled for the winter of 2003.

1.4.17 Hominy Swamp Creek (Subbasin 03-04-07)

The NCWRP has a 2,232-linear foot stream restoration project on Hominy Swamp Creek in a city park in Wilson. There was five acres of riparian buffer restored and protected to reduce sediment and nutrient loads from the Town of Wilson. The project is in year one of the five-year post-construction monitoring.

1.4.18 Contentnea Creek (Subbasin 03-04-07)

The NCWRP has a 16.5-acre buffer enhancement project on Beamon's Run (a tributary to Contentnea Creek) in Greene County. This is the only NCWRP project to date focused solely on riparian buffers. The project will be entering post-construction monitoring during 2002.

1.4.19 South River (Subbasin 03-04-10)

Open Grounds Farm has made extensive efforts to improve water quality in the South River watershed, including removal of cattle operations and installation of BMPs on the farm. Both of these efforts help to reduce the potential for bacterial contamination of the South River.

1.5 Local Initiatives

1.5.1 Ellerbe Creek Watershed Association

Dedicated to restoring Ellerbe Creek and making it an asset for the citizens of Durham, the Ellerbe Creek Watershed Association gained official 501(c)(3) nonprofit status in April of 1999. In July 1999, it was awarded a matching grant by Durham County to purchase six wooded acres along Ellerbe Creek for an urban nature reserve and public trail. ECWA is working with NC State and NC Wetland Restoration Program (page 203) watershed specialists to restore sections of Ellerbe Creek and demonstrate ways to utilize stormwater in wetland gardens. ECWA is promoting the creation of a unique wildlife/recreation area on waste ground behind Durham's closed landfill and working with developers, homeowners and city government to reduce stormwater impacts on the creek and preserve greenspace. ECWA is also involving volunteers in periodic monitoring of Ellerbe Creek's water quality through the Stream Watch Program (page 211). Long-term goals for the organization include the establishment of a volunteer network throughout the watershed, completion of an urban trail system throughout the watershed, preservation of Ellerbe Creek's headwaters and other special features, and restoration of the creek's lower floodplain. Visit the association's website at http://www.ellerbecreek.org/.

1.5.2 Friends of South Ellerbe Creek

The Friends of South Ellerbe Creek is an informal group of citizens dedicated to conserving and enhancing the scenic, recreational, natural and historic qualities of South Ellerbe Creek and its landscape. From its headwaters near Greystone Baptist on Hillsborough Road, South Ellerbe Creek flows for three miles through some of Durham's oldest and most densely developed neighborhoods: Old West Durham, Walltown, Northgate Park, Trinity Park. Another branch of South Ellerbe flows north out of downtown Durham, through Durham Central Park and Trinity Park. South Ellerbe then joins Ellerbe Creek in a small forest just northwest of the I-85/Roxboro Road interchange. Along some wooded stretches, the creek quietly flows through areas as scenic as any in North Carolina. Elsewhere, South Ellerbe is a troubled creek.

Efforts to clean up urban streams throughout the city of Durham are paying off. But nowhere is that progress more evident than in the Ellerbe Creek watershed. The Friends of South Ellerbe Creek and other neighborhood volunteer groups are helping to focus community awareness on the need to protect and restore streams in Durham. For more information or to get involved, visit http://www.owdna.org/fosec.htm.

1.5.3 Eno River Association

The Eno River Association is a nonprofit, tax-exempt organization founded in 1965 and incorporated in 1975 to protect the magnificent Eno River from the threats of development and pollution. The Eno River has been threatened by a succession of urban plans for a municipal reservoir, a belt-thoroughfare, a city landfill, and a major sewer system. Through the years, the Eno River Association has battled with some success to protect the Eno and preserve it as a natural river for future generations to enjoy.

The Conservation Trust for North Carolina (page 218) awarded the Eno River Association a grant to prepare a riparian corridor conservation design for the Eno River. The goal of the design project is to identify and prioritize areas where preservation and restoration projects would have the greatest positive effect on water quality. Twenty-one parcels have high priority ratings for protection in the upper Eno River watershed and made recommendations for assisting the City of Durham in preservation and restoration of areas in the lower Eno River watershed. For more information, call (919) 620-9099 or visit http://www.enoriver.org/.

1.5.4 Upper Neuse River Basin Association

In 1996, fourteen local governments formed the Upper Neuse River Basin Association (UNRBA) to provide an ongoing forum to address watershed management issues of mutual concern in the 770-square mile watershed above the Falls Lake Dam. The upper Neuse basin includes nine man-made water supply reservoirs that serve about one-half million people. It also includes water resources that are essential for a variety of wildlife and a variety of recreational opportunities. The UNRBA is currently developing a Watershed Management Plan and is involved in several related public education and awareness initiatives.

Although it is has not yet been approved by the UNRBA Board of Directors, the preliminary draft Watershed Management Plan (dated September, 2001) documents projected general water quality conditions under a year 2025 development scenario and two build-out scenarios for the watershed. The preliminary plan indicates that to meet identified water quality goals and objectives, additional watershed management measures will be needed throughout much of the study area.

Alternative management strategies now under consideration by the UNRBA for potential recommendation to UNRBA member governments include: enhanced public education and awareness; careful monitoring, inspection and enforcement activities relating to stormwater and sanitary sewer facilities, and sediment and erosion control measures; more protective zoning within targeted areas in the watershed; performance standards for new development (peak flow control, impervious surface limits, and nutrient loading limits); resource monitoring to assess conditions and trends and to measure the effectiveness of management strategies; and protection and restoration of wetlands and riparian corridors. The specific management strategies that will be included in the final management plan will be determined following review and comment from the UNRBA's member governments, watershed stakeholders, applicable state agencies, and the general public.

The UNRBA is also assisting the North Carolina Wetlands Restoration Program in undertaking detailed assessments and restoration/protection plans for two sub-watersheds within the upper Neuse basin - the Lake Rogers Watershed and the Ellerbe Creek Watershed.

The UNRBA is one of the 18 founding partners participating in the newly-established Clean Water Education Partnership (CWEP) program. The CWEP program involves a collaborative mass media nonpoint source pollution education and awareness campaign primarily throughout much of the Neuse River Basin and a portion of the Cape Fear River basin. The association is also sponsoring a series of workshops relating to conservation easements, watershed training for teachers, and low impact design tools and techniques.

Wake County has experienced significant changes in terms of economic development and population growth since 1990. This growth and development is expected to continue in the foreseeable future, and the population is expected to increase by 500,000 within the next twenty years. Though numerous benefits are associated with the gains in economic development and population growth, there are also accompanying pressures on the county's watersheds. The Wake County Commissioners recognized these pressures on the county's watersheds and unanimously approved to develop a comprehensive watershed management plan in November 2000. The plan is expected to be complete in summer 2002.

A three-step stakeholder process is being used to develop the watershed management plan. The three steps are: assess current conditions, evaluate options and strategies, and prepare plan and adopt strategies.

1.5.5 Wake County Watershed Task Force

The Wake County Commissioners established a task force to provide input to the watershed management plan. The task force included an elected official from each of the other local governments within the county. A member of the Soil and Water Conservation District Board, the Open Space Advisory Committee, and the Human Services Board was also appointed. There were eight at-large appointments that included members of the development community, local landowners, agriculture and citizens groups. The task force met monthly throughout the project. Other stakeholders were invited to each meeting and were given opportunity to participate in the discussion.

The assessment of current conditions included reviewing available biological and chemical data. Benthic data were collected at an additional 24 sites within the county, and habitat/ geomorphology data were collected at 86 sites within the county. These data along with land use information such as the percentage of impervious cover and amount of forested land within riparian buffers were used to classify each of the watersheds into one of the following categories: healthy, impacted, impacted/restorable, degraded, degraded/restorable. Thirty watersheds were classified as healthy, 33 as impacted/restorable, four as impacted, eight as degraded/restorable, and five as degraded.

The eight tools of watershed protection as described by the Center for Watershed Protection are currently being evaluated by the task force to determine how they should be integrated into the watershed plan. The recommendations that will be made in the watershed plan are being coordinated with recommendations that are coming out of other plans currently being developed by the county such as the open space and growth management plans.

The final step will be to prepare the plan based on input from the task force. The plan will then be presented to the county commissioners and other local governments for adoption and implementation. Specific implementation items, time frames, and funding needs and mechanisms will be identified in the plan.

1.6 Regional Initiatives

1.6.1 Conservation Trust for North Carolina

The Conservation Trust for North Carolina and CWMTF have funded three riparian corridor conservation plans in the Neuse River basin. Plans were prepared for the Eno River, upper Neuse subbasin and Lower Swift Creek.

1.6.2 Triangle Greenways Council

The Triangle Greenways Council is an advocacy group for the promotion of greenways in the RTP area. The Conservation Trust for North Carolina (page 218) awarded the Triangle Greenways Council a grant to prepare a riparian corridor conservation design for the upper Neuse River basin. The goal of the design project is to identify and prioritize areas where preservation and restoration projects would have the greatest positive effect on water quality. Potential parcels have been identified on Walnut Creek, Crabtree Creek, Reedy Creek and the Flat River. For more information, visit http://www.trianglegreenways.com/.

1.6.3 Triangle Land Conservancy

Triangle Land Conservancy is a nonprofit corporation organized in 1983 with the mission to create a regional network of open space and natural areas in the six county Triangle J Region of North Carolina, which includes Chatham, Durham, Johnston, Lee, Orange and Wake counties.

The Conservation Trust for North Carolina (page 218) awarded the Triangle Land Conservancy a grant to prepare a conservation assessment for the Lower Swift Creek. The assessment recommends conservation strategies designed to protect water quality in Swift Creek in Wake and Johnston counties. For more information, call (919)-833-3662 or visit http://www.tlc-nc.org/index.html.

The Triangle Land Conservancy has also developed the Triangle GreenPrint which maps existing forested and protected areas in the upper Neuse River basin. This tool would be useful for local development and transportation planning. The Triangle GreenPrint can veiwed at http://www.trianglegreenprint.org/.

1.6.4 Triangle J Council of Governments

The Triangle J Council of Governments is recognized as a leader in water supply protection efforts. TJCOG assisted local governments in the development of their watershed management regulations and has strongly encouraged the development of the state's minimum standards for protection of public water supplies. It has also played an important role in the ongoing effort to develop an initial watershed protection plan for Falls of the Neuse Reservoir.

TJCOG has worked closely with local, state and federal agencies to develop the Triangle Area Water Supply Monitoring Project. Under way since 1988, the program involves systematic sampling and analysis of water quality at several major water supplies in the region. Through this effort local communities now have important information about the existing and potential quality of the public's water supply. For more information on The Triangle Council of Governments water quality initiatives, visit http://www.tjcog.dst.nc.us/.

1.6.5 Neuse River Foundation

The Neuse River Foundation, Inc. is a membership-based, 501(c)(3) nonprofit organization with more than 2,400 members. Since its inception in 1980, NRF has been educating the public, advocating for clean water and fighting to stop water pollution. In 1993, NRF hired North

Carolina's first Riverkeeper. In late 2001, NRF hired a second Riverkeeper to provide coverage throughout the river basin. The upper Neuse Riverkeeper is based in Raleigh and looks after the Neuse from its headwaters down to Goldsboro. The lower Neuse Riverkeeper is based in New Bern and is responsible for the river from Goldsboro to the Pamlico Sound. For more information on the NRF or to contact the Neuse Riverkeeper®, visit http://www.neuseriver.org/.

1.6.6 Lower Neuse Basin Association

The Lower Neuse Basin Association (LNBA) is an association of 25 municipalities and industries with wastewater treatment facilities permitted to discharge treated wastewater into the Neuse River below Falls of the Neuse Dam. The association was formed for information exchange and undertakes activities best accomplished by a group effort. The LNBA currently collects water quality data from 50 sites covering 6,200 square miles of the basin in 19 counties.

Over $16 million was spent on projects to reduce nitrogen at member facilities in order to meet the requirements of the Neuse NSW strategy (page 64). Members expected to spend an additional $31 million on nitrogen reduction projects before 2003. For more information on the LNBA, visit their website at http://www.uncwil.edu/neuseriver/lnba.htm.

1.6.7 Neuse River Watershed Atlas

The Neuse River Watershed Atlas is a CD-ROM that provides planners and decision makers with user friendly tools to support water quality and conservation planning in the Neuse River Watershed. The Atlas contains GIS data layers, a resource guide, reports and a list of watershed oganizations that can be used to enhance environmental decision-making in the watershed. The atlas was created by The Conservation Fund and Duke University Nicholas School of the Environment with support from the Neuse River Foundation and the North Carolina Coastal Land Trust. For more information, please contact Will Allen at The Conservation Fund (919) 967-2223.

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Appendix I

NPDES Dischargers
and
Individual Stormwater Permits
in the
Neuse River Basin

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0056731	SEDGEFIELD DEV.CORP-GRANDE OAK	03-04-01	45
NC0063614	HEATER UTIL-WILDWOOD GREEN	03-04-01	196
NC0049662	HEATER UTIL-HAWTHORNE SUBDIV.	03-04-01	199
NC0085863	HEATER UTIL-WATERFALL	03-04-01	202
NC0086720	W.S. BALLARD & COMPANY	03-04-01	203
NC0051071	REDWOOD PARTNERS; LLC	03-04-01	204
NC0058785	BIBLE BAPTIST CHURCH	03-04-01	205
NC0023841	DURHAM (CITY) - NORTH WWTP	03-04-01	206
NC0059099	LAKE RIDGE AERO PARK	03-04-01	207
NC0037869	ARBOR HILLS MHP	03-04-01	208
NC0024520	G. & S. ASSOCIATES / DAYS INN	03-04-01	209
NC0085243	NELLO TEER CO-DURHAM QUARRY	03-04-01	210
NC0082759	ORANGE-ALAMANCE WATER SYS WTP	03-04-01	211
NC0085111	CWS - HEATHER GLEN WATER SYS.	03-04-01	212
NC0026433	HILLSBOROUGH; TOWN - WWTP	03-04-01	213
NC0026824	BUTNER; TOWN-JOHN UMSTEAD WWTP	03-04-01	214
NC0007625	CREEDMOOR (TOWN) - WTP	03-04-01	215
NC0058416	DHHS-JOHN UMSTEAD WTP	03-04-01	216
NC0003379	EATON CORP.-AIR CONTROLS DIV.	03-04-01	217
NC0081647	AMOCO OIL CO-STATION #539 ***	03-04-02	30
NC0085936	JERRY G. WILLIAMS & SONS; INC.	03-04-02	93
NC0085936	JERRY G. WILLIAMS & SONS; INC.	03-04-02	94
NC0085936	JERRY G. WILLIAMS & SONS; INC.	03-04-02	95
NC0030716	JOHNSTON CO-CEN JOHNSTON WWTP	03-04-02	96
NC0080519	LAMPE & MALPHRUS LUMBER (1)	03-04-02	97
NC0084824	STANCIL OIL COMPANY	03-04-02	101
NC0083348	SMITHFIELD; TOWN - WTP	03-04-02	102
NC0027227	CROWN CENTRAL PETROLEUM/SELMA	03-04-02	103
NC0003549	TRANSMONTAIGNE - SELMA SOUTH	03-04-02	105
NC0003549	TRANSMONTAIGNE - SELMA SOUTH	03-04-02	106
NC0003549	TRANSMONTAIGNE - SELMA SOUTH	03-04-02	107
NC0032875	PHILLIPS PIPE LINE CO-SELMA	03-04-02	108
NC0032875	PHILLIPS PIPE LINE CO-SELMA	03-04-02	109
NC0036145	BP OIL - SELMA	03-04-02	110
NC0036145	BP OIL - SELMA	03-04-02	111
NC0027006	EXXON COMPANY USA - SELMA	03-04-02	112
NC0031011	COLONIAL PIPELINE - SELMA	03-04-02	113
NC0049204	TRIAD TERMINAL CO.;LLC	03-04-02	114
NC0021954	CITGO PETROLEUM - SELMA	03-04-02	116
NC0021954	CITGO PETROLEUM - SELMA	03-04-02	117
NC0052311	WILLIAMS ENERGY VENTURES-SELMA	03-04-02	118
NC0076457	VALERO MARKETING & SUPPLY CO.	03-04-02	119

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0084735	JOHNSTON COUNTY WTP	03-04-02	120
NC0025453	CLAYTON (TOWN) - WWTP	03-04-02	129
NC0060771	INDIAN CREEK OVERLOOK	03-04-02	134
NC0060330	JOHNSTON CO. / WHITE OAK WWTP	03-04-02	136
NC0055701	HEATER UTIL-NOTTINGHAM WTP	03-04-02	137
NC0064564	HEATER UTIL-RIVER DELL FARMS	03-04-02	138
NC0056499	UNIPROP; INC. / MILL RUN MHP	03-04-02	139
NC0064378	CWS - WILLOWBROOK SUBDIVISION	03-04-02	141
NC0049034	MOUNT AUBURN TRAINING CENTER	03-04-02	143
NC0060526	POPE INDUSTRIAL PARK II; LTD	03-04-02	149
NC0029033	RALEIGH (CITY)-NEUSE RVR WWTP	03-04-02	154
NC0062219	CWS - KINGS GRANT SUBDIVISION	03-04-02	155
NC0051322	CWS - ASHLEY HILL SUBDIVISION	03-04-02	158
NC0056391	CROSS CREEK MOBILE ESTATES	03-04-02	159
NC0038784	RIVERVIEW MOBILE HOME PARK	03-04-02	160
NC0040266	KNIGHTDALE ESTATES MHP	03-04-02	161
NC0065706	CROSBY UTILITIES/COTTONWOOD	03-04-02	162
NC0040606	HEATER UTIL-BARCLAY DOWNS	03-04-02	163
NC0084310	A.T. WILLIAMS OIL CO. ***	03-04-02	167
NC0060577	HEATER UTIL-BEACHWOOD	03-04-02	168
NC0086126	ALCATEL NETWORK SYSTEMS; INC.	03-04-02	170
NC0081540	SQUARE D COMPANY	03-04-02	171
NC0048879	CARY (TOWN) - NORTH WWTP	03-04-02	172
NC0039292	UNIPROP; INC. / RIVERWALK MHP	03-04-02	174
NC0058505	HEATER UTIL-MALLARD CROSSING	03-04-02	175
NC0081469	COLONIAL PIPELINE-RDU DELIVERY	03-04-02	176
NC0081469	COLONIAL PIPELINE-RDU DELIVERY	03-04-02	177
NC0065714	TRADEWINDS HOMEOWNERS ASSO.INC	03-04-02	180
NC0064408	NEUSE CROSSING UTILITIES CORP.	03-04-02	181
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	182
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	183
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	184
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	185
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	186
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	187
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	188
NC0084514	RDU INTERNATIONAL AIRPORT-WWTP	03-04-02	189
NC0045608	WARD TRANSFORMER COMPANY	03-04-02	190
NC0030759	WAKE FOREST (TOWN) - WWTP	03-04-02	191
NC0064149	JONES DAIRY FARM UTILITIES	03-04-02	192
NC0001376	RIVERPLACE II; LLC	03-04-02	193
NC0082376	RALEIGH; CITY-JOHNSON WTP	03-04-02	194
NC0082376	RALEIGH; CITY-JOHNSON WTP	03-04-02	195

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0063746	IRA D. LEE-DEERCHASE	03-04-02	197
NC0073318	IRA D. LEE-WHIPPOORWILL VALLEY	03-04-02	198
NC0056278	RIVER MILL HOMEOWNER ASSN; INC	03-04-02	200
NC0007528	WAKE FOREST; TOWN - WTP	03-04-02	201
NC0083747	DUTCHMAN CREEK; INC./TWIN LAKE	03-04-03	73
NC0073679	HEATER UTIL-OAK HOLLOW WTP	03-04-03	124
NC0066516	FUQUAY-VARINA (TOWN) - WWTP	03-04-03	126
NC0035181	N.C. CENTER FOR MATURE ADULTS	03-04-03	127
NC0066150	BROOKFIELD PROP-BRIGHTON FOR	03-04-03	128
NC0062715	HEATER UTIL/CROOKED CREEK	03-04-03	131
NC0061638	NERO UTILITY - AMHERST WWTP	03-04-03	132
NC0065102	CARY (TOWN) - SOUTH WWTP	03-04-03	133
NC0082996	HEATER UTIL-HOLLYBROOK	03-04-03	144
NC0062740	HEATER UTIL/BRIARWOOD FARMS	03-04-03	145
NC0022217	STAR ENTERPRISE SALES TERMINAL	03-04-03	150
NC0064050	APEX (TOWN)-MIDDLE CREEK WWTP	03-04-03	151
NC0084654	MOTIVA ENTERPRISES-APEX TERM.	03-04-03	153
NC0020389	BENSON (TOWN) - WWTP	03-04-04	87
NC0065196	DUPREE'S MOBILE HOME COURT	03-04-04	104
NC0078255	JAG INC.-W. JOHNSON MOBILE ***	03-04-04	115
NC0032573	LENOIR CO SCH-MOSS HILL ELEM.	03-04-05	61
NC0020541	KINSTON (CITY)-PEACHTREE WWTP	03-04-05	64
NC0084999	KENNEDY BAPTIST HOME ***	03-04-05	65
NC0076724	COASTAL LUMBER CO./KINSTON	03-04-05	66
NC0024236	KINSTON (CITY)-NORTHSIDE WWTP	03-04-05	67
NC0039233	WALNUT CREEK (VILLAGE)-WWTP	03-04-05	69
NC0021644	LA GRANGE (TOWN) - WWTP	03-04-05	71
NC0003760	DUPONT FIBERS - KINSTON PLANT	03-04-05	74
NC0003760	DUPONT FIBERS - KINSTON PLANT	03-04-05	75
NC0003760	DUPONT FIBERS - KINSTON PLANT	03-04-05	76
NC0063177	SEYMOUR JOHNSON AIR FORCE B***	03-04-05	79
NC0063177	SEYMOUR JOHNSON AIR FORCE B***	03-04-05	80
NC0064891	KENLY; TOWN - REGIONAL WWTP	03-04-06	122
NC0064556	RIVER DELL UTIL-BUFFALO CREEK	03-04-06	130
NC0064246	PACE MOBILE HOME PARK	03-04-06	152
NC0038938	JOHNSTON CO BOE-CORINTH HOLDER	03-04-06	157
NC0086266	CWS - WOODTRACE WELL #1 WTP	03-04-06	173
NC0049042	RILEY HILL BAPTIST CHURCH INC.	03-04-06	179
NC0032557	LENOIR CO SCH-S. LENOIR HIGH	03-04-07	56

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0032565	LENOIR CO SCH-N. LENOIR HIGH	03-04-07	82
NC0032077	CONTENTNEA SEWERAGE DIST. WWTP	03-04-07	83
NC0061492	MAURY SANITARY LAND DISTRICT	03-04-07	89
NC0025712	HOOKERTON (TOWN) - WWTP	03-04-07	90
NC0020842	SNOW HILL; TOWN - WWTP	03-04-07	91
NC0034801	WAYNE CO SCH-NORWAYNE JR HIGH	03-04-07	98
NC0034819	WAYNE CO SCH-C. B. AYCOCK H.S.	03-04-07	99
NC0048062	EUREKA; TOWN - WWTP	03-04-07	100
NC0057606	STANTONSBURG (TOWN) - WWTP	03-04-07	121
NC0029572	FARMVILLE (TOWN) - WWTP	03-04-07	123
NC0007536	STANTONSBURG; TOWN - WTP	03-04-07	125
NC0049948	SARATOGA; TOWN - WTP	03-04-07	135
NC0023906	WILSON (CITY) - WWTP	03-04-07	140
NC0085570	WEST WILSON WTR/WHITE OAK WTP	03-04-07	142
NC0081884	STANDARD COMMERCIAL TOBACCO CO	03-04-07	146
NC0081884	STANDARD COMMERCIAL TOBACCO CO	03-04-07	147
NC0083917	WILLIAMSON PRODUCE; INC.	03-04-07	148
NC0084581	WILSON TECHNICAL COMM COLLEGE	03-04-07	156
NC0086541	BAILEY; TOWN - WELL # 2	03-04-07	164
NC0086061	BAILEY (TOWN) - WTP	03-04-07	165
NC0086118	MIDDLESEX (TOWN) - WELL #4	03-04-07	166
NC0079316	ZEBULON (TOWN)-LITTLE CRK WWTP	03-04-07	169
NC0037915	NASH/ROCKY MT SOUTHERN NASH HS	03-04-07	178
NC0075281	CRAVEN COUNTY WOOD ENERGY	03-04-08	53
NC0075281	CRAVEN COUNTY WOOD ENERGY	03-04-08	54
NC0003191	WEYERHAEUSER CO-NEW BERN	03-04-08	62
NC0029904	CRAVEN CO SCH - W. CRAVEN MIDD	03-04-08	63
NC0031828	VANCEBORO (TOWN) - WWTP	03-04-09	68
NC0080071	VANCEBORO; TOWN - WTP	03-04-09	70
NC0073229	WEYERHAEUSER COMPANY - AYDEN	03-04-09	88
NC0078131	HAVELOCK; CITY-BROWN BLVD WTP	03-04-10	1
NC0021253	HAVELOCK (CITY) - WWTP	03-04-10	2
NC0002917	HAVELOCK; CITY - WTP	03-04-10	3
NC0003816	US MCAS CHERRY POINT	03-04-10	4
NC0003816	US MCAS CHERRY POINT	03-04-10	5
NC0003816	US MCAS CHERRY POINT	03-04-10	6
NC0003816	US MCAS CHERRY POINT	03-04-10	7
NC0003816	US MCAS CHERRY POINT	03-04-10	8
NC0003816	US MCAS CHERRY POINT	03-04-10	9
NC0003816	US MCAS CHERRY POINT	03-04-10	10

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0003816	US MCAS CHERRY POINT	03-04-10	11
NC0003816	US MCAS CHERRY POINT	03-04-10	12
NC0003816	US MCAS CHERRY POINT	03-04-10	13
NC0003816	US MCAS CHERRY POINT	03-04-10	14
NC0003816	US MCAS CHERRY POINT	03-04-10	15
NC0003816	US MCAS CHERRY POINT	03-04-10	16
NC0003816	US MCAS CHERRY POINT	03-04-10	17
NC0003816	US MCAS CHERRY POINT	03-04-10	18
NC0003816	US MCAS CHERRY POINT	03-04-10	19
NC0003816	US MCAS CHERRY POINT	03-04-10	20
NC0003816	US MCAS CHERRY POINT	03-04-10	21
NC0003816	US MCAS CHERRY POINT	03-04-10	22
NC0003816	US MCAS CHERRY POINT	03-04-10	23
NC0003816	US MCAS CHERRY POINT	03-04-10	24
NC0003816	US MCAS CHERRY POINT	03-04-10	25
NC0003816	US MCAS CHERRY POINT	03-04-10	26
NC0040789	PAMILCO COUNTY-MINNESOTT WTP	03-04-10	27
NC0056618	CAROLINA PINES UTIL CO-ESTATES	03-04-10	28
NC0070084	CRAVEN CO. W&S/STATELY PINES	03-04-10	29
NC0077500	NCDOT-FERRY DIVISION (WTP)	03-04-10	31
NC0003174	FULCHER'S POINT PRIDE SEAFOOD	03-04-10	32
NC0003174	FULCHER'S POINT PRIDE SEAFOOD	03-04-10	33
NC0007617	GARLAND F. FULCHER SEAFOOD	03-04-10	34
NC0007617	GARLAND F. FULCHER SEAFOOD	03-04-10	35
NC0007617	GARLAND F. FULCHER SEAFOOD	03-04-10	36
NC0033111	CWS - NORTHEAST CRAVEN UTIL.	03-04-10	37
NC0007609	DIAMOND SHOAL SEAFOOD; INC.	03-04-10	42
NC0007609	DIAMOND SHOAL SEAFOOD; INC.	03-04-10	43
NC0007609	DIAMOND SHOAL SEAFOOD; INC.	03-04-10	44
NC0056545	CRAVEN CO. W&S / TRENT RIVER	03-04-10	46
NC0066621	ZACHARY TAYLOR - SANDY POINT	03-04-10	47
NC0042340	NEUSE WOODS APARTMENTS	03-04-10	48
NC0066613	ZACHARY TAYLOR - HWY 55 SITE	03-04-10	49
NC0060321	FIRST CRAVEN SANITARY DISTRICT	03-04-10	50
NC0074837	BRIDGETON (TOWN) - WWTP	03-04-10	51
NC0025348	NEW BERN (CITY) - WWTP	03-04-10	52
NC0001881	PHILLIPS PLATING COMPANY	03-04-10	55
NC0021342	TRENTON (TOWN) - WWTP	03-04-11	38
NC0030406	RIVER BEND (TOWN) - WWTP	03-04-11	39
NC0086797	RIVER BEND - WTP 1 & 2	03-04-11	40
NC0086797	RIVER BEND - WTP 1 & 2	03-04-11	41

NPDES Permit Map Labels for Subbasin Maps in Section B

Permit	Facility	Subbasin	Id number
NC0050695	BMCA GOLDSBORO; INC.	03-04-12	77
NC0023949	GOLDSBORO (CITY) - WWTP	03-04-12	78
NC0030392	WAYNE COUNTY (GENOA IND. WWTP)	03-04-12	81
NC0003417	CP&L - LEE STEAM ELECTRIC PLT	03-04-12	84
NC0003417	CP&L - LEE STEAM ELECTRIC PLT	03-04-12	85
NC0003417	CP&L - LEE STEAM ELECTRIC PLT	03-04-12	86
NC0026662	PRINCETON (TOWN) - WWTP	03-04-12	92
NC0002071	PAMLICO PACKING COMPANY	03-04-13	57
NC0002071	PAMLICO PACKING COMPANY	03-04-13	58
NC0002071	PAMLICO PACKING COMPANY	03-04-13	59
NC0002071	PAMLICO PACKING COMPANY	03-04-13	60
NC0066109	BAY RIVER MSD/BAY RIVER WWTP	03-04-13	72

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0037869	Arbor Hills Mobile Home Park	Arbor Hills Mobile Home Park	Orange	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.006	03-04-01
NC0058785	Bible Baptist Church	Bible Baptist Church	Durham	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.003	03-04-01
NC0085111	Carolina Water Service, Inc. of NC	Heather Glen	Durham	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-01
NC0007625	Creedmoor Town	Creedmoor WTP	Granville	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-01
NC0023841	Durham City	Durham North WWTP	Durham	Raleigh	Muncipal Wastewater Discharge, Large	Major	20.0	03-04-01
NC0003379	Eaton Corp	Air Controls Division	Person	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-01
NC0024520	G & S Associates	Days Inn WWTP	Durham	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.018	03-04-01
NC0049662	Heater Utilities, Inc.	Hawthorne Subdivision WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.161	03-04-01
NC0063614	Heater Utilities, Inc.	Wildwood Green WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.1	03-04-01
NC0085863	Heater Utilities, Inc.	Waterfall Plantation WTP	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-01
NC0026433	Hillsborough Town	Hillsborough WWTP	Orange	Raleigh	Muncipal Wastewater Discharge, Large	Major	3.0	03-04-01
NC0059099	Lake Ridge Aero Park	Lake Ridge Aero Park	Durham	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.016	03-04-01
NC0026824	NC DHHS	Butner WWTP	Granville	Raleigh	Muncipal Wastewater Discharge, Large	Major	3.5	03-04-01
NC0058416	NC DHHS	John Umstead WTP	Granville	Raleigh	Water Plants and Water Conditioning Discharge	Minor	0.1	03-04-01
NC0085243	Nello L Teer Company	Durham Quarry remediation site	Durham	Raleigh	Groundwater Remediation Discharge	Minor	0.0014	03-04-01
NC0082759	Orange Alamance Water System	Orange-Alamance Water System WTP	Orange	Raleigh	Water Plants and Water Conditioning Discharge	Minor	0.05	03-04-01
NC0051071	Redwood Partners LLC	Redwood Partners LLC	Durham	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.002	03-04-01
NC0056731	Sedgefield Dev Corp	Grande Oaks WWTP	Durham	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.0068	03-04-01
NC0086720	W P Ballard & Company	W P Ballard & Company	Durham	Raleigh	Groundwater Remediation Discharge	Minor	0.014	03-04-01
NC0086126	Alcatel Network Systems Inc	Alcatel Network Systems Incorporated	Wake	Raleigh	Groundwater Remediation Discharge	Major	0.08	03-04-02
NC0081647	Amoco Oil Co	Amoco Oil Co/#539	Johnston	Raleigh	Groundwater Remediation Discharge	Minor	0.003	03-04-02
NC0036145	Bp Oil	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0051322	Carolina Water Service, Inc. of NC	Ashley Hill WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.125	03-04-02
NC0062219	Carolina Water Service, Inc. of NC	Kings Grant Subdivision WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.07	03-04-02
NC0064378	Carolina Water Service, Inc. of NC	Willowbrook WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.03	03-04-02
NC0048879	Cary Town	Cary North WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	12.0	03-04-02
NC0049204	Charter-Triad Terminals LLC	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0021954	CITGO Petroleum Corporation	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0025453	Clayton Town	Clayton Little Creek WWTP	Johnston	Raleigh	Muncipal Wastewater Discharge, Large	Major	1.9	03-04-02

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0081469	Colonial Pipeline	RDU Delivery facility	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0031011	Colonial Pipeline Co	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0065706	Crosby Utilities	Cottonwood WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.0575	03-04-02
NC0027227	Crown Central Petroleum Corporation	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0027006	ExxonMobil Refining and Supply Company	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0040606	Heater Utilities, Inc.	Barclay Downs WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.035	03-04-02
NC0055701	Heater Utilities, Inc.	Nottingham WTP	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-02
NC0056391	Heater Utilities, Inc.	Cross Creek Mobile Estates WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0058505	Heater Utilities, Inc.	Mallard Crossing WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.1	03-04-02
NC0060577	Heater Utilities, Inc.	Beachwood WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.1	03-04-02
NC0064564	Heater Utilities, Inc.	Neuse Colony WWTP	Johnston	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0060771	Indian Creek Overlook	Indian Creek Overlook	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.064	03-04-02
NC0073318	Ira D Lee	Whippoorwill Valley WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0063746	Ira D Lee & Assoc	Deerchase WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0085936	Jerry G Williams & Sons Inc	Jerry G Williams & Sons Incorporated	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0060330	Johnston Co	White Oak Plantation WWTP	Johnston	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0030716	Johnston County	Central Johnston County WWTP	Johnston	Raleigh	Muncipal Wastewater Discharge, Large	Major	4.5	03-04-02
NC0084735	Johnston County	Johnston County/WTP	Johnston	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-02
NC0064149	Jones Dairy Farm Utilities	Jones Dairy Farm WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.16	03-04-02
NC0040266	Knightdale Estates Mhp	Knightdale Estates Mobile Home Park	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.025	03-04-02
NC0080519	Lampe & Malphrus Lumber	Lampe & Malphrus Lumber	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0049034	Mount Auburn Training Center	Mount Auburn Training Center	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.0024	03-04-02
NC0032875	Phillips Pipe Line Company	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0060526	Pope Industrial Park II Ltd	Pope Industrial Park II Limited	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.008	03-04-02
NC0029033	Raleigh City	Raleigh Neuse River WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	60.0	03-04-02
NC0082376	Raleigh City	Johnson WTP	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0084514	RDU International Airport	RDU International Airport-WWTP	Wake	Raleigh	Groundwater Remediation Discharge	Minor	0.0144	03-04-02
NC0056278	River Mill Homeowner Assn Inc	River Mill Homeowner Assn Inc	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.02	03-04-02
NC0001376	Riverplace II, LLC	Riverplace II LLC	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Major	5.0	03-04-02
NC0038784	Riverview Mobile Home Park	Riverview Mobile Home Park	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.035	03-04-02

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0083348	Smithfield Town	Smithfield WTP	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0081540	Square D Company	Square D Company	Wake	Raleigh	Groundwater Remediation Discharge	Minor	0.0432	03-04-02
NC0065714	Tradewinds Homeowners Asso Inc	Tradewinds Homeowners Asso Inc	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.05	03-04-02
NC0003549	TransMontaigne Terminaling, Inc.	Selma South terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0039292	Uniprop, Inc.	Riverwalk Mobile Home Park	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.051	03-04-02
NC0056499	Uniprop, Inc.	Mill Run Mobile Home Park	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.026	03-04-02
NC0076457	Valero Marketing & Supply Company	Valero Marketing & Supply Co	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0007528	Wake Forest Town	Wake Forest WTP	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0030759	Wake Forest Town	Wake Forest WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	2.4	03-04-02
NC0045608	Ward Transformer Company	Ward Transformer Company	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	0.05	03-04-02
NC0064408	Whitewood Prop Inc	Neuse Crossing WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.15	03-04-02
NC0052311	Williams Terminals Holdings LP	Selma terminal	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-02
NC0064050	Apex Town	Middle Creek WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	3.6	03-04-03
NC0066150	Brookfield Prop	Brighton Forest WTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.117	03-04-03
NC0065102	Cary Town	Cary South WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	12.8	03-04-03
NC0083747	Dutchman Creek Inc	Twin Lake WTP	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-03
NC0066516	Fuquay-Varina, Town of	Terrible Creek WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Minor	0.5	03-04-03
NC0062715	Heater Utilities, Inc.	Crooked Creek WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.04	03-04-03
NC0062740	Heater Utilities, Inc.	Briarwood Farms WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.04	03-04-03
NC0073679	Heater Utilities, Inc.	Oak Hollow WTP	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-03
NC0082996	Heater Utilities, Inc.	Hollybrook WTP	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-03
NC0086690	Heater Utilities, Inc.	Stansted Well #2 (WTP)	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-03
NC0022217	Motiva Enterprises LLC	Raleigh Sales Terminal	Wake	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-03
NC0035181	NC Center For Mature Adults	NC Center For Mature Adults	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.0065	03-04-03
NC0061638	Utilities Inc	Amherst WWTP	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.046	03-04-03
NC0020389	Benson Town	Benson WWTP	Johnston	Raleigh	Muncipal Wastewater Discharge, Large	Major	1.5	03-04-04
NC0065196	Dupree's Mobile Home Court	Dupree's Mobile Home Court	Johnston	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-04

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0003760	DAK MONOMERS, LLC	Dupont- Kinston Plant	Lenoir	Washington	Industrial Process & Commercial Wastewater Discharge	Major	3.6	03-04-05
NC0086918	Eastern Wayne Sanitary District	Rockford Church Road WTP	Wayne	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-05
NC0020541	Kinston City	Kinston Peachtree WWTP	Lenoir	Washington	Muncipal Wastewater Discharge, Large	Major	6.75	03-04-05
NC0024236	Kinston City	Kinston Northside WWTP	Lenoir	Washington	Muncipal Wastewater Discharge, Large	Major	4.5	03-04-05
NC0021644	La Grange, Town of	La Grange WWTP	Lenoir	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.75	03-04-05
NC0032557	Lenoir Co Sch	South Lenoir High School WWTP	Lenoir	Washington	Discharging 100% Domestic < 1MGD	Minor	0.012	03-04-05
NC0032573	Lenoir Co Sch	Moss Hill Elementary School WWTP	Lenoir	Washington	Discharging 100% Domestic < 1MGD	Minor	0.011	03-04-05
NC0039233	Walnut Creek Village	Walnut Creek WWTP	Wayne	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.04	03-04-05
NC0086266	Carolina Water Service, Inc. of NC	Woodtrace	Wake	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-06
NC0038938	Johnston Co Boe	Corinth Holder School WWTP	Johnston	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.009	03-04-06
NC0064891	Kenly Town	Kenly Regional WWTP	Johnston	Raleigh	Municipal Wastewater Discharge, < 1MGD	Minor	0.63	03-04-06
NC0064246	Pace Mobile Home Park	Pace Mobile Home Park	Johnston	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.015	03-04-06
NC0049042	Riley Hill Baptist Church Inc	Riley Hill Baptist Church Inc	Wake	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.0012	03-04-06
NC0064556	River Dell Util	Buffalo Creek WWTP	Johnston	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.25	03-04-06
NC0086061	Bailey Town	Bailey Well #1 WTP	Nash	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-07
NC0086541	Bailey Town	Bailey Well #2 WTP	Nash	Raleigh	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-07
NC0086967	Belfast-Patetown Sanitary District	Napoleon Road WTP	Wayne	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-07
NC0032077	Contentnea Sewerage District	Contentnea Sewerage Dist WWTP	Pitt	Washington	Muncipal Wastewater Discharge, Large	Major	2.85	03-04-07
NC0048062	Eureka Town	Eureka WWTP	Wayne	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.04	03-04-07
NC0029572	Farmville Town	Farmville WWTP	Pitt	Washington	Muncipal Wastewater Discharge, Large	Major	3.5	03-04-07
NC0025712	Hookerton Town	Hookerton WWTP	Greene	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.06	03-04-07
NC0032565	Lenoir Co Sch	North Lenoir High School WWTP	Lenoir	Washington	Discharging 100% Domestic < 1MGD	Minor	0.018	03-04-07
NC0061492	Maury Sanitary Land Dist	Maury WWTP	Greene	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.225	03-04-07
NC0086118	Middlesex Town	Middlesex Well #4 WTP	Nash	Raleigh	Water Plants and Water Conditioning Discharge	Minor	0.008	03-04-07
NC0037915	Nash/Rocky Mount BOE	Southern Nash High School WWTP	Nash	Raleigh	Discharging 100% Domestic < 1MGD	Minor	0.015	03-04-07
NC0086959	Northwestern Wayne Sanitary District	Memorial Church Road WTP	Wayne	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-07
NC0049948	Saratoga Town	Saratoga WTP	Wilson	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-07
NC0020842	Snow Hill Town	Snow Hill WWTP	Greene	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.25	03-04-07

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0081884	Standard Commercial Tobacco Co	Standard Commercial Tobacco Co	Wilson	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-07
NC0007536	Stantonsburg Town	Stantonsburg WTP	Wilson	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-07
NC0057606	Stantonsburg Town	Stantonsburg WWTP	Wilson	Raleigh	Municipal Wastewater Discharge, < 1MGD	Minor	0.375	03-04-07
NC0034801	Wayne Co Boe	Norwayne Jr High School WWTP	Wayne	Washington	Discharging 100% Domestic < 1MGD	Minor	0.012	03-04-07
NC0034819	Wayne Co Boe	C B Aycock High School WWTP	Wayne	Washington	Discharging 100% Domestic < 1MGD	Minor	0.01	03-04-07
NC0085570	West Wilson Wtr	White Oak WTP	Wilson	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-07
NC0083917	Williamson Produce Inc	Williamson Produce Incorporated	Wilson	Raleigh	Industrial Process & Commercial Wastewater Discharge	Minor	0.009	03-04-07
NC0023906	Wilson City	Wilson WWTP	Wilson	Raleigh	Muncipal Wastewater Discharge, Large	Major	12.0	03-04-07
NC0084581	Wilson Technical Comm College	Wilson Technical Comm College	Wilson	Raleigh	Groundwater Remediation Discharge	Minor	0.0144	03-04-07
NC0079316	Zebulon Town	Little Creek WWTP	Wake	Raleigh	Muncipal Wastewater Discharge, Large	Major	1.85	03-04-07
NC0029904	Craven Co Sch	West Craven Middle School WWTP	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.017	03-04-08
NC0075281	Craven County Wood Energy	Craven County Wood Energy	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	0.425	03-04-08
NC0003191	Weyerhaeuser Company	New Bern Mill	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Major	32.0	03-04-08
NC0031828	Vanceboro Town	Vanceboro WWTP	Craven	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.25	03-04-09
NC0080071	Vanceboro Town	Vanceboro WTP	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-09
NC0073229	Weyerhaeuser Company	Ayden plant	Pitt	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-09
NC0074837	Bridgeton Town	Bridgeton WWTP	Craven	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.075	03-04-10
NC0033111	Carolina Water Service, Inc. of NC	NE Craven WWTP	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.6	03-04-10
NC0056618	Carolina Water Service, Inc. of NC	Carolina Pines WWTP	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.125	03-04-10
NC0047104	Coastal Lumber Co	Coastal Lumber Co-New Bern	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-10
NC0056545	Craven Co W&S	Trent River WWTP	Craven	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.075	03-04-10
NC0070084	Craven Co W&S	Stately Pines WWTP	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.1	03-04-10
NC0007609	Diamond Shoal Seafood Inc	Diamond Shoal Seafood Incorporated	Pamlico	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-10
NC0060321	First Craven Sanitary District	First Craven Sanitary District	Craven	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-10
NC0003174	Fulcher's Point Pride Seafood	Fulcher's Point Pride Seafood	Pamlico	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	0.0046	03-04-10
NC0007617	Garland F Fulcher Seafood	Garland F Fulcher Seafood	Pamlico	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-10
NC0002917	Havelock City	Havelock WTP	Craven	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-10

NPDES Discharges in the Neuse River Basin (as of September 26, 2001)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin
NC0021253	Havelock City	Havelock WWTP	Craven	Washington	Muncipal Wastewater Discharge, Large	Major	1.9	03-04-10
NC0078131	Havelock City	Brown Blvd WTP	Craven	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-10
NC0077500	NC Dept. of Transportation	Ferry Division WTP	Carteret	Wilmington	Water Plants and Water Conditioning Discharge	Minor	0.01	03-04-10
NC0042340	Neuse Woods Apartments	Neuse Woods Apartments	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.012	03-04-10
NC0025348	New Bern City	New Bern WWTP	Craven	Washington	Muncipal Wastewater Discharge, Large	Major	4.7	03-04-10
NC0040789	Pamilco County	Minnesott WTP	Pamlico	Washington	Water Plants and Water Conditioning Discharge	Minor	not limited	03-04-10
NC0001881	Phillips Plating Company	Phillips Plating Company	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Major	0.1	03-04-10
NC0003816	US MCAS Cherry Point	US MCAS Cherry Point	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Major	3.5	03-04-10
NC0030406	River Bend Town	River Bend WWTP	Craven	Washington	Discharging 100% Domestic < 1MGD	Minor	0.33	03-04-11
NC0086797	River Bend Town	River Bend WTP 1 & 2	Craven	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-11
NC0021342	Trenton Town	Trenton WWTP	Jones	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.07	03-04-11
NC0003417	Carolina Power & Light	Lee Steam Electric Plant	Wayne	Washington	Industrial Process & Commercial Wastewater Discharge	Major	1.4	03-04-12
NC0023949	Goldsboro City	Goldsboro WWTP	Wayne	Washington	Muncipal Wastewater Discharge, Large	Major	10.8	03-04-12
NC0026662	Town of Princeton	Princeton WWTP	Johnston	Raleigh	Municipal Wastewater Discharge, < 1MGD	Minor	0.275	03-04-12
NC0030392	Wayne Co	Genoa Industrial WWTP	Wayne	Washington	Municipal Wastewater Discharge, < 1MGD	Minor	0.4	03-04-12
NC0002071	Pamlico Packing Company	Pamlico Packing Company	Pamlico	Washington	Industrial Process & Commercial Wastewater Discharge	Minor	not limited	03-04-13

Stormwater Permits in the Neuse River Basin (as of December 20, 2001)

Permit Number	Facility Name	Receiving Stream	Subbasin	County
NCS000043	Loxco	UT Mill Creek	03-04-06	Wayne
NCS000136	Mallinckrodt Chemical, Inc.	Neuse River	03-04-02	Wake
NCS000175	AETS,L.L.C.	UT Little Ledge Creek	03-04-01	Granville
NCS000191	East Carolina Metal Treating, Inc.	Rocky Branch	03-04-02	Wake
NCS000211	Weyerhaeuser Company	Neuse River	03-04-10	Craven
NCS000223	EnviroChem Environmental Services	Middle Creek	03-04-03	Wake
NCS000254	Square D Company	Marks Creek	03-04-02	Wake
NCS000268	Athol Corporation	UT Picture Creek	03-04-01	Granville
NCS000282	Cargill Incorporated	UT Rocky Branch & Walnut Creek	03-04-02	Wake
NCS000286	North Carolina State University	Rocky Branch	03-04-02	Wake
NCS000294	Southern States Cooperative- Creedmoor	UT To Robertson Creek	03-04-01	Granville
NCS000299	Cargill Inc.- Nutrena Feed	Hominy Swamp	03-04-07	Wilson
NCS000303	Waukesha Electric Systems	Neuse River	03-04-05	Wayne
NCS000338	Royster-Clark, Inc.	UT Hominy Swamp	03-04-09	Wilson
NCS000370	Bridgestone/Firestone, Inc.	UT Toisnot Swamp & White Swamp	03-04-07 & 03-03-03	Wilson

Appendix II

Biological Water Quality Data Collected by DWQ

Benthic Macroinvertebrate Sampling Methods and Criteria

Freshwater Wadeable and Flowing Waters

Benthic macroinvertebrates can be collected from wadeable, freshwater, flowing waters using two sampling procedures. The Division of Water Quality's standard qualitative sampling procedure includes 10 composite samples: two kick-net samples, three bank sweeps, two rock or log washes, one sand sample, one leafpack sample, and visual collections from large rocks and logs (NCDEHNR, 1997). The purpose of these collections is to inventory the aquatic fauna and produce an indication of relative abundance for each taxon. Organisms are classified as Rare (1-2 specimens), Common (3-9 specimens), or Abundant (≥10 specimens).

Several data analysis summaries (metrics) can be produced to detect water quality problems. These metrics are based on the idea that unstressed streams and rivers have many invertebrate taxa and are dominated by intolerant species. Conversely, polluted streams have fewer numbers of invertebrate taxa and are dominated by tolerant species. The diversity of the invertebrate fauna is evaluated using taxa richness counts; the tolerance of the stream community is evaluated using a biotic index.

EPT taxa richness (EPT S) is used with DWQ criteria to assign water quality ratings (bioclassifications). "EPT" is an abbreviation for Ephemeroptera + Plecoptera + Trichoptera, insect groups that are generally intolerant of many kinds of pollution. Higher EPT taxa richness values usually indicate better water quality. Water quality ratings also are based on the relative tolerance of the macroinvertebrate community as summarized by the North Carolina Biotic Index (NCBI).

Both tolerance values for individual species and the final biotic index values have a range of 0-10, with higher numbers indicating more tolerant species or more polluted conditions. Water quality ratings assigned with the biotic index numbers are combined with EPT taxa richness ratings to produce a final bioclassification, using criteria for coastal plain streams. EPT abundance (EPT N) and total taxa richness calculations also are used to help examine between-site differences in water quality. If the EPT taxa richness rating and the biotic index differ by one bioclassification, the EPT abundance value is used to determine the final site rating.

Benthic macroinvertebrates can also be collected using an EPT sampling procedure. Four rather than 10 composite qualitative samples are taken at each site: 1 kick, 1 sweep, 1 leafpack and visual collections. Only EPT groups are collected and identified, and only EPT criteria are used to assign a bioclassification.

Both EPT taxa richness and biotic index values also can be affected by seasonal changes. DWQ criteria for assigning bioclassification are based on summer sampling: June - September. For samples collected outside summer, EPT taxa richness can be adjusted by subtracting out winter/spring Plecoptera or other adjustment based on resampling of summer site. The biotic index values also are seasonally adjusted for samples outside the summer season.

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is not assessed as well by a taxa richness analysis.

Boat Sampling and Coastal B Criteria

Coastal B rivers are defined as waters in the coastal plain that are deep (nonwadeable) with little or no visible current under normal or low flow conditions and that have freshwater. Other characteristics may include open canopy, low pH and low dissolved oxygen. These waters require a boat for sampling. These are usually large coastal plain rivers, including the lower sections of the Alligator, Chowan, Meherrin, Neuse, Pasquotank, Perquimans, Roanoke, Tar, South, Black, Waccamaw, Wiccacon, Northeast Cape Fear and Cape Fear Rivers. In such habitats, petite Ponar dredge sampling replaces kick-net samples, but all other standard qualitative collections techniques are still useable.

The standard boat method still aims at a total of 10 composite samples per site:

- Dredges - 3 composite samples using a petite Ponar.
- Sweeps - 3 samples collected from bank habitats, sampling as much of the edge habitat as possible, including aquatic macrophytes, roots and areas of debris.
- Leaf packs/Debris wash -1 composite sample of leaves and other large particulate organic matter are to be rinsed in a wash bucket.
- Epifaunal collections - 2 composite samples of macrophytes and well-colonized logs both in the current and along the shore.
- Visuals - should cover macrophytes, logs along the shore, and especially logs in the current.

The Biological Assessment Unit has limited data on Coastal B rivers and has had a difficult time gathering more data. Criteria have been developed based only on EPT taxa richness (Table A-II-1), although using biotic index values and total taxa richness values were also evaluated. The criteria that are presented here will continue to be evaluated, and any bioclassifications derived from them should be considered tentative and not used for use support decisions.

References

Chutter, F. M. 1972. *An Empirical Biotic Index of the Quality of Water in South African Streams and Rivers*. Water Research. 6: 19-30.

Hilsenhoff, W. L. 1977. *Use of Arthropods to Evaluate Water Quality in Streams*. Wisconsin Department of Natural Resources, Technical Bulletin No. 100.

Lenat, D. L. 1993. *A Biotic Index for the Southeastern United States: Derivation and List of Tolerance Values, with Criteria for Assigning Water Quality Ratings*. J. North American Benthological Society. 12: 279-290.

Flow Measurement

Changes in the benthic macroinvertebrate community are often used to help assess between-year changes in water quality. Some between-year changes in the macroinvertebrates, however, may be due largely to changes in flow. High flow years magnify the potential effects of nonpoint source runoff, leading to scour, substrate instability and reduced periphyton. Low flow years may accentuate the effect of point source dischargers by providing less dilution of wastes. For these reasons, all between-year changes in the biological communities are considered in light of flow conditions (high, low or normal) for one month prior to the sampling date. Daily flow information is obtained from the closest available USGS monitoring site and compared to the long-term mean flows. High flow is defined as a mean flow >140 percent of the long-term mean for that time period, usually July or August. Low flow is defined as a mean flow <60 percent of the long-term mean, while normal flow is 60-140 percent of the mean. While broad scale regional patterns are often observed, there may be large geographical variation within the state, and large variation within a single summer period.

Habitat Evaluation

The Division has developed a habitat assessment form to better evaluate the physical habitat of a stream. The habitat score has a potential range of 1-100, based on evaluation of channel modification, amount of instream habitat, type of bottom substrate, pool variety, bank stability, light penetration and riparian zone width. Higher numbers suggest better habitat quality, but no criteria have been developed to assign impairment ratings.

Table A-II-1 Benthic Macroinvertebrate Data, Neuse River Basin, 1983 - 2000 (Basin sites are in **bold**.)

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
03-04-01									
Sevenmile Cr	SR 1120	Orange	27-2-6-(0.5)	8/7/00	---	18	---	5.00	Good-Fair
				8/1/95	---	21	---	5.10	Good
				7/8/91	---	20	---	5.28	Good-Fair
Eno R	SR 1336	Orange	27-2-(1)	8/7/00	---	21	---	4.95	Good
				7/24/95	---	20	---	5.30	Good-Fair
				7/8/91	---	20	---	4.45	Good-Fair
Eno R	NC 70 Bypass	Orange	27-2-(7)	8/17/89	75	17	6.16	5.22	Good-Fair
Eno R	NC 86, above WWTP	Orange	27-2-(7)	8/17/89	89	24	6.29	5.51	Good-Fair
Eno R	Above Hillsborough WWTP	Orange	27-2-(7)	9/20/94	72	15	6.05	4.69	Good-Fair
Eno R	Below Hillsborough WWTP	Orange	27-2-(7)	9/20/94	71	13	6.09	4.54	Fair
Eno R	2nd NC 70 Bypass	Orange	27-2-(7)	8/17/89	90	26	6.00	5.19	Good
				6/21/88	73	20	6.06	4.83	Good-Fair
Eno R	SR 1569, Cabes Ford	Orange	27-2-(10)	8/7/00	75	26	4.75	4.24	Excellent
				10/14/96	88	28	5.38	4.52	Good
				7/28/95	85	27	5.09	4.19	Excellent
				7/9/91	97	33	4.89	4.21	Excellent
				6/21/88	92	30	5.66	4.22	Good
Eno R	US 15/501	Durham	27-2-(10)	8/8/00	83	36	5.49	5.00	Excellent
				7/28/95	70	23	5.47	4.63	Good
				7/11/90	87	30	5.65	4.64	Good
				7/14/88	90	27	6.14	5.18	Good
				7/7/86	82	28	5.58	4.46	Good
				8/6/84	87	31	5.43	4.69	Good
Eno R	SR 1004	Durham	27-2-(19.5)	8/9/00	62	24	5.57	4.75	Good
				7/28/95	71	27	5.52	4.94	Good
				7/9/91	88	31	5.35	4.51	Good
				6/10/85	91	32	5.85	4.45	Good
Little R	SR 1461	Durham	27-2-21-(3.5)	8/8/00	88	34	5.27	4.39	Excellent
				7/28/95	81	28	5.72	4.67	Good
				7/8/91	82	31	4.89	3.98	Excellent
				10/22/90	79	25	5.76	4.18	Good
				9/11/90	100	36	5.16	3.92	Excellent
				4/5/90	96	37	4.84	3.88	Excellent
				1/11/90	86	31	5.10	4.17	Excellent
				10/12/89	93	34	4.99	3.61	Excellent
				7/27/89	82	30	5.38	4.79	Good
				4/20/89	78	30	4.58	3.84	Excellent
				2/15/89	102	33	5.79	3.93	Excellent
Little R	US 501	Durham	27-2-21-(3.5)	7/6/87	113	38	5.57	4.46	Excellent
				7/29/85	90	31	5.19	3.90	Good
Little R	SR 1004	Durham	27-2-21-(6)	6/12/85	76	25	5.89	4.70	Good-Fair
S Fk Little R	SR 1538	Orange	27-2-21-2	8/4/00	23	23	4.50	4.50	Good
				8/1/95	---	19	---	4.45	Fair
N Fk Little R	SR 1519	Orange	27-2-21-3	8/04/00	---	17	---	5.09	Good-Fair
				7/24/95	---	11	---	6.16	Fair
N Fk Little R	SR 1538	Orange	27-2-21-3	8/8/00	---	20	---	4.34	Good-Fair
				7/24/95	99	29	5.70	4.63	Good

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
N Fk Little R	SR 1461	Durham	27-2-21-3	7/8/91	103	33	5.58	4.44	Good
Mountain Cr	Above SR 1464	Durham	27-2-21-4-(1)	3/15/94	44	15	5.86	3.75	Good-Fair
Mountain Cr	Below SR 1464	Durham	27-2-21-4-(1)	3/15/94	50	16	5.68	4.29	Good-Fair
Mountain Cr	SR 1466	Durham	27-2-21-4-(1)	3/15/94	45	17	5.05	3.52	Good-Fair
Flat R	SR 1737	Person	27-3-(1)	6/9/93	81	27	5.37	4.71	Good
				5/8/90	29	29	4.12	4.12	Good
Flat R	SR 1614	Durham	27-3-(1)	8/3/00	90	30	5.46	4.84	Good
				10/14/96	75	28	5.67	4.66	Good
				3/13/95	102	42	5.00	4.00	Excellent
				7/24/95	86	27	5.80	4.97	Good
				7/8/93	98	32	5.22	4.12	Excellent
				2/8/93	92	33	5.11	3.72	Excellent
				7/8/91	98	36	5.24	4.47	Excellent
				7/11/90	107	37	5.82	4.73	Good
				7/14/88	91	26	5.53	4.43	Good
				7/7/86	92	28	5.55	4.76	Good
				8/9/84	82	25	5.02	4.46	Good
				8/6/84	68	23	5.35	4.43	Good
Flat R	SR 1004	Durham	27-3-(9)	8/9/00	48	13	6.85	5.95	Fair
				8/1/95	62	12	7.06	5.35	Fair
				6/12/85	61	10	7.03	6.56	Fair
N Flat R	SR 1144	Person	27-3-2	6/9/93	65	12	5.93	5.54	Good-Fair
N Flat R	SR 1715	Person	27-3-2	7/8/93	77	24	5.00	4.22	Good
				2/9/93	80	29	4.83	3.60	Excellent
				7/8/91	---	21	---	4.66	Good
S Flat R	SR 1009	Person	27-3-3	5/8/90	---	11	---	5.56	Fair
S Flat R	NC 157	Person	27-3-3	6/9/93	90	24	5.86	4.99	Good-Fair
				5/8/90	29	29	4.73	4.69	Good
S Flat R	SR 1125	Person	27-3-3	7/8/93	75	23	5.25	4.04	Good
				2/9/93	76	28	4.55	3.42	Good
Brushy Fk	SR 1108	Person	27-3-3-1	5/8/90	---	23	---	4.17	Good
Deep Cr	SR 1717	Person	27-3-4	2/9/93	67	20	6.02	4.42	Good
Deep Cr	SR 1715	Person	27-3-4	8/4/00	---	21	---	4.70	Good
				7/24/95	---	23	---	4.88	Good
				3/13/95	113	41	5.08	4.30	Excellent
				2/8/93	80	31	5.25	4.07	Good
				5/8/90	---	32	---	3.85	Excellent
Deep Cr	SR 1734	Person	27-3-4	11/6/84	78	24	5.50	3.52	Good
Knap of Reeds Cr	SR 1104	Granville	27-4-(6)	6/12/85	65	15	6.72	6.31	Fair
Knap of Reeds Cr	Above WWTP	Granville	27-4-(6)	9/19/94	78	12	6.84	5.79	Fair
				8/7/91	58	12	6.64	5.97	Fair
				2/5/87	62	14	6.92	5.00	Fair
				6/12/85	70	10	7.08	6.42	Fair
				5/26/82	61	11	7.09	6.45	Fair
Knap of Reeds Cr	Below WWTP	Granville	27-4-(6)	8/9/00	51	8	7.10	6.55	Fair
				9/19/94	66	7	7.39	5.88	Fair
				8/7/91	46	8	7.08	5.88	Fair
				2/5/87	32	3	8.12	6.23	Poor
				6/12/85	19	0	7.92	0.00	Poor
				5/26/82	30	4	8.05	6.55	Poor
Knap of Reeds Cr	above 1st tributary	Granville	27-4-(6)	2/5/87	39	3	8.32	6.66	Poor
				6/13/85	40	2	7.92	7.30	Poor
Ellerbe Cr	SR 1709	Durham	27-5-(0.7)	3/13/95	32	4	7.88	5.97	Poor
				8/7/91	41	0	8.42	0.00	Poor
Ellerbe Cr	SR 1636	Durham	27-5-(2)	8/23/00	41	6	7.28	6.72	Fair
				3/29/95	38	3	7.74	6.11	Poor
				8/7/91	36	3	7.84	7.42	Poor

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
				6/10/85	35	2	8.74	7.51	Poor
L Lick Cr	SR 1815	Durham	27-9-(0.5)	2/14/95	27	1	7.95	5.81	Poor
				8/7/91	56	7	7.79	6.25	Poor
				2/15/88	---	5	---	5.80	Poor
L Lick Cr	SR 1814	Durham	27-9-(0.5)	3/6/00	26	2	7.07	7.22	Poor
				2/14/95	34	6	7.89	6.22	Poor
				8/7/91	59	7	7.21	6.34	Fair
				2/15/88	---	4	---	5.99	Poor
				6/13/85	77	11	7.09	5.87	Fair
Lick Cr	SR 1905	Durham	27-11-(0.5)	3/6/00	26	12	6.69	5.69	Fair
				2/14/95	---			5.77	Fair
				2/15/88	---	5	---	4.31	Fair
Smith Cr	SR 1710	Granville	27-12-2-(1)	8/10/00	---	21	---	5.18	Good
				7/25/95	85	24	5.92	5.37	Good-Fair
				3/2/95	90	31	5.13	4.26	Good
				4/24/92	84	30	5.14	4.44	Good
				8/6/91	---	17	---	4.73	Good-Fair
				11/16/84	84	29	5.41	4.62	Good
				6/20/84	87	23	5.38	4.97	Good
				4/2/84	100	32	5.45	4.44	Good
				1/25/84	79	29	5.01	4.14	Good
New Light Cr	SR 1912	Wake	27-13-(0.1)	8/10/00	---	23	---	5.20	Good
				3/2/95	---	24	---	4.24	Good-Fair
Upper Barton Cr	NC 50	Wake	27-15-(1)	8/10/00	---	14	---	5.44	Good-Fair
				12/9/96	---	13	---	4.58	Fair
				7/25/95	---	16	---	4.49	Good-Fair
				2/23/95	---	32	---	3.93	Good
				2/14/95	---	29	---	3.71	Good
				7/9/91	---	21	---	4.34	Good
Lower Barton Cr	SR 1844	Wake	27-16-(1)	2/14/95	---	31	---	3.82	Good-Fair
		Wake		6/13/85	83	19	6.12	5.34	Good-Fair
Horse Cr	SR 1923	Wake	27-17-(0.7)	9/12/96	---	12	---	4.48	Fair
03-04-02									
Neuse R	US 401	Wake	27-(20.7)	7/6/00	63	21	5.76	4.99	Good-Fair
				7/25/95	56	22	5.89	5.01	Good-Fair
				7/9/91	70	20	5.91	5.18	Good-Fair
				8/18/89	53	15	6.27	5.55	Good-Fair
				7/10/87	---	19	---	5.01	Good-Fair
				6/30/87	74	21	6.15	4.83	Good-Fair
				12/4/86	---	12	---	4.97	Fair
				7/26/85	71	20	6.66	5.60	Good-Fair
				11/22/83	58	12	6.33	5.25	Fair
				10/14/83	70	19	6.53	5.56	Good-Fair
				9/16/83	68	13	6.64	5.64	Fair
				7/13/83	58	17	6.14	5.38	Good-Fair
Neuse R	US 1	Wake	27-(20.7)	12/4/86	---	12	---	5.36	Fair
				11/6/85	48	10	7.25	5.56	Fair
Neuse R	US 64	Wake	27-(20.7)	9/11/00	45	16	5.86	5.17	Good-Fair
				10/24/96	48	17	5.61	4.64	Good-Fair
				7/26/95	62	22	5.59	4.79	Good
				7/10/91	69	22	6.00	4.81	Good-Fair
				12/4/86	---	13	---	5.23	Fair
Neuse R	SR 2555	Wake	27-(20.7)	6/30/87	74	22	6.17	5.14	Good-Fair
Neuse R	SR 2509	Wake	27-(20.7)	6/30/87	71	22	6.01	4.98	Good-Fair
UT Neuse R	ab N Wake fill	Wake	27-(20.7)	5/18/92	73	24	5.40	4.01	Good
UT Neuse R	be N Wake fill	Wake	27-(20.7)	5/19/92	50	17	4.77	3.77	Good
UT Neuse R	Mallinkrodt M1	Wake	27-(20.7)	5/18/92	54	5	6.96	4.48	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
UT Neuse R	Mallinkrodt M3	Wake	27-(20.7)	5/18/92	49	2	7.61	6.05	Poor
Richland Cr	SR 1931	Wake	27-21	5/20/97	---	17	---	4.08	Good-Fair
Richland Cr	US 1	Wake	27-21	3/17/00	---	18	---	4.90	Good-Fair
				12/10/96	---	13	---	5.08	Fair
				3/10/95	---	20	---	4.41	Good-Fair
				3/24/94	60	22	5.09	4.30	Good-Fair
				8/20/91	---	17	---	4.58	Good-Fair
Smith Cr	be WF Res.	Wake	27-23-(2)	3/25/87	---	2	---	4.95	Poor
Smith Cr	SR 2049	Wake	27-23-(2)	12/2/86	---	12	---	5.45	Fair
Smith Cr	SR 2044	Wake	27-23-(2)	12/2/86	---	2	---	6.58	Poor
Smith Cr	SR 2045	Wake	27-23-(2)	7/6/00	---	12	---	5.10	Fair
				7/25/95	---	15	---	5.38	Good-Fair
				12/2/86	---	4	---	6.07	Poor
Austin Cr	SR 2053	Wake	27-23-3	3/25/87	---	12	---	3.41	Fair
Sanford Br	SR 2049	Wake	27-23-5	12/2/86	---	9	---	5.99	Fair
UT Toms Cr	SR 2044	Wake	27-24	5/12/00	59	20	5.49	4.30	NR
Toms Cr	off powerline	Wake	27-24	5/11/00	45	14	4.98	3.54	NR
Toms Cr	Ab Deerchase	Wake	27-24	8/21/00	36	6	6.79	6.27	NR
Toms Cr	SR 2044	Wake	27-24	7/6/00	---	11	---	5.40	Fair
				5/11/00	45	8	6.21	5.58	NR
				7/25/95	---	10	---	5.35	Fair
				8/21/91	61	17	5.70	4.23	Good
Perry Cr	SR 2006	Wake	27-25-(2)	7/6/00	---	8	---	5.23	Fair
				12/9/96	---	11	---	5.56	Fair
				7/25/95	---	8	---	5.87	Fair
Mango Cr	ab WWTP	Wake	27-32	3/24/87	---	6	---	4.57	Poor
Mango Cr	be WWTP	Wake	27-32	3/24/87	---	3	---	5.97	Poor
Crabtree Cr	NC 54	Wake	27-33-(1)	7/5/00	70	8	7.55	7.07	Poor
				7/24/95	---	6	---	6.68	Poor
				7/9/91	---	8	---	6.61	Fair
				8/3/88	---	5	---	6.38	Poor
				3/22/88	65	15	7.25	6.24	Fair
Crabtree Cr	SR 1002	Wake	27-33-(1)	8/3/88	---	9	---	6.36	Fair
				3/22/88	66	12	7.25	6.18	Fair
Crabtree Cr	SR 1795	Wake	27-33-(1)	4/19/94	51	6	7.69	7.17	Poor
				6/23/87	---	6	---	6.65	Poor
				10/26/84	73	11	6.59	5.91	Fair
				4/19/84	61	14	6.03	5.16	Good-Fair
Crabtree Cr	I-40	Wake	27-33-(3.5)	4/19/94	55	11	7.18	5.56	Fair
				6/23/87	---	7	---	6.27	Fair
				10/26/84	56	8	7.20	6.60	Fair
				4/12/84	68	16	5.32	4.59	Fair
Crabtree Cr	Umstead Pk	Wake	27-33-(3.5)	7/5/00	55	13	6.19	5.99	Good-Fair
				7/24/95	54	13	6.37	5.98	Good-Fair
				4/19/94	54	10	6.56	6.40	Fair
				7/2/87	55	9	6.54	6.69	Fair
				6/23/87	---	9	---	6.09	Fair
				4/15/86	80	20	6.31	5.30	Good-Fair
				10/26/84	65	14	6.18	5.67	Good-Fair
Black Cr	Weston Pkwy	Wake	27-33-5	7/27/00	---	8	---	6.33	Fair
				5/17/94	---	11	---	5.56	Fair
Reedy Cr	Umstead Park	Wake	27-33-8	5/19/00	31	7	6.76	6.16	NR
Sycamore Cr	SR 1649	Wake	27-33-9	8/20/91	---	15	---	5.79	Good-fair
UT Turkey Cr	ab Delta Rdg	Wake	27-33-9-2	7/26/00	26	6	5.25	5.14	NR
UT Turkey Cr	be Delta Rdg	Wake	27-33-9-2	7/26/00	15	3	6.21	3.69	NR
Crabtree Cr	SR 1649	Wake	27-33-(10)	4/19/94	---	9	---	5.62	Fair
				7/9/91	---	9	---	6.30	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
				6/22/87	---	15	---	5.63	Good-Fair
Crabtree Cr	US 1	Wake	27-33-(10)	8/30/00	54	13	6.55	5.89	Fair
				10/15/96	41	11	6.64	6.14	Fair
				7/24/95	54	16	6.55	6.09	Fair
				10/12/89	45	12	6.70	6.14	Fair
				7/27/89	54	12	6.62	6.16	Fair
				4/21/89	63	14	6.47	5.31	Fiar
				2/15/89	46	9	7.14	6.29	Fair
				9/6/84	56	10	6.85	5.97	Fair
Richlands Cr	SR 1775	Wake	27-33-11	8/15/96	---	7	---	7.04	Fair
Richlands Cr	SR 1649	Wake	27-33-11	8/15/96	---	12	---	6.21	Fair
				7/9/91	---	10	---	6.27	Fair
Hare Snipe Cr	US 70	Wake	27-33-12-(2)	3/17/00	---	5	---	5.53	Poor
				2/23/95	---	10	---	5.17	Fair
Mine Cr	above lake	Wake	27-33-14	9/26/95	---	7	---	5.71	Fair
Mine Cr	below lake	Wake	27-33-14	3/17/00	---	3	---	6.93	Poor
				2/23/95	---	4	---	6.05	Poor
Pigeon House Cr	Dortch St	Wake	27-33-18	7/25/95	31	1	8.85	7.00	Poor
Pigeon House Cr	Fenton St	Wake	27-33-18	2/27/00	33	2	8.13	7.60	Poor
Marsh Cr	near US 1	Wake	27-33-20	7/27/00	40	3	7.43	6.61	Poor
				7/26/95	44	6	6.85	6.47	Fair
				11/16/84	39	4	7.59	6.83	Poor
				4/2/84	39	3	7.88	5.82	Poor
				1/25/84	20	4	7.59	5.57	Poor
				6/4/83	48	6	7.55	6.62	Poor
Walnut Cr	SR 1700	Wake	27-34-(4)	11/6/85	49	3	7.61	6.84	Poor
Walnut Cr	Hammond Rd	Wake	27-34-(4)	11/6/85	36	5	8.27	7.01	Poor
Walnut Cr	SR 1004	Wake	27-34-(4)	3/24/94	47	7	7.68	5.22	Poor
				11/6/85	36	2	8.26	7.69	Poor
Walnut Cr	State St	Wake	27-34-(4)	3/24/94	45	4	7.28	6.01	Poor
Walnut Cr	SR 2554	Wake	27-34-(4)	3/24/94	44	5	7.33	6.11	Poor
Walnut Cr	SR 1730	Wake	27-34-(4)	7/16/91	---	9	---	6.04	Fair
Walnut Cr	SR 2551	Wake	27-34-(4)	7/27/00	61	15	6.37	5.57	Good-Fair
				7/26/95	51	10	7.03	5.59	Fair
				3/24/94	49	12	6.10	4.60	Fair
				11/8/85	42	13	6.45	5.93	Fair
UT Big Br	ab Goodmark	Wake	27-34-11	4/20/89	47	6	7.03	4.91	NR
UT Big Br	be Goodmark	Wake	27-34-11	4/20/89	31	1	8.11	5.50	NR
UT Poplar Cr	ab WWTP	Wake	27-35	11/10/98	24	5	5.70	3.89	NR
UT Poplar Cr	ab SR 2509	Wake	27-35	11/10/98	17	1	7.80	2.21	NR
Neuse R	NC 42	Johnston	27-(36)	10/12/00	63	25	5.45	4.63	Good
				9/11/00	60	24	5.59	4.73	Good
				10/25/96	49	20	5.32	4.53	Good
				7/27/95	67	21	5.78	4.90	Good-Fair
				7/10/91	70	25	5.82	4.81	Good
				8/6/90	72	23	5.94	4.73	Good-Fair
				7/13/88	79	21	6.08	5.19	Good-Fair
				7/11/88	---	14	---	5.39	Good-Fair
				7/11/86	81	20	6.39	5.09	Good-Fair
				7/11/86	65	18	6.40	5.19	Good-Fair
				7/22/85	63	18	6.26	5.24	Good-Fair
				9/19/84	60	21	5.90	5.08	Good-Fair
				7/14/83	58	13	6.24	5.02	Good-Fair
Neuse R	SR 1201	Johnston	27-(36)	10/13/00	61	23	5.56	4.25	Good
				8/3/95	60	25	4.99	4.00	Good
				7/10/91	64	24	5.61	4.53	Good
UT Neuse R	SR 1903	Johnston	27-(36)	9/15/92	65	18	5.23	4.73	Good
Marks Cr	SR 1714	Johnston	27-38	9/8/00	---	19	---	5.12	Good-Fair

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				7/27/95	---	18	---	5.01	Good-Fair
				7/15/91	---	17	---	4.47	Good-Fair
Mill Cr	NC 70A	Johnston	27-40	9/15/92	46	7	7.31	6.58	NR
Swift Cr	Old Raleigh Rd	Wake	27-43-(1)	3/16/89	---	1	---	7.78	NR
Swift Cr	ab Williams Cr	Wake	27-43-(1)	5/19/00	43	7	6.61	6.59	NR
Swift Cr	ab US 1	Wake	27-43-(1)	7/5/00	---	5	---	6.72	Poor
				5/10/00	32	8	6.99	6.78	NR
				7/24/95	---	4	---	7.41	Poor
				7/9/91	---	10	---	6.27	Fair
				3/2/89	---	9	---	6.34	Fair
Swift Cr	SR 1300	Wake	27-43-(1)	5/3/00	63	9	7.36	6.33	Poor
				3/2/89	---	14	---	6.18	Fair
Swift Cr	SR 1152	Wake	27-43-(1)	7/5/00	---	9	---	6.80	Fair
				4/24/00	56	12	6.84	6.41	Fair
				7/24/95	---	7	---	6.34	Fair
				3/6/89	---	9	---	6.17	Fair
UT Swift Cr B	Radio Tower	Wake	27-43-(1)	3/6/89	---	13	---	2.77	NR
UT Swift Cr	nr Swift Cr	Wake	27-43-(1)	3/6/89	---	5	---	4.67	NR
UT Swift Cr A	T4	Wake	27-43-(1)	3/2/89	---	13	---	3.07	NR
UT Swift Cr	Hemlock Bluff	Wake	27-43-(1)	3/2/89	---	23	---	2.91	NR
UT Swift Cr	Old Stage cont	Wake	27-43-(1)	6/13/97	---	16	---	4.12	NR
UT Swift Cr	Old Stage Dev	Wake	27-43-(1)	6/13/97	---	6	---	5.94	NR
Williams Cr	ab US 64	Wake	27-43-2	5/19/00	39	6	7.29	6.69	NR
Williams Cr	Old Raleigh	Wake	27-43-2	3/6/89	---	4	---	6.75	NR
Speight Cr	SR 1345	Wake	27-43-3.5	5/2/00	55	6	6.75	5.51	NR
Swift Cr	NC 42	Johnston	27-43-(8)	7/12/91	---	8	---	5.61	Fair
				7/11/86	53	8	6.75	5.36	Fair
Swift Cr	SR 1525	Johnston	27-43-(8)	7/27/95	---	14	---	5.55	Good-Fair
Swift Cr	SR 1555	Johnston	27-43-(8)	10/2/00	---	16	---	5.76	Good-Fair
Swift Cr	SR 1501	Johnston	27-43-(8)	10/2/00	67	21	5.52	4.83	Good
				7/27/95	58	18	5.60	5.08	Good
				8/19/91	76	19	5.74	5.00	Good-Fair
UT Swift Cr	ab MHP	Johnston	27-43-(8)	3/24/87	---	15	---	4.09	Good-Fair
UT Swift Cr	be MHP	Johnston	27-43-(8)	3/24/87	---	16	---	4.06	Good-Fair
Little Cr	SR 1562	Johnston	27-43-12	9/8/00	---	11	---	6.20	Fair
				7/27/95	---	10	---	5.59	Fair
				8/19/91	---	13	---	5.48	Fair
Moccasin/Racoon Swp	SR 1007	Johnston	27-51	7/11/91	---	7	---	5.96	Fair
03-04-03									
UT Middle Cr	Lufkin Rd.	Wake	27-43-15-(1)	2/6/87	29	2	8.09	2.66	Poor
				2/6/87	27	1	8.90	7.78	Poor
Middle Cr	SR 2739	Wake	27-43-15-(1)	6/2/86	82	12	6.51	5.05	Fair
	Tallicud Rd	Wake	27-43-15-(1)	5/30/86	72	10	6.93	5.89	Fair
Middle Cr	SR 1301	Wake	27-43-15-(1)	9/5/90	81	16	6.26	4.46	Good-Fair
				5/29/86	65	9	7.07	5.70	Fair
Basal Cr	NC 55	Wake	27-43-15-3	5/29/86	95	16	6.08	4.65	Good-Fair
Middle Cr	SR 1375	Wake	27-43-15-(4)	8/21/00	42	13	6.01	5.78	Good-Fair
				8/11/95	39	10	6.01	5.94	Fair
				7/25/91	55	11	6.25	5.77	Good-Fair
				5/30/86	67	14	6.82	4.95	Fair
Middle Cr	US 401	Wake	27-43-15-(4)	6/2/86	96	26	6.22	4.91	Good
Middle Cr	NC 50	Johnston	27-43-15-(4)	8/21/00	49	18	5.49	4.88	Good-Fair
				8/9/95	46	14	5.78	4.68	Good-Fair
				7/24/91	82	17	5.99	4.95	Good-Fair
				7/13/90	84	18	6.16	4.72	Good-Fair
				7/10/87	---	14	---	5.06	Good-Fair
				7/7/87	80	17	6.61	4.83	Fair

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Terrible Cr	SR 1507	Johnston	27-43-15-8-(2)	6/3/86	73	13	6.58	5.26	Fair
03-04-04									
Black Cr	SR 1330	Johnston	27-45-(2)	8/9/95	47	7	6.56	5.47	Fair
				7/24/91	62	10	7.11	5.86	Fair
Mill Cr	SR 1662	Johnston	27-52	7/11/83	50	19	6.30	4.93	Good-Fair
Mill Cr	SR 1009	Johnston	27-52	8/24/00	---	12	---	5.29	Good-Fair
				8/8/95	---	12	---	4.82	Good-Fair
				8/19/91	---	13	---	5.07	Good-Fair
Hannah Cr	SR 1200	Johnston	27-52-6	7/11/83	58	11	7.55	5.72	Fair
Hannah Cr	SR 1009	Johnston	27-52-6	8/15/00	---	11	---	5.68	Fair
				8/8/95	---	13	---	5.33	Good-Fair
				8/19/91	---	8	---	5.27	Fair
Stone Cr	SR 1138	Johnston	27-52-5	8/9/95	---	8	---	5.46	Good-Fair
03-04-05									
Neuse R	NC 58	Lenoir	27-(56)	10/17/00	62	22	5.42	4.17	Good
				8/7/95	58	20	5.08	4.18	Good
				7/19/91	60	21	5.21	4.75	Good
				7/10/90	70	24	5.38	4.51	Good
				7/11/88	71	24	5.66	4.97	Good
				7/7/87	76	23	5.85	4.84	Good-Fair
				6/26/86	74	23	6.28	5.17	Good-Fair
				9/3/85	74	22	5.83	4.73	Good-Fair
				9/4/84	63	20	5.57	4.46	Good
				7/25/83	60	18	5.65	4.90	Good
Stoney Cr	Ashe St park	Wayne	27-62	6/15/00	52	5	7.19	6	Fair
Stoney Cr	SR 1920	Wayne	27-62	8/22/00	---	8	---	5.60	Fair
				6/15/00	50	5	6.98	5.73	Fair
				8/8/95	---	4	---	5.96	Poor
Bear Cr	SR 1731	Wayne	27-572	10/13/00	63	21	5.25	4.24	Good
Bear Cr	SR 1311	Lenoir	27-72	8/22/00	---	13	---	5.24	Good-Fair
				8/7/95	---	7	---	5.40	Fair
				7/10/91	---	14	---	4.92	Good-Fair
Falling Cr	SR 1546	Lenoir	27-77	1/7/97	---	8	---	5.31	Poor
Falling Cr	SR 1519	Lenoir	27-77	10/5/00	---	11	---	5.44	Fair
Falling Cr	SR 1001	Lenoir	27-77	11/18/99	---	13	---	5.61	Good-Fair
Falling Cr	SR 1340	Lenoir	27-77	7/10/91	---	14	---	4.55	Good-Fair
				8/7/95	---	12	---	5.45	Good-Fair
Southwest Cr	SR 1804	Lenoir	27-80	8/7/95	---	6	---	6.03	Not Rated
Briery Run	SR 1732	Lenoir	27-81-8	7/10/91	---	6	---	6.03	Not Rated
				11/2/93	23	1	8.82	6.37	Not Rated
Stonyton Cr	SR 1742	Lenoir	27-81-8	11/2/93	25	1	7.52	5.50	Not Rated
03-04-06									
Little R	NC 96	Wake	27-57-(1)	08/15/00	---	20	---	5.09	Good-Fair
				08/24/95	94	21	6.48	4.94	Good-Fair
				01/27/95	70	20	6.45	4.84	Good-Fair
				08/14/91	81	21	6.35	5.13	Good-Fair
				11/06/84	98	25	6.12	4.64	Good-Fair
				09/21/84	92	21	5.98	4.94	Good-Fair
				08/02/84	96	18	5.87	4.62	Good-Fair
				06/22/84	101	23	6.00	4.77	Good-Fair
				05/15/84	107	26	5.91	4.49	Good
				04/13/84	104	32	5.62	4.31	Good
				03/14/84	102	30	5.74	4.42	Good
				02/10/84	89	24	5.65	4.67	Good
				01/23/84	80	28	5.74	5.03	Good

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				12/16/83	107	28	6.19	5.40	Good-Fair
				11/22/83	100	25	6.33	5.15	Good-Fair
				10/14/83	96	21	6.10	4.89	Good-Fair
				09/07/83	89	19	6.43	4.94	Good-Fair
Little R	SR 2224	Wake	27-57-(1)	01/27/95	75	15	6.19	5.01	Good-Fair
Little R	SR 1722	Johnston	27-57-(8.5)	07/23/91	77	19	6.14	4.72	Good-Fair
Little R	SR 2130	Johnston	27-57-(8.5)	08/15/00	66	19	5.51	4.68	Good
				08/24/95	75	16	5.98	4.85	Good-Fair
				07/23/91	75	24	5.39	4.73	Good
				03/24/88	---	37	---	3.55	Excellent
Little R	SR 2335	Johnston	27-57-(8.5)	03/23/88	---	16	---	5.17	Good-Fair
Little R	SR 2320	Johnston	27-57-(8.5)	07/11/89	64	17	5.73	5.13	Good-Fair
				07/08/87	83	23	5.77	5.01	Good-Fair
				09/03/85	78	13	6.51	5.35	Fair
				07/11/83	63	22	5.31	4.09	Good
Buffalo Cr	SR 1007	Wake	27-57-16-(2)	08/06/91	---	2	---	7.63	Poor
Buffalo Cr	SR 1941	Johnston	27-57-16-(3)	08/15/00	73	15	6.27	5.47	Good-Fair
				07/25/91	---	9	---	4.62	Fair
Mill Cr	above Kenly WWTP	Johnston	27-57-18	03/23/88	41	8	6.89	4.67	Not Rated
Mill Cr	below Kenly WWTP	Johnston	27-57-18	03/23/88	23	1	8.60	5.81	Not Rated
				07/23/91	56	5	7.30	6.90	Not Rated
Little R	NC 581	Wayne	27-57-(20.2)	08/24/00	60	17	5.56	4.48	Good-Fair
				08/24/95	69	17	6.11	4.33	Good-Fair
				07/24/91	78	25	5.51	4.58	Good
Little R	off SR 1326	Wayne	27-57-(21.1)	07/06/94	84	20	6.49	4.93	Good-Fair
Little R	above US 70	Wayne	27-57-(21.2)	07/xx/94	69	21	---	---	Good
Little R	US 70	Wayne	27-57-(21.2)	07/06/94	---	14	---	4.81	Good-Fair
03-04-07									
Moccasin Cr	NC 231	Nash	27-86-2	09/22/00	---	17	---	5.37	Good-Fair
				08/15/00	---	14	---	6.04	Good-Fair
				09/20/96	---	13	---	5.21	Fair
				08/23/95	---	16	---	5.38	Good-Fair
				07/25/91	---	17	---	4.97	Good-Fair
Moccasin Cr	SR 1131	Nash	27-86-2	05/29/91	64	16	6.01	5.32	Good-Fair
				05/10/88	79	25	5.81	5.15	Good
Little Cr	NC 39	Wake	27-86-2-4	07/23/91	46	2	7.92	7.64	Poor
Bull Br	above SR 2110	Johnston	27-86-2-6.5	10/03/00	43	17	4.96	4.21	Not Rated
Turkey Cr	SR 1109	Nash	27-86-3-(1)	08/15/00	---	11	---	6.26	Fair
Turkey Cr	SR 1101	Nash	27-86-3-(1)	05/29/91	74	14	6.67	6.10	Fair
				05/10/88	81	15	6.38	5.65	Good-Fair
Turkey Cr	SR 1128	Wilson	27-86-3-(1)	08/23/95	---	18	---	4.84	Good-Fair
				07/25/91	13	13	5.13	5.13	Good-Fair
Beaverdam Cr	SR 1111	Nash	27-86-3-8	10/03/00	56	8	6.52	6.60	Fair
				07/22/91	84	18	6.00	5.00	Good-Fair
Beaverdam Cr	SR 1112	Nash	27-86-3-8	05/29/91	75	11	6.54	5.66	Fair
				05/10/88	76	17	6.27	5.14	Good-Fair
Bloomery Swp	NC 42	Wilson	27-86-6-(3)	09/20/96	---	4	---	5.95	Poor
		Wilson		08/28/96	60	8	6.40	5.87	Good-Fair
Contentnea Cr	NC 42	Wilson	27-86-(1)	08/29/96	67	15	6	5.65	Good-Fair
Contentnea Cr	SR 1606	Wilson	27-86-(7)	08/28/96	62	9	6.96	6.07	Fair
Contentnea Cr	NC 222	Wilson	27-86-(7)	08/29/00	78	20	6.39	5.65	Good-Fair
Contentnea Cr	NC 58	Wilson	27-86-(7)	08/23/95	64	11	7.07	6.36	Fair
				07/22/91	78	19	6.28	5.38	Good-Fair
				07/09/90	54	13	6.95	5.43	Fair
				07/11/88	60	7	7.09	6.14	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
				07/10/86	79	15	6.56	5.27	Good-Fair
Contentnea Cr	SR 1800	Pitt	27-86-(7)	10/17/00	75	19	6.35	5.19	Good-Fair
				08/22/95	69	16	6.51	5.06	Good-Fair
				07/22/91	77	25	5.69	4.75	Good
				07/07/87	89	24	6.37	5.11	Good
				07/22/85	86	20	6.54	5.14	Good-Fair
				07/26/83	70	20	6.13	5.02	Good-Fair
Great Swp	SR 1634	Wilson	27-86-9-3	08/28/96	60	4	7.23	6.01	Poor
Toisnot Swp	US 264	Wilson	27-86-11-(5)	10/05/00	---	9	---	5.80	Fair
Toisnot Swp	NC 222	Wilson	27-86-11-(5)	08/29/96	68	5	6.71	6.77	Fair
				07/24/91	---	11	---	5.82	Fair
Nanhunta Swp	SR 1058	Greene	27-86-14	08/16/00	72	9	6.54	5.43	Fair
				11/18/99	---	6	---	5.83	Fair
				08/22/95	57	6	6.40	5.76	Fair
				07/09/90	68	16	6.54	5.24	Good-Fair
				05/02/90	66	13	6.34	5.13	Good-Fair
				07/11/88	65	10	6.70	4.99	Fair
Wheat Swp Cr	NC 58	Lenoir	27-86-24	02/22/00	48	6	7.54	6.03	Not Rated
	SR 1091	Greene	27-86-24	02/25/92	82	7	7.35	6.58	Not Rated
				07/24/91	---	2	---	6.28	Not Rated
L Contentnea Cr	NC 264A	Pitt	27-86-26	10/05/00	---	6	---	6.08	Fair
03-04-08									
Neuse R	SR 1423	Craven	27-(85)	07/21/95	68	10	6.98	5.86	Good-Fair
				07/14/89	73	18	6.64	5.51	Good-Fair
				07/07/87	66	15	7.16	5.81	Good-Fair
				07/23/85	64	12	7.50	6.73	Fair
				07/12/83	52	9	7.19	5.48	Good-Fair
Core Cr	NC 55	Craven	27-90	08/16/00	61	10	6.92	6.47	Fair
				08/21/95	44	3	7.52	7.53	Poor
				07/23/91	---	8	---	6.26	Fair
Flat Swp	NC 55	Craven	27-90-3	02/23/00	55	8	7.85	6.91	Not Rated
Rollover Cr	SR 1224	Craven	27-98-2	05/25/89	49	5	6.94	5.48	Not Rated
				05/03/88	29	9	6.40	5.36	Not Rated
Beaverdam Br	SR 1244	Craven	27-98-2.2	05/25/89	59	4	7.22	5.18	Not Rated
				05/03/88	36	6	7.09	6.06	Not Rated
Caswell Br	off SR 1243	Craven	27-98-2.6	05/25/89	52	10	6.32	4.58	Not Rated
				05/03/88	35	11	6.34	5.35	Not Rated
03-04-09									
Swift Cr	NC 102	Pitt	27-97-(0.5)	08/22/95	---	5	---	5.88	Poor
				07/24/91	---	8	---	6.04	Fair
Swift Cr	NC 118	Craven	27-97-(0.5)	10/12/00	78	13	6.82	6.19	Fair
				08/21/95	59	6	7.04	6.01	Fair
				07/23/91	---	12	---	5.95	Good-Fair
Swift Cr	SR 1478	Craven	27-97-(0.5)	07/07/87	65	11	7.29	5.78	Not Rated
				07/22/85	55	2	7.88	6.18	Not Rated
				07/12/83	45	2	7.99	6.03	Not Rated
Fork Swp	SR 1711	Pitt	27-97-4	08/14/95	46	2	7.39	5.99	Not Rated
				03/14/95	42	2	7.53	7	Not Rated
Clayroot Swp	SR 1941	Pitt	27-97-5	08/16/00	---	3	---	5.89	Poor
				02/24/00	56	8	7.03	5.45	Fair
				08/21/95	---	3	---	5.88	Poor
				07/23/91	---	9	---	5.57	Fair
Creeping Swp	NC 102	Pitt	27-97-5-3	02/24/00	30	2	6.87	7.39	Not Rated
Palmetto Swp	NC 43	Craven	27-97-5.3	02/24/00	60	8	7.09	6.44	Not Rated
L Swift Cr	SR 1623	Craven	27-97-8	03/14/95	25	2	7.66	7.07	Not Rated
Fisher Swp	SR 1621	Craven	27-97-8-3	02/25/97	44	4	7.14	7.27	Not Rated
				03/14/95	48	4	6.97	6.24	Not Rated

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
				08/14/95	35	2	7.25	6.82	Not Rated
03-04-10									
Freshwater									
Mill Br	nr Mouth	Craven	27-99.5	08/22/95	35	5	8.30	---	Not Rated
W Pr Brices Cr	SR 1101	Craven	27-101-40-(1)	04/22/86	53	13	6.12	4.47	Not Rated
Upper Broad Cr	SR 1612	Craven	27-106-(1)	03/15/95	34	3	6.89	6.72	Not Rated
Upper Broad Cr	NC 55	Craven	27-106-(1)	02/25/00	35	4	7.19	7.33	Not Rated
Deep Run	NC 55	Pamlico	27-106-6	04/28/95	29	5	7.06	6.54	Not Rated
				03/14/95	24	5	6.14	5.78	Not Rated
Goose Cr (Black Cr)	SR 1100	Pamlico	27-107-(1)	02/23/99	30	3	6.75	6.57	Not Rated
		Pamlico		03/06/98	21	2	5.98	4.95	Not Rated
		Pamlico		02/25/97	27	0	7.26	---	Not Rated
		Pamlico		03/21/95	27	4	6.41	5.89	Not Rated
SW Pr Slocum Cr	SR 1746	Craven	27-112-1	02/25/00	48	13	6.50	4.95	Not Rated
Fork Run	SR 1005	Pamlico	27-125-2	03/21/95	26	1	8.06	---	Not Rated
Estuarine									
Neuse R	New Bern	Craven	27-96	08/22/95	25	1	2.2	---	Not Rated
Lawson Cr	at Mouth	Craven	27-101-42	08/22/95	10*	---	1.4	---	Not Rated
Upper Slocum Cr	at Turkey Gut	Craven	27-112	02/09/92	10*	---	1.2*	---	Not Rated
Slocum Cr	at Mouth	Craven	27-112	08/23/95	14	---	2.4	---	Not Rated
E Pr Slocum Cr	below Havelock WWTP	Craven	27-112-2	02/09/92	3*	---	1.3*	---	Not Rated
Neuse R	at Hancock Cr	Craven	27-(115)	08/23/95	19	---	2.3	---	Not Rated
Hancock Cr	E of Cherry Pt	Craven	27-115	02/09/92	12*	---	1.5*	---	Not Rated
Clubfoot Cr	nr Mouth	Craven	27-123	08/23/95	18	---	2.1	---	Not Rated
Neuse R	Pierson Pt	Pamlico	27-(129)	06/03/98	31	---	2.4	---	Not Rated
Neuse R	NC 55 Bridge	Pamlico	27-(129)	07/12/84	29	---	1.8	---	Not Rated
Neuse R	Windmill Pt	Pamlico	27-(129)	06/03/98	27	---	2.4	---	Not Rated
Greens Cr	above Kershaw Cr	Pamlico	27-129-(1)	02/09/92	16*	---	1.3*	---	Not Rated
Greens Cr	at Kershaw Cr	Pamlico	27-129-(2)	06/03/98	42	---	2.0	---	Not Rated
			27-129-(2)	08/22/95	10*	---	1.9*	---	Not Rated
Greens Cr	NC 55	Pamlico	27-129-(2)	06/03/98	37	---	2.0	---	Not Rated
Greens Cr	nr Yacht Club	Pamlico	27-129-(2)	02/09/92	10*	---	1.3*	---	Not Rated
				06/03/98	32	---	1.9		Not Rated
Oriental Harbor	at Docks	Pamlico	27-129-8	02/09/92	7	---	1.2	---	Not Rated
Oriental Harbor	at Fulcher's Seafood	Pamlico	27-129-8	08/22/95	9	---	1.3	---	Not Rated
Oriental Harbor	Boathouse	Pamlico	27-129-8	06/03/98	25	---	1.4	---	Not Rated
South R	at mouth	Carteret	27-135	06/02/94	31	---	2.0	---	Not Rated
W Fk South R	Open Ground Farms	Carteret	27-135-1	06/02/94	33	---	2.0	---	Not Rated
Southwest Cr	Open Ground Farms	Carteret	27-135-9	06/02/94	34	---	2.0	---	Not Rated
Eastman Cr	at WIRO site 15	Carteret	27-135-10	06/02/94	19	---	1.5	---	Not Rated
Eastman Cr	nr headwaters	Carteret	27-135-10	06/02/94	31	---	1.9	---	Not Rated
Mulberry Cr	at Island	Carteret	27-135-16	06/02/94	31	---	2.0	---	Not Rated
Hardy Cr	Upstream	Carteret	27-135-18	06/02/94	31	---	1.6	---	Not Rated
Hardy Cr	at Mouth	Carteret	27-135-18	06/02/94	31	---	2.3	---	Not Rated
03-04-11									
Trent R	SR 1153	Jones	27-101-(1)	02/25/00	57	7	7.36	5.89	Not Rated
Trent R	near Comfort	Jones	27-101-(1)	05/09/00	50	7	6.82	5.97	Fair
Trent R	NC 58	Jones	27-101-(1)	08/21/95	71	12	6.38	5.15	Good-Fair
				11/01/90	61	13	6.29	3.50	Good-Fair
				06/27/90	69	12	6.80	5.28	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
				06/26/89	72	19	6.48	4.58	Good-Fair
				05/02/90	70	19	5.94	4.41	Good-Fair
				06/23/87	86	22	6.48	4.50	Good-Fair
				06/25/86	79	20	6.46	4.96	Good-Fair
				09/03/85	76	13	6.07	4.66	Good-Fair
				07/11/83	64	12	6.29	5.17	Good-Fair
				08/11/82	77	19	5.37	3.95	Good
Trent R	NC 17, Pollocksville	Jones	27-101-(1)	03/20/95	63	5	7.26	5.28	Not Rated
Beaverdam Swp	NC 258	Lenoir	27-101-3	07/22/91	---	6	---	5.68	Not Rated
Tuckahoe Swp	SR 1142	Jones	27-101-5-1	02/23/00	69	10	6.76	5.81	Not Rated
Tuckahoe Swp	SR 1105	Lenoir	27-101-5-1	08/12/92	23	2	7.07	5.88	Not Rated
				05/13/92	45	7	6.90	5.36	Not Rated
				02/24/92	61	10	6.57	5.18	Not Rated
Reedy Br	NC 41	Jones	27-101-7	07/22/91	---	6	---	5.02	Good-Fair
Cypress Cr	SR 1134	Jones	27-101-8	08/11/92	29	0	8.49	---	Not Rated
				05/15/92	51	3	7.26	5.37	Not Rated
				02/24/92	49	6	6.96	6.48	Not Rated
L Chinquapin Cr	SR 1131	Jones	27-101-11	07/22/91	---	7	---	5.79	Not Rated
Beaver Cr	SR 1315 or 1316	Jones	27-101-15	03/02/00	49	8	7.65	6.33	Not Rated
				07/23/91	---	9	---	5.48	Fair
Musselshell Cr	SR 1320	Jones	27-101-17	02/24/00	26	2	7.31	6.05	Not Rated
				08/15/95	19	1	8.32	6.22	Not Rated
				03/15/95	15	1	7.64	7.41	Not Rated
Crooked Run	SR 1123	Jones	27-101-18	03/02/00	29	1	6.59	6.37	Not Rated
Beaverdam Cr	SR 1002	Jones	27-101-21	02/24/00	52	8	6.77	5.38	Not Rated
				02/25/97	43	7	6.39	5.49	Not Rated
				03/20/95	44	11	6.02	4.50	Not Rated
Mill Run	NC 58	Jones	27-101-23	07/22/91	---	19	---	4.12	Good
UT Mill Run	SR 1119	Jones	27-101-23	07/22/91	---	13	---	4.60	Good
Island Cr	SR 1004	Jones	27-101-33	11/17/99	20	20	4.92	4.92	Not Rated
				02/22/99	67	20	5.76	4.41	Not Rated
				08/15/95	63	22	6.04	4.46	Not Rated
				03/15/95	60	18	6.47	5.70	Not Rated
				07/22/91	---	15	---	4.15	Good
				12/13/84	82	25	5.83	4.13	Good
Wilson Cr	US 17	Craven	27-101-37	04/28/95	45	4	7.55	7.04	Not Rated
03-04-12									
Thoroughfare Swp	SR 1120	Wayne	27-54-5-(1.5)	2/25/92	72	9	7.60	7.07	
				7/11/91	1	1	7.41	7.41	Not Rated
Neuse R	SR 1915	Wayne	27-(56)	7/9/90	71	22	5.48	4.54	Good
				7/11/88	73	23	5.91	4.90	Good-Fair
				7/10/86	81	26	6.03	4.79	Good
				9/4/84	57	17	6.31	5.22	Good-Fair
Neuse R	US 117	Wayne	27-(56)	8/29/00	66	23	6.06	4.85	Good-Fair
				8/8/95	53	16	5.47	4.64	Good-Fair
				7/19/91	77	29	5.36	4.57	Good

* From dredge samples only, not directly comparable to sweeps used for later estuarine collections.

[1] For estuarine waters, the Estuarine Biotic Index (EBI) is applied.

Fish Community Sampling Methods and Criteria

Wadeable Stream Sampling Methods

At each sample site, a 600-foot section of stream was selected and measured. The fish in the delineated stretch of stream were then collected using two backpack electrofishing units and two persons netting the stunned fish. After collection, all readily identifiable fish were examined for sores, lesions, fin damage or skeletal anomalies, measured (total length to the nearest 1 mm), and then released. Those fish that were not readily identifiable were preserved and returned to the laboratory for identification, examination and total length measurement. Detailed descriptions of the sampling methods may be found in NCDENR (2001) or electronically at http://www.esb.enr.state.nc.us/BAUwww/IBI%20Methods%202001.pdf.

Nonwadeable Small Boat Sampling Methods

At each site, a 400 m section of stream is measured off into 100 m segments. There are four segments along each shoreline and two segments down the center of the stream, for a total of 10 segments. For each of the 100 m segments, fish are collected and processed the same as those collected using the wadeable stream method. The last collection technique used at each location is a timed catfish collection effort outside the measured stream reach. Data from each of the 100 meter segments and the catfish sampling are currently treated as a separate subsample.

NCIBI Analysis

The assessment of biological integrity using the North Carolina Index of Biotic Integrity (NCIBI) is provided by the cumulative assessment of 12 parameters or metrics. The values provided by the metrics are converted into scores on a 1, 3 or 5 scale. A score of 5 represents conditions which would be expected for undisturbed reference streams in the specific river basin or ecoregion, while a score of 1 indicates that the conditions deviate greatly from those expected in undisturbed streams of the region. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score. Finally, the score (an even number between 12 and 60) is then used to determine the ecological integrity class, as proposed by Karr (1981), of the stream from which the sample was collected (Table A-II-2).

The NCIBI has recently been revised (NCDENR, 2001). Since the mid-to-late 1990s, the focus of using and applying the NCIBI has been restricted to wadeable streams that can be sampled by a crew of four persons. The bioclassifications and criteria have also be recalibrated against regional reference site data (Biological Assessment Unit Memorandum 20001017) (Tables A-II-3 and A-II-4).

Table A-II-2 Original Scores, Integrity Classes and Class Attributes for Evaluating Fish Communities using Karr's 1981 Index of Biotic Integrity

NCIBI Scores	Integrity Classes	Class Attributes[1]
>58	Excellent	Comparable to the best situations without human disturbance. All regionally expected species for the habitat and stream size, including the most intolerant forms are present, along with a full array of size classes and a balanced trophic structure.
48-52	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant species; some species are present with less than optimal abundances or size distributions; and the trophic structure shows some signs of stress.
40-44	Fair	Signs of additional deterioration include the loss of intolerant species, fewer species and a highly skewed trophic structure.
28-34	Poor	Dominated by omnivores, tolerant species and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; and diseased fish often present.
<22	Very Poor	Few fish present, mostly introduced or tolerant species; and disease fin damage and other anomalies are regular.
-----	No fish	Repeated sampling finds no fish.

[1] Over-lapping classes share attributes with classes greater than and less than the respective IBI score.

Table A-II-3 Revised Scores and Classes for Evaluating the Fish Community of a Wadeable Stream Using the North Carolina Index of Biotic Integrity in the Piedmont Portion of the Cape Fear, Neuse, Roanoke and Tar River Basins

NCIBI Scores	NCIBI Classes
>54	Excellent
46 -52	Good
40-44	Good-Fair
34-38	Fair
≤32	Poor

Criteria and ratings applicable only to wadeable streams in the piedmont region of the Neuse River basin are the same as those for the Cape Fear, Roanoke and Tar River basins. The definition of the piedmont for these four river basins is based map of North Carolina watersheds by Fels (1997). Specifically for the Neuse River basin, the piedmont encompasses the entire basin above Smithfield and Wilson, NC, except for the south and southwest portions of Johnston County and the eastern two-thirds of Wilson County.

Metrics and ratings should not be applied to nonwadeable streams and all streams in the coastal plain region of each of these basins. These streams are currently not rated.

References

Fels, J. 1997. *North Carolina Watersheds Map*. North Carolina State University Cooperative Extension Service. Raleigh, NC.

Karr, J. R. 1981. *Assessment of Biotic Integrity Using Fish Communities*. Fisheries. 6: 21-27.

NCDENR. 2001. *Stream Fish Community Assessment and Fish Tissue*. *Standard Operating Procedure Biological Monitoring*. Biological Assessment Unit. Environmental Sciences Branch. Water Quality Section. Division of Water Quality. North Carolina Department of Environment and Natural Resources. Raleigh, NC.

Table A-II-4 Scoring Criteria for the NCIBI for Wadeable Streams in the Outer Piedmont of the Cape Fear, Neuse, Roanoke and Tar River Basins Ranging Between 3.1 and 328 mi^2

No.	Metric		Score
1	**No. of species**		
	≥ 16 species		5
	10-15 species		3
	< 10 species		1
2	**No. of fish**		
	≥ 225 fish		5
	150-224 fish		3
	< 150 fish		1
3	**No. of species of darters**		
	Cape Fear	Neuse, Roanoke and Tar	
	≥ 2 species	≥ 3 species	5
	1 species	1 or 2 species	3
	0 species	0 species	1
4	**No. of species of sunfish**		
	≥ 4 species		5
	3 species		3
	0, 1, or 2 species		1
5	**No. of species of suckers**		
	Cape Fear	Neuse, Roanoke and Tar	
	≥ 2 species	≥ 3 species	5
	1 species	1 or 2 species	3
	0 species	0 species	1
6	**No. of intolerant species**		
	Cape Fear	Neuse, Roanoke and Tar	
	≥ 1 species	≥ 3 species	5
	no middle score	1 or 2 species	3
	0 species	0 species	1
7	**Percentage of tolerant individuals**		
	≤ 35%		5
	36-50%		3
	> 50%		1
8	**Percentage of omnivorous and herbivorous individuals**		
	10-35%		5
	36-50%		3
	> 50%		1
	< 10%		1
9	**Percentage of insectivorous individuals**		
	65-90%		5
	45-64%		3
	< 45%		1
	> 90%		1
10	**Percentage of piscivorous individuals**		
	≥ 1.4-15%		5
	0.4-1.3%		3
	< 0.4%		1
	> 15%		1
11	**Percentage of diseased fish (DELT = diseased, fin erosion, lesions and tumors)**		
	≤ 1.75%		5
	1.76-2.75%		3
	> 2.75%		1
12	**Percentage of species with multiple age groups**		
	≥ 50% of all species have multiple age groups		5
	35-49% all species have multiple age groups		3
	< 35% all species have multiple age groups		1

Table A-II-5 Fish Community Structure Data Collected in the Neuse River Basin, 1990 – 2000 (Current basinwide sites are **bolded**.)

Subbasin/ Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
03-04-01						
Eno R	**SR 1336**	**Orange**	27-2-1	04/04/00	54	Excellent
Eno R	SR 1569	Orange	27-2-(10)	08/03/98	60	Excellent
Eno R	SR 1003	Durham	27-2-(10)	08/03/98	60	Excellent
S Fk Little R	**SR 1461**	**Durham**	27-2-21-2	04/07/00	60	Excellent
N Fk Little R	**SR 1461**	**Durham**	27-2-21-3	04/07/00	48	Good
N Flat R	**SR 1715**	**Person**	27-3-2	04/06/00	56	Excellent
				06/10/99	50	Good
S Flat R	**NC 157**	**Person**	27-3-3	04/06/00	48	Good
Deep Cr	**SR 1734**	**Person**	27-3-4	04/06/00	56	Excellent
				05/16/95	56	Excellent
				07/19/90	60	Excellent
Ellerbe Cr	SR 1709	Durham	27-5-(0.7)	04/11/95	26	Poor
Ellerbe Cr	SR 1636	Durham	27-5-(2)	04/11/95	28	Poor
Smith Cr	**SR 1710**	**Granville**	27-12-2-(2)	04/04/00	44	Good-Fair
				04/11/95	48	Good
Newlight Cr	SR 1911	Wake	27-13-2	05/16/95	42	Good-Fair
Upper Barton Cr	**NC 50**	**Wake**	27-15-(2)	04/03/00	52	Good
				05/18/95	48	Good
03-04-02						
Richland Cr	US 1	Wake	27-21	04/12/95	52	Good
Smith Cr	**SR 2045**	**Wake**	27-23-(2)	04/03/00	56	Excellent
				05/18/95	42	Good-Fair
Crabtree Cr	**SR 1664**	**Wake**	27-33-10	06/22/00	54	Excellent
Crabtree Cr	US 1/401	Wake	27-33-10	04/12/95	50	Good
Walnut Cr	SR 1348	Wake	27-34-(1.7)	04/03/95	32	Poor
				06/25/91	44	Good-Fair
Walnut Cr	SR 1564	Wake	27-34-(4)	06/25/91	48	Good
Walnut Cr	SR 2542	Wake	27-34-(4)	04/04/95	32	Poor
Walnut Cr	**SR 2544**	**Wake**	27-34-(4)	04/11/00	44	Good-Fair
				04/04/95	34	Fair
				06/25/91	48	Good
Marks Cr	**SR 1714**	**Johnston**	27-38	04/05/00	54	Excellent
				05/18/95	50	Good
				09/23/91	46	Good
Swift Cr	**SR 1152**	**Wake**	27-43-(1)	04/24/00	34	Fair
				04/24/00	40	Good-Fair
				10/15/99	34	Fair
				10/15/99	40	Good-Fair
				08/20/99	38	Fair
				08/20/99	38	Fair
				06/25/99	38	Fair
				06/25/99	40	Good-Fair
				04/28/99	38	Fair
				04/28/99	42	Good-Fair
				04/27/95	28	Poor
Swift Cr	SR 1525	Johnston	27-43-(8)	04/27/95	34	Fair
				10/02/91	50	Good

Subbasin/ Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
03-04-03						
Middle Cr	SR 1404	Wake	27-43-15-(4)	04/27/95	52	Good
				06/04/91	48	Good
Middle Cr	SR 1531	Johnston	27-43-15-(4)	06/04/91	34	Fair
Middle Cr	NC 50	Johnston	27-43-15-(4)	06/01/95	52	Good
Middle Cr	SR 1504	Johnston	27-43-15-(4)	06/01/95	54	Excellent
				06/04/91	48	Good
03-04-04						
Black Cr	SR 1330	Johnston	27-45-(2)	05/25/95	---	Not rated
Stone Cr	SR 1138	Johnston	27-52-5	05/25/95	---	Not rated
				10/02/91	---	Not rated
Hannah Cr	SR 1162	Johnston	27-52-6	05/25/95	---	Not rated
				10/02/91	---	Not rated
03-04-05						
Stoney Cr	**SR 1920**	**Wayne**	27-62	04/17/00	---	Not rated
				07/20/95	---	Not rated
Bear Cr	**SR 1311**	**Lenoir**	27-72	06/14/00	---	Not rated
				10/28/96	---	Not rated
				05/22/95	---	Not rated
Falling Cr	off SR 1546	Lenoir	27-77	10/28/96	---	Not rated
Falling Cr	**SR 1340**	**Lenoir**	27-77	06/14/00	---	Not rated
				05/22/95	---	Not rated
Moseley Cr	**SR 1475**	**Craven**	27-77-2	06/13/00	---	Not rated
				10/29/96	---	Not rated
				04/19/95	---	Not rated
				06/27/91	---	Not rated
Southwest Cr	SR 1804	Lenoir	27-80	05/22/95	---	Not rated
Briery Run	SR 1732	Lenoir	27-81-1	11/02/93	---	Not rated
Stonyton Cr	SR 1742	Lenoir	27-81	11/02/93	---	Not rated
03-04-06						
Little R	**NC 96**	**Wake**	27-57-(1)	04/04/00	40	Good-Fair
				07/19/95	50	Good
Little R	SR 2130	Johnston	27-57-(8.5)	08/01/95	54	Excellent
Buffalo Cr	**SR 1941**	**Johnston**	27-57-16-(3)	04/05/00	44	Good-Fair
				07/19/95	54	Excellent
03-04-07						
Moccasin Cr	SR 1001	Wake	27-86-2	06/06/91	42	Good-Fair
Moccasin Cr	**NC 231**	**Johnston**	27-86-2	06/22/00	58	Excellent
				10/31/96	54	Excellent
				07/21/95	56	Excellent
				06/06/91	54	Excellent
Turkey Cr	**SR 1131**	**Nash**	27-86-3-(1)	04/05/00	---	Not rated
Hominy Swp	SR 1606	Wilson	27-86-8	08/03/95	---	Not rated
Toisnot Swp	SR 1945	Nash	27-86-11-(1)	06/05/91	---	Not rated
Toisnot Swp	NC 42	Wilson	27-86-11-(5)	06/05/91	---	Not rated
Toisnot Swp	US 264	Wilson	27-86-11-(5)	06/05/91	---	Not rated
Toisnot Swp	**NC 222**	**Wilson**	27-86-11-(5)	05/25/00	---	Not rated
				08/01/95	---	Not rated
The Slough	**SR 1535**	**Wayne**	27-86-14-1	05/25/00	---	Not rated
				08/03/95	---	Not rated
Tyson Marsh	US 13/NC 58	Greene	27-86-17	05/23/95	---	Not rated
Little Contentnea Cr	SR 1228	Pitt	27-86-26	05/23/95	---	Not rated

Subbasin/ Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Sandy Run	US 258/13	Greene	27-86-26-5-1	05/23/95	---	Not rated
03-04-08						
Core Cr	SR 1001	Craven	27-90	10/28/96	---	Not rated
				04/19/95	---	Not rated
03-04-09						
Swift Cr	NC 102	Pitt	27-97-(0.5)	05/22/95	---	Not rated
Fork Swp	SR 1711	Pitt	27-97-4	08/14/95	---	Not rated
				03/22/95	---	Not rated
Clayroot Swp	**SR 1941**	**Pitt**	27-97-5	06/13/00	---	Not rated
				05/22/95	---	Not rated
				06/26/91	---	Not rated
Creeping Swp	SR 1800	Pitt	27-97-5-3	08/30/91	---	Not rated
	NC 43	Pitt	27-97-5-3	08/30/91	---	Not rated
Little Swift Cr	SR 1623	Craven	27-97-8	03/22/95	---	Not rated
Fisher Swp	SR 1621	Craven	27-97-8-3	08/14/95	---	Not rated
				03/22/95	---	Not rated
03-04-10						
Deep Run	NC 55	Pamlico	27-106-6	03/22/95	---	Not rated
03-04-11						
Trent R	SR 1130	Jones	27-101-(1)	11/05/91	---	Not rated
Tuckahoe Cr	**SR 1142**	**Jones**	27-101-5	06/12/00	---	Not rated
Little Chinquapin Br	SR 1131	Jones	27-101-11	07/16/91	---	Not rated
Musselshell Cr	SR 1320	Jones	27-101-17	08/15/95	---	Not rated
				03/23/95	---	Not rated
Mill Run	**NC 58**	**Jones**	27-101-23	06/12/00	---	Not rated
Island Cr	**SR 1004**	**Jones**	27-101-33	06/12/00	---	Not rated
				08/15/95	---	Not rated
				03/23/95	---	Not rated
03-04-12						
Thoroughfare Swp	SR 1120	Wayne	27-101-5-(1.5)	07/20/95	---	Not rated

Table A-II-6 Fish Community Metric Values from Wadeable Streams During the 2000 Basinwide Monitoring (Ratable streams are only in the piedmont ecoregion.)

Subbasin Waterbody	Location	County	Eco-Region	d. a. (mi^2)	Date	No. Species	No. Fish	No. Sp. Darters	No. Sp. Sunfish	No. Sp. Suckers	No. Intol. Sp.	% Tolerant	% Omni. + Herb.	% Insect.	% Pisc.	% DELT	% MA
03-04-01																	
Deep Cr	SR 1734	Person	P	32.5	04/06/00	22	411	4	4	4	3	13	29	71	0.2	0.0	50
Eno R	SR 1336	Orange	P	26.7	04/04/00	18	169	3	5	2	2	5	14	82	4.7	0.0	61
N Fk Little R	SR 1461	Durham	P	29.7	04/07/00	14	418	2	4	1	3	12	51	46	2.9	0.0	57
N Flat R	SR 1715	Person	P	33.0	04/06/00	21	581	4	5	4	3	8	27	73	0.2	0.0	62
S Fk Little R	SR 1461	Durham	P	39.0	04/07/00	24	361	3	6	4	3	33	12	79	9.0	0.0	50
S Flat R	NC 157	Person	P	17.3	04/06/00	17	451	2	4	2	2	13	42	58	0.4	0.0	65
Smith Cr	SR 1710	Granville	P	6.2	04/04/00	15	366	2	5	0	0	17	33	67	0.0	0.0	53
Upper Barton Cr	NC 50	Wake	P	5.8	04/03/00	21	795	2	4	3	0	10	28	71	0.4	0.0	52
03-04-02																	
Crabtree Cr	SR 1664	Wake	P	84.0	06/22/00	19	240	3	3	2	1	25	15	81	3.3	0.0	63
Marks Cr	SR 1714	Johnston	P	25.2	04/05/00	18	366	3	3	2	2	23	11	80	8.0	0.0	56
Smith Cr	SR 2045	Wake	P	22.6	04/03/00	17	494	3	5	1	1	25	15	79	6.0	0.0	53
Swift Cr	SR 1152	Wake	P	21.0	04/24/00	18	389	1	6	2	0	19	7	92	0.8	0.8	39
Swift Cr	SR 1152	Wake	P	21.0	04/24/00	13	369	1	6	1	0	24	0	99	0.5	3.0	46
Walnut Cr	SR 2544	Wake	P	29.4	04/11/00	18	400	3	3	0	2	22	1	92	7.0	0.0	56
03-04-05																	
Bear Cr	SR 1311	Lenoir	CA	61.7	06/14/00	22	387	4	8	0	2	45	0	69	25.0	0.0	41
Falling Cr	SR 1340	Lenoir	CA	46.9	06/14/00	25	661	3	8	1	1	30	3	59	38.0	0.0	68
Moseley Cr	SR 1475	Craven	CA	45.7	06/13/00	25	436	2	7	1	1	42	3	73	10.0	0.0	56
Stoney Cr	SR 1920	Wayne	CA	25.4	04/17/00	15	259	1	4	0	0	30	0	69	31.0	0.0	60
03-04-06																	
Buffalo Cr	SR 1941	Johnston	P	41.2	04/05/00	15	139	3	3	0	3	28	3	86	12.0	0.0	60
Little R	NC 96	Wake	P	21.2	04/04/00	11	263	1	3	0	0	47	5	89	6.0	0.4	55
03-04-07																	
Moccasin Cr	NC 231	Johnston	P	59.0	06/22/00	26	524	4	7	1	3	7	10	86	3.6	0.0	50
The Slough	SR 1535	Wayne	CA	15.9	05/25/00	26	321	3	6	1	2	25	2	87	11.0	0.0	35
Toisnot Swp	NC 222	Wilson	CA	114.7	05/25/00	24	421	5	4	1	3	37	1	81	13.0	0.2	29
Turkey Cr	SR 1131	Nash	CA	29.7	04/05/00	13	77	2	3	1	0	4	8	84	8.0	0.0	23
03-04-09																	
Clayroot Swp	SR 1941	Pitt	CA	12.0	06/13/00	23	815	2	5	1	1	22	1	52	40.0	0.0	61
03-04-11																	
Island Cr	SR 1004	Jones	CA	5.7	06/12/00	15	206	1	6	1	0	4	2	50	48.0	0.0	73
Mill Run	NC 58	Jones	CA	21.0	06/12/00	19	345	2	6	1	1	24	3	62	35.0	0.0	58
Tuckahoe Swp	SR 1142	Jones	CA	49.7	06/12/00	19	424	3	4	1	1	24	4	78	19.0	0.0	74

[1] Abbreviations are d.a. = drainage area; No. = number; Sp. = species; Intol. = intolerants; Omni.+Herb.. = omnivores+herbivores; Insect. = insectivores; Pisc. = piscivores; DELT = disease, erosion, lesions and tumors; and MA = species with multiple age groups.

Fish Tissue Criteria

In evaluating fish tissue analysis results, several different types of criteria are used. Human health concerns related to fish consumption are screened by comparing results with Federal Food and Drug Administration (FDA) action levels (USFDA, 1980), Environmental Protection Agency (USEPA) recommended screening values, and criteria adopted by the North Carolina State Health Director (Table A-II-7). Individual parameter results which appear to be of potential human health concern are evaluated by the NC Division of Occupational and Environmental Epidemiology by request from DWQ.

The FDA levels were developed to protect humans from the chronic effects of toxic substances consumed in foodstuffs, and thus, employ a "safe level" approach to fish tissue consumption. Presently, the FDA has only developed metals criteria for mercury.

The USEPA has recommended screening values for target analytes which are formulated from a risk assessment procedure (USEPA, 1995). These are the concentrations of analytes in edible fish tissue that are of potential public health concern. The DWQ compares fish tissue results with USEPA screening values to evaluate the need for further intensive site specific monitoring.

The North Carolina State Health Director has adopted a selenium limit of 5 µg/g for issuing an advisory. Although the USEPA has suggested a screening value of 0.7 ppt (pg/g) for dioxins, the State of North Carolina currently uses a value of 3.0 ppt in issuing an advisory.

Table A-II-7 Fish Tissue Criteria (All wet weight concentrations are reported in parts per million (ppm, µg/g), except for dioxin which is in parts per trillion (ppt, pg/g)).

Contaminant	FDA Action Levels	US EPA Screening Values	NC Health Director
Metals			
Cadmium		10.0	
Mercury	1.0	0.6	1.0
Selenium		50.0	5.0
Organics			
Aldrin	0.3		
Chlorpyrifos		30	
Total chlordane		0.08	
Cis-chlordane	0.3		
Trans-chlordane	0.3		
Total DDT[1]		0.3	
o,p DDD	5.0		
p, p DDD	5.0		
o,p DDE	5.0		
p,p DDE	5.0		
o,p DDT	5.0		
p,p DDT	5.0		
Dieldrin		0.007	
Dioxins (total)		0.7	3.0
Endosulfan (I and II)		60.0	
Endrin	0.3	3.0	
Heptachlorepoxide		0.01	
Hexachlorobenzene		0.07	
Lindane		0.08	
Mirex		2.0	
Total PCBs		0.01	
PCB-1254	2.0		
Toxaphene		0.1	

[1] Total DDT includes the sum of all its isomers and metabolites (i.e., p,p DDT, o,p DDT, DDE and DDD).

[2] Total chlordane includes the sum of cis-and trans- isomers as well as nonachlor and oxychlordane.

Appendix III

Use Support Methodology
and
Use Support Ratings

Multiple-Category Use Support Methods

DRAFT February 26, 2002

A. 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.

B. Interpretation of Data and Information

Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data, fish consumption advisories from the NC Department of Health and Human Services, and swimming advisories and shellfish sanitation growing area classification from the NC Division of Environmental Health (as appropriate). Available land cover and land use information is also used, along with annual water supply reports from regional water treatment plant consultants.

Although there is a general procedure for analyzing the data and information for determining use support ratings, each waterbody is reviewed individually, and best professional judgment is applied during these determinations. Assessments are made on either a monitored (M) or evaluated (E) basis depending on the level of information available. Refer to Part E for more information on the basis of assessments.

When interpreting the use support ratings, it is important to understand its associated limitations and degree of uncertainty. The assessments are not intended to provide precise conclusions about pollutant budgets for specific watersheds. Rather, the intent of use support assessments is to gain an overall picture of water quality, to describe how well surface waters support the uses for which they were classified, and to document the potential contribution made by different pollution sources.

C. Assessment Methodology

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, as shown in the table below. 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*.

	Use Support Categories					
Primary Classification	**Ecosystem Approach**	**Human Health Approach**				
	Aquatic Life/Secondary Recreation	**Fish Consumption**	**Primary Recreation**	**Water Supply**	**Shellfish Harvesting**	**Other**
C	X	X	N/A	N/A	N/A	X
SC	X	X	N/A	N/A	N/A	X
B	X	X	X	N/A	N/A	X
SB	X	X	X	N/A	N/A	X
SA	X	X	X	N/A	X	X
WS I – WS IV	X	X	N/A	X	N/A	X

Many types of information are used to determine use support ratings and to identify causes and sources of water quality impairment. A use support data file is maintained for each of the 17 river basins. All existing data pertaining to a stream segment for each applicable use support category are entered into its record and can include, but is not limited to, use support ratings, basis of assessment, biological data, ambient monitoring data, problem parameters and potential sources. The following describes the data and methodologies used to make use support assessments for the surface water classifications (described in Section A, Chapter 3 of each basin plan) using the six use support categories. These methods will continue to be refined, as additional information becomes available.

Basis of Assessment

Supporting ratings are extrapolated up tributaries from monitored streams when no problematic dischargers or change in land use/cover are identified. Supporting ratings may also be applied to unmonitored tributaries where there is little land disturbance (e.g., national forests and wildlife refuges, wilderness areas or state natural areas). Problem parameters or sources (except general NPS) are not applied to unmonitored tributaries. Impaired ratings are not extrapolated to unmonitored tributaries. Refer to Part E for more information.

Problem Parameters

Where an ambient parameter is identified as a potential concern, the parameter is listed in the DWQ database and use support summary table. Where habitat degradation is identified by DWQ biologists based on site visits, it is listed and attempts are made to identify the type of habitat degradation (e.g., sedimentation, loss of woody habitat, loss of pools, loss of riffles, channelization, lack of riparian vegetation, streambed scour and bank erosion). Habitat evaluation methods are being developed to better identify specific types of habitat degradation.

Potential Sources

General nonpoint sources (NPS) and point sources (PS) of pollution are identified where there is sufficient information.

Aquatic Life and Secondary Recreation Use Support

The aquatic life and secondary recreation use support category is an ecosystem approach to assess whether aquatic life (benthic macroinvertebrates and fish) can live and reproduce in the waters of the state and whether waters support secondary recreation (i.e., wading, boating and minimal human body contact with water). This category is applied to all waters of the state. Biological data, ambient monitoring data and NPDES discharger data are all considered in assessing the aquatic life and secondary recreation use support category. The following is a description of each data type and methods used to assess how well a water is meeting the criteria for protection of aquatic life and secondary recreation.

Biological Data

There are two main types of biological data: benthic marcoinvertebrate and fish community. Where recent data for both benthic macroinvertebrates and fish communities are available, both are evaluated in assessing use support. It is important to note that where both ambient monitoring data and biological data are available, biological data are given greater weight.

In special situations, where there are currently insufficient biological data available, the basinwide planner will make a request of the DWQ Environmental Sciences Branch to determine whether a biological survey is appropriate. If a biological survey is appropriate, the use support rating will be determined by the bioclassification resulting from the survey. If a biological survey is not appropriate, then the stream will be not rated.

Benthic Macroinvertebrate Bioclassifications

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to most benthic macroinvertebrate samples based on the number of taxa present in the pollution intolerant aquatic insect groups of *Ephemeroptera*, *Plecoptera* and *Trichoptera* (EPTs) and the Biotic Index (BI), which summarizes tolerance data for all taxa in each collection. The benthic macroinvertebrate bioclassifications are translated into use support ratings according to the following scheme:

Bioclassification	Use Support Rating
Excellent	Supporting
Good	Supporting
Good-Fair	Supporting
Fair	Impaired
Poor	Impaired

Due to the increased emphasis placed on Fair or Poor bioclassifications and the borderline nature of some bioclassification scores, sites should be resampled within 12-24 months after a Fair rating is obtained in 1999 and beyond, if this Fair rating will result in a lower use support rating or if data are from a site never sampled before. This resampling will be done to validate the Fair bioclassification. Such sites will not be given a use support rating until the second sample is obtained. The table below shows how a final use support rating is obtained for sites that are resampled.

New Benthic Macroinvertebrate Classifications (1999 and Beyond) and Data Causing a Decline in Use Support Ratings

Pre-1999 Bioclassification	1st sample Bioclassification	Draft Use Support Rating	2nd sample Bioclassification	Final Use Support Rating
N/A	Fair	Not Rated; resample	Good-Fair, Good or Excellent	Supporting
N/A	Fair	Not Rated; resample	Fair or Poor	Impaired
N/A	Poor	Impaired	N/A	Impaired
Good-Fair, Good or Excellent	Fair	Not Rated; resample	Good-Fair, Good or Excellent	Supporting
Good-Fair, Good or Excellent	Fair	Not Rated; resample	Fair or Poor	Impaired
Good-Fair, Good or Excellent	Poor	Impaired	N/A	Impaired

N/A – Not Applicable NR = Not Rated

The use of benthic macroinvertebrate data can be limited in some waters. The accumulation of swamp stream data over nearly a decade suggests that not all swamp streams support similar fauna. The development of swamp stream criteria is complex, and one set of criteria is not appropriate for all swamp streams. Benthic macroinvertebrate data will not be used in waters characterized or classified by DWQ as swamp waters until the bioclassification criteria for these waters can be used with confidence. Benthic macroinvertebrate data are also not used to develop use support ratings for estuarine waters. Until bioclassification criteria for swamp and estuarine waters are developed, a designation of Not Rated will be used, and these waters will be listed as Not Rated for aquatic life and secondary recreation use support assessments.

Benthic macroinvertebrate data are used to provide bioclassifications for high elevation trout streams. The benthic macroinvertebrate data, while not a direct measure of the trout population, are a robust measure of stream integrity. Loss of canopy, increase in stream temperature, increased nutrients, toxicity and increased sedimentation will affect the benthic macroinvertebrate and fish communities. For these reasons, the benthic macroinvertebrate bioclassifications provide a valuable assessment of the integrity of trout waters.

A designation of Not Impaired may be used for flowing waters that are too small to be assigned a bioclassification (less than 4 meters in width), but meet the criteria for a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria. This designation will translate into a use support rating of Supporting.

Fish Community Bioclassifications

The North Carolina Index of Biotic Integrity (NCIBI) is a method for assessing a stream's biological integrity by examining the structure and health of its fish community. The NCIBI incorporates information about species richness and composition, indicator species, trophic function, abundance and condition, and reproductive function. The NCIBI is translated into use support ratings according to the following scheme:

NCIBI	Use Support Rating
Excellent	Supporting
Good	Supporting
Good-Fair	Supporting
Fair	Impaired
Poor	Impaired

The NCIBI was recently revised by DWQ (NCDENR, 2001). Currently, the focus of using and applying the NCIBI is restricted to wadeable streams that can be sampled by a crew of four persons. Infrequently, larger wadeable streams can be sampled if there is a crew of six persons. The bioclassifications and criteria have also been recalibrated against regional reference site data (NCDENR, 2000a, 2000b and 2001a).

NCIBI criteria are applicable only to wadeable streams in the following river basins: Broad, Catawba, Savannah, Yadkin-Pee Dee, Cape Fear, Neuse, Roanoke, Tar-Pamlico, French Broad, Hiwassee, Little Tennessee, New and Watauga. Additionally, the NCIBI criteria are only applicable to streams in the piedmont portion of the Cape Fear, Neuse, Roanoke and Tar-Pamlico River basins. The definition of the "piedmont" for these four river basins is based upon a map of North Carolina watersheds (Fels, 1997). Specifically:

- In the Cape Fear River basin – all waters except for those draining the Sandhills in Moore, Lee and Harnett counties and the entire basin upstream of Lillington, NC.
- In the Neuse River basin -- the entire basin above Smithfield and Wilson, except for the south and southwest portions of Johnston County and eastern two-thirds of Wilson County.
- In the Roanoke River basin -- the entire basin in North Carolina upstream of Roanoke Rapids, NC and a small area between Roanoke Rapids and Halifax, NC.
- In the Tar-Pamlico River basin -- the entire basin above Rocky Mount, except for the lower southeastern one-half of Halifax County and the extreme eastern portion of Nash County.

NCIBI criteria have not been developed for:

- Streams in the Broad, Catawba, Yadkin-Pee Dee, Savannah, French Broad, Hiwassee, Little Tennessee, New and Watauga River basins which are characterized as wadeable first to third order streams with small watersheds, naturally low fish species diversity, cold water temperatures, and high gradient plunge-pool flows. Such streams are typically thought of as "Southern Appalachian Trout Streams".
- Wadeable streams in the Sandhills ecoregion of the Cape Fear, Lumber and Yadkin-Pee Dee River basins.
- Wadeable streams and swamps in the coastal plain region of the Cape Fear, Chowan, Lumber, Neuse, Pasquotank, Roanoke, Tar-Pamlico and White Oak River basins.
- All nonwadeable and large streams and rivers throughout the state.

Due to the increased emphasis placed on Fair or Poor bioclassifications and the borderline nature of some bioclassification scores, sites should be resampled within 12-24 months after a Fair rating is obtained in 1999 and beyond, if this Fair rating will result in a lower use support rating or if data are from a site never sampled before. This resampling will be done to validate the Fair bioclassification. Such sites will not be given a use support rating until the second sample is obtained. The table below shows how a final use support rating is obtained for sites that are resampled.

New Fish Community Classifications (1999 and Beyond) and Data Causing a Decline in Use Support Ratings

Pre-1999 Bioclassification	1st sample Bioclassification	Draft Use Support Rating	2nd sample Bioclassification	Final Use Support Rating
N/A	Fair	Not Rated; resample	Good-Fair, Good or Excellent	Supporting
N/A	Fair	Not Rated; resample	Fair or Poor	Impaired
N/A	Poor	Impaired	N/A	Impaired
Good-Fair, Good or Excellent	Fair	Not Rated; resample	Good-Fair, Good or Excellent	Supporting
Good-Fair, Good or Excellent	Fair	Not Rated; resample	Fair or Poor	Impaired
Good-Fair, Good or Excellent	Poor	Impaired	N/A	Impaired

N/A – Not Applicable NR = Not Rated

Ambient Monitoring Data

Chemical/physical water quality data are collected through the DWQ Ambient Monitoring System. These data are downloaded from the Surface Water Information Management System for analysis. Total number of samples and percent of samples exceeding the NC water quality standards are evaluated for the development of use support ratings along with other data or alone when other data are not available. Where both ambient data and biological data are available, biological data are given greater weight.

When reviewing ambient data, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the ambient data would be September 1, 1995 to August 31, 2000. Selected ambient parameters are used to assess aquatic life/secondary recreation use support. These parameters include ammonia, dissolved oxygen, pH, chloride, arsenic, cadmium, chromium, nickel and lead. These parameters are measured against standards for a minimum of ten samples as follows:

Standards Violation	Rating
Criterion exceeded ≤10%	Supporting
Criterion exceeded 11-25%	Impaired

Data for copper, iron and zinc are not used according to the scheme outlined above. These metals have action level standards because they are generally not bioaccumulative and have variable toxicity to aquatic life depending on chemical form, solubility and stream characteristics. In order for an action level standard to be violated, there must be a toxicological test that documents an impact on a sensitive aquatic organism. The action level standard is used to screen waters for potential problems with copper, iron and zinc.

Metals data for copper and iron are screened at the 85th percentile of five years of ambient data ending on August 31 of the year of biological sampling. Sites, other than estuarine and swamp waters, with an 85th percentile of ≥20 μg/l of copper and/or ≥2000 μg/l of iron are identified and flagged for instream chronic toxicity testing by DWQ. Chronic toxicity testing in estuarine and swamp waters is not ecologically meaningful. Criteria are still being developed for zinc. If a stream does not have biological data that would deem a Supporting rating, then the stream can be rated Impaired for aquatic life if instream chronic toxicity is found. Criteria for evaluating instream chronic toxicity are three chronic pass/fail tests over three months using *Ceriodaphnia*. Two fails result in an Impaired rating.

It is important to note that some waters may exhibit characteristics outside the numerical standards due to natural conditions (e.g., many swamp waters are characterized by low pH and dissolved oxygen). These natural conditions do not constitute a violation of water quality standards.

NPDES Discharger Data

Aquatic Toxicity Data

For facilities that perform Whole Effluent Toxicity (WET) tests according to state NPDES discharge permit requirements, a review of the results of a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the aquatic toxicity data would be September 1, 1995 to August 31, 2000. If a stream with a WET test facility has not been sampled for instream chronic toxicity, biological community data or has no ambient data, and that facility has failed three or more WET tests in the most recent two years, the stream is not rated. If failures continue, DWQ will work with the facility to correct the failures and assess stream impacts before the next basin sampling cycle begins with either a biological survey or instream chronic toxicity testing, if possible.

Discharge Effluent Data

NPDES effluent data are reviewed by analyzing monthly averages of water quality parameters over a two-year period of data ending on August 31 of the year of biological sampling in a basin. Prior to May 31, 2000, facilities were screened for criterion 40 percent in excess of state water quality standards for conventional pollutant limitations or 20 percent in excess of state water quality standards for toxic pollutants for two or more months during two consecutive quarters, or chronic violations of either conventional or toxic pollutant limitations for four or more months during two consecutive quarters.

After May 31, 2000, facilities are screened for criterion 20 percent in excess of state water quality standards for both conventional and toxic pollutants for two or more months during two consecutive quarters, or chronic violations of either conventional or toxic pollutant limitations for four or more months during two consecutive quarters. Streams with discharges that are in excess of permit limits will not be rated if no biological or ambient monitoring data are available. Therefore, streams will not be rated impaired based on effluent data alone. Appropriate DWQ staff will be given a list of these facilities for follow-up.

Fish Consumption Use Support

The fish consumption use support category is a human health approach to assess whether humans can safely consume fish from a water. This use support category is applied to all waters of the state. The use support rating is assigned using fish consumption advisories issued by the NC Department of Health and Human Services. 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.

The current statewide limited fish consumption advisory for bowfin due to elevated levels of mercury in fish tissue is an exception. It is recognized that bowfin only live and reproduce in waters of the piedmont and coastal plain. Therefore, the use support ratings will be based on the combination of the current statewide fish consumption advisory for bowfin and the documented presence of bowfin in each river basin as found in *Freshwater Fisheries of North Carolina* (Menhinick, 1991). In river basins where there are documented populations of bowfin (Roanoke, Chowan, Pasquotank, White Oak, Lumber, Neuse, Tar-Pamlico, Cape Fear, Yadkin and Catawba), all waters will be rated Impaired for the fish consumption category. In river basins where there are no documented populations of bowfin (Little Tennesee, Hiwassee, Savannah, Watauga, New, French Broad and Broad), the waters will be rated Supporting for the fish consumption category unless there is a site-specific advisory.

In order to separate this statewide advisory from other fish consumption advisories and to identify actual bowfin populations with high levels of mercury, only waters with fish tissue monitoring data are presented on the use support maps and in the use support summary tables of the basin plans. A review of the present methods for assessing the fish consumption use support category is being conducted, and methods may be modified in the future.

Primary Recreation Use Support

In addition to the use support categories applicable to Class C and SC waters, the primary recreation use support category will be assessed for all Class B, Class SA and Class SB waters where data are available. This use support category is a human health approach to assess whether waters support primary recreation activities such as swimming, water-skiing, skin diving and similar uses involving human body contact in an organized or frequent basis. The use support rating is based on swimming advisories issued by local health departments and by the NC Division of Environmental Health (DEH) beach monitoring program.

Freshwaters

Each January, the geometric mean for ambient stations in Class B waters for the previous sampling year is obtained, and a screen is conducted for waters with geometric means greater than 200 colonies per 100 ml. If the geometric mean is greater than 200 colonies per 100 ml during the previous year, fecal coliform bacteria are noted as a problem parameter, and a request is made of the DWQ regional office to sample this water five times within 30 days in June during non-runoff events, if possible. If this data, as required to assess the NC standard, indicate a geometric mean greater than 200 colonies per 100 ml, then the data are sent to DEH for consideration of posting swimming advisories. The DWQ regional office should continue to sample the stream five times within 30 days during the months of July and August and send the data to DEH.

When reviewing fecal coliform data and swimming advisories, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the fecal coliform data and swimming advisories would be September 1, 1995 to August 31, 2000. Monitored Class B waters are rated Supporting if the geometric mean over the five-year window is less than or equal to 200 colonies per 100 ml. If a water was posted with an advisory for at least two months or posted as "Do Not Swim" for more than two months within the five-year window, it is rated as Impaired unless DEH staff believes that the cause of elevated fecal bacteria is not persistent. Class B waters without fecal coliform data or swimming advisories are not rated.

DWQ attempts to determine if there are any inland swimming areas monitored by county or local health departments. County or local health departments are asked to list those waters with swimming advisories posted for at least two months in the previous five years (ending on August 31 of the year of biological sampling).

Estuarine waters

Each January, the geometric mean for ambient stations in Class SB and SA waters for the previous sampling year is obtained, and a screen is conducted for waters with geometric means greater than 200 colonies per 100 ml. If the geometric mean is greater than 200 colonies per 100 ml during the previous year, fecal coliform bacteria are noted as a problem parameter, and a request is made of the DWQ regional office to sample this water five times within 30 days in June during non-runoff events, if possible. If this data, as required to assess the NC standard, indicate a geometric mean greater than 200 colonies per 100 ml, then the data are sent to DEH for consideration of posting swimming advisories. The DWQ regional office should continue to sample the stream five times within 30 days during the months of July and August and send the data to DEH.

DEH fecal coliform data are used to assess estuarine (SA and SB) waters. Each January, DEH submits a letter to DWQ stating which coastal waters were posted with an advisory reporting an increased risk from swimming during the prior year. When reviewing DEH fecal coliform data and swimming advisories, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the DEH fecal coliform data and swimming advisories would be September 1, 1995 to August 31, 2000. If a water was posted with an advisory for at least two months or posted as "Do Not Swim" for more than two months within the five-year window, it is rated as Impaired unless DEH staff believes that the cause of elevated fecal bacteria is not persistent. If DEH has no data on a water, that water will not be rated.

Shellfish Harvesting Use Support

The shellfish harvesting use support category is a human health approach to assess whether shellfish can be commercially harvested and is therefore applied only to Class SA waters. The following data sources are used to determine use support ratings for shellfish waters and to determine causes and sources of impairment for these waters.

Division of Environmental Health (DEH) Shellfish Sanitation Surveys

DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Estuarine waters are delineated according to DEH shellfish management areas (e.g., Outer Banks, Area H-5) which include Class SA, SB and SC waters. DEH samples growing areas regularly and reevaluates the areas by conducting shellfish sanitation surveys every three years to determine if their classification is still applicable. DEH classifications may be changed after the most recent sanitary survey. Classifications are based on DEH fecal coliform bacteria sampling, locations of pollution sources, and the availability of the shellfish resource. Growing waters are classified as follows:

DEH Classification	DEH Criteria
Approved (APP)	**Fecal Coliform Standard for Systematic Random Sampling:** The median fecal coliform Most Probable Number (MPN) or the geometric mean MPN of the water shall not exceed 14 per 100 milliliters (ml), and the estimated 90th percentile shall not exceed an MPN of 43 MPN per 100 ml for a 5-tube decimal dilution test. **Fecal Coliform Standard for Adverse Pollution Conditions Sampling:** The median fecal coliform or geometric mean MPN of the water shall not exceed 14 per 100 ml, and not more than 10 percent of the samples shall exceed 43 MPN per 100 ml for a 5-tube decimal dilution test.
Conditionally Approved-Open (CAO)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan.
Conditionally Approved-Closed (CAC)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan.
Restricted (RES)	Sanitary Survey indicates limited degree of pollution, and the area is not contaminated to the extent that consumption of shellfish could be hazardous after controlled depuration or relaying.
Prohibited (PRO)	No Sanitary Survey; point source discharges; marinas; data do not meet criteria for Approved, Conditionally Approved or Restricted Classification.

Assigning Use Support Ratings to Shellfish Harvesting Waters (Class SA)

It is important to note that DEH classifies all actual and potential growing areas (which includes all saltwater and brackish water areas) for their suitability for shellfish harvesting. Thus, the DWQ Class SA waters must be separated out and rated for shellfish harvesting use support. The acreage of Supporting and Impaired waters are calculated using GIS showing DWQ and DEH classifications as attribute information. However, the DEH "Closed" polygon coverage includes CAC, RES and PRO classifications, and it is not currently possible to separate out the PRO from the RES areas. Therefore, these areas are a combined polygon coverage, and DWQ rates these waters as Impaired.

DWQ use support ratings may be assigned to separate segments within DEH management areas. In assessing use support, the DEH classifications and management strategies are only applicable to those areas that DWQ Class SA (shellfish harvesting waters). This will result in a difference of acreage between DEH areas classified as CAC, PRO, RES and DWQ waters rated as Impaired. For example, if DEH classifies a 20-acre area CAC, but only 10 acres are Class SA, only those 10 acres of Class SA waters are rated as Impaired.

Sources of fecal coliform bacteria are more difficult to separate out for Class SA areas. DEH describes the potential sources in the sanitary surveys, but they do not describe specific areas affected by these sources. Therefore, in the past, DEH identified the same sources for all Class SA sections of an entire management area (e.g., urban runoff and septic systems). Until a better way to pinpoint sources is developed, this procedure will continue to be used. A point source discharge is only listed as a potential source when NPDES permit limits are exceeded.

DWQ and DEH are developing the database and expertise necessary to assess shellfish harvesting use support using a frequency of closures-based approach. This database will allow DWQ to better assess the extent and duration of closures in Class SA waters. These tools will not be available for use support determinations in Class SA waters for the 2001 White Oak, 2002 Neuse and 2003 Lumber River basin use support assessments. DWQ believes it is important to identify frequency of closures in these waters, so an interim methodology will be used based on existing databases and GIS shapefiles. There will likely be changes in reported acreages in future assessments using the permanent methods and tools that result from this project. DWQ and DEH hope to have these tools fully developed for using the frequency of closure-based methods for the 2005 Cape Fear River use support assessment and basin plan.

Interim Frequency of Closure-Based Assessment Methodology

The interim method will be used for the 2001 White Oak, 2002 Neuse and 2003 Lumber River basin use support assessments. Shellfish harvesting use support ratings for Class SA waters using the interim methodology are summarized below.

Interim Frequency of Closure-Based Use Support Ratings

Percent of Time Closed within Basin Data Window	DEH Growing Area Classification	DWQ Use Support Rating
N/A	Approved*	Supporting
Closed ≤10% of data window	Portion of CAO closed ≤10% of data window	Supporting
Closed >10% of the data window	Portion of CAO closed >10% of data window	Impaired
N/A	CAC and P/R**	Impaired

* Approved waters are closed only during extreme meteorological events (hurricanes).

** CAC and P/R waters are rarely opened to shellfish harvesting.

For CAO areas, DWQ will work with DEH to determine the number of days and acreages that CAO Class SA waters were closed to shellfish harvesting during a five-year window of data that ends on August 31 of the year of biological sampling. For example, if biological data are collected in a basin in 2000, then the five-year window for data review would be September 1, 1995 to August 31, 2000. For each growing area with CAO Class SA waters, DEH and DWQ staff will define subareas within the CAO area that were opened and closed at the same time. The number of days these CAO areas were closed will be determined using DEH proclamation summary sheets and the original proclamations.

The number of days that APP areas in the growing area were closed due to preemptive closures because of named storms are not counted. For example, all waters in growing area E-9 were preemptively closed for Hurricane Fran on September 5, 1996. APP waters were reopened September 20, 1996. Nelson Bay (CAO) was reopened September 30, 1996. This area was considered closed for 10 days after the APP waters were reopened.

Proposed Permanent Frequency of Closure-Based Assessment Methodology

Over the next few years DWQ, DEH, Division of Coastal Management (DCM) and Division of Marine Fisheries (DMF) will be engaged in developing a fully functionally database with related georeferenced (GIS) shellfish harvesting areas. The new database and GIS tools will be valuable for the above agencies to continue to work together to better serve the public. DWQ proposes to use information generated by these new tools to do frequency of closure-based shellfish harvesting use support assessments in Class SA waters, starting with the 2005 Cape Fear River basin use support assessment.

Using the new database with georeferenced areas and monitoring sites, DEH will be able to report the number of days each area was closed excluding closures related to named storms. The percent of the five-year data window that individual Class SA waters are closed will be used to make use support determinations for areas that are classified by DEH as CAO. PRO, RES and CAC areas will be rated Impaired and CAO areas will be rated Supporting or Impaired based on the methodology outlined above in the interim methods. Growing areas that have been reclassified by DEH during the data window from a lower classification to APP will be rated FS. Areas that are reclassified from APP to CAO during the data window will be rated as described above in the interim methods, taking into account the total days closed during the data window, including when the area was classified as APP.

Water Supply Use Support

This use support category is used to assess all Class WS waters and is a human health approach to assess whether a water can be used for water supply purposes. Many drinking water supplies in NC are drawn from human-made reservoirs that often have multiple uses.

Water supply use support is assessed using information from the seven regional water treatment plant (WTP) consultants. Each January, the WTP consultants submit a spreadsheet listing closures and water intake switch-overs for all water treatment plants in their region. This spreadsheet describes the length and time of the event, contact information for the WTP, and the reason for the closure or switch.

The WTP consultants' spreadsheets are reviewed to determine if any closures/switches were due to water quality concerns. Those closures/switches due to water quantity problems and reservoir turnovers are not considered for use support. The frequency and duration of closures/switches due to water quality concerns are considered when assessing use support. In general, North Carolina's surface water supplies are currently rated supporting. Specific criteria for rating waters impaired are yet to be determined.

Other Uses: All Waters in the State

This category of use will be assessed infrequently but could be applied to any water in the state. Examples of uses that could fall into this category are aesthetics and industrial and agricultural water supply. This category allows for the assessment of any use that is not considered for aquatic life and secondary recreation, primary recreation, fish consumption, shellfish harvesting or water supply.

D. Use of Outside Data

DWQ actively solicits outside data and information in the year before biological sampling in a particular basin. The solicitation allows approximately 60 days for data to be submitted. Data from sources outside DWQ are screened for data quality and quantity. If data are of sufficient quality and quantity, they may be incorporated into use support assessments. A minimum of ten samples for more than a one-year period is needed to be considered for use support assessments.

The way the solicited data are used depends on the degree of quality assurance and quality control of the collection and analysis of the data as detailed in the 2000 303(d) report and shown in the table below. Level 1 data can be use with the same confidence as DWQ data to determine use support ratings. Level 2 or Level 3 data may be used to help identify causes of pollution and problem parameters. They may also be used to limit the extrapolation of use support ratings up or down a stream segment from a DWQ monitoring location. Where outside data indicate a potential problem, DWQ evaluates the existing DWQ biological and ambient monitoring site locations for adjustment as appropriate.

Criteria Levels for Use of Outside Data in Use Support Assessments

Criteria	Level 1	Level 2	Level 3
Monitoring frequency of at least 10 samples for more than a one-year period	Yes	Yes/No	No
Monitoring locations appropriately sited and mapped	Yes	Yes	No
State certified laboratory used for analysis according to 15A NCAC 2B .0103	Yes	Yes/No	No
Quality assurance plan available describing sample collection and handling	Yes, rigorous scrutiny	Yes/No	No

E. Monitored vs. Evaluated

Assessments are made on either a monitored (M) or evaluated (E) basis depending on the level of information available. Because a monitored rating is based on the most recent five-year window and site-specific data, it is treated with more confidence than an evaluated rating.

Supporting ratings are extrapolated up tributaries to monitored streams where there are no dischargers with permit violations or changes in land use/cover. Problem parameters or sources (except general NPS) are not applied to unmonitored tributaries. Impaired ratings are not applied to unmonitored tributaries. Refer to the following summary for the basis of assigning use support ratings.

Summary of Basis for Assigning Use Support Ratings to Surface Waters			
Use Support Status	**Overall Basis**	**Specific Basis**	**Description**
Supporting/ Impaired	Monitored	Monitored (M)	Monitored stream segments[a] with data[b] ≤5[c] years old where a bioclassification has been assigned to the sampling site and/or ambient and/or fish tissue data exist and/or DEH shellfish growing area data and/or information on posted swimming closures are available; may be applied to any use support category being assessed.
Not Rated		Monitored (M)	Monitored stream segments[a] with data[b] ≤5[c] years old where a bioclassification has not been assigned to the sampling site; can only be applied to the Aquatic Life/Secondary Recreation use support category.
Supporting		Monitored/Evaluated (ME)	Stream segment[a] is not monitored, but is assigned a use support rating based on another segment of same stream for which data[b] ≤5[c] years old are available where a bioclassification has been assigned to the sampling site and/or ambient data are available and the segment is given a Supporting rating; can only be applied to the Aquatic Life/Secondary Recreation use support category.
Supporting	Evaluated	Evaluated (E)	Applied to unmonitored streams that are direct or indirect tributaries to monitored stream segments rated Supporting in the Aquatic Life/Secondary Recreation use support category that share similar land use to the monitored stream segment; waters in the Water Supply use support category where no significant problems have been noted in the Regional Surface Water Supply Reports; waters in the Fish Consumption use support category in river basins that do not contain documented populations of bowfin.
Impaired		Evaluated (E)	Only applied to waters in the Fish Consumption use support category in river basins that contain documented populations of bowfin.
Not Rated		Evaluated (E)	Unmonitored streams that receive effluent from a NPDES discharger that has been found to be in "significant noncompliance" or has failed three or more WET tests during the two-year review period; only applied to the Aquatic Life/Secondary Recreation use support category.
No Data (ND)			Insufficient or no data available to determine use support; includes unmonitored streams that are direct or indirect tributaries to stream segments rated Impaired.

a) A stream segment is a stream, or a portion thereof, listed in the Classifications and Water Quality Standards for a river basin. Each segment is assigned a unique identification number (index number).
b) Major data sources include benthic macroinvertebrate and fish community bioclassifications and chemical/physical monitoring data.
c) From the year that basin monitoring was done.

F. Nutrient Enrichment Issues

One of the main causes of impacts to lakes is nutrient enrichment, or eutrophication. Several water quality variables help to describe the level of eutrophication. These include pH, chlorophyll *a*, dissolved oxygen, phosphorus, nitrogen, turbidity, total dissolved gases and other quantitative indicators, some of which have specific water quality standards. It is generally agreed that excessive amounts of nitrogen and phosphorus are the principal culprits in eutrophication related use impairment. These variables are important concerns; however, climate, hydrology and biological response factors (chlorophyll, phytoplankton, fish kills, etc.) are also essential to evaluate because they may control the frequency of episodes related to potential use impairment. In addition, many of North Carolina's lakes are human-made reservoirs that do not mimic natural systems.

Violations of water quality standards in lakes or estuaries are not equated with use impairment unless uses are not met. DWQ does not determine eutrophication related use impairment with the quantitative assessment of an individual water quality variable (i.e., chlorophyll *a*). Likewise, DWQ does not depend on a fixed index composed of several water quality variables, which does not have the flexibility to adapt to numerous hydrological situations, to determine use impairment. Instead, the weight of evidence approach is used to determine use support in lakes. This approach can be flexibly applied depending on the amount and quality of available information. The approach uses the following sources of information:

- multiple quantitative water quality variables (e.g., dissolved oxygen, chlorophyll *a*)
- third party reports
- analysis of water quality or aesthetic complaints, and taste and odor observations
- algal bloom reports
- macrophyte observations
- fish kill reports
- frequency of noxious algal activity
- reports/observations of the NC Wildlife Resources Commission, lake associations and water treatment plant operators

<u>References</u>

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Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
NEUSE RIVER	From source (confluence of Eno River Arm of Falls Lake and Flat River Arm of Falls Lake) to I-85 bridge	WS-IV NSW CA	030401	2,703.6	0.0	0.0	S	M			
Eno River	From source to a point 0.4 mile upstream of Dry Run	WS-II NSW	030401	0.0	2.2	0.0	S	M	NP		
East Fork Eno River (Lake Orange)	From source to Eno River	WS-II NSW	030401	143.6	0.0	0.0	S	M	NP		
Sevenmile Creek	From source to a point 0.4 mile upstream of I-85	WS-II NSW	030401	0.0	5.8	0.0	S	M			
Sevenmile Creek	From a point 0.4 mile upstream of I-85 to Lake Ben Johnston, Eno River	WS-II NSW CA	030401	0.0	1.6	0.0	S	M			
Eno River	From Orange County SR 1561 to U. S. Highway 501	WS-IV&B NSW	030401	0.0	16.2	0.0	S	M			
Eno River	From U. S. Highway 501 to a point 0.5 mile upstream of City of Durham emergency pumping facility raw water intake (Lat: 36 04’ 40" Long: 78 53’ 00")	WS-IV NSW	030401	0.0	1.6	0.0	S	M			
Eno River	From a point 0.5 mile upstream of Durham emergency pumping facility raw water intake to Durham emergency pumping facility raw water intake	WS-IV NSW CA	030401	0.0	0.4	0.0	S	M			
Eno River (including the Eno River Arm of Falls Lake)	From City of Durham emergency pumping facility raw water intake to a point 0.5 mile upstream of Little River	WS-IV NSW	030401	0.0	4.3	0.0	S	M			
Eno River (including the Eno River Arm of Falls Lake)	From a point 0.5 mile upstream of Little River to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	S	M			
Little River	From source to a point 0.1 mile upstream of Durham County SR 1461	WS-II NSW	030401	0.0	2.3	0.0	S	M			
South Fork Little River	From source to Little River	WS-II NSW	030401	0.0	18.5	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
North Fork Little River	From source to Little River	WS-II NSW	030401	0.0	20.6	0.0	S	M			
Little River (Little River Reservoir)	From a point 0.1 mile upstream of Durham County SR 1461 to dam at Little River Reservoir	WS-II NSW CA	030401	32.4	0.0	0.0	S	M			
Little River	From a point 0.9 mile upstream of mouth to Eno River Arm of Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.9	0.0	S	M			
Flat River	From source to a point 2.0 miles downstream of Durham County SR 1614	WS-III NSW	030401	0.0	9.1	0.0	S	M			
North Flat River	From source to Flat River	WS-III NSW	030401	0.0	16.4	0.0	S	M			
South Flat River	From source to Flat River	WS-III NSW	030401	0.0	17.6	0.0	S	M			
Deep Creek	From source to Flat River	WS-III NSW	030401	0.0	16.3	0.0	S	M			
Flat River (Lake Michie)	From a point 2.0 miles downstream of Durham County SR 1614 to dam at Lake Michie	WS-III NSW CA	030401	471.7	0.0	0.0	S	M			
Flat River	From dam at Lake Michie to a point 0.2 miles upstream of Durham County SR 1004	WS-IV NSW	030401	0.0	1.1	0.0	I	M			Upstream Impoundment
Knap of Reeds Creek (including Butner Lake below normal water elevation 356 ft. MSL)	From a point 0.3 mile upstream of mouth of Camp Creek to dam at Lake Butner	WS-II NSW CA	030401	323.8	0.0	0.0	S	M			
Knap of Reeds Creek	From dam at Butner Lake to a point 1.9 miles downstream of Granville County SR 1120	WS-IV NSW	030401	0.0	4.6	0.0	I	M		Habitat degradation	
Knap of Reeds Creek	From a point 1.9 miles downstream of Granville County SR 1120 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	I	M			
Ellerbe Creek	From source to I-85 Bridge	C NSW	030401	0.0	3.1	0.0	I	M	NP	Habitat degradation	

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Ellerbe Creek	From I-85 Bridge to a point 0.2 mile upstream of Durham County SR 1636	WS-IV NSW	030401	0.0	7.3	0.0	I	M	NP, P	Habitat degradation	
Ellerbe Creek	From a point 0.2 mile upstream of Durham County SR 1636 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	I	M	NP, P	Habitat degradation	
NEUSE RIVER (Falls Lake below normal pool elevation)	From I-85 bridge to dam at Falls Lake	WS-IV&B NSW CA	030401	9,530.3	0.0	0.0	S	M			
Little Lick Creek	From source to a point 0.4 mile upstream of Durham County SR 1811	WS-IV NSW	030401	0.0	7.2	0.0	I	M	NP	Habitat degradation	
Little Lick Creek (including portion of Little Lick Creek Arm of Falls Lake)	From a point 0.4 mile upstream of Durham SR 1811 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	I	M	NP	Habitat degradation	
Ledge Creek (Lake Rogers)	From a point 1.0 mile downstream of I-85 to dam at Creedmoor Water Supply Reservoir	WS-II NSW CA	030401	140.7	0.0	0.0	S	M			
Ledge Creek (including portion of Ledge Creek Arm of Falls Lake)	From Granville County SR 1724 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	S	M			
Lick Creek	From source to Wake County SR 1809	WS-IV NSW	030401	0.0	6.5	0.0	I	M	NP	Habitat degradation	
Lick Creek	From Wake County SR 1809 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.7	0.0	I	M	NP	Habitat degradation	
Smith Creek	From source to a point 0.5 mile downstream of Granville County SR 1711	C NSW	030401	0.0	1.5	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Smith Creek	From a point 0.5 mile downstream of Granville County SR 1711 to a point 0.4 mile upstream of mouth	WS-IV NSW	030401	0.0	5.7	0.0	S	M			
Smith Creek	From a point 0.4 mile upstream of mouth to Beaverdam Reservoir, Beaverdam Creek	WS-IV NSW CA	030401	0.0	0.5	0.0	S	M			
New Light Creek	From source to Wake County SR 1911	WS-IV NSW	030401	0.0	1.8	0.0	S	M			
Upper Barton Creek	From source to a point 0.5 mile upstream of Wake County SR 1844	WS-IV NSW	030401	0.0	4.9	0.0	S	M	NP		
Upper Barton Creek	From a point 0.5 mile upstream of Wake County SR 1844 to Falls Lake, Neuse River	WS-IV NSW CA	030401	0.0	0.6	0.0	S	M			
Horse Creek	From a point 0.3 mile upstream of Franklin County SR 1139 to a point 0.1 mile downstream of Wake County SR 1923	WS-IV NSW	030401	0.0	6.0	0.0	NR	M			
NEUSE RIVER	From dam at Falls Lake to mouth of Beddingfield Creek	C NSW	030402	0.0	25.9	0.0	S	M			
Richland Creek	From source to Neuse River	C NSW	030402	0.0	8.6	0.0	S	M			
Smith Creek	From dam at Wake Forest Reservoir to Neuse River	C NSW	030402	0.0	5.8	0.0	S	M			
Toms Creek (Mill Creek)	From source to Browns Laker	C NSW	030402	0.0	1.6	0.0	NR	M			
Toms Creek (Mill Creek)	From Browns Lake to Neuse River	C NSW	030402	0.0	1.5	0.0	I	M	NP, P	Chlorine	Package Plants (Small Flows)
Perry Creek (Greshams Lake)	From source to dam at Greshams Lake	B NSW	030402	0.0	2.4	0.0	I	M	NP	Habitat degradation	
Perry Creek	From dam at Greshams Lake to Neuse River	C NSW	030402	0.0	2.5	0.0	I	M	NP	Habitat degradation	
Crabtree Creek	From source to backwaters of Crabtree Lake	C NSW	030402	0.0	5.1	0.0	I	M	NP	Habitat degradation	

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Crabtree Creek (Crabtree Lake)	From backwaters of Crabtree Lake to mouth of Richlands Creek	B NSW	030402	0.0	12.2	0.0	S	M			
Black Creek	From source to Crabtree Lake, Crabtree Cr.	C NSW	030402	0.0	3.6	0.0	I	M	NP	Habitat degradation	
Reedys Creek (Reedy Creek Lake)	From source to Crabtree Creek	B NSW	030402	28.8	0.0	0.0	NR	M			
Crabtree Creek	From mouth of Hairsnipe Creek to 2.75 miles upstream of Neuse River	C NSW	030402	0.0	10.9	0.0	I	M	NP	Habitat degradation	
Crabtree Creek	From 2.75 miles upstream of Neuse River to Neuse River	C NSW	030402	0.0	2.8	0.0	S	M			
Crabtree Creek	From mouth of Richlands Creek to Hairsnipe Creek	C NSW	030402	0.0	2.0	0.0	S	M			
Richlands Creek	From source to Crabtree Creek	C NSW	030402	0.0	4.7	0.0	I	M	NP	Habitat degradation	Construction
Hare Snipe Creek (Lake Lynn)	From source to dam at Lake Lynn	B NSW	030402	0.0	2.0	0.0	I	M	NP	Habitat degradation	
Hare Snipe Creek	From dam at Lake Lynn to Crabtree Creek	C NSW	030402	0.0	2.5	0.0	I	M	NP	Habitat degradation	
Mine Creek	From source to Crabtree Creek	C NSW	030402	0.0	4.7	0.0	I	M	NP	Habitat degradation	
Pigeon House Branch	From source to Crabtree Creek	C NSW	030402	0.0	2.9	0.0	I	M		Habitat degradation	
Marsh Creek	From source to Crabtree Creek	C NSW	030402	0.0	6.2	0.0	I	M	NP	Habitat degradation	
Walnut Creek	From UT 0.6 miles west of I-440 to Neuse River	C NSW	030402	0.0	3.7	0.0	S	M			
Rocky Branch	From source to Walnut Creek	C NSW	030402	0.0	4.1	0.0	NR	M			
Poplar Creek	From source to Neuse River	C NSW	030402	0.0	5.5	0.0	S	M			
NEUSE RIVER	From mouth of Beddingfield Creek to a point 0.2 mile downstream of Johnston County SR 1700	WS-V NSW	030402	0.0	4.3	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Marks Creek (Lake Myra)	From soruce to Neuse River	C NSW	030402	0.0	10.3	0.0	S	M			
NEUSE RIVER	From a point 0.2 mile downstream of Johnston County SR 1700 to a point 1.4 mile downstream of Johnston County SR 1908	WS-IV NSW	030402	0.0	9.7	0.0	S	M			
NEUSE RIVER	From a point 1.4 mile downstream of Johnston County SR 1908 to Johnston County proposed water supply intake (located 1.9 mile downstream of Johnston County SR 1908)	WS-IV NSW CA	030402	0.0	0.5	0.0	S	M			
NEUSE RIVER	From Johnston County proposed water supply intake to a point 0.1 mile downstream of mouth of Poplar Creek	WS-IV NSW	030402	0.0	5.8	0.0	S	M			
NEUSE RIVER	From a point 0.1 mile downstream of mouth of Poplar Creek to City of Smithfield water supply intake	WS-IV NSW CA	030402	0.0	0.5	0.0	S	M			
NEUSE RIVER	From City of Smithfield water supply intake to a point 1.7 miles upstream of Bawdy Creek	WS-V NSW	030402	0.0	26.2	0.0	S	M			
Swift Creek	From Lake Wheeler Dam to a point 0.6 mile upstream of Wake County SR 1006	WS-III NSW	030402	0.0	2.4	0.0	I	M		Low DO	Source Unknown
Swift Creek	From confluence with Williams Creek to backwaters of Lake Wheeler	WS-III NSW	030402	0.0	5.5	0.0	I	M	NP	Habitat degradation	
Swift Creek (Lake Wheeler)	From backwaters of Lake Wheeler to the Lake Wheeler Dam	WS-III NSW	030402	564.5	0.0	0.0	S	M			
Swift Creek	From source to confluence with Williams Creek	WS-III NSW	030402	0.0	2.6	0.0	NR	M			
Williams Creek	From source to Swift Creek	WS-III NSW	030402	0.0	2.6	0.0	NR	M			
Swift Creek (Lake Benson)	From a point 0.6 mile upstream of Wake County SR 1006 to dam at Lake Benson	WS-III NSW CA	030402	472.0	0.0	0.0	S	M			
Swift Creek	From dam at Lake Benson to Neuse River	C NSW	030402	0.0	32.7	0.0	S	M			
Little Creek	From source to Swift Creek	C NSW	030402	0.0	11.4	0.0	I	M		Habitat degradation	

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
NEUSE RIVER	From a point 1.7 miles upstream of Bawdy Creek to subbasin 030402-030412 boundary	WS-IV NSW	030402	0.0	7.0	0.0	S	M			
Middle Creek	From source to 0.8 miles south of US 1	C NSW	030403	0.0	1.4	0.0	I	M	NP	Low DO	Urban Runoff/Storm Sewers
Middle Creek	From 0.8 miles south of US 1 to backwaters of Sunset Lake	C NSW	030403	0.0	4.6	0.0	S	M			
Middle Creek	From dam at Sunset Lake to Swift Creek	C NSW	030403	0.0	44.4	0.0	S	M			
Black Creek	From dam at Holts Lake to Neuse River	C NSW	030404	0.0	2.0	0.0	I	M		Low DO	Source Unknown
Hannah Creek	From source to NC 96	C NSW	030404	0.0	10.3	0.0	I	M		Low DO	Major Municipal Point Source
Hannah Creek	From NC 96 to Mill Creek	C NSW	030404	0.0	13.4	0.0	S	M			
Mill Creek	From Mill Branch to Neuse River	WS-IV NSW	030404	0.0	2.9	0.0	S	M			
NEUSE RIVER	From subbasin 030405-030412 boundary to mouth of Contentnea Creek	C NSW	030405	0.0	63.2	0.0	S	M			
Stoney Creek	From source to Neuse River	C NSW	030405	0.0	10.7	0.0	I	M	NP	Habitat degradation	
Walnut Creek (Lake Wackena, Spring Lake)	From source to Neuse River	C NSW	030405	0.0	6.9	0.0	I	M	NP, P	Low DO	Minor Municipal Point Source
Bear Creek	From source to Neuse River	C Sw NSW	030405	0.0	17.9	0.0	S	M			
Mosely Creek	From source to Falling Creek	C Sw NSW	030405	0.0	5.2	0.0	NR	M			
Mosley Creek	From source to Neuse River	C Sw NSW	030405	0.0	12.7	0.0	NR	M			
Little River (Moores Pond, Mitchell Mill Pond)	From source to a point 0.2 mile upstream of Wake County SR 2368	WS-II NSW	030406	0.0	16.1	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Little River	From a point 0.2 mile upstream of Wake County SR 2368 to bridge at N.C. Hwy. 97 (Town of Zebulon water supply intake)	WS-II NSW CA	030406	0.0	0.6	0.0	S	M			
Little River (Tarpleys Pond)	From Little Buffalo Creek to Spring Branch	WS-V NSW	030406	0.0	11.5	0.0	I	M		Low DO	Minor Municipal Point Source
Little River (Tarpleys Pond)	From bridge at N.C. Hwy. 97 to Little Buffalo Creek	WS-V NSW	030406	0.0	33.5	0.0	S	M			
Buffalo Creek (Wendell Lake)	From UT on west side of creek 0.8 miles south of Wendell Lake to Little River	C NSW	030406	0.0	15.0	0.0	S	M			
Little River	From Spring Branch to 4.2 miles upstream of NC 581	WS-IV NSW	030406	0.0	8.5	0.0	I	M		Low DO	Minor Municipal Point Source
Little River	From 4.2 miles upstream of NC 581 to a point 0.6 mile downstream of Smith Mill Run	WS-IV NSW	030406	0.0	11.9	0.0	S	M			
Little River	From a point 0.6 mile downstream of Smith Mill Run to City of Goldsboro water supply intake	WS-IV NSW CA	030406	0.0	1.1	0.0	S	M			
Little River	From City of Goldsboro water supply intake to U.S. Hwy. 70	C NSW	030406	0.0	1.2	0.0	S	M			
Little River	From U. S. Highway 70 to a point 1.0 mile downstream from U. S. Highway 70	B NSW	030406	0.0	1.0	0.0	S	M			
Little River	From a point 1.0 mile downstream from U.S. 70 to Neuse River	C NSW	030406	0.0	2.6	0.0	S	M			
Contentnea Cr (Buckhorn Reservoir)	From source to a point 0.6 mile upstream of Marsh Swamp	WS-V NSW	030407	0.0	6.2	0.0	S	M			
Moccasin Creek (Bunn Lake)	From source to Contentnea Creek	C NSW	030407	0.0	22.8	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Little Creek (West Side)	From source to Moccasin Creek	C NSW	030407	0.0	4.1	0.0	I	M	NP, P	Low DO	Urban Runoff/Storm Sewers
Bull Branch	From source to Moccasin Creek	C NSW	030407	0.0	4.0	0.0	NR	M			
Turkey Creek	From SR 1101 to Buckhorn Reservoir, Contentnea Creek	C NSW	030407	0.0	3.4	0.0	S	M			
Turkey Creek	From source to SR 1101	C NSW	030407	0.0	21.4	0.0	NR	M		Low DO	Source Unknown
Beaverdam Creek	From source to Turkey Creek	C NSW	030407	0.0	5.6	0.0	S	M			
Contentnea Creek	From a point 0.6 mile upstream of Marsh Swamp to a point 0.6 mile downstream of Shepard Branch	WS-IV NSW	030407	0.0	7.7	0.0	S	M			
Contentnea Creek (Wiggins Mill Reservoir)	From a point 0.6 mile downstream of Shepard Branch to dam at Wilson Water Supply Intake (Wiggins Mill Reservoir)	WS-IV NSW CA	030407	510.5	0.0	0.0	S	M			
Bloomery Swamp	From a point 0.3 mile upstream of mouth to Contentnea Creek	WS-IV NSW CA	030407	0.0	0.2	0.0	NR	M			
Contentnea Creek	From dam at Wilson Water Supply (Wiggins Mill Pond) to Neuse River	C Sw NSW	030407	0.0	79.8	0.0	S	M			
Hominy Swamp	From source to Contentnea Creek	C Sw NSW	030407	0.0	9.9	0.0	I	M			
Great Swamp	From source to Black Swamp	C Sw NSW	030407	0.0	12.7	0.0	NR	M			
Toisnot Swamp	From UT 0.9 miles south of US 301 to Contentnea Creek	C Sw NSW	030407	0.0	12.0	0.0	S	M			
Nahunta Swamp	From source to Contentnea Creek	C Sw NSW	030407	0.0	27.1	0.0	I	M	NP	Habitat degradation	Agriculture
The Slough	From source to Nahunta Swamp	C Sw NSW	030407	0.0	8.6	0.0	S	M			
Little Contentnea Creek	From source to Contentnea Creek	C Sw NSW	030407	0.0	34.9	0.0	I	M			
NEUSE RIVER	From mouth of Contentnea Creek to Streets Ferry	C Sw NSW	030408	0.0	22.3	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Core Creek	From Grape Creek to Neuse River	C Sw NSW	030408	0.0	15.4	0.0	I	M	NP	Habitat degradation	
Core Creek	From source to Grape Creek	C Sw NSW	030408	0.0	6.4	0.0	NR	M	NP		
Flat Swamp	From source to Core Creek	C Sw NSW	030408	0.0	5.2	0.0	NR	M			
NEUSE RIVER	From Streets Ferry to subbasin 030408-030410 boundary	SC Sw NSW	030408	0.0	0.0	426.5	I	M	NP, P	Chlorophyll a	
Swift Creek	From Clayroot Swamp to mouth of Bear Branch	C Sw NSW	030409	0.0	14.4	0.0	I	M	NP	Habitat degradation	Agriculture
Clayroot Swamp	From source to Swift Creek	C Sw NSW	030409	0.0	12.9	0.0	I	M	NP	Habitat degradation	Agriculture
Creeping Swamp	From source to Clayroot Swamp	C Sw NSW	030409	0.0	8.1	0.0	NR	M			
Palmetto Swamp	From source to Swift Creek	C Sw NSW	030409	0.0	8.6	0.0	NR	M			
Swift Creek	From mouth of Bear Branch to Neuse River	SC Sw NSW	030409	0.0	8.0	0.0	I	M	NP	Habitat degradation	Agriculture
NEUSE RIVER	From subbasin 030408-030410 boundary to a line across Neuse River from Johnson Point to McCotter Point	SC Sw NSW	030410	0.0	0.0	5,838.0	I	M	NP, P	Chlorophyll a	
Trent River	From boundary between subbasins 030410 and 030411 to mouth of Brice Creek	SB Sw NSW	030410	0.0	0.0	509.7	I	M	NP, P	Chlorophyll a	
Trent River	From mouth of Brice Creek to Neuse River	SB Sw NSW	030410	0.0	0.0	500.1	I	M	NP, P	Chlorophyll a	
NEUSE RIVER	From a line across Neuse River from Johnson Point to McCotter Point to a line across Neuse River from Wilkinson Point to Cherry Point	SB Sw NSW	030410	0.0	0.0	24,492.9	I	M	NP, P	Chlorophyll a	
Upper Broad Creek	From source to N. C. Hwy. 55 Bridge	C Sw NSW	030410	0.0	7.3	0.0	NR	M			
Goose Creek	From source to Scotts Store road (Pamlico County SR 1105)	C Sw NSW	030410	0.0	1.2	0.0	NR	m			
Southwest Prong Slocum Creek	From source to Slocum Creek	C Sw NSW	030410	0.0	4.2	0.0	NR	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
NEUSE RIVER	DEH prohibited area at mouth of Clubfoot Creek	SA NSW	030410	0.0	0.0	96.2	S	M			
NEUSE RIVER	From a line across Neuse River from Wilkinson Point to Cherry Point to its mouth in Pamlico Sound (mouth of Neuse River described as a line running from Maw point to Point of Marsh)excluding DEH prohibited areas at mouths of Clubfoot Creek, Greens Creek and Peirce Creek and DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	0.0	0.0	67,274.4	S	M			
NEUSE RIVER	DEH prohibited area at mouth of Green Creek	SA NSW	030410	0.0	0.0	61.7	S	M			
NEUSE RIVER	DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	0.0	0.0	210.0	S	M			
NEUSE RIVER	DEH prohibited area at mouth of Peirce Creek	SA NSW	030410	0.0	0.0	7.7	S	M			
Smith Creek	From a point 0.l miles downstream of Morris Creek to Greens Creek	SC NSW	030410	0.0	0.0	69.1	NR	M			
Trent River	From source to mouth of Deep Gully	C Sw NSW	030411	0.0	77.4	0.0	NR	M			
Tuckahoe Creek	From source to Trent River	C Sw NSW	030411	0.0	6.5	0.0	NR	M			
Beaver Creek	From source to Trent River	C Sw NSW	030411	0.0	12.3	0.0	NR	M			
Musselshell Creek	From souce to Trent River	C Sw NSW	030411	0.0	5.8	0.0	NR	M			
Crooked Run	From source to Trent River	C Sw NSW	030411	0.0	8.0	0.0	NR	M			
Beaverdam Creek	From source to Trent River	C Sw NSW	030411	0.0	6.0	0.0	NR	M			
Mill Run	From source to Trent River	C Sw NSW	030411	0.0	3.9	0.0	NR	M			
Trent River	From mouth of Deep Gully to boundary between subbasin 030410 and 030411	SB Sw NSW	030411	0.0	0.0	252.7	NR	M			
NEUSE RIVER	From subbasin 030402-030412 boundary to a point 0.8 mile upstream of Little River	WS-IV NSW	030412	0.0	18.5	0.0	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
NEUSE RIVER	From a point 0.8 mile upstream of Little River to City of Goldsboro water supply intake (located 0.4 mile upstream of Little River)	WS-IV NSW CA	030412	0.0	0.5	0.0	S	M			
NEUSE RIVER	From City of Goldsboro water supply intake to subbasin 030405-030412 boundary	C NSW	030412	0.0	5.8	0.0	S	M			
PAMLICO SOUND	Northern portion Pamlico within Neuse River Basin subbasin 030413	SA NSW	030413	0.0	0.0	64,244.0	S	M			
PAMLICO SOUND	DEH prohibited area at Cedar Island Ferry Harbor in southern portion Pamlico within Neuse River Basin subbasin 030414	SA NSW	030414	0.0	0.0	12.5	S	M			
PAMLICO SOUND	Southern portion Pamlico within Neuse River Basin subbasin 030414 with the exception of DEH prohibited area at mouth of Cedar Island Ferry Harbor	SA NSW	030414	0.0	0.0	84,692.5	S	M			
West Bay	From source to Pamlico Sound	SA NSW	030414	0.0	0.0	16,359.3	S	M			
Long Bay	From source to West Bay	SA NSW	030414	0.0	0.0	3,227.8	S	M			
Flag Creek	From source to Long Bay	SA NSW	030414	0.0	0.0	4.7	S	M			
Golden Creek	From source to Long Bay	SA NSW	030414	0.0	0.0	9.7	S	M			
Benneys Creek	From source to Long Bay	SA NSW	030414	0.0	0.0	2.6	S	M			
Henrys Creek	From source to Long Bay	SA NSW	030414	0.0	0.0	2.7	S	M			
Fur Creek	From source to Long Bay	SA NSW	030414	0.0	0.0	7.3	S	M			
Stump Bay	From source to Long Bay	SA NSW	030414	0.0	0.0	101.8	S	M			
Old Canal	From source to Stump Bay	SA NSW	030414	0.0	0.0	10.5	S	M			
Piney Island Bay	From source to Long Bay	SA NSW	030414	0.0	0.0	57.7	S	M			
Owens Bay	From source to Long Bay	SA NSW	030414	0.0	0.0	74.5	S	M			
Jacks Bay	From source to Long Bay	SA NSW	030414	0.0	0.0	61.0	S	M			
West Thorofare Bay	From source to West Bay	SA NSW	030414	0.0	0.0	1,018.2	S	M			
Bull Creek	From source to West Thorofare Bay	SA NSW	030414	0.0	0.0	13.2	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Cadduggen Creek	From source to West Thorofare Bay	SA NSW	030414	0.0	0.0	2.5	S	M			
Goose Bay	From source to West Thorofare Bay	SA NSW	030414	0.0	0.0	46.2	S	M			
Merkle Bay	From source to West Bay	SA NSW	030414	0.0	0.0	336.1	S	M			
Deep Bend	From source to West Bay	SA NSW	030414	0.0	0.0	241.2	S	M			
Nameless Bay	From source to West Bay	SA NSW	030414	0.0	0.0	75.5	S	M			
Green Point Cove	From source to West Bay	SA NSW	030414	0.0	0.0	100.3	S	M			
Dowdy Bay	From source to West Bay	SA NSW	030414	0.0	0.0	157.6	S	M			
Point of Island Bay	From source to West Bay	SA NSW	030414	0.0	0.0	115.5	S	M			
Newstump Bay	From source to West Bay	SA NSW	030414	0.0	0.0	176.6	S	M			
North Bay	From source to West Bay	SA NSW	030414	0.0	0.0	958.4	S	M			
Neuse-Southeast Pamlico Sound ORW Area	All waters within a line beginning at the southwest tip of Ocracoke Island, and extending northwest along the Tar-Pamlico River Basin and Neuse River Basin boundary line to Lat. 35 06’50", Long 76 06’30", thence in a southwest direction to Ship Point	SA ORW NSW	030414	0.0	0.0	38,582.8	S	M			
Core Sound	From Northeastern limit of White Oak River Basin (a line from Hall Point to Drum Inlet) to Pamlico Sound	SA ORW NSW	030414	0.0	0.0	18,201.7	S	M			
Thorofare Bay	From source to Core Sound	SA ORW NSW	030414	0.0	0.0	1,674.5	S	M			
Thorofare	From West Thorofare Bay to Thorofare Bay	SA NSW	030414	0.0	0.0	34.9	S	M			
Merkle Hammock Creek	From source to Thorofare Bay	SA NSW ORW	030414	0.0	0.0	186.0	S	M			
Barry Bay	From source to Thorofare Bay	SA ORW NSW	030414	0.0	0.0	606.6	S	M			
Rumley Bay	From source to Core Sound	SA ORW NSW	030414	0.0	0.0	167.7	S	M			
John Day Ditch	From source to Rumley Bay	SA NSW	030414	0.0	0.0	2.4	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Lewis Creek	From source to Core Sound	SA ORW NSW	030414	0.0	0.0	72.3	S	M			
Southwest Prong Lewis Creek	From source to Lewis Creek	SA ORW NSW	030414	0.0	0.0	11.8	S	M			
Big Gut	From source to Lewis Creek	SA NSW	030414	0.0	0.0	1.9	S	M			
Cedar Island Bay	Entire Bay, including all inlets, coves, and bays, not otherwise named in the schedule of classifications	SA ORW NSW	030414	0.0	0.0	2,857.0	S	M			
Great Pond	From source to Cedar Island Bay	SA ORW NSW	030414	0.0	0.0	3.0	S	M			
Back Bay	Entire Bay, including all inlets, coves, and bays, not otherwise named in the schedule of classifications	SA ORW NSW	030414	0.0	0.0	850.6	S	M			
Great Pond	From Pamlico Sound to Back Bay	SA ORW NSW	030414	0.0	0.0	42.5	S	M			
Noras Cove	Entire Cove	SA ORW NSW	030414	0.0	0.0	29.6	S	M			
End of Island Slough	From Pamlico Sound to Back Bay	SA ORW NSW	030414	0.0	0.0	2.8	S	M			
Snake Gut	From Pamlico Sound to Back Bay	SA ORW NSW	030414	0.0	0.0	4.8	S	M			
Fullers Ditch	From Pamlico Sound to Back Bay	SA ORW NSW	030414	0.0	0.0	6.9	S	M			
The Passage	From Pamlico Sound to Back Bay	SA ORW NSW	030414	0.0	0.0	70.6	S	M			
Deep Slough	From Pamlico Sound to The Passage	SA ORW NSW	030414	0.0	0.0	3.8	S	M			
Drum Pond	From source to Back Bay	SA ORW NSW	030414	0.0	0.0	0.3	S	M			
Goose Bay	Entire Bay	SA ORW NSW	030414	0.0	0.0	33.4	S	M			
Oyster Creek	From Core Sound to Goose Bay	SA ORW NSW	030414	0.0	0.0	45.8	S	M			

Name	Description	Class	Subbasin	Fresh water Acres	Stream Miles	Estuarine Acres	Rating	Basis	Source	Problem Parameter	Potential Source
Great Ditch	From Core Sound to Goose Bay	SA ORW NSW	030414	0.0	0.0	47.6	S	M			
Hog Island Narrows	From Cedar Island Bay to Back Bay	SA ORW NSW	030414	0.0	0.0	11.5	S	M			

NOTES

"Rating" = Use Support Rating

"Basis"=Rating basis

"Habitat degradation" is identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and stream bed scour.

ABBREVIATION KEY

P = Point Source Pollution (Major source)	nut = high nutrient levels
NP = Non-point Source Pollution	turb = turbidity
M = Monitored	fecal = fecal coliform bacteria
S = Supporting	sed = sediment
I = Impaired	ab = above
NR = Not Rated	nr = near
	be = below

Name	Description	Class	Subbasin	Fresh-water Acres	Estuarine Acres	Stream Miles	Rating	Basis	Potential Source
Eno River	From Orange County SR 1561 to U. S. Highway 501	WS-IV&B NSW	030401	0.0	0.0	16.2	S	M	
NEUSE RIVER (Falls Lake below normal pool elevation)	From I-85 bridge to dam at Falls Lake	WS-IV&B NSW CA	030401	9,530.3	0.0	0.0	S	M	
Crabtree Creek (Crabtree Lake)	From backwaters of Crabtree Lake to mouth of Richlands Creek	B NSW	030402	0.0	0.0	12.2	S	M	
Reedys Creek (Reedy Creek Lake)	From source to Crabtree Creek	B NSW	030402	28.8	0.0	0.0	S	M	
Sycamore Creek (Big Lake)	From source to Crabtree Creek	B NSW	030402	61.8	0.0	0.0	S	M	
Mill Branch (Cliffs of Neuse Lake)	From source to Still Branch	B NSW	030405	8.0	0.0	0.0	S	M	
Trent River	From boundary between subbasins 030410 and 030411 to mouth of Brice Creek	SB Sw NSW	030410	0.0	509.7	0.0	S	M	
Trent River	From mouth of Deep Gully to boundary between subbasin 030410 and 030411	SB Sw NSW	030411	0.0	252.7	0.0	S	M	
NEUSE RIVER	From a line across Neuse River from Johnson Point to McCotter Point to a line across Neuse River from Wilkinson Point to Cherry Point	SB Sw NSW	030410	0.0	24,492.9	0.0	S	M	
Northwest Creek	From source to Neuse River	SB Sw NSW	030410	0.0	165.4	0.0	S	M	
Upper Broad Creek	From Pamlico County SR 1103 (Lees Landing) to Neuse River	SB Sw NSW	030410	0.0	795.9	0.0	S	M	
Goose Creek	From a point 0.5 miles downstream of Cypress Creek to Neuse River	SB Sw NSW	030410	0.0	512.6	0.0	S	M	
NEUSE RIVER	DEH prohibited area at mouth of Clubfoot Creek	SA NSW	030410	0.0	96.2	0.0	S	M	
NEUSE RIVER	DEH prohibited area at mouth of Green Creek	SA NSW	030410	0.0	61.7	0.0	S	M	
NEUSE RIVER	DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	0.0	210.0	0.0	S	M	
NEUSE RIVER	From a line across Neuse River from Wilkinson Point to Cherry Point to its mouth in Pamlico Sound (mouth of Neuse River described as a line running from Maw point to Point of Marsh)excluding DEH prohibited areas at mouths of Clubfoot Creek, Greens Creek and Peirce Creek and DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	0.0	67,274.4	0.0	S	M	

Name	Description	Class	Subbasin	Fresh-water Acres	Estuarine Acres	Stream Miles	Rating	Basis	Potential Source
NEUSE RIVER	DEH prohibited area at mouth of Peirce Creek	SA NSW	030410	0.0	7.7	0.0	S	M	
Clubfoot Creek	From source to Neuse River	SA NSW	030410	0.0	562.6	0.0	S	M	
Dawson Creek	From mouth of Tarkiln Creek to Neuse River	SA NSW	030410	0.0	122.1	0.0	S	M	
Adams Creek	From a line crossing Adams Creek at a point 406 meters south of mouth of Kellum Creek to a point 637 meters north of mouth Beck Creek exluding DEH prohibited area at mouth of Dumpling Creek to Neuse River	SA NSW	030410	0.0	1,424.6	0.0	S	M	
Adams Creek	DEH conditionally approved-closed area from source to a line crossing Adams Creek at a point 406 meters south of mouth of Kellum Creek to a point 637 meters north of mouth of Beck Creek	SA NSW	030410	0.0	317.0	0.0	S	M	
Adams Creek	DEH prohibited area at mouth of Dumpling Creek	SA NSW	030410	0.0	3.2	0.0	S	M	
Adams Creek Canal (Intracoastal Waterway)	From the White Oak River Basin Boundary (Craven-Cataret County Line) to Adams Creek	SA NSW	030410	0.0	138.9	0.0	S	M	
Back Creek (Black Creek)	From source to Adams Creek	SA NSW	030410	0.0	261.7	0.0	S	M	
Whittaker Creek	From source to Neuse River	SA NSW	030410	0.0	96.1	0.0	S	M	
Pierce Creek	From source to Neuse River	SA NSW	030410	0.0	50.7	0.0	S	M	
Orchard Creek	From a line crossing Orchard Creek at a point 91 meters south of mouth of Bright Creek to a point 99 meters north of mouth of Pasture Creek to Neuse River	SA NSW	030410	0.0	20.4	0.0	S	M	
PAMLICO SOUND	Northern portion Pamlico within Neuse River Basin subbasin 030413	SA NSW	030413	0.0	64,244.0	0.0	S	M	
PAMLICO SOUND	Southern portion Pamlico within Neuse River Basin subbasin 030414 with the exception of DEH prohibited area at mouth of Cedar Island Ferry Harbor	SA NSW	030414	0.0	84,692.5	0.0	S	M	
West Bay	From source to Pamlico Sound	SA NSW	030414	0.0	16,359.3	0.0	S	M	
West Thorofare Bay	From source to West Bay	SA NSW	030414	0.0	1,018.2	0.0	S	M	
Neuse-Southeast Pamlico Sound ORW Area	All waters within a line beginning at the southwest tip of Ocracoke Island, and extending northwest along the Tar-Pamlico River Basin and Neuse River Basin boundary line to Lat. 35 06’50", Long 76 06’30", thence in a southwest direction to Ship Point	SA ORW NSW	030414	0.0	38,582.8	0.0	S	M	
Core Sound	From Northeastern limit of White Oak River Basin (a line from Hall Point to Drum Inlet) to Pamlico Sound	SA ORW NSW	030414	0.0	18,201.7	0.0	S	M	

Name	Description	Class	Subbasin	Fresh-water Acres	Estuarine Acres	Stream Miles	Rating	Basis	Potential Source
Thorofare Bay	From source to Core Sound	SA ORW NSW	030414	0.0	1,674.5	0.0	S	M	
Thorofare	From West Thorofare Bay to Thorofare Bay	SA NSW	030414	0.0	34.9	0.0	S	M	
Merkle Hammock Creek	From source to Thorofare Bay	SA NSW ORW	030414	0.0	186.0	0.0	S	M	
Bay River	From a line across Bay River from Flea Point to The Hammock, (excluding that portion of the Bay River landward of a line running from Poorhouse Point to Darby Point which is classified SC Sw NSW also excluding the DEH prohibited area extending 366 meters east of this line), to Pamlico Sound	SA NSW	030413	0.0	8,999.0	0.0	S	M	

NOTES

"Rating" = Use Support Rating

"Basis"=Rating basis

ABBREVIATION KEY

P = Point Source Pollution (Major source)

NP = Non-point Source Pollution

M = Monitored

S = Supporting

I = Impaired

NR = Not Rated

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
NEUSE RIVER	DEH prohibited area at mouth of Clubfoot Creek	SA NSW	030410	96.2	I	M	PRO	100
NEUSE RIVER	DEH prohibited area at mouth of Green Creek	SA NSW	030410	61.7	I	M	PRO	100
NEUSE RIVER	DEH prohibited area at mouth of Peirce Creek	SA NSW	030410	7.7	I	M	PRO	100
NEUSE RIVER	DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	210.0	S	M	CAO	4.2
NEUSE RIVER	From a line across Neuse River from Wilkinson Point to Cherry Point to its mouth in Pamlico Sound (mouth of Neuse River described as a line running from Maw point to Point of Marsh)excluding DEH prohibited areas at mouths of Clubfoot Creek, Greens Creek and Peirce Creek and DEH Conditionally approved-open area at mouth of the South River	SA NSW	030410	67,274.4	S	M	APP	
Cherry Branch	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
King Creek	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
Gatlin Creek	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
Sassafras Branch	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
Clubfoot Creek	From source to Neuse River	SA NSW	030410	562.6	I	M	PRO	100
Harlowe Canal	From White Oak River Basin Boundary (Craven-Carteret County Line) to Clubfoot Creek	SA NSW	030410	0.0	I	M	PRO	100
Mortons Mill Pond	From source to Clubfoot Creek	SA NSW	030410	30.6	I	M	PRO	100
West Prong Mortons Mill Pond	From source to Mortons Mill Pond	SA NSW	030410	0.0	I	M	PRO	100
East Prong Mortons Mill Pond	From source to Mortons Mill Pond	SA NSW	030410	0.0	I	M	PRO	100
Gulden Creek	From source to Clubfoot Creek	SA NSW	030410	34.9	I	M	PRO	100
Mitchell Creek	From source to Clubfoot Creek	SA NSW	030410	117.5	I	M	PRO	100
Big Branch	From source to Mitchell Creek	SA NSW	030410	1.6	I	M	PRO	100
Snake Branch	From source to Mitchell Creek	SA NSW	030410	0.0	I	M	PRO	100
Long Creek	From source to Neuse River	SA NSW	030410	67.7	S	M	APP	
Dawson Creek	From mouth of Tarkiln Creek to Neuse River	SA NSW	030410	122.1	I	M	PRO	100
Great Neck Creek	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
Courts Creek (Coaches Creek)	From source to Neuse River	SA NSW	030410	43.1	S	M	APP	
Adams Creek	From a line crossing Adams Creek at a point 406 meters south of mouth of Kellum Creek to a point 637 meters north of mouth Beck Creek exluding DEH prohibited area at mouth of Dumpling Creek to Neuse River	SA NSW	030410	1,424.6	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
Adams Creek	DEH prohibited area at mouth of Dumpling Creek	SA NSW	030410	3.2	I	M	PRO	100
Adams Creek	DEH conditionally approved-closed area from source to a line crossing Adams Creek at a point 406 meters south of mouth of Kellum Creek to a point 637 meters north of mouth of Beck Creek	SA NSW	030410	317.0	I	M	CAC	
Adams Creek Canal (Intracoastal Waterway)	From the White Oak River Basin Boundary (Craven-Cataret County Line) to Adams Creek	SA NSW	030410	138.9	I	M	PRO	100
Jerry Bay	From source to Adams Creek	SA NSW	030410	52.2	I	M	CAC	
Isaac Creek	From source to Adams Creek	SA NSW	030410	39.1	I	M	PRO	100
Back Creek (Black Creek)	From source to Adams Creek	SA NSW	030410	261.7	I	M	PRO	100
Kearney Creek	From source to Adams Creek	SA NSW	030410	4.0	I	M	CAC	
Kellum Creek	From source to Adams Creek	SA NSW	030410	10.5	S	M	APP	
Cedar Creek	From source to Adams Creek	SA NSW	030410	108.9	S	M	APP	
Cullie Creek	From source to Cedar Creek	SA NSW	030410	4.4	S	M	APP	
Jonaquin Creek	From source to Cedar Creek	SA NSW	030410	35.9	S	M	APP	
Dumpling Creek	From source to Adams Creek	SA NSW	030410	25.4	I	M	PRO	100
Sandy Huss Creek	From source to Adams Creek	SA NSW	030410	15.5	S	M	APP	
Delamar Creek	From source to Adams Creek	SA NSW	030410	11.6	S	M	APP	
Godfrey Creek	From source to Adams Creek	SA NSW	030410	34.7	S	M	APP	
Whittaker Creek	From source to Neuse River	SA NSW	030410	96.1	I	M	PRO	100
Garbacon Creek	From source to Neuse River	SA NSW	030410	25.8	S	M	APP	
Berrys Creek	From source to Neuse River	SA NSW	030410	0.0	S	M	APP	
Pierce Creek	From source to Neuse River	SA NSW	030410	50.7	I	M	PRO	100
Orchard Creek	From source to a line crossing Orchard Creek at a point 91 meters south of mouth of Bright Creek to a point 99 meters north of mouth of Pasture Creek	SA NSW	030410	37.1	I	M	PRO	100
Orchard Creek	From a line crossing Orchard Creek at a point 91 meters south of mouth of Bright Creek to a point 99 meters north of mouth of Pasture Creek to Neuse River	SA NSW	030410	20.4	S	M	APP	
Bright Creek	From source to Orchard Creek	SA NSW	030410	10.9	I	M	PRO	100
Pasture Creek	From source to Orchard Creek	SA NSW	030410	20.3	S	M	APP	
Old House Creek	From source to Orchard Creek	SA NSW	030410	6.0	S	M	APP	
South River	From source to a line crossing the South River at a point 97 meters north of mouth of Southwest Creek to a point 418 meters north of mouth of Doe Creek	SA NSW	030410	385.0	I	M	PRO	100

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
South River	From a line crossing the South River at a point 97 meters north of mouth of Southwest Creek to a point 418 meters north of mouth of Doe Creek t Neuse River	SA NSW	030410	2,094.9	S	M	CAO	4.2
West Fork South River	From source to South River	SA NSW	030410	35.5	I	M	PRO	100
East Fork South River	From source to South River	SA NSW	030410	14.3	I	M	PRO	100
Rich Island Gut	From source to East Fork South River	SA NSW	030410	0.0	I	M	PRO	100
Miry Gut	From source to South River	SA NSW	030410	0.1	I	M	PRO	100
Elisha Creek	From source to South River	SA NSW	030410	2.2	I	M	PRO	100
Neal Creek	From source to South River	SA NSW	030410	2.9	I	M	PRO	100
Duck Creek	From source to South River	SA NSW	030410	2.6	I	M	PRO	100
Buck Creek	From source to South River	SA NSW	030410	6.4	I	M	PRO	100
Doe Creek	From source to South River	SA NSW	030410	4.9	I	M	PRO	100
Southwest Creek	From source to South River	SA NSW	030410	151.3	I	M	PRO	100
Eastman Creek	From source to South River	SA NSW	030410	95.6	I	M	PRO	100
Little Creek	From source to South River	SA NSW	030410	6.2	S	M	CAO	4.2
Royal Creek	From source to South River	SA NSW	030410	10.1	S	M	CAO	4.2
Coffee Creek	From source to South River	SA NSW	030410	6.1	S	M	CAO	4.2
Dixon Creek	From source to South River	SA NSW	030410	2.3	S	M	CAO	4.2
Old House Creek	From source to South River	SA NSW	030410	3.2	S	M	CAO	4.2
Mulberry Creek	From source to South River	SA NSW	030410	6.4	S	M	CAO	4.2
Big Creek	From DEH prohibited area line to South River	SA NSW	030410	58.4	S	M	CAO	4.2
Big Creek	From source to DEH prohibited area line	SA NSW	030410	59.6	I	M	PRO	100
Hardy Creek	From source to South River	SA NSW	030410	24.2	I	M	PRO	100
Horton Bay	From source to South River	SA NSW	030410	101.3	S	M	CAO	4.2
Herring Pond	Entire pond and connecting stream to South River	SA NSW	030410	11.1	S	M	APP	
Brown Creek	From source to Neuse River	SA NSW	030410	98.5	S	M	APP	
Turnagain Bay	From source to Neuse River	SA NSW	030410	1,556.8	S	M	APP	
Sanborns Gut	From source to Trunagain Bay	SA NSW	030410	3.7	S	M	APP	
Big Gut	From source to Turnagain Bay	SA NSW	030410	70.0	S	M	APP	
Deep Gut	From source to Turnagain Bay	SA NSW	030410	51.0	S	M	APP	
Broad Creek	From source to Turnagain Bay	SA NSW	030410	49.2	S	M	APP	
Pitman Creek	From source to Broad Creek	SA NSW	030410	2.0	S	M	APP	
Parsons Creek	From source to Broad Creek	SA NSW	030410	26.7	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
Abraham Bay	From source to Turnagain Bay	SA NSW	030410	96.9	S	M	APP	
Tump Gut	From source to Turnagain Bay	SA NSW	030410	20.9	S	M	APP	
Mulberry Point Creek	From source to Turnagain Bay	SA NSW	030410	15.7	S	M	APP	
Cedar Bay	From source to Neuse River	SA NSW	030410	267.4	S	M	APP	
Little Creek	From source to Neuse River	SA NSW	030410	13.5	S	M	APP	
Gum Tricket Creek	From source to Neuse River	SA NSW	030410	10.5	S	M	APP	
Broad Creek	From source to a line across Broad Creek from a point 331 meters east of mouth of Browns Creek to a point 145 meters east of mouth of Tar Creek	SA NSW	030410	202.3	I	M	PRO	100
Broad Creek	From a line across Broad Creek from a point 331 meters east of mouth of Browns Creek to a point 145 meters east of mouth of Tar Creek to the Neuse River	SA NSW	030410	527.7	S	M	APP	
Ship Creek	From source to Broad Creek	SA NSW	030410	5.4	I	M	PRO	100
Gideon Creek	From source to Broad Creek	SA NSW	030410	26.0	I	M	PRO	100
Brown Creek	From source to Broad Creek	SA NSW	030410	122.4	I	M	PRO	100
Spice Creek	From source to Brown Creek	SA NSW	030410	4.7	I	M	PRO	100
Coffee Creek	From source to Brown Creek	SA NSW	030410	7.1	I	M	PRO	100
Tar Creek	From source to Broad Creek	SA NSW	030410	44.3	I	M	PRO	100
Pasture Creek	From source to Broad Creek	SA NSW	030410	2.1	S	M	APP	
Parris Creek	From source to Broad Creek	SA NSW	030410	19.4	S	M	APP	
Burton Creek	From source to Broad Creek	SA NSW	030410	46.3	S	M	APP	
Pittman Creek	From source to Broad Creek	SA NSW	030410	65.8	S	M	APP	
Mill Creek	From source to Broad Creek	SA NSW	030410	12.3	S	M	APP	
Cedar Creek	From source to Broad Creek	SA NSW	030410	11.7	S	M	APP	
Green Creek	From source to Broad Creek	SA NSW	030410	79.1	S	M	APP	
Piney Point Creek	From source to Neuse River	SA NSW	030410	13.0	S	M	APP	
Rattan Bay	From source to Neuse River	SA NSW	030410	369.8	S	M	APP	
South Bay	From source to Rattan Bay	SA NSW	030410	527.1	S	M	APP	
East Bay	From source to Rattan Bay	SA NSW	030410	174.2	S	M	APP	
North Bay	From source to Rattan Bay	SA NSW	030410	126.9	S	M	APP	
Swan Creek	From source to Neuse River	SA NSW	030410	207.0	S	M	APP	
Wading Creek	From source to Neuse River	SA NSW	030410	9.0	S	M	APP	
Maw Bay	From source to Neuse River	SA NSW	030410	18.9	S	M	APP	
Maw Point Creek	From source to Neuse River	SA NSW	030410	7.5	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
PAMLICO SOUND	Northern portion Pamlico within Neuse River Basin subbasin 030413	SA NSW	030413	64,244.0	S	M	APP	
Bay River	DEH closed extending 366 meters east of SC SA line	SA NSW	030413	100.0	I	M	PRO	100
Bay River	From a line across Bay River from Flea Point to The Hammock, (excluding that portion of the Bay River landward of a line running from Poorhouse Point to Darby Point which is classified SC Sw NSW also excluding the DEH prohibited area extending 366 meters east of this line), to Pamlico Sound	SA NSW	030413	8,999.0	S	M	APP	
Harper Creek	From source to Bay River	SA NSW	030413	32.5	I	M	PRO	100
Tempe Gut	From source to Bay River	SA NSW	030413	0.9	S	M	APP	
Moore Creek	From source to Bay River	SA NSW	030413	28.3	S	M	APP	
Chappel Creek	From source to Moore Creek	SA NSW	030413	1.5	S	M	APP	
Newton Creek	From source to Bay River	SA NSW	030413	3.8	S	M	APP	
Little Pasture Creek	From source to Bay River	SA NSW	030413	6.0	S	M	APP	
Rice Creek	From source to Bay River	SA NSW	030413	12.8	S	M	APP	
Mesic Creek	From source to Bay River	SA NSW	030413	4.3	S	M	APP	
Ball Creek	From source to Bay River	SA NSW	030413	112.4	S	M	APP	
Simpson Creek	From source to Ball Creek	SA NSW	030413	8.6	S	M	APP	
Pasture Creek	From source to Ball Creek	SA NSW	030413	9.3	S	M	APP	
Cabin Creek	From source to Ball Creek	SA NSW	030413	30.5	S	M	APP	
Harris Creek	From source to Bay River	SA NSW	030413	2.8	S	M	APP	
Gascon Creek	From source to Bay River	SA NSW	030413	3.2	S	M	APP	
Barnes Creek	From source to Bay River	SA NSW	030413	1.5	S	M	APP	
Potter Creek	From source to Bay River	SA NSW	030413	13.7	S	M	APP	
Oyster Creek	From source to Bay River	SA NSW	030413	19.6	S	M	APP	
Bonner Bay	From source to Bay River	SA NSW	030413	865.3	S	M	APP	
Spring Creek	From source to Bonner Bay	SA NSW	030413	279.0	S	M	APP	
Richardson Creek	From source to Spring Creek	SA NSW	030413	8.9	S	M	APP	
Maul Run	From source to Spring Creek	SA NSW	030413	1.2	S	M	APP	
Horton Creek	From source to Spring Creek	SA NSW	030413	4.6	S	M	APP	
Bryan Creek	From source to Spring Creek	SA NSW	030413	13.2	S	M	APP	
Ives Creek	From source to Bryan Creek	SA NSW	030413	8.5	S	M	APP	
Long Creek	From source to Bonner Bay	SA NSW	030413	356.8	S	M	APP	
Deep Oak Gut	From source to Long Creek	SA NSW	030413	2.2	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
Cow Gallus Creek	From source to Long Creek	SA NSW	030413	11.4	S	M	APP	
Dipping Vat Creek	From source to Long Creek	SA NSW	030413	26.9	S	M	APP	
Riggs Creek	From source to Bonner Bay	SA NSW	030413	115.2	S	M	APP	
Savannah Creek	From source to Riggs Creek	SA NSW	030413	11.0	S	M	APP	
Morris Creek	From source to Riggs Creek	SA NSW	030413	5.4	S	M	APP	
Raff Creek	From source to Riggs Creek	SA NSW	030413	10.9	S	M	APP	
Sheephead Creek	From source to Bonner Bay	SA NSW	030413	18.7	S	M	APP	
Little Bear Creek	From source to Bay River	SA NSW	030413	55.3	S	M	APP	
Blossum Pond Creek	From source to Little Bear Creek	SA NSW	030413	15.1	S	M	APP	
Bear Creek	From DEH prohibited area line 42 meters south of confluence with Bennet Creek to Bay River	SA NSW	030413	199.9	S	M	APP	
Bear Creek	From source to DEH prohibited area line 42 meters south of confluence with Bennett Creek	SA NSW	030413	199.9	I	M	PRO	100
Bennett Creek	From source to Bear Creek	SA NSW	030413	15.7	I	M	PRO	100
Win Creek	From source to Bear Creek	SA NSW	030413	1.2	S	M	APP	
Plum Creek	From source to Bear Creek	SA NSW	030413	8.1	S	M	APP	
Riggs Creek	From source to Bear Creek	SA NSW	030413	23.2	S	M	APP	
Cox Creek	From source to Bear Creek	SA NSW	030413	3.4	S	M	APP	
Garden Creek	From source to Bear Creek	SA NSW	030413	6.4	S	M	APP	
Harper Creek	From source to Bear Creek	SA NSW	030413	4.1	S	M	APP	
Catchall Creek	From source to Bear Creek	SA NSW	030413	4.6	S	M	APP	
Chadwick Creek	From source to Bay River	SA NSW	030413	54.4	S	M	APP	
No Jacket	From source to Bay River	SA NSW	030413	13.3	S	M	APP	
Gale Creek	From source to DEH prohibited area line on west side of ICWW	SA NSW	030413	29.4	I	M	PRO	100
Gale Creek	From DEH prohibited area line on west side of ICWW to Bay River including east side of ICWW	SA NSW	030413	189.6	S	M	APP	
Intracoastal Waterway	From Jones Bay to Gale Creek	SA NSW	030413	83.9	S	M	APP	
Jumpover Creek	From source to Intracoastal Waterway	SA NSW	030413	7.7	S	M	APP	
Raccoon Creek	From source to Gale Creek	SA NSW	030413	8.1	S	M	APP	
Whealton Creek	From source to Gale Creek	SA NSW	030413	7.6	S	M	APP	
Tar Creek	From source to Gale Creek	SA NSW	030413	3.8	S	M	APP	
Ditch Creek	From source to Gale Creek	SA NSW	030413	19.0	S	M	APP	
Ditch Creek Canal	From Ditch Creek (Jones Bay) to Ditch Creek (Gale Creek)	SA NSW	030413	0.0	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
Sheeppen Creek	From source to Bay River	SA NSW	030413	9.7	S	M	APP	
Hogpen Creek	From source to Bay River	SA NSW	030413	3.9	S	M	APP	
Yaupon Creek	From source to Bay River	SA NSW	030413	18.6	S	M	APP	
Dump Creek	From source to Bay River	SA NSW	030413	84.2	S	M	APP	
Rockhole Bay	From source to Bay River	SA NSW	030413	230.1	S	M	APP	
Fisherman Bay	From source to Bay River	SA NSW	030413	64.5	S	M	APP	
Sound Bay	From source to Pamlico Sound	SA NSW	030413	53.6	S	M	APP	
Jones Bay	From source to Pamlico Sound	SA NSW	030413	2,876.2	S	M	APP	
Intracoastal Waterway	From N. C. Hwy 304 Bridge to Jones Bay	SA NSW	030413	7.0	S	M	APP	
Henry Creek	From source to Jones Bay	SA NSW	030413	1.5	S	M	APP	
Bills Creek	From source to Jones Bay	SA NSW	030413	8.1	I	M	PRO	100
Doll Creek	From source to Jones Bay	SA NSW	030413	11.2	S	M	APP	
Lambert Creek	From source to Jones Bay	SA NSW	030413	7.4	S	M	APP	
Ditch Creek	From source to Jones Bay	SA NSW	030413	171.2	S	M	APP	
Sheepneck Creek	From source to Ditch Creek	SA NSW	030413	15.6	S	M	APP	
Dowdy Creek	From source to Ditch Creek	SA NSW	030413	7.5	S	M	APP	
Drum Creek	From source to Jones Bay	SA NSW	030413	59.0	S	M	APP	
Little Eve Creek	From source to Jones Bay	SA NSW	030413	24.9	S	M	APP	
Little Drum Creek	From source to Jones Bay	SA NSW	030413	20.6	S	M	APP	
Coot Creek	From source to Jones Bay	SA NSW	030413	0.3	S	M	APP	
Fishing Bay	From source to Pamlico Sound	SA NSW	030413	63.0	S	M	APP	
Middle Bay	From source to Pamlico Sound	SA NSW	030413	535.5	S	M	APP	
Capp Creek	From source to Middle Bay	SA NSW	030413	11.0	S	M	APP	
Leary Canal	From Porpoise Creek to Capp Creek	SA NSW	030413	0.0	S	M	APP	
Preston Bay	From source to Middle Bay	SA NSW	030413	9.0	S	M	APP	
Flower Bay	From source to Middle Bay	SA NSW	030413	21.6	S	M	APP	
Roundabout Bay	From source to Middle Bay	SA NSW	030413	33.6	S	M	APP	
Little Oyster Creek	From source to Middle Bay	SA NSW	030413	62.4	S	M	APP	
Big Oyster Creek	From source to Pamlico Sound	SA NSW	030413	55.5	S	M	APP	
Big Porpoise Bay	From source to Pamlico Sound	SA NSW	030413	661.7	S	M	APP	
Porpoise Creek	From source to Big Porpoise Bay	SA NSW	030413	24.2	S	M	APP	
Little Porpoise Bay	From source to Pamlico Sound	SA NSW	030413	176.1	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
PAMLICO SOUND	Southern portion Pamlico within Neuse River Basin subbasin 030414 with the exception of DEH prohibited area at mouth of Cedar Island Ferry Harbor	SA NSW	030414	84,692.5	S	M	APP	
PAMLICO SOUND	DEH prohibited area at Cedar Island Ferry Harbor in southern portion Pamlico within Neuse River Basin subbasin 030414	SA NSW	030414	12.5	I	M	PRO	100
West Bay	From source to Pamlico Sound	SA NSW	030414	16,359.3	S	M	APP	
Long Bay	From source to West Bay	SA NSW	030414	3,227.8	S	M	APP	
Flag Creek	From source to Long Bay	SA NSW	030414	4.7	S	M	APP	
Golden Creek	From source to Long Bay	SA NSW	030414	9.7	I	M	PRO	100
Benneys Creek	From source to Long Bay	SA NSW	030414	2.6	S	M	APP	
Henrys Creek	From source to Long Bay	SA NSW	030414	2.7	S	M	APP	
Fur Creek	From source to Long Bay	SA NSW	030414	7.3	S	M	APP	
Stump Bay	From source to Long Bay	SA NSW	030414	101.8	S	M	APP	
Old Canal	From source to Stump Bay	SA NSW	030414	10.5	S	M	APP	
Piney Island Bay	From source to Long Bay	SA NSW	030414	57.7	S	M	APP	
Owens Bay	From source to Long Bay	SA NSW	030414	74.5	S	M	APP	
Jacks Bay	From source to Long Bay	SA NSW	030414	61.0	S	M	APP	
West Thorofare Bay	From source to West Bay	SA NSW	030414	1,018.2	S	M	APP	
Bull Creek	From source to West Thorofare Bay	SA NSW	030414	13.2	S	M	APP	
Cadduggen Creek	From source to West Thorofare Bay	SA NSW	030414	2.5	S	M	APP	
Goose Bay	From source to West Thorofare Bay	SA NSW	030414	46.2	S	M	APP	
Merkle Bay	From source to West Bay	SA NSW	030414	336.1	S	M	APP	
Deep Bend	From source to West Bay	SA NSW	030414	241.2	S	M	APP	
Nameless Bay	From source to West Bay	SA NSW	030414	75.5	S	M	APP	
Green Point Cove	From source to West Bay	SA NSW	030414	100.3	S	M	APP	
Dowdy Bay	From source to West Bay	SA NSW	030414	157.6	S	M	APP	
Point of Island Bay	From source to West Bay	SA NSW	030414	115.5	S	M	APP	
Newstump Bay	From source to West Bay	SA NSW	030414	176.6	S	M	APP	
North Bay	From source to West Bay	SA NSW	030414	958.4	S	M	APP	
Neuse-Southeast Pamlico Sound ORW Area	All waters within a line beginning at the southwest tip of Ocracoke Island, and extending northwest along the Tar-Pamlico River Basin and Neuse River Basin boundary line to Lat. 35 06’50", Long 76 06’30", thence in a southwest direction to Ship Point	SA ORW NSW	030414	38,582.8	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
Core Sound	From Northeastern limit of White Oak River Basin (a line from Hall Point to Drum Inlet) to Pamlico Sound	SA ORW NSW	030414	18,201.7	S	M	APP	
Thorofare Bay	From source to Core Sound	SA ORW NSW	030414	1,674.5	S	M	APP	
Thorofare	From West Thorofare Bay to Thorofare Bay	SA NSW	030414	34.9	I	M	PRO	100
Merkle Hammock Creek	From source to Thorofare Bay	SA NSW ORW	030414	186.0	S	M	APP	
Barry Bay	From source to Thorofare Bay	SA ORW NSW	030414	606.6	S	M	APP	
Rumley Bay	From source to Core Sound	SA ORW NSW	030414	167.7	S	M	APP	
John Day Ditch	From source to Rumley Bay	SA NSW	030414	2.4	S	M	APP	
Lewis Creek	From source to Core Sound	SA ORW NSW	030414	72.3	S	M	APP	
Southwest Prong Lewis Creek	From source to Lewis Creek	SA ORW NSW	030414	11.8	S	M	APP	
Big Gut	From source to Lewis Creek	SA NSW	030414	1.9	S	M	APP	
Cedar Island Bay	Entire Bay, including all inlets, coves, and bays, not otherwise named in the schedule of classifications	SA ORW NSW	030414	2,857.0	S	M	APP	
Great Pond	From source to Cedar Island Bay	SA ORW NSW	030414	3.0	s	M	PRO	100
Back Bay	Entire Bay, including all inlets, coves, and bays, not otherwise named in the schedule of classifications	SA ORW NSW	030414	850.6	S	M	APP	
Great Pond	From Pamlico Sound to Back Bay	SA ORW NSW	030414	42.5	S	M	APP	
Noras Cove	Entire Cove	SA ORW NSW	030414	29.6	S	M	APP	
End of Island Slough	From Pamlico Sound to Back Bay	SA ORW NSW	030414	2.8	S	M	APP	
Snake Gut	From Pamlico Sound to Back Bay	SA ORW NSW	030414	4.8	S	M	APP	
Fullers Ditch	From Pamlico Sound to Back Bay	SA ORW NSW	030414	6.9	S	M	APP	

Name	Description	Class	Subbasin	Estuarine Acres	Rating	Basis	DEH Class	Percent Closed
The Passage	From Pamlico Sound to Back Bay	SA ORW NSW	030414	70.6	S	M	APP	
Deep Slough	From Pamlico Sound to The Passage	SA ORW NSW	030414	3.8	S	M	APP	
Drum Pond	From source to Back Bay	SA ORW NSW	030414	0.3	S	M	APP	
Goose Bay	Entire Bay	SA ORW NSW	030414	33.4	S	M	APP	
Oyster Creek	From Core Sound to Goose Bay	SA ORW NSW	030414	45.8	S	M	APP	
Great Ditch	From Core Sound to Goose Bay	SA ORW NSW	030414	47.6	S	M	APP	
Hog Island Narrows	From Cedar Island Bay to Back Bay	SA ORW NSW	030414	11.5	S	M	APP	
NOTES								
"Rating" = Use Support Rating	Problem Parameter for all impaired Class SA waters is fecal coliform bacteria							
"Basis"=Rating basis								
ABBREVIATION KEY								
M = Monitored	APP = Approved							
S = Supporting	CAO = Conditionally Approved-Open							
I = Impaired	CAC = Conditionally Approved-Closed							
NR = Not Rated	PRO = Prohibited							

Appendix IV

303(d) Listing
and
Reporting Methodology

303(d) LISTING AND REPORTING REQUIREMENTS

What is the 303(d) List?

Section 303(d) of the Clean Water Act (CWA) requires states to develop a comprehensive public accounting of all impaired waters. North Carolina's list of impaired waters must be submitted to EPA by April 1 of every even year (40 CFR 130.7). The list includes waters impaired by pollutants, such as nitrogen, phosphorus and fecal coliform bacteria, and by pollution, such as hydromodification and habitat degradation. The source of impairment might be from point sources, nonpoint sources or atmospheric deposition. Some sources of impairment exist across state lines. North Carolina lists impaired waters regardless of whether the pollutant or source of pollution is known and whether the pollutant/pollution source(s) can be legally controlled or acted upon by the State of North Carolina. More complete information can be obtained from *North Carolina's 2000 303(d) List* (http://h2o.enr.state.nc.us/mtu/), which can be obtained by calling the Planning Branch of DWQ at (919) 733-5083.

303(d) List Development

Generally, there are three steps to preparing North Carolina's 303(d) list. They are: 1) gathering information about the quality of North Carolina's waters; 2) screening those waters to determine if any are impaired and should be listed; and 3) prioritizing listed waters for TMDL development. The following subsections describe each of these steps in more detail.

Sources of Information

North Carolina considers all practical existing and readily available data and information in preparing the 303(d) list. Sources solicited for "existing and readily available data and information" include, but are not limited to the following:

- The previous 303(d) list.
- Basinwide Water Quality Plans and Assessment Reports.
- 305(b) reports.
- 319 nonpoint source pollution assessments.
- Waters where specific fish or shellfish consumption bans and/or advisories are currently in effect.
- Waters for which effluent toxicity test results indicate possible or actual excursions of state water quality standards.
- Waters identified by the state as impaired in its most recent Clean Lakes Assessment.
- Drinking water source water assessments under the Safe Drinking Water Act.
- Trend analyses and predictive models used for determining numeric and narrative water quality standard compliance.
- Data, information and water quality problems reported from local, state or federal agencies, Tribal governments, members of the public and academic institutions.

Listing Criteria

Waters whose use support ratings were not supporting (NS) or partially supporting (PS) based on monitored information in the 305(b) report are considered as initial candidates for the 303(d) list. Waters that were listed on the previously approved 303(d) list are evaluated and automatically included if the use support rating was NS, PS or not rated (NR).

Guidance from EPA on developing the 1998 303(d) lists indicates that impaired waters without an identifiable problem parameter should not be included on the 303(d) list. However, DWQ feels that waters listed in the 305(b) report as impaired for biological reasons, where problem parameters have not been identified, should remain on the 303(d) list. The Clean Water Act states that chemical, physical and biological characteristics of waters shall be restored. The absence of an identified cause of impairment does not mean that the water should not receive attention. Instead, DWQ should resample or initiate more intensive studies to determine why the water is impaired. Thus, biologically impaired waters without an identified cause of impairment are on the 2000 303(d) list.

Assigning Priority

North Carolina has developed a TMDL priority ranking scheme that reflects the relative value and benefits that a water provides to the state. The priority ranking system is designed to take into account the severity of the impairment, especially when threats to human health, endangered species or the designated uses of the water are present.

A priority of High, Medium or Low has been assigned to all waters on Parts 1, 4, 5 and 6 of the list (the following section describes these parts in more detail). A high priority is assigned to all waters that are classified as water supplies. A high priority is also automatically assigned to all waters harboring species listed as endangered or threatened under the federal Endangered Species Act (ESA). A medium priority has minimally been assigned to waters harboring state listed endangered and threatened species. As a way of addressing anti-degradation concerns, classified Outstanding Resource Waters and High Quality Waters start at the medium priority. The remaining waters on the list are prioritized according to severity of the impairment.

New Format of the List

North Carolina has begun to make the structural changes prescribed in EPA's July 13, 2000 final TMDL rule. The 2000 303(d) list reflects many of these changes. EPA's final rule will likely eventually require 303(d) lists to be divided into four sections. North Carolina's 2000 list has been divided into six parts and reflects comments made on the proposed rules by North Carolina and other states. This six-part format meets the requirements of existing rules, and future lists will meet requirements of revised federal rules (when implemented). A summary of each part of the list is provided below. A more detailed discussion is found in the preface to the actual list document.

Part 1 - Waters impaired by a *pollutant* as defined by EPA.

"The term pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into the water." TMDLs will be submitted for all water/pollutant combinations listed in Part 1.

Part 2 - Waters impaired by *pollution*, not by a *pollutant*.

EPA defines *pollution* as "The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water" in the CWA section 502(19). EPA believes that in situations where the impairment is not caused by a *pollutant*, a TMDL is generally not the appropriate solution to the problem. In keeping with the principle that the 303(d) list is an accounting of all impaired waters; however, these types of waters will remain on Part 2 of the list until water quality uses and standards are attained by some other means.

Part 3 - Waters for which EPA has approved or established a TMDL and water quality standards have not yet been attained.
Monitoring data will be considered when evaluating Part 3 waters for potential delisting. Waters will be moved to Part 1 of the list if updated information and data demonstrate that the approved TMDL is inadequate.

Part 4 - Waters for which TMDLs are not required.
Other required regulatory controls (e.g., NPDES permit limits, Phase I Federal Stormwater Permits, etc.) are expected to attain water quality standards by the next regularly scheduled listing cycle.

Part 5 - Biologically impaired waters with no identified cause of impairment.
Roughly half of the waters on North Carolina's 303(d) list appear on Part 5. Identification of the cause(s) of impairment will precede movement of these waters to Parts 1 and 2 of the list. EPA recognized that in specific situations the data are not available to establish a TMDL, and that these specific waters might be better placed on a separate part of the 2000 303(d) list (64 FR, 46025). Data collection and analysis will be performed in an attempt to determine a cause of impairment. North Carolina's proposed plan for managing biologically impaired waters can be found in the preface to Part 5 of the list.

Part 6 – The *proper technical conditions* do not yet exist to develop a TMDL.
"*Proper technical conditions* refers to the availability of the analytical methods, modeling techniques and data base necessary to develop a technically defensible TMDL. These elements will vary in their level of sophistication depending on the nature of the pollutant and characteristics of the segment in question" (43 FR 60662). These are waters that would otherwise be on Part 1 of the list. In the proposed TMDL regulations, EPA again recognized that in some specific situations the data, analyses or models are not available to establish a TMDL, and that these specific waters might be better off on a separate part of the 2000 303(d) list (64 FR, 46025). North Carolina seeks EPA technical guidance in developing technically defensible TMDLs for these waters. DWQ has included fecal impaired shellfish waters on this part of the list. North Carolina's approach to managing shellfish waters impaired because of fecal coliform violations is outlined in the preface to Part 6 of the list.

Scheduling TMDLs

North Carolina will submit TMDLs for each water within 13 years of its first listing, starting with the EPA-approved 1998 303(d) list. TMDLs for waters first listed in 1998 or earlier will be developed by 2011. As a general rule, TMDLs will be addressed according to highest priority in accordance with the rotating basinwide planning approach. Due to the wide range of complexities encountered in TMDL development, TMDLs will not necessarily be submitted to EPA in order of priority.

TMDLs on Part 1 of the 303(d) list are at many different stages on the path to an approved TMDL. Some require additional data collection to adequately define the problem in TMDL terms. Some require more outreach to increase stakeholder involvement and "buy-in". Others need to have a technical strategy budgeted and scheduled. Some are almost ready for submittal to EPA for approval. As the current regulations require, North Carolina has listed waters targeted for TMDL development within the next two years.

North Carolina has used "biological impairment" to place the majority of waters on the 303(d) list. Additional consideration and data collection are necessary if the establishment of a TMDL for waters on Part 5 is to be expected. It is important to understand that the identification of waters on Part 5 of the list does not mean that they are low priority waters. The problem parameter identification (PPI) approach is a high priority for the State of North Carolina. However, it should be noted that it may take significant resources and time to determine the cause of impairment. The PPI approach is also a declaration of need for more data and more time to adequately define the problems and whether they are affected by *pollution*, *pollutants* or a combination.

North Carolina believes it to be both practical and honest to schedule TMDL development for only those waters where we have some information about the cause of impairment. Scheduling TMDLs for waters that may not be impaired by a *pollutant* is misleading and counterproductive.

Delisting Waters

North Carolina relies heavily on the existing 305(b) reporting methodology to complete the 303(d) process. In general, waters will be removed from the 303(d) list when data show that a water is fully supporting its uses. In some cases, mistakes have been discovered in the original listing decision and the mistakes are being corrected. Waters appearing on the previously approved 303(d) list will be removed from the 303(d) lists under the following circumstances:

- An updated 305(b) use support rating of fully supporting.
- Applicable water quality standards are being met (i.e., no longer impaired for a given *pollutant*).
- The basis for putting the water on the list is determined to be invalid (i.e., was mistakenly identified as impaired in accordance with 40 CFR 130.7(b)(6)(iv) and/or *National Clarifying Guidance for State and Territory 1998 Section 303(d) Listing Decisions*. Robert Wayland III, Director. Office of Wetlands, Oceans, and Watersheds. Aug 27, 1997.)
- A water quality variance has been issued for a specific standard (e.g., chloride).
- Removal of fish consumption advisories.
- Typographic listing mistakes (i.e., the wrong water was identified).

Appendix V

Neuse River Basin
Workshop Summaries

Issues Associated with Specific Waters of the Neuse River Basin

Water or Area	Subbasin	Issue	Workshop
Panther Creek	03-04-01	Cumulative impacts from nearby development.	Durham
Lake Michie	03-04-01	Eutrophication of water supplies and increased treatment costs.	Durham
Lake Rogers	03-04-01	Eutrophication of water supplies and increased treatment costs.	Durham
Upper Falls Reservoir	03-04-01	Eutrophication of water supplies and increased treatment costs.	Durham
Neuse Estuary	03-04-10	Eutrophication and increasing fish kills.	Durham and New Bern
Person County	03-04-01	Road building expansion of Hwy 501.	Durham
Johnston County	03-04-02	Sedimentation of streams near Clayton.	Goldsboro
Flat River	03-04-01	Decreases in animal operations and increases in development.	Durham
Little River	03-04-09	Increased development.	Durham
Eno River	03-04-01	Increased development.	Durham
Triangle Counties	03-04-02	Concerns regarding enforcement of existing laws and lack of intergovernmental communication.	Raleigh
Swift Creek	03-04-02	Supplemental classification to protect endangered aquatic life.	Raleigh
Crabtree Creek	03-04-02	Sedimentation for I-540 construction.	Raleigh
Raleigh	03-04-02	Monitoring of runoff from Raleigh WWTP land application site.	Raleigh
Trent River	03-04-10	Cost share money needed to reduce impacts of snagging operations.	New Bern
Brice Creek	03-04-10	Concerns regarding decreased fish populations.	New Bern
Slocum Creek	03-04-10	Toxic stormwater runoff.	New Bern

Issues Related to Urbanization and Land Use Changes Basinwide

Specific Issue	Recommendation	Workshop
Loss of farmland	Zoning and land use ordinances.	Durham
Loss of forest	Zoning and land use ordinances.	Durham
Increasing impervious surface	Conservation planning.	Durham, Raleigh and New Bern
Increasing use of residential fertilizers	Education programs at retailers.	Durham, Raleigh and Goldsboro
Hydromodification	Control peak flows.	Durham
Stormwater retrofitting	Urban stormwater programs.	Raleigh
Auto emmissions	Mass transit.	Raleigh
Stormwater runoff	Limit development establish urban growth boundaries.	Durham, Raleigh and New Bern

Issues Related to Water Supply Quantity and Protection

Issue	Workshop
Lack of planning by local governments to provide water for future needs.	Durham
Dwindling water supply in coastal counties.	Goldsboro
Lack of water supply planning.	Raleigh, Durham and Goldsboro
Little effort to establish reuse program.	Raleigh
More public input needed on IBT and withdrawals.	Raleigh
Local governments need to work to provide future water supplies.	Goldsboro
Need to increase groundwater recharge in coastal plain.	Goldsboro
Need for increased protection of surface water supplies.	Durham

Issues Related to Enforcement, Permitting, Rule Making and Monitoring

Specific Issue	Recommendation	Workshop
Landfills	Require recycling and liners in all landfills. More public involvement in landfill siting.	Raleigh
Triangle Counties	Enforce existing laws.	Raleigh
Buffer Rules	Need more monitoring and enforcement.	Raleigh
Point Sources	Remove from floodplain.	Raleigh and New Bern
Land Application Sites	More monitoring of sites.	Raleigh
Package Plants	More monitoring and elimination of bad plants.	Raleigh
Waste Haulers	Need to monitor.	Raleigh
Monitoring Data	More public access to DWQ monitoring data.	Raleigh
Nonpoint Source	More inspectors needed.	Raleigh
BMPs	Require BMPs to remove nutrients and sediment and remove minimum exclusion. Provide performance information and more research on efficiency.	Goldsboro Raleigh
Septic Systems	Create incentives for monitoring existing systems. Increase funding for alternative systems. Require maintenance by rule.	Goldsboro New Bern Raleigh
Nitrogen	Develop standards for and limits for areal deposition.	New Bern
Shellfish Closures	Rule needed to prevent future closures.	New Bern
Brine Discharges	Develop rules for reverse osmosis discharges into freshwater streams.	New Bern
Funding	More money for education and enforcement.	New Bern

Issues Related to Funding Sources and Education

Specific Issue	Recommendation	Workshop
Loss of technical assistance	Go to general assembly	Durham
Need for BMP research		Raleigh and Goldsboro
Resources to address known problems		Raleigh
Education		Raleigh and New Bern
Farmer funds		Raliegh
Homeowner education on fertilizer application		Raleigh
Education for local officials		Raleigh
Resources to address nonpoint source pollution		Raleigh
Education on buffers		Raleigh
Cost share funds should be targeted to the Trent River		New Bern
Money needed for septic system repairs		Raleigh and Goldsboro
Farmland protection		Raleigh and Goldsboro
Protection of sensitive areas		Durham
Open space preservation		Durham and Raleigh

Appendix VI

Neuse River Basin Nonpoint Source Program Description and Contacts

Statewide Nonpoint Source Management Program Description

The North Carolina Nonpoint Source Management Program consists of a broad framework of federal, state and local resource and land management agencies. More than 2,000 individuals administer programs that are directly related to nonpoint source pollution management within the state. A range of responsibilities have been delegated to county or municipal programs including the authority to inspect and permit land clearing projects or septic system performance. In the field of agriculture, a well-established network of state and federal agricultural conservationists provide technical assistance and program support to individual farmers.

Staff in the DWQ Water Quality Section's Planning Branch lead the Nonpoint Source Management Program, working with various agencies to insure that program goals are incorporated into individual agencies' management plans. The goals include:

1. Coordinate implementation of state and federal initiatives addressing watershed protection and restoration.
2. Continue to target geographic areas and waterbodies for protection based upon best available information.
3. Strengthen and improve existing nonpoint source management programs.
4. Develop new programs that control nonpoint sources of pollution not addressed by existing programs.
5. Integrate the NPS Program with other state programs and management studies (e.g., Albemarle-Pamlico National Estuary Program).
6. Monitor the effectiveness of BMPs and management strategies, both for surface and groundwater quality.

Coordination between state agencies is achieved through reports in the *North Carolina Nonpoint Source Management Program Update*. Reports are intended to keep the program document current and develop a comprehensive assessment identifying the needs of each agency to meet the state nonpoint source program goals. Annual reports are developed to describe individual program priorities, accomplishments, significant challenges, issues yet to be addressed, and resource needs. A copy of the latest Annual Report (FY1998) is available online: http://h2o.enr.state.nc.us/nps/nps_mp.htm.

The nature of nonpoint source pollution is such that involvement at the local level is imperative. Basinwide Water Quality Plans identify watersheds that are impaired by nonpoint sources of pollution. Identification, status reports and recommendations are intended to provide the best available information to local groups and agencies interested in improving water quality. The plans also make available information regarding federal, state and local water quality initiatives aimed at reducing or preventing nonpoint source pollution.

The following table is a comprehensive guide to contacts within the state's Nonpoint Source Management Program. For more information, contact Alan Clark at (919) 733-5083 ext. 570.

Agriculture

USDA Natural Resources Conservation Service:

Part of the US Department of Agriculture, formerly the Soil Conservation Service. Technical specialists certify waste management plans for animal operations; provide certification training for swine waste applicators; work with landowners on private lands to conserve natural resources, helping farmers and ranchers develop conservation systems unique to their land and needs; administer several federal agricultural cost share and incentive programs; provide assistance to rural and urban communities to reduce erosion, conserve and protect water, and solve other resource problems; conduct soil surveys; offer planning assistance for local landowners to install best management practices; and offer farmers technical assistance on wetlands identification.

Area 2 Conservationist	Michael E. Sugg	704-637-2400	600 West Innes Street, Salisbury, NC 28144 msugg@nc.usda.gov
Area 3 Conservationist	William J. Harrell	919-751-0976	208 Mallory St, Suite C, Cashwell Office Park ,Goldsboro, NC 27530-3676 wharrell@nc.usda.gov
County	**District Conservationist**	**Phone**	**Address**
Craven	Andrew W. Metts	252-637-2547	302 Industrial Drive, New Bern, NC 28562-5434 ametts@nc.usda.gov
Durham	Diana Lewis	919-560-0558	County Agriculture Building, 721 Foster Street, Durham, NC 27701 dlewis@nc.usda.gov
Franklin	Joshua W. Spencer	919-496-3137 ext. 202	101 South Bickett Blvd. Suite B, County Ag. Bldg., Louisburg, NC 27549 jspencer@nc.usda.gov
Granville	Diana Lewis	919-693-4603	146 Main Street, Post Office Box 10, Oxford, NC 27565 dlewis@nc.usda.gov
Greene	William D. Radford	252-747-3705	3 Professional Drive. Suite D, Snow Hill, NC 28580-1332 ewest@nc.usda.gov
Johnston	Mark A. Ferguson	919-934-7156 ext. 3	County Agriculture Building, 806 North Street, Smithfield, NC 27577 mferguson@nc.usda.gov
Jones	Andrew Metts	252-637-2547	302 Industrial Drive, New Bern, NC 28562-5343 ametts@nc.usda.gov
Lenoir	William D. Radford	252-747-3705	3 Professional Drive. Suite D, Snow Hill, NC 28580-1332 ewest@nc.usda.gov
Nash	Terry L. Best	252-459-4115	1006 Eastern Avenue, Room 107, Ag. Center Drive, Nashville, NC 27856-1750 tbest@nc.usda.gov
Orange	E. Brent Bogue	919-644-1079 ext. 3	306-D Revere Road, County Planning/Agriculture Center, Post Office Box 8181, Hillsborough, NC 27278 bbogue@nc.usda.gov
Pamlico	Andrew Metts	252-637-2547	302 Industrial Drive, New Bern, NC 28562-5343 ametts@nc.usda.gov
Person	James E. Huey	336-597-2973	304 South Morgan Street, Room 126, Person County Office Bldg., Roxboro, NC 27573 jhuey@nc.usda.gov
Pitt	James T. Etheridge	252-752-2720 ext. 3	403 Government Circle, Suite 4, Greenville, NC 27834-8166 tetheridge@nc.usda.gov
Wake	Stephen C. Woodruff	919-250-1070	4001 Carya Drive, Agriculture Services Building, Suite D, Raleigh, NC 27610 swoodruff@nc.usda.gov
Wayne	Patricia S. Gabriel	919-731-5281	Wayne Center, Room 104, 208 West Chestnut Street, Goldsboro, NC 27530 pgabriel@nc.usda.gov
Wilson	David A. Little	252-237-5147	1806 Goldsboro Street, SW, Wilson, NC 27893-8508 dlittle@nc.usda.gov

Agriculture

Soil & Water Conservation Districts:

Boards and staff under the administration of the NC Soil and Water Conservation Commission (SWCC). Districts are responsible for: administering the *Agricultural Cost Share Program for Nonpoint Source Pollution Control* at the county level; identifying areas needing soil and/or water conservation treatment; allocating cost share resources; signing cost share contracts with landowners; providing technical assistance for the planning and implementation of BMPs; and encouraging the use of appropriate BMPs to protect water quality.

County	Board Chairman	Phone	Address
Craven	James K. Spruill	252-637-2547	302 Industrial Drive, New Bern, NC 28562
Durham	Ed C. Harrison	919-560-0558	721 Foster Street, Durham NC 27701-2110
Franklin	Elmer G. Mullen	919-496-3137	101 South Bickett Blvd., Suite B, Louisburg, NC 27549
Granville	Bobby E. Green	919-693-4603	Post Office Box 10, Oxford, NC 27565
Greene	Jack Edmondson, Jr.	252-747-3705	3 Professional Drive, Suite B, Snow Hill, NC 28580
Johnston	James W. Hughes	919-989-5381	County Agriculture Building, 806 North Street, Smithfield, NC 27577
Jones	William B. Griffin	252-448-2731	Post Office Box 40, Trenton, NC 28585
Lenoir	Dr. Morris L. Hill	252-523-7010	2026 NC Hwy 11-55, Federal Bldg., Kinston, NC 28501
Nash	John W. Finch	252-459-4115	Ag. Center Drive, Room 107, Nashville, NC 27856-1750
Orange	Charles W. Snipes	919-644-1079	Post Office Box 8181, Hillsborough, NC 27278
Pamlico	L. Reginald Caroon	252-745-4303	Post Office Box 305, Bayboro, NC 28515
Person	Bruce Whitfield	336-597-2973	304 South Morgan Street, Room 126, Person County Office Bldg., Roxboro, NC 27573
Pitt	Thurston Jones	252-752-2720	403 Government Circle, Suite 4, Greenville, NC 27834
Wake	Kay A. Adcock	919-250-1070	4001-D Carya Drive, Raleigh, NC 27610-2921
Wayne	Russell Gurley	919-731-1532	Wayne Center, Room 104, 208 West Chestnut Street, Goldsboro, NC 27530-4708
Wilson	J. F. Scott	252-237-2711	1806 Goldsboro Street, Wilson, NC 27893

Division of Soil and Water Conservation:

State agency that administers the *Agricultural Cost Share Program for Nonpoint Source Pollution Control* (ACSP). Allocates ACSP funds to the Soil & Water Conservation Districts; and provides administrative and technical assistance related to soil science and engineering. Distributes Wetlands Inventory maps for a small fee.

Central Office	David Williams	919-715-6110	512 North Salisbury Street, Raleigh, NC 27626 david.williams@ncmail.net
Raleigh Region	Margaret O'Keefe	919-571-4700	3800 Barrett Drive, Suite 101 or 1628 Mail Service Center, Raleigh, NC 27699-1628 margaret.okeefe@ncmail.net
Washington Region	Pat Hooper	252-946-6481	943 Washington Square, Washington, NC 27889 pat.hooper@ncmail.net

NCDA Regional Agronomists:

The NC Department of Agriculture technical specialists: certify waste management plans for animal operations; provide certification training for swine waste applicators; track, monitor and account for use of nutrients on agricultural lands; operate the state *Pesticide Disposal Program*; and enforce the state pesticide handling and application laws with farmers.

Central Office	Tom Ellis	919-733-7125	Post Office Box 27647, Raleigh, NC 27611
Region 4	Tim Hall	910-590-2801	104 Jaclane Drive, Clinton, NC 28502-3867
Region 5	Rick Morris	910-866-5485	3184 Old NC 41, Bladenboro, NC 28320
Region 7	Kevin Johnson	919-736-1799	Post Office Box 1970, Pikeville, NC 27863
Region 8	Robin Watson	336-570-6850	1709 Fairview Street, Burlington, NC 27215
Region 9	David Dycus	919-776-9338	5022 Henley Road, Sanford, NC 27330
Region 10	Tim Hambrick	336-352-5360	192 Davis Road, Mount Airy, NC 27030

Education			

NC Cooperative Extension Service:

Provides practical, research-based information and programs to help individuals, families, farms, businesses and communities.

County	Contact Person	Phone	Address
Craven	Billy Dunham	252-633-1477	300 Industrial Drive, New Bern, NC 28562 billy_dunham@ces.ncsu.edu
Durham	Cheryl L. Lloyd	919-560-0525	721 Foster Street, Agriculture Building, Durham, NC 27701 cherly_lloyd@ncsu.edu
Franklin	Cedric K. Jones	919-496-3344	103 South Bickett Boulevard, Louisburg, NC 27549 cedric_jones@ncsu.edu
Granville	Johnsie Cunningham	919-603-1350	Post Office Box 926 johnsie_cunningham@ncsu.edu
Greene	William S. Dixon	252-747-5831	229 Kingold Boulevard, Suite E, Snow Hill, NC 28580 stan_dixon@ncsu.edu
Johnston	Kenneth R. Bateman	919-989-5380	Agricultural Center, 806 North Street, Smithfield, NC 27577 kbateman@johnston.ces.ncsu.edu
Jones	Curtis Fountain	252-448-9621	110 South Market Street, Trenton, NC 28585 curtis_fountain@ncsu.edu
Lenoir	Melissa S. Hight	252-527-2191	Lenoir County Center, 1791 Hwy 11/55, Kinston, NC 28504 melissa_hight@ncsu.edu
Nash	Linda Aycock	252-459-9810	Ag. Center Drive, Room 102, Nashville, NC 27856 linda_aycock@ncsu.edu
Orange	Fletcher Barber	919-245-2050	306-E Revere Road, Post Office Box 8181, Hillsborough, NC 27278 fletcher_barber@ncsu.edu
Pamlico	Ray Harris, Interim	252-745-4121	Post Office Box 8, Bayboro, NC 28515 ray_harris@ncsu.edu
Person	Derek Day	336-599-1195	304 South Morgan Street, Room 123, Roxboro, NC 27573 dday@person.ces@ncsu.edu
Pitt	Mitch Smith	252-757-2801	403 Government Center, Greenville, NC 27834 mitch_smith@ces.ncsu.edu
Wake	Brent Henry	919-250-1100	4001-E Carya Drive, Raleigh, NC 27610 bhenry@co.wake.nc.us
Wayne	Howard Scott	919-731-1520	Wayne County Center, 208 West Chestnut Street, Post Office Box 68, Goldsboro, NC 27533-0068 howard_scott@ncsu.edu
Wilson	Walter Earle	252-237-0111	Wilson County Ag. Center, 1806 South Goldsboro Street, Wilson, NC 27893 walter_earle@ncsu.edu

Forestry			

Division of Forest Resources:

Develop, protect and manage the multiple resources of North Carolina's forests through professional stewardship, enhancing the quality of our citizens while ensuring the continuity of these vital resources.

Districts 3,5,6,8,10,11 Region II	Mike Hendricks, Region Forester	919-542-1515	3490 Bigwood Road, Chapel Hill, NC 27514-7652 mike.hendricks@ncmail.net
Central Office	Bill Swartley	919-733-2162	512 North Salisbury Street, Raleigh, NC or 1616 Mail Service Center, Raleigh, NC 27699-1616 bill.swartley@ncmail.net

Construction/Mining			
DENR Division of Land Resources: Administers the NC Erosion and Sedimentation Control Program for construction and mining operations. Conducts land surveys and studies, produces maps, and protects the state's land and mineral resources.			
Central Office	Mel Nevills, Chief of Land Quality	919-733-4574	512 North Salisbury Street, Raleigh, NC 27626 mel.nevills@ncmail.net
Raleigh Region	John Holley, Chief Engineer	919-571-4700	3800 Barrett Drive, Raleigh, NC 27609 john.holley@ncmail.net
Washington Region	Floyd Williams, Chief of Engineer	252-946-6481	943 Washington Square Mall, Washington, NC 27889 floyd.williams@ncmail.net
Local Erosion and Sedimentation Control Ordinances: Several local governments in the basin have qualified to administer their own erosion and sedimentation control ordinances.			
Town of Apex	Robert (Rocky) Ross	919-387-3090 ext.101	Post Office Box 250, Apex, NC 27502 rross@ci.apex.nc.us
Town of Cary	Tom Hortsman	919-469-4347	318 N. Academy Street or Post Office Box 8005, Cary, NC 27512-8005
Town of Chapel Hill	W. Calvin Horton or George Small	919-968-2700	306 North Columbia Street, Chapel Hill, NC 27514-3699
City of Durham/ Durham County	Bill Noyes	919-560-0735	120 East Parrish Street, Suite 100, Durham, NC 27701
City of Greenville	Maria Alge	252-329-4525	1500 Beatty Street, Greenville, NC 27835 malge@ci.greenville.nc.us
Town of Holly Springs	Katie McDonald	919-557-3932	Post Office Box 8, Holly Springs, NC 27540 katie.mcdonald@ncmail.net
Orange County / Town of Chapel Hill	Ren Ivins	919-732-8181 ext. 2586	Post Office Box 8181, Hillsborough, NC 27278
Pitt County	Dwane Jones	252-902-3250	1717 West 5th Street, Greenville, NC 27834 dljones@co.pitt.nc.us
City of Raleigh	Bill Brower	919-890-3766	222 West Hargett Street or Post Office Box 590, Raleigh, NC 27603 brower@raleigh-nc.org
Wake County	Lee R. Squires	(919) 856-6199	PO Box 550, Raleigh, NC 27602 lsquires@co.wake.nc.us

General Water Quality			
DWQ Water Quality Section:			
Coordinate the numerous nonpoint source programs carried out by many agencies; coordinate the French Broad and Neuse River Nutrient Sensitive Waters Strategies; administer the Section 319 grants program statewide; conduct stormwater permitting; model water quality; conduct water quality monitoring; perform wetlands permitting; conduct animal operation permitting and enforcement; and conduct water quality classifications and standards activities.			
NPS Planning	Alan Clark	919-733-5083 ext. 570	512 North Salisbury Street, or 1617 Mail Service Center Raleigh, NC 27699-1617
Urban Stormwater	Bradley Bennett	919-733-5083 ext. 525	512 North Salisbury Street, or 1617 Mail Service Center, Raleigh, NC 27699
Modeling	Michelle Woolfolk	919-733-5083 ext. 505	512 North Salisbury Street, or 1617 Mail Service Center Raleigh, NC 27699-1617
Monitoring	Jimmie Overton	919-733-9960 ext. 204	4401 Reedy Creek Road, or 1621 Mail Service Center Raleigh, NC 27699-1621
Wetlands	John Dorney	919-733-1786	4401 Reedy Creek Road, or 1621 Mail Service Center, Raleigh, NC 27699-1621
Animal Operations	Dennis Ramsey	919-733-5083 ext. 528	512 North Salisbury Street, or 1617 Mail Service Center, Raleigh, NC 27699-1617
Classifications and Standards	Tom Reeder	919-733-5083 ext. 557	512 North Salisbury Street, or 1617 Mail Service Center Raleigh, NC 27699-1617
DWQ Regional Offices:			
Conduct permitting and enforcement fieldwork on point sources, stormwater, wetlands and animal operations; conduct enforcement on water quality violations of any kind; and perform ambient water quality monitoring.			
Raleigh Region	Ken Schuster	919-571-4700	3800 Barrett Drive or 1628 Mail Service Center, Raleigh, NC 27699-1628
Washington Region	Jim Mulligan	252-946-6481	943 Washington Square Mall, Washington, NC 27889
Wildlife Resources Commission:			
To manage, restore, develop, cultivate, conserve, protect and regulate the wildlife resources of the state; and to administer the laws enacted by the General Assembly relating to game, game and non-game freshwater fishes, and other wildlife resources in a sound, constructive, comprehensive, continuing and economical manner.			
Central Office	Shannon Deaton	919-733-3633, ext. 283	512 North Salisbury Street, or 1721 Mail Service Center, Raleigh, NC 27699-1721 deatonsl@ncmail.wildlife.state.nc.us
US Army Corps of Engineers:			
Responsible for: investigating, developing and maintaining the nation's water and related environmental resources; constructing and operating projects for navigation, flood control, major drainage, shore and beach restoration and protection; hydropower development; water supply; water quality control, fish and wildlife conservation and enhancement, and outdoor recreation; responding to emergency relief activities directed by other federal agencies; and administering laws for the protection and preservation of navigable waters, emergency flood control and shore protection. Responsible for wetlands and 404 Federal Permits. Ask for the project manager covering your county.			
Wilmington Field Office	Keith Harris, Chief	910-251-4511	69 Darlington Avenue, Wilmington, NC or Post Office Box 1890, Wilmington, NC 28402-1890
Raleigh Field Office	Ken Jolly, Chief	919-876-8441 ext.22	6508 Falls of the Neuse Road, Suite 120, Raleigh, NC 27615

General Water Quality			
DWQ Groundwater Section: Groundwater classifications and standards; enforcement of groundwater quality protection standards and cleanup requirements; review of permits for wastes discharged to groundwater; issuance of well construction permits; underground injection control; administration of the underground storage tank (UST) program (including the UST Trust Funds); well head protection program development; and ambient groundwater monitoring.			
Central Office	Carl Bailey	919-715-6169	2728 Capital Boulevard or Mail Service Center 1636, Raleigh, NC 27699-1636
Raleigh Region	Jay Zimmerman	919-571-4700 ext. 244	3800 Barrett Drive, Raleigh, NC 27609
Washington Region	Willie Hardison	252-946-6481 ext. 335	943 Washington Square Mall, Washington, NC 27889

Solid Waste			
DENR Division of Waste Management: Management of solid waste in a way that protects public health and the environment. The Division includes three sections and one program – Hazardous Waste, Solid Waste, Superfund and the Resident Inspectors program.			
Central Office	Brad Atkinson	919-733-0692	401 Oberlin Road, Suite 150, Raleigh, NC 27605

On-Site Wastewater Treatment			
Division of Environmental Health and County Health Departments: Safeguard life, promote human health, and protect the environment through the practice of modern environmental health science, the use of technology, rules, public education, and above all, dedication to the public trust. Services include: • Training of and delegation of authority to local environmental health specialists concerning on-site wastewater. • Engineering review of plans and specifications for wastewater systems 3,000 gallons or larger and industrial process wastewater systems designed to discharge below the ground surface. • Technical assistance to local health departments, other state agencies, and industry on soil suitability and other site considerations for on-site wastewater systems.			
Central Office	Steve Steinbeck, Onsite Wastewater Supervisor	919-715-3273	2728 Capital Boulevard, Raleigh, NC 27604 steve.steinbeck@ncmail.net
Raleigh Region	Vacant, Onsite Wastewater Supervisor	919-571-4700	3800 Barrett Drive, Raleigh, NC 27609
Washington Region	Bob Uebler, Onsite Wastewater Supervisor	252-946-6481	943 Washington Square Mall, Washington, NC 27889 bob.uebler@ncmail.net

County Health Departments			
County	**Primary Contact**	**Phone**	**Address**
Craven	Wanda Sandale, Health Director	252-636-4936	Post Office Box 12610, New Bern, NC 28561 ha.craven@coastalnet.com
Durham	Brian Letourneau, Health Director	919-560-7600	414 East Main Street, Durham, NC 27701 bletourneau@ph.co.durham.nc.us
Franklin	Keith Patton, Health Director	919-496-8110	107 Industrial Drive, Suite C, Louisburg, NC 27549 nc0860@interpath.com
Granville	W. Rodwell Drake, Jr. MD, Health Director	919-693-2141	101 Hunt Drive, Oxford, NC 27565 gvhd@gloryroad.net
Greene	Danny Jacob, Health Director	252-747-8183	227 Kingold Boulevard, Suite B, Snow Hill, NC 28580 djacob@co.greene.nc.us
Johnston	L. S. Woodall, M D, Health Director	919-989-5200	205 South Second Street, Smithfield, NC 27577 leonard.woodall@mail.co.johnston.nc.us
Jones	Ruth Little, Health Director	252-448-9111	401 Highway 51 South, Trenton, NC 28585 jchd@connect.net
Lenoir	Joey Huff, Health Director	252-526-4212	201 North McLewean Street, Kinston, NC 28502 jhuff@health.co.lenoir.nc.us
Nash	William Hill, Jr., Health Director	252-459-9819	214 South Barnes Street, Nashville, NC 27856whill@co.nash.nc.us
Orange	Dr. Rosemary Summers, Health Director	919-732-2411	Post Office Box 8181, Hillsborough, NC 27278 rsummers@co.orange.nc.us
Pamlico	Jenny Lassiter, Health Director	252-745-5111	Post Office Box 306, Bayboro, NC 28515 pchd@coastalnet.com
Person	Marc Kolman, Health Director	336-597-2204	325 South Morgan, Roxboro, NC 27573 mkolman.pchd@personco.com
Pitt	Dr. John Morrow, Health Director	252-413-1305	201 Government Circle, Greenville, NC 27834 jhmorrow@co.pitt.nc.us
Wake	Richard K. Rowe, Health Director	919-856-7444	336 Fayetteville Street, Raleigh, NC 27602 rrowe@co.wake.nc.us
Wayne	Mark Swendenburg, Health Director	919-731-1000	310 North Herman Street, Box CC, Goldsboro, NC 27530 wchd.dir@ncmail.net
Wilson	Louis E. Latour, MD, Health Director	252-291-5470 ext. 276	1801 Glendale Drive, Wilson, NC 27893 llatour@wilson.co.com

- **DENR Raleigh Region Office covers the following counties:** Durham, Franklin, Granville, Johnston, Nash, Orange, Person, Wake and Wilson.
- **DENR Washington Region Office covers the following counties:** Craven, Greene, Jones, Lenoir, Pamlico, Pitt and Wayne.

Appendix VII

Glossary
of
Terms and Acronyms

Glossary

§	Section.
30Q2	The minimum average flow for a period of 30 days that has an average recurrence of one in two years.
7Q10	The annual minimum 7-day consecutive low flow, which on average will be exceeded in 9 out of 10 years.
B (Class B)	Class B Water Quality Classification. This classification denotes freshwaters protected for primary recreation and other uses suitable for Class C. Primary recreational activities include frequent and/or organized swimming and other human contact such as skin diving and water skiing.
basin	The watershed of a major river system. There are 17 major river basins in North Carolina.
benthic macroinvertebrates	Aquatic organisms, visible to the naked eye (macro) and lacking a backbone (invertebrate), that live in or on the bottom of rivers and streams (benthic). Examples include, but are not limited to, aquatic insect larvae, mollusks and various types of worms. Some of these organisms, especially aquatic insect larvae, are used to assess water quality. See EPT index and bioclassification for more information.
benthos	A term for bottom-dwelling aquatic organisms.
best management practices	Techniques that are determined to be currently effective, practical means of preventing or reducing pollutants from point and nonpoint sources, in order to protect water quality. BMPs include, but are not limited to: structural and nonstructural controls, operation and maintenance procedures, and other practices. Often, BMPs are applied as system of practices and not just one at a time.
bioclassification	A rating of water quality based on the outcome of benthic macroinvertebrate sampling of a stream. There are five levels: Poor, Fair, Good-Fair, Good and Excellent.
BMPs	See *best management practices*.
BOD	Biochemical Oxygen Demand. A measure of the amount of oxygen consumed by the decomposition of biological matter or chemical reactions in the water column. Most NPDES discharge permits include a limit on the amount of BOD that may be discharged.
C (Class C)	Class C Water Quality Classification. This classification denotes freshwaters protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and others uses.
channelization	The physical alteration of streams and rivers by widening, deepening or straightening of the channel, large-scale removal of natural obstructions, and/or lining the bed or banks with rock or other resistant materials.
chlorophyll *a*	A chemical constituent in plants that gives them their green color. High levels of chlorophyll *a* in a waterbody, most often in a pond, lake or estuary, usually indicate a large amount of algae resulting from nutrient overenrichment or eutrophication.
coastal counties	Twenty counties in eastern NC subject to requirements of the Coastal Area Management Act (CAMA). They include: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington.
Coastal Plain	One of three major physiographic regions in North Carolina. Encompasses the eastern two-fifths of state east of the *fall line* (approximated by Interstate I-95).
conductivitiy	A measure of the ability of water to conduct an electrical current. It is dependent on the concentration of dissolved ions such as sodium, chloride, nitrates, phosphates and metals in solution.
degradation	The lowering of the physical, chemical or biological quality of a waterbody caused by pollution or other sources of stress.

DENR	Department of Environment and Natural Resources.
DO	Dissolved oxygen.
drainage area	An alternate name for a watershed.
DWQ	North Carolina Division of Water Quality, an agency of DENR.
dystrophic	Naturally acidic (low pH), "black-water" lakes which are rich in organic matter. Dystrophic lakes usually have low productivity because most fish and aquatic plants are stressed by low pH water. In North Carolina, dystrophic lakes are scattered throughout the Coastal Plain and Sandhills regions and are often located in marshy areas or overlying peat deposits. NCTSI scores are not appropriate for evaluating dystrophic lakes.
effluent	The treated liquid discharged from a wastewater treatment plant.
EMC	Environmental Management Commission.
EPA	United States Environmental Protection Agency.
EPT Index	This index is used to judge water quality based on the abundance and variety of three orders of pollution sensitive aquatic insect larvae: Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).
eutrophic	Elevated biological productivity related to an abundance of available nutrients. Eutrophic lakes may be so productive that the potential for water quality problems such as algal blooms, nuisance aquatic plant growth and fish kills may occur.
eutrophication	The process of physical, chemical or biological changes in a lake associated with nutrient, organic matter and silt enrichment of a waterbody. The corresponding excessive algal growth can deplete dissolved oxygen and threaten certain forms of aquatic life, cause unsightly scums on the water surface and result in taste and odor problems.
fall line	A geologic landscape feature that defines the line between the piedmont and coastal plain regions. It is most evident as the last set of small rapids or rock outcroppings that occur on rivers flowing from the piedmont to the coast.
FS	Fully supporting. A rating given to a waterbody that fully supports its designated uses and generally has good or excellent water quality.
GIS	Geographic Information System. An organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information.
habitat degradation	Identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour.
headwaters	Small streams that converge to form a larger stream in a watershed.
HQW	High Quality Waters. A supplemental surface water classification.
HU	Hydrologic unit. See definition below.
Hydrilla	The genus name of an aquatic plant - often considered an aquatic weed.
hydrologic unit	A watershed area defined by a national uniform hydrologic unit system that is sponsored by the Water Resources Council. This system divides the country into 21 regions, 222 subregions, 352 accounting units and 2,149 cataloging units. A hierarchical code consisting of two digits for each of the above four levels combined to form an eight-digit hydrologic unit (cataloging unit). An eight-digit hydrologic unit generally covers an average of 975 square miles. There are 54 eight-digit hydrologic (or cataloging) units in North Carolina. These units have been further subdivided into eleven and fourteen-digit units.
hypereutrophic	Extremely elevated biological productivity related to excessive nutrient availability. Hypereutrophic lakes exhibit frequent algal blooms, episodes of low dissolved oxygen or periods when no oxygen is present in the water, fish kills and excessive aquatic plant growth.
impaired	Term that applies to a waterbody that has a use support rating of partially supporting (PS) or not supporting (NS) its uses.

impervious	Incapable of being penetrated by water; non-porous.
kg	Kilograms. To change kilograms to pounds multiply by 2.2046.
lbs	Pounds. To change pounds to kilograms multiply by 0.4536.
loading	Mass rate of addition of pollutants to a waterbody (e.g., kg/yr)
macroinvertebrates	Animals large enough to be seen by the naked eye (macro) and lacking backbones (invertebrate).
macrophyte	An aquatic plant large enough to be seen by the naked eye.
mesotrophic	Moderate biological productivity related to intermediate concentrations of available nutrients. Mesotrophic lakes show little, if any, signs of water quality degradation while supporting a good diversity of aquatic life.
MGD	Million gallons per day.
mg/l	Milligrams per liter (approximately 0.00013 oz/gal).
NCIBI	North Carolina Index of Biotic Integrity. A measure of the community health of a population of fish in a given waterbody.
NH_3-N	Ammonia nitrogen.
nonpoint source	A source of water pollution generally associated with rainfall runoff or snowmelt. The quality and rate of runoff of NPS pollution is strongly dependent on the type of land cover and land use from which the rainfall runoff flows. For example, rainfall runoff from forested lands will generally contain much less pollution and runoff more slowly than runoff from urban lands.
NPDES	National Pollutant Discharge Elimination System.
NPS	Nonpoint source.
NR	Not rated. A waterbody that is not rated for use support due to insufficient data.
NS	Not supporting. A rating given to a waterbody that does not support its designated uses and has poor water quality and severe water quality problems. Both PS and NS are called impaired.
NSW	Nutrient Sensitive Waters. A supplemental surface water classification intended for waters needing additional nutrient management due to their being subject to excessive growth of microscopic or macroscopic vegetation. Waters classified as NSW include the Neuse, Tar-Pamlico and Chowan River basins; the New River watershed in the White Oak basin; and the watershed of B. Everett Jordan Reservoir (including the entire Haw River watershed).
NTU	Nephelometric Turbidity Units. The units used to quantify turbidity using a turbidimeter. This method is based on a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of the light scattered by a standard reference suspension under the same conditions.
oligotrophic	Low biological productivity related to very low concentrations of available nutrients. Oligotrophic lakes in North Carolina are generally found in the mountain region or in undisturbed (natural) watersheds and have very good water quality.
ORW	Outstanding Resource Waters. A supplemental surface water classification intended to protect unique and special resource waters having excellent water quality and being of exceptional state or national ecological or recreational significance. No new or expanded wastewater treatment plants are allowed, and there are associated stormwater runoff controls enforced by DWQ.
pH	A measure of the concentration of free hydrogen ions on a scale ranging from 0 to 14. Values below 7 and approaching 0 indicate increasing acidity, whereas values above 7 and approaching 14 indicate a more basic solution.
phytoplankton	Aquatic microscopic plant life, such as algae, that are common in ponds, lakes, rivers and estuaries.

Piedmont	One of three major physiographic regions in the state. Encompasses most of central North Carolina from the Coastal Plain region (near I-95) to the eastern slope of the Blue Ridge Mountains region.
PS	Partially supporting. A rating given to a waterbody that only partially supports its designated uses and has fair water quality and severe water quality problems. Both PS and NS are called impaired.
riparian zone	Vegetated corridor immediately adjacent to a stream or river. See also SMZ.
river basin	The watershed of a major river system. North Carolina is divided into 17 major river basins: Broad, Cape Fear, Catawba, Chowan, French Broad, Hiwassee, Little Tennessee, Lumber, Neuse, New, Pasquotank, Roanoke, Savannah, Tar-Pamlico, Watauga, White Oak and Yadkin River basins.
river system	The main body of a river, its tributary streams and surface water impoundments.
runoff	Rainfall that does not evaporate or infiltrate the ground, but instead flows across land and into waterbodies.
SA	Class SA Water Classification. This classification denotes saltwaters that have sufficient water quality to support commercial shellfish harvesting.
SB	Class SB Water Classification. This classification denotes saltwaters with sufficient water quality for frequent and/or organized swimming or other human contact.
SC	Class SC Water Classification. This classification denotes saltwaters with sufficient water quality to support secondary recreation and aquatic life propagation and survival.
sedimentation	The sinking and deposition of waterborne particles (e.g., eroded soil, algae and dead organisms).
silviculture	Care and cultivation of forest trees; forestry.
SOC	Special Order by Consent. An agreement between the Environmental Management Commission and a permitted discharger found responsible for causing or contributing to surface water pollution. The SOC stipulates actions to be taken to alleviate the pollution within a defined time. The SOC typically includes relaxation of permit limits for particular parameters, while the facility completes the prescribed actions. SOCs are only issued to facilities where the cause of pollution is not operational in nature (i.e., physical changes to the wastewater treatment plant are necessary to achieve compliance).
streamside management zone (SMZ)	The area left along streams to protect streams from sediment and other pollutants, protect streambeds, and provide shade and woody debris for aquatic organisms.
subbasin	A designated subunit or subwatershed area of a major river basin. Subbasins typically encompass the watersheds of significant streams or lakes within a river basin. Every river basin is subdivided into subbasins ranging from one subbasin in the Watauga River basin to 24 subbasins in the Cape Fear River basin. There are 133 subbasins statewide. These subbasins are not a part of the national uniform hydrologic unit system that is sponsored by the Water Resources Council (see *hydrologic unit*).
Sw	Swamp Waters. A supplemental surface water classification denoting waters that have naturally occurring low pH, low dissolved oxygen and low velocities. These waters are common in the Coastal Plain and are often naturally discolored giving rise to their nickname of "blackwater" streams.
TMDL	Total maximum daily load. The amount of a given pollutant that a waterbody can assimilate and maintain its uses and water quality standards.
TN	Total nitrogen.
TP	Total phosphorus.
tributary	A stream that flows into a larger stream, river or other waterbody.

trophic classification	Trophic classification is a relative description of a lake's biological productivity, which is the ability of the lake to support algal growth, fish populations and aquatic plants. The productivity of a lake is determined by a number of chemical and physical characteristics, including the availability of essential plant nutrients (nitrogen and phosphorus), algal growth and the depth of light penetration. Lakes are classified according to productivity: unproductive lakes are termed "oligotrophic"; moderately productive lakes are termed "mesotrophic"; and very productive lakes are termed "eutrophic".
TSS	Total Suspended Solids.
turbidity	An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a sample. All particles in the water that may scatter or absorb light are measured during this procedure. Suspended sediment, aquatic organisms and organic particles such as pieces of leaves contribute to instream turbidity.
UT	Unnamed tributary.
watershed	The region, or land area, draining into a body of water (such as a creek, stream, river, pond, lake, bay or sound). A watershed may vary in size from several acres for a small stream or pond to thousands of square miles for a major river system. The watershed of a major river system is referred to as a basin or river basin.
WET	Whole effluent toxicity. The aggregate toxic effect of a wastewater measured directly by an aquatic toxicity test.
WS	Class WS Water Supply Water Classification. This classification denotes freshwaters used as sources of water supply. There are five WS categories. These range from WS-I, which provides the highest level of protection, to WS-V, which provides no categorical restrictions on watershed development or wastewater discharges like WS-I through WS-IV.
WWTP	Wastewater treatment plant.