TAR-PAMLICO RIVER BASINWIDE WATER QUALITY PLAN

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This document was approved and endorsed by the NC Environmental Management Commission on March 11, 2004 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 Tar-Pamlico River basin. This plan is the second five-year update to the Tar-Pamlico River Basinwide Water Quality Plan approved by the NC Environmental Management Commission in December 1994.

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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 17 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 entail the coordinated efforts of many agencies, local governments and stakeholders in the state. The first basinwide plan for the Tar-Pamlico River basin was completed in 1994 and the second in 1999.

This document is the third five-year update of the *Tar-Pamlico 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 Tar-Pamlico 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.

Tar-Pamlico River Basin Overview

The Tar-Pamlico River basin is the fourth largest river basin in North Carolina and is one of only four river basins whose boundaries are located entirely within the state. The Tar River originates in north central North Carolina in Person, Granville and Vance counties and flows southeasterly until it reaches tidal waters near Washington and becomes the Pamlico River. The Pamlico River is a tidal estuary that flows into the Pamlico Sound. Major tributaries of the Tar River include Fishing Creek, Swift Creek, Little Fishing Creek, Town Creek, Conetoe Creek, Chicod Creek, Tranters Creek and the Pungo River.

From 1982 to 1997, urban and built-up land cover increased by 87,000 acres. Uncultivated cropland and pastureland also increased by 46,000 acres. Forest and cultivated cropland cover significantly decreased by 57,000 and 154,000 acres, respectively. Most land cover change is accounted for in the Pamlico Sound hydrologic unit that includes rapidly growing areas in Hyde and Dare counties.

Populations of counties that are wholly or partly contained within the basin increased by over 89,000 people between 1990 and 2000. Franklin, Granville and Nash counties 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 170,000 by 2020 to almost one million people. Although the Tar-Pamlico River basin population is growing slower than some other river basins, 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 2,566.4 freshwater stream miles, 3,976.8 acres of freshwater reservoirs and lakes, 663,593.2 estuarine acres, and 17.3 miles of Atlantic coastline in the Tar-Pamlico River basin. There are also countless miles of unmapped small perennial, intermittent and ephemeral streams. The lower Tar-Pamlico River basin contains many 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 Tar-Pamlico 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, recreation, fish consumption, shellfish harvesting, 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 Category

The aquatic life category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. Biological, chemical and physical monitoring data collected between September 1997 and August 2002 were used to assign a use support rating in this category. Use support ratings by subbasin are summarized in Section B.

Approximately 32.9 percent of stream miles (845.5 miles) were monitored. Impaired stream miles (64.1 miles) accounted for 2.5 percent of all stream miles and 7.6 percent of monitored stream miles. Approximately 29.8 percent of freshwater acres (1,186.5 acres) were monitored. Impaired freshwater acres (369.9) accounted for 9.3 percent of all freshwater acres and 31.1 percent of monitored acres. Approximately 91.5 percent of estuarine acres (607,211.4 acres) were monitored. Impaired estuarine acres (6,070.9) accounted for 0.95 percent of all estuarine acres and 1.0 percent of monitored acres. No data were collected along the 17.3-mile coastline to assess water quality in the aquatic life category. Table 1 summarizes aquatic life use support ratings in the Tar-Pamlico River basin.

Table 1 Aquatic Life Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Aquatic Life Ratings/Basis	**Freshwater**		**Estuarine Acres**	**Coastline Miles**
	Miles	**Acres**		
Impaired/Monitored	64.1	369.9	6,070.9	0.0
Supporting/Monitored	699.3	816.6	598,786.2	0.0
Not Rated/Monitored	82.1	0.0	2,354.2	0.0
Total Monitored	**845.5**	**1,186.5**	**607,211.4**	**0.0**
Supporting/Evaluated	153.4	0.0	77.0	0.0
Not Rated/Evaluated	153.0	0.0	690.4	0.0
No Data	1,414.5	2,790.3	55,614.4	17.3
Total Unmonitored	**1,720.9**	**2,790.3**	**56,381.8**	**17.3**
Total	**2,566.4**	**3,976.8**	**663,593.2**	**17.3**
Aquatic Life Summary Percentages	**Freshwater**		**Estuarine Acres**	**Coastline Miles**
	Miles	**Acres**		
Percent of Total Monitored	32.9	29.8	91.5	0.0
Percent of Monitored/Impaired	7.6	31.1	1.0	0.0
Percent of Total Impaired	2.5	9.3	0.95	0.0

<u>Recreation Category</u>

Like the aquatic life category, the recreation category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. DWQ fecal coliform monitoring data and DEH Recreational Water Quality Monitoring Program data collected between September 1997 and August 2002 were used to assign use support ratings in this category. Use support ratings by subbasin are summarized in Section B.

Approximately 9.4 percent of stream miles (242.4 miles) were monitored. There were no Impaired stream miles in this category. No freshwater acres were monitored. Approximately 14.7 percent of estuarine acres (97,266.4 acres) were monitored. Impaired estuarine acres (2.8) were less than 1 percent of all estuarine acres. Table 2 summarizes recreation use support ratings in the Tar-Pamlico River basin.

Table 2 Recreation Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Recreation Ratings and Basis	**Freshwater Miles**	**Freshwater Acres**	**Estuarine Acres**	**Coastline Miles**
Impaired/Monitored	0.0	0.0	2.8	0.0
Supporting/Monitored	242.4	0.0	97,266.4	0.0
Not Rated/Monitored	0.0	0.0	0.0	0.0
Total Monitored	**242.4**	**0.0**	**97,269.2**	**0.0**
Supporting/Evaluated	0.0	0.0	0.0	0.0
Not Rated/Evaluated	0.0	0.0	0.0	0.0
No Data	2,324.0	3,976.8	566,324.0	17.3
Total Unmonitored	**2,324.0**	**3,976.8**	**566,324.0**	**17.3**
Total	**2,566.4**	**3,976.8**	**663,593.2**	**17.3**
Recreation Summary Percentages	**Freshwater Miles**	**Freshwater Acres**	**Estuarine Acres**	**Coastline Miles**
Percent of Total Monitored	9.4	0.0	14.7	0.0
Percent of Monitored/Impaired	0.0	0.0	<1	0.0
Percent of Total Impaired	0.0	0.0	<1	0.0

Fish Consumption Category

Like the aquatic life and recreation categories, the fish consumption category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. Department of Health and Human Services Fish Consumption Advice was used to assign a use support rating in this category. Use support ratings by subbasin are summarized in Section B.

Fish tissue data were collected on 28.6 miles of the Tar River and for 17.3 Atlantic coastline miles. These waters are Impaired/Monitored in the fish consumption category. All waters in the basin are Impaired/Evaluated because of widespread fish consumption advice.

Shellfish Harvesting Category

There are 564,938.6 estuarine acres classified for shellfish harvesting (Class SA) in the Tar-Pamlico River basin. All were monitored during the past five years by DEH Shellfish Sanitation. DEH growing area classifications were used to assign a use support rating in this category. Impaired estuarine acres accounted for 1.3 percent (7,515.9 acres) of the estuarine acres in the shellfish harvesting category. Use support ratings by subbasin are summarized in Section B. Table 3 summarizes shellfish harvesting use support ratings in the Tar-Pamlico River basin.

Table 3 Shellfish Harvesting Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Shellfish Harvesting Status and Basis	Estuarine Acres
Impaired/Monitored	7,515.9
Supporting/Monitored	557,422.7
Total Monitored	**564,938.6**
Shellfish Harvesting Summary Percentages	**Estuarine Acres**
Percent of Monitored/Impaired	1.3
Percent of Total Impaired	1.3

Water Supply Category

There are 481.3 freshwater stream miles and 821.0 freshwater acres currently classified for water supply in the Tar-Pamlico River basin. All water supply waters have been assigned a use support rating of Supporting on an evaluated basis based on reports from DEH regional water treatment consultants. The reports are used to evaluate the ability of water treatment plants to provide potable water to consumers for Class WS waters. Raw water quality is not assessed in this category.

Impaired Waters

Table 4 presents Impaired waters (in all categories) in the Tar-Pamlico River basin that were monitored by DWQ within the last five years. The 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. Current status and recommendations for restoration of water quality for each water are discussed in detail in the appropriate subbasin chapter. Maps showing current use support ratings for waters in the Tar-Pamlico River basin are presented in each subbasin chapter in Section B.

Table 4 Impaired Monitored Waters within the Tar-Pamlico River Basin (1997 to 2002) [1]

Name	Assessment Unit	Class	Subbasin	Miles	Acres	Category
Fishing Creek	28-11c	C NSW	03-03-01	0.9	0.0	Aquatic Life
Fishing Creek	28-11d	C NSW	03-03-01	1.0	0.0	Aquatic Life
Cokey Swamp	28-83-3a	C NSW	03-03-03	8.6	0.0	Aquatic Life
Bynums Mill Creek	28-83-4	C NSW	03-03-03	9.7	0.0	Aquatic Life
Conetoe Creek	28-87-(0.5)d	C NSW	03-03-03	6.7	0.0	Aquatic Life
Conetoe Creek	28-87-(0.5)b	C NSW	03-03-03	5.9	0.0	Aquatic Life
Crisp Creek	28-87-1	C NSW	03-03-03	8.7	0.0	Aquatic Life
Ballahack Canal	28-87-1.2	C NSW	03-03-03	8.4	0.0	Aquatic Life
Chicod Creek	28-101	C NSW	03-03-05	14.1	0.0	Aquatic Life
TAR RIVER	28-(102.5)	C NSW	03-03-07	0.0	338.0	Aquatic Life
Kennedy Creek	28-104	C NSW	03-03-07	0.0	32.0	Aquatic Life
PAMLICO RIVER	29-(1)	SC NSW	03-03-07	0.0	739.5	Aquatic Life
Rodman Creek	29-4-(2)	SC NSW	03-03-07	0.0	19.1	Aquatic Life
PAMLICO RIVER	29-(5)a	SB NSW	03-03-07	0.0	1,765.6	Aquatic Life
Chocowinity Bay	29-6-(1)	SC NSW	03-03-07	0.0	389.6	Aquatic Life
Chocowinity Bay	29-6-(5)	SB NSW	03-03-07	0.0	503.2	Aquatic Life
Pantego Creek	29-34-34-(2)	SC NSW	03-03-07	0.0	952.4	Aquatic Life
Pungo Creek	29-34-35	SC NSW	03-03-07	0.0	1,701.6	Aquatic Life
Pungo River	29-34-(12)b	SB NSW	03-03-07	0.0	2.8	Recreation
TAR RIVER	28-(66.5)	WS-IV NSW CA	03-03-02	0.7	0.0	Fish Consumption
TAR RIVER	28-(80)	C NSW	03-03-03	14.8	0.0	Fish Consumption
TAR RIVER	28-(94)	C NSW	03-03-05	13.1	0.0	Fish Consumption
Atlantic Ocean	99-(6)	SB	03-03-08	17.3	0.0	Fish Consumption
South Creek	29-28-(6.5)	SA NSW	03-03-07	0.0	3,073.5	Shellfish Harvesting
Whitehurst Creek	29-28-7-(2)	SA NSW	03-03-07	0.0	15.6	Shellfish Harvesting
Jacks Creek	29-28-8-(2)	SA NSW	03-03-07	0.0	8.8	Shellfish Harvesting
Little Creek	29-28-9-(2)	SA NSW	03-03-07	0.0	21.3	Shellfish Harvesting
Jacobs Creek	29-28-10-(2)	SA NSW	03-03-07	0.0	13.4	Shellfish Harvesting
Drinkwater Creek	29-28-10-3-(2)	SA NSW	03-03-07	0.0	10.3	Shellfish Harvesting
Short Creek	29-28-11	SA NSW	03-03-07	0.0	6.5	Shellfish Harvesting
Tooley Creek	29-28-12-(2)	SA NSW	03-03-07	0.0	15.4	Shellfish Harvesting
Long Creek	29-28-13-(2)	SA NSW	03-03-07	0.0	30.4	Shellfish Harvesting
Schooner Creek	29-28-14	SA NSW	03-03-07	0.6	0.0	Shellfish Harvesting
Bond Creek	29-28-15-(2)	SA NSW	03-03-07	0.0	373.2	Shellfish Harvesting

Alligator Gut	29-28-15-3	SA NSW	03-03-07	0.0	3.2	Shellfish Harvesting
Flannigan Gut	29-28-15-4	SA NSW	03-03-07	0.0	4.0	Shellfish Harvesting
Muddy Creek	29-28-15-5-(2)	SA NSW	03-03-07	0.0	97.2	Shellfish Harvesting
Robin Gut	29-28-15-5-3	SA NSW	03-03-07	0.0	0.2	Shellfish Harvesting
Wilson Gut	29-28-15-5-4	SA NSW	03-03-07	0.0	0.1	Shellfish Harvesting
Sheepskin Creek	29-28-15-5-5	SA NSW	03-03-07	0.0	1.6	Shellfish Harvesting
North Creek	29-29-(2)a	SA NSW	03-03-07	0.0	162.0	Shellfish Harvesting
Garrett Gut	29-29-4	SA NSW	03-03-07	0.0	8.0	Shellfish Harvesting
Eastham Creek	29-33-3a	SA NSW	03-03-07	0.0	62.5	Shellfish Harvesting
Alligator Creek	29-33-3-1	SA NSW	03-03-07	0.0	1.8	Shellfish Harvesting
Long Creek	29-33-3-2	SA NSW	03-03-07	0.0	1.1	Shellfish Harvesting
Slade Creek	29-34-40a	SA NSW	03-03-07	0.0	591.0	Shellfish Harvesting
Jones Creek	29-34-40-1	SA NSW	03-03-07	0.0	15.1	Shellfish Harvesting
Jarvis Creek	29-34-40-2	SA NSW	03-03-07	0.0	8.0	Shellfish Harvesting
Raffing Creek	29-34-40-3	SA NSW	03-03-07	0.0	5.0	Shellfish Harvesting
Becky Creek	29-34-40-4	SA NSW	03-03-07	0.0	19.6	Shellfish Harvesting
Neal Creek	29-34-40-5	SA NSW	03-03-07	0.0	68.0	Shellfish Harvesting
Wood Creek	29-34-40-6	SA NSW	03-03-07	0.0	26.7	Shellfish Harvesting
Spellman Creek	29-34-40-7	SA NSW	03-03-07	0.0	15.2	Shellfish Harvesting
Speer Creek	29-34-40-8	SA NSW	03-03-07	0.0	10.7	Shellfish Harvesting
Jordan Creek	29-34-41a	SA NSW	03-03-07	0.0	90.0	Shellfish Harvesting
Satterthwaite Creek	29-34-48a	SA NSW	03-03-07	0.0	85.8	Shellfish Harvesting
Wrights Creek	29-34-49	SA NSW	03-03-07	0.0	40.1	Shellfish Harvesting
North Prong Wrights Creek	29-34-49-1	SA NSW	03-03-07	0.0	37.6	Shellfish Harvesting
South Prong Wrights Creek	29-34-49-2	SA NSW	03-03-07	0.0	45.2	Shellfish Harvesting
Bradley Creek	29-34-49-2-1	SA NSW	03-03-07	0.0	9.6	Shellfish Harvesting
Oyster Creek	29-35a	SA NSW	03-03-07	0.0	117.6	Shellfish Harvesting
Bill Daniels Gut	29-35-1	SA NSW	03-03-07	0.0	1.7	Shellfish Harvesting
Bill Gut	29-35-2	SA NSW	03-03-07	0.0	6.2	Shellfish Harvesting
River Ditch	29-35-3	SA NSW	03-03-07	0.0	8.4	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)e	SA	03-03-08	0.0	48.9	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)c	SA	03-03-08	0.0	0.4	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)b	SA	03-03-08	0.0	48.7	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)d	SA	03-03-08	0.0	120.0	Shellfish Harvesting
Germantown Bay	29-42-1a	SA	03-03-08	0.0	179.7	Shellfish Harvesting
Long Creek	29-42-1-1	SA	03-03-08	0.0	53.6	Shellfish Harvesting

Midgette Creek	29-42-1-2	SA	03-03-08	0.0	8.4	Shellfish Harvesting
Rose Bay	29-44a	SA	03-03-08	0.0	318.0	Shellfish Harvesting
Rose Bay Creek	29-44-1	SA	03-03-08	0.0	154.3	Shellfish Harvesting
Swanquarter Bay	29-49a	SA ORW	03-03-08	0.0	136.2	Shellfish Harvesting
Oyster Creek	29-49-3a	SA ORW	03-03-08	0.0	35.3	Shellfish Harvesting
Juniper Bay	29-52a	SA ORW	03-03-08	0.0	66.6	Shellfish Harvesting
Northwest Creek	29-52-2	SA	03-03-08	0.0	19.4	Shellfish Harvesting
Wysocking Bay	29-60a	SA	03-03-08	0.0	126.3	Shellfish Harvesting
Middle Town Creek	29-66	SA	03-03-08	0.0	71.5	Shellfish Harvesting
Cedar Creek	29-67	SA	03-03-08	0.0	12.2	Shellfish Harvesting
Lone Tree Creek	29-69	SA	03-03-08	0.0	1.8	Shellfish Harvesting
Far Creek	29-70-(4)	SA	03-03-08	0.0	389.5	Shellfish Harvesting
Waupopin Creek	29-70-5-(3)	SA	03-03-08	0.0	96.2	Shellfish Harvesting
Oyster Creek	29-70-6	SA	03-03-08	0.0	50.1	Shellfish Harvesting
Berrys Bay	29-71a	SA	03-03-08	0.0	12.5	Shellfish Harvesting
Long Shoal River	29-73-(2)a	SA	03-03-08	0.0	419.8	Shellfish Harvesting
Long Shoal River	29-73-(2)c	SA	03-03-08	0.0	35.2	Shellfish Harvesting

* Although all waters in the basin are considered Impaired for the fish consumption category, only the Tar River (28.6 miles) and the Atlantic coastline (17.3 miles) were monitored. Refer to Appendix III for a description of the Impaired segments.

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 Tar-Pamlico 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 and recreation). 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 Tar-Pamlico 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 *Tar-Pamlico River Basinwide Water Quality Plan* (2009).

Addressing Waters on the State's 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. 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.

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.

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 17 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 entail 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.

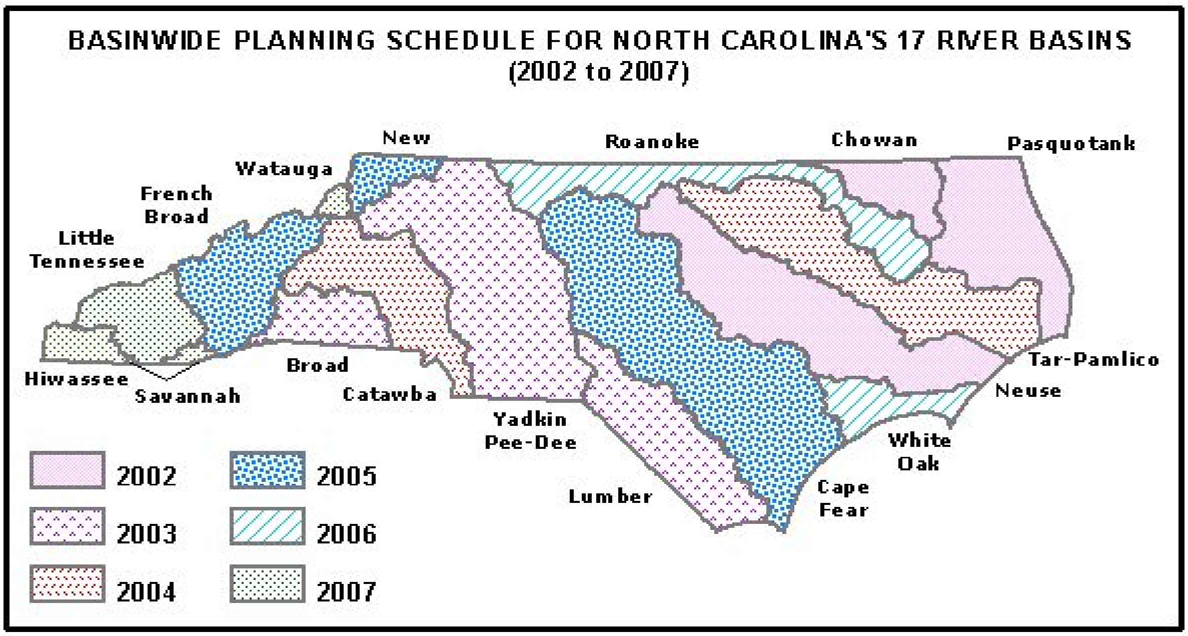


Figure A-1 Basinwide Planning Schedule (2002 to 2007)

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 Basinwide Planning Schedule (2000 to 2007)

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
Chowan	Summer 2000	3/2001	5/2002	7/2002	11/2002
Pasquotank	Summer 2000	3/2001	5/2002	7/2002	12/2002
Neuse	Summer 2000	6/2001	5/2002	7/2002	1/2003
Broad	Summer 2000	11/2001	11/2002	2/2003	7/2003
Yadkin-Pee Dee	Summer 2001	4/2002	1/2003	3/2003	9/2003
Lumber	Summer 2001	12/2002	9/2003	12/2003	7/2004
Tar-Pamlico	**Summer 2002**	**3/2003**	**12/2003**	**3/2004**	**9/2004**
Catawba	Summer 2002	10/2003	7/2004	9/2004	12/2004
French Broad	Summer 2002	11/2003	11/2004	2/2005	9/2005
New	Summer 2003	4/2004	5/2005	9/2005	3/2006
Cape Fear	Summer 2003	5/2004	4/2005	8/2005	4/2006
Roanoke	Summer 2004	4/2005	4/2006	8/2006	1/2007
White Oak	Summer 2004	10/2005	9/2006	12/2006	6/2007
Savannah	Summer 2004	10/2005	11/2006	2/2007	8/2007
Watauga	Summer 2004	10/2005	12/2006	3/2007	9/2007
Hiwassee	Summer 2004	10/2005	11/2006	2/2007	8/2007
Little Tennessee	Summer 2004	3/2006	1/2007	4/2007	10/2007

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.

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 b*y 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 discusses 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 30 days in length. Draft plans are made available on-line or by request.

1.6 Other References

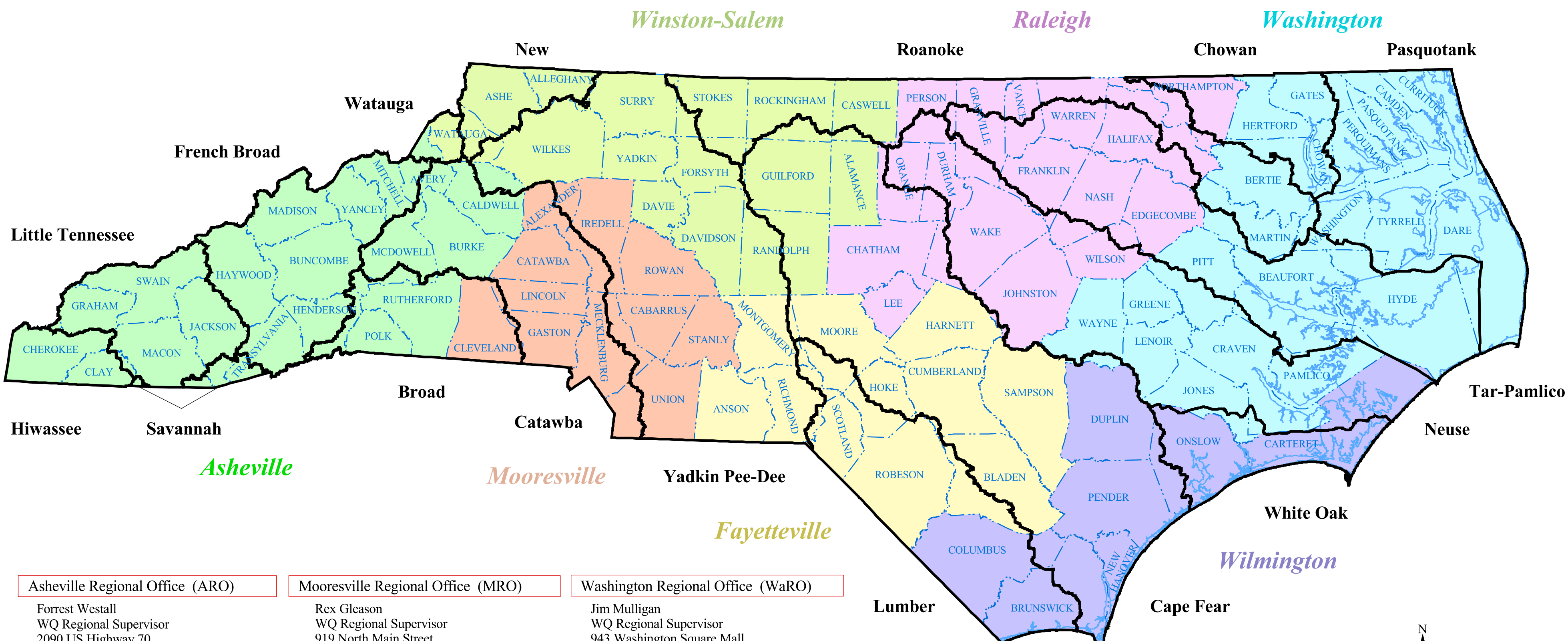
There are several reference documents and websites that provide additional information about basinwide planning and the basin's water quality:

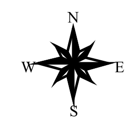
- *Tar-Pamlico River Basinwide Assessment Report*. May 2003. This technical report presents physical, chemical and biological data collected in the Tar-Pamlico River basin. 202 pages.
- *Tar-Pamlico River Basinwide Water Quality Management Plan*. July 1994 and December 1999. These first basinwide plans for the Tar-Pamlico River basin present water quality data, information and recommended management strategies for the first two five-year cycles. 280 and 231 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. Visit the website at http://h2o.enr.state.nc.us/basinwide/ to download document.
- *NC Basinwide Wetlands and Riparian Restoration Plan for the Tar-Pamlico River Basin*. August 1998. DWQ NC Wetlands Restoration Program. 74 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





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Cherokee	Madison	Yancey
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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)

Steve Tedder
WQ Regional Supervisor
585 Waughtown Street
Winston-Salem, NC 27107
COURIER 13-15-01
Phone: (336) 771-4600
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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
COURIER 52-01-00
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Fayetteville Regional Office (FRO)

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Anson	Moore
Bladen	Richmond
Cumberland	Robeson
Harnett	Sampson
Hoke	Scotland
Montgomery	

Raleigh Regional Office (RRO)

Ken Schuster
WQ Regional Supervisor
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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
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Wilmington, NC 28405-2845
COURIER 04-16-33
Phone: (910) 395-3900
Fax: (910) 350-2004

Brunswick	New Hanover
Carteret	Onslow
Columbus	Pender
Duplin	

NCDENR

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April 1, 2004

Section A - Chapter 2
Tar-Pamlico River Basin Overview

2.1 General Overview

The Tar-Pamlico River basin is the fourth largest river basin in North Carolina and is one of only four river basins whose boundaries are located entirely within the state. The Tar River originates in north central North Carolina in Person, Granville and Vance counties and flows southeasterly until it reaches tidal waters near Washington and becomes the Pamlico River. The Pamlico River is a tidal estuary that flows into the Pamlico Sound (Figure A-3). Major tributaries of the Tar River include Fishing Creek, Swift Creek, Little Fishing Creek, Town Creek, Conetoe Creek, Chicod Creek, Tranters Creek and the Pungo River.

Tar-Pamlico River Basin Statistics

Total Area: 5,571 sq. miles
Freshwater Stream Miles: 2,566.4
Freshwater Lakes Acres: 3,976.8
Estuarine Acres: 663,593.2
Coastline Miles: 17.3
No. of Counties: 16
No. of Municipalities: 50
No. of Subbasins: 8
Population (2000): 414,929 *
Pop. Density (2000): 74.5 persons/sq. mi. *

* Estimated based on % of county land area that is partially or entirely within the basin.

The most populated areas are located in and around the cities of Greenville, Rocky Mount and Washington. The basin population is estimated to be 414,929 people in 2000 up from 367,339 in 1990. Population density in the basin is estimated to be 74.5 people/square mile. Compared to the statewide density of 152 people/square mile, the Tar-Pamlico River basin remains relatively rural.

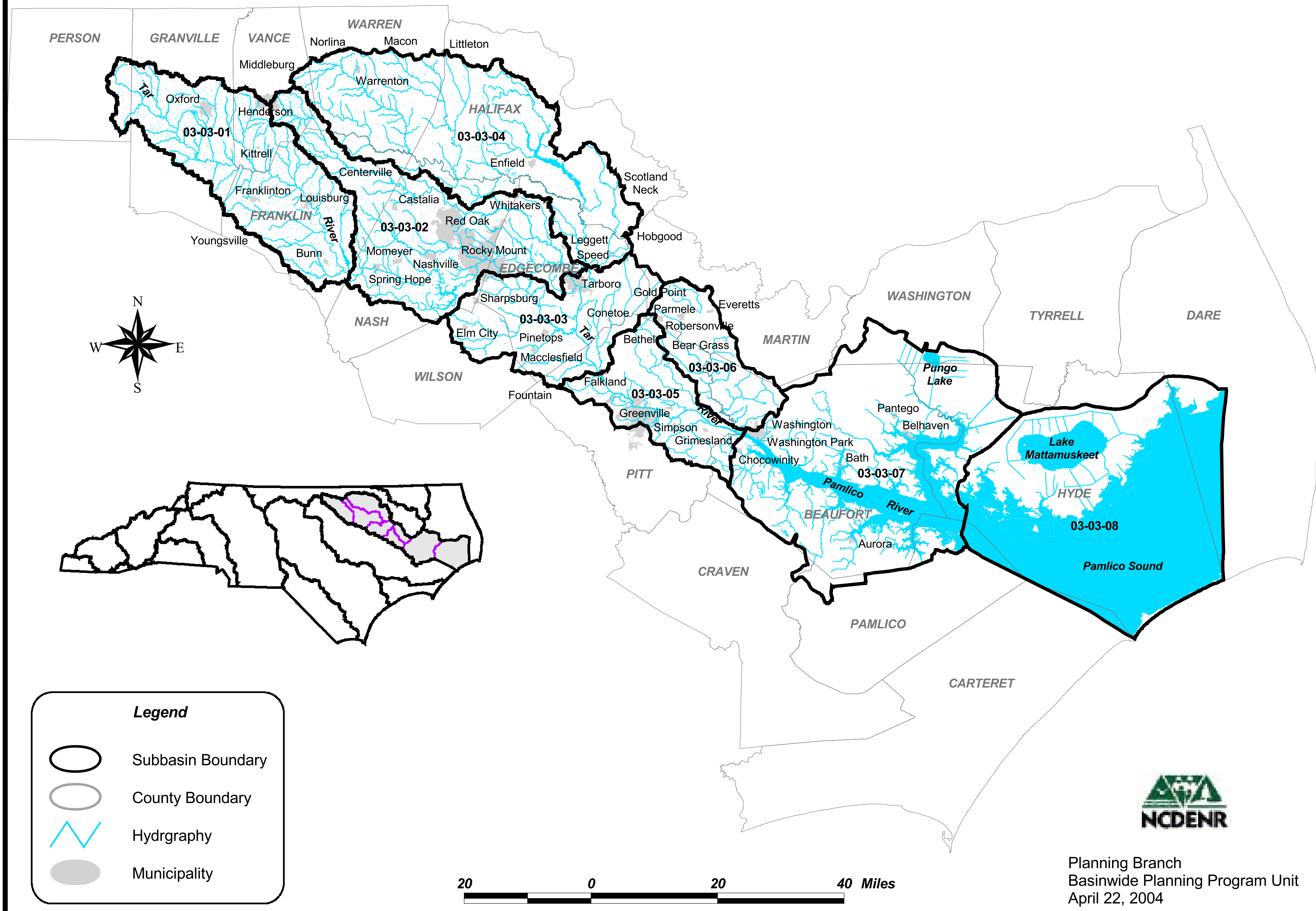
Fifty-five percent of the land in the basin is forest or wetland, and about 25 percent is in cultivated cropland and pasture/managed herbaceous land cover. Only 1 percent of the land falls into the urban/built-up category (NCDEHNR-DLR-CGIA, 1997). There has been a 16 percent (-4,000 acres) decrease in cultivated cropland (USDA-NRCS, updated June 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 Tar-Pamlico River basin is divided into eight 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 Tar-Pamlico River Basin



Under the federal system, the Tar-Pamlico River basin is made up of hydrologic areas referred to as cataloging units (USGS 8-digit hydrologic units). The Tar-Pamlico River basin is made up of five whole cataloging units: the Upper Tar River, Fishing Creek, Lower Tar River, Pamlico River and Pamlico Sound. Cataloging units are further divided into smaller watershed units (14-digit hydrologic units or local watersheds) that are used for smaller scale planning like that done by EEP (page 168). There are 168 local watershed units in the basin. Table A-3 compares the three systems.

Table A-3 Hydrologic Subdivisions in the Tar-Pamlico 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 Tar River Tar River Fishing Creek North Fork Tar River Tar River Stoney Creek Whiteoak Swamp Swift Creek Sandy Creek	 03-03-01 03-03-02	03020101	010010, 010020, 010030, 010040, 010050, 010060, 020010, 030010, 030020, 030030, 030040, 030050, 030060, 030070, 030080, 040010, 040020, 040030, 040040, 040050, 040060, 040070, 040080, 040090, 050010, 060010, 060020, 060030, 060040, 070010, 080010, 080020, 090010, 100010, 100020, 100030, 100040, 100050, 110010, 110020, 110030, 120010, 120020, 120030, 130010, 130020, 130030, 130040, 130050, 130060, 130070, 130080, 130090, 130100, 130105, 130110
Fishing Creek Fishing Creek Little Fishing Creek Shocco Creek	 03-03-04	03020102	010010, 010020, 010030, 010040, 020010, 020020, 020030, 020040, 020050, 030010, 030020, 030030, 030040, 030050, 030060, 030070, 030080, 030090, 040010, 040020, 040030, 040035, 040040, 040045, 050010, 050020, 050030, 050040, 060010, 060020, 070010, 070011, 070020, 070030, 070040, 070050
Lower Tar River Tar River Cokey Swamp Little Cokey Swamp Otter Creek Town Creek Conetoe Creek Tar River Grindle Creek Chicod Creek Cow Swamp Tranters Creek	 03-03-03 03-03-05 03-03-06	03020103	010010, 010020, 020010, 020020, 030010, 030020, 030030, 030040, 030050, 030060, 040010, 040020, 040030, 050010, 050020, 050030, 050040, 050050, 060010, 060020, 060030, 070010, 070020, 070030, 080010, 080020, 080030, 090010, 090020, 090030, 090040, 090050
Pamlico River Pamlico River Pungo River Whitehurst Creek South Creek Kennedy Creek	 03-03-07	03020104	010010, 010020, 020010, 020020, 020030, 020040, 020050, 030010, 030020, 030030, 030040, 040010, 040020, 040030, 040040, 050010, 050020, 060010, 060020, 070010, 070020, 080010, 090010, 090020, 100010, 100020, 110010, 110020, 120010, 120020, 120030
Pamlico Sound Pamlico Sound Lake Mattamuskeet	 03-03-08	03020105	020040, 030010, 030020, 040010, 040020, 050010, 060010, 070010, 070020, 080015, 080025, 090010, 090030

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

2.2.2 Hydrologic Features

There are 2,566.4 freshwater stream miles, 3,976.8 acres of freshwater reservoirs and lakes, 663,593.2 estuarine acres, and 17.3 miles of Atlantic coastline in the Tar-Pamlico River basin. There are also countless miles of unmapped small perennial, intermittent and ephemeral streams. The lower Tar-Pamlico River basin contains many 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 a few 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.

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.

Rocky Mount Mills Dam, an unlicensed hydropower facility, is required to provide, under the NC Dam Safety Act, a continuous, instantaneous minimum flow of 60 cubic feet per second (cfs) in the natural channel directly below the dam, the bypassed reach. The dam is also required to have a calibrated staff gage on the dam crest or in the bypassed reach to monitor the flow requirement.

Tar River Reservoir Dam is required to provide a continuous downstream release of 80 cfs in the Tar River.

The Division of Water Resources completed a streamflow study in the Tar River in 1995 in conjunction with a proposal by the Town of Louisburg to increase the withdrawal from the Tar River at the town's water treatment plant from 2 MGD to 3 MGD. In conjunction with a 3 MGD withdrawal, agencies requested that a flow of between 9.0 and 11.5 cfs be maintained at the stream gage just downstream of Highway 401.

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 60 (77 MGD total) registered water withdrawals in the Tar-Pamlico River basin. Thirty-nine (36 MGD) were agricultural and 21 (41 MGD) were nonagricultural. Fifty-one of these are surface water withdrawals. For more information on water withdrawals, visit the website at http://www.ncwater.org 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 Tar-Pamlico River basin. Table A-4 summarizes IBTs involving the Tar-Pamlico 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 the website at http://www.ncwater.org or call DWR at (919) 733-4064.

Table A-4 Estimated Interbasin Transfers in the Tar-Pamlico River Basin (2000)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD)
Kerr Lake Regional Water System	City of Oxford	Roanoke River	Tar River	1.33
Kerr Lake Regional Water System	Warren County	Roanoke River	Fishing Creek	0.64
Kerr Lake Regional Water System	Franklin County	Roanoke River	Tar River	0.35
Halifax County	Littleton	Roanoke River	Fishing Creek	0.1

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 Tar-Pamlico River basin (NCDENR-DWR, January 2001). The information is compiled from Local Water Supply Plans submitted to DWR by the 43 public water systems in the basin.

Total water use in the Tar-Pamlico River basin is reported to be approximately 94 MGD with 46 MGD coming from groundwater sources and 48 MGD from surface water sources. Residential demand accounted for 25 MGD. Public water systems supplied 26 MGD from surface water and 10 MGD from groundwater. Self-supplied water accounted for 9.5 MGD. For more information or to view local water supply plans, visit http://www.ncwater.org or call DWR at (919) 733-4064.

2.3 Population and Growth Trends

In the following sections, there are three different ways of presenting population data for the Tar-Pamlico River basin. The Office of State Budget and Management projects population growth by county, into the future, using 2000 Census data as a starting point. This information is important for estimating areas that expect significant population changes in the future. Data presented by municipality summarizes information on past growth of large urban areas in the basin. While the municipal data are not projected into the future, it is possible to identify areas where past growth may have impacted water quality. These two measures are based on political boundaries and not on watershed areas. Population data were also presented by subbasin to gain insight into population densities within the basin. While the three different sets of information cannot be directly compared because the areas and time periods are different, 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 subbasins in the Tar-Pamlico River basin.

2.3.1 County Population and Growth Trends

Table A-5 shows the projected population for 2020 and the change in growth between 1990 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 Tar-Pamlico River basin. This information is intended to present an estimate of expected population growth in counties that have some land area in the Tar-Pamlico River basin.

Table A-5 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	97	42,283	44,958	48,755	2,675	3,797
Dare	11	22,746	29,967	44,061	7,221	14,094
Edgecombe	100	56,692	55,606	51,959	-1,086	-3,647
Franklin	90	36,414	47,260	69,994	10,846	22,734
Granville	43	38,341	48,498	68,600	10,157	20,102
Halifax	60	55,516	57,370	58,988	1,854	1,618
Hyde	91	5,411	5,826	6,310	415	484
Martin	25	25,078	25,593	25,736	515	143
Nash	80	76,677	87,420	107,475	10,743	20,055
Pamlico	17	11,368	12,934	15,095	1,566	2,161
Person	8	30,180	35,623	45,510	5,443	9,887
Pitt	58	108,480	133,798	187,000	25,318	53,202
Vance	48	38,892	42,954	51,151	4,062	8,197
Warren	62	17,265	19,972	24,183	2,707	4,211
Washington	19	13,997	13,723	12,823	-274	-900
Wilson	19	66,061	73,814	88,418	7,753	14,604
Subtotal		645,401	735,316	906,058	89,915	170,742

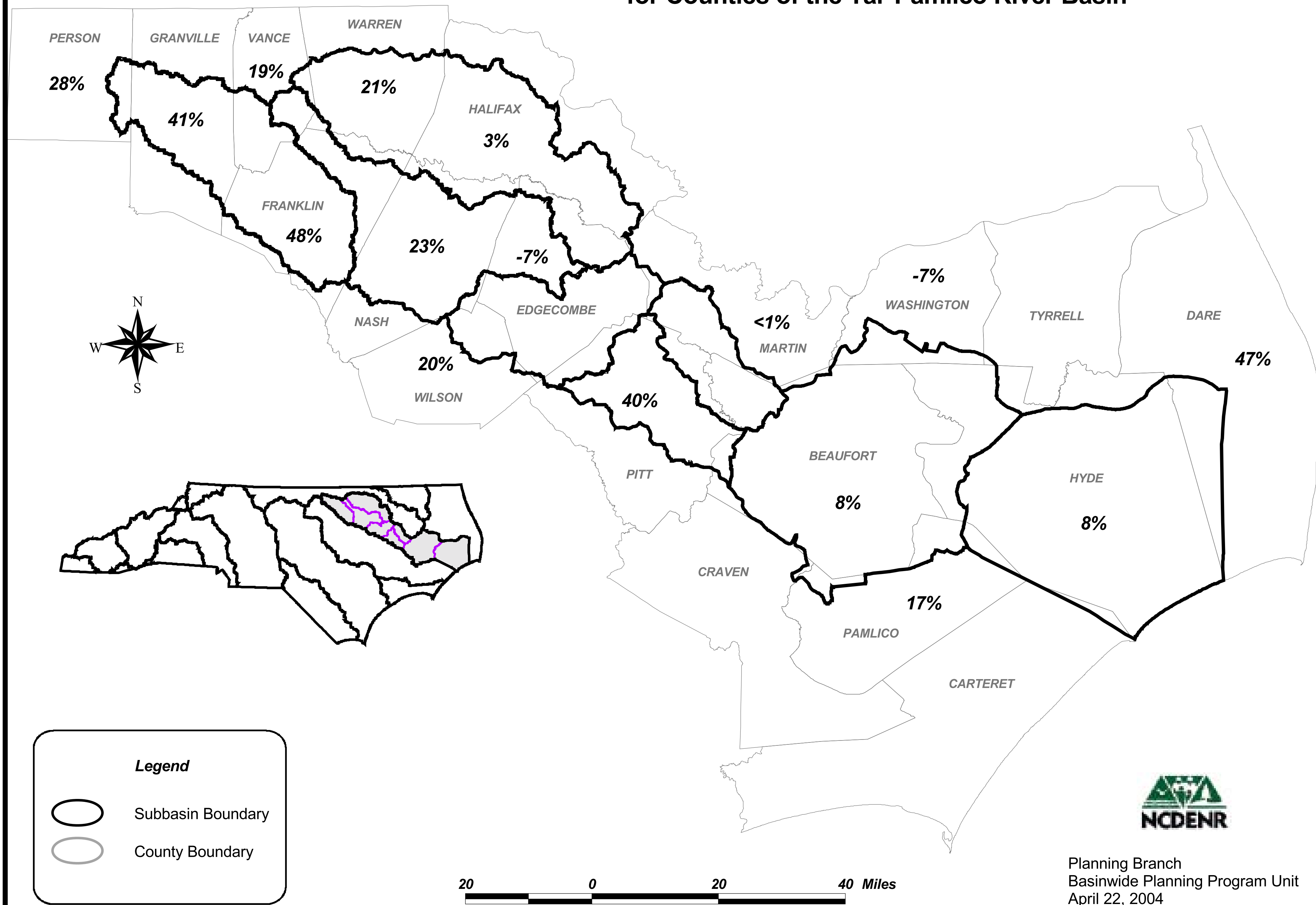
♦ Source: North Carolina Center for Geographic Information and Analysis

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 89,000 people between 1990 and 2000. Figure A-4 presents projected population growth by county (2000-2020) for the Tar-Pamlico River basin. Franklin, Granville and Nash counties 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 170,000 by 2020 to almost one million people. Although the Tar-Pamlico River basin population is growing slower than some other river basins, 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 Budget and Management at (919) 733-7061 or visit the North Carolina State Demographics website at http://demog.state.nc.us/.

Figure A-4 Percent Projected County Population Growth (2000-2020) for Counties of the Tar-Pamlico River Basin



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2.3.2 Municipal Population and Growth Trends

Table A-6 presents population data from Office of State Planning for municipalities with populations greater than 2,000 persons, located wholly or partly within the basin. These data represent 12 of the 50 municipalities in the basin. Greenville and Sharpsburg had very high growth rates. Nashville and Rocky Mount also increased population substantially in the last ten years.

Table A-6 Population (1980, 1990, 2000) and Population Change for Municipalities Greater Than 2,000 Located Wholly or Partly in the Tar-Pamlico River Basin

Municipality	County	Apr-80	Apr-90	Apr-2000	Percent Change (1980-90)	Percent Change (1990-2000)
Belhaven	Beaufort	2,430	2,269	1,968	-6.6	-13.3
Enfield	Halifax	2,995	3,082	2,347	2.9	-23.8
Greenville •	Pitt	35,740	46,305	60,476	29.6	30.6
Henderson •	Vance	13,522	15,655	16,095	15.8	2.8
Louisburg	Franklin	3,238	3,037	3,111	-6.2	2.4
Nashville	Nash	3,033	3,617	4,309	19.3	19.1
Oxford	Granville	7,709	7,965	8,338	3.3	4.7
Rocky Mount	Edgecombe, Nash	42,158	49,961	55,893	18.5	11.9
Scotland Neck •	Halifax	2,834	2,575	2,362	-9.1	-8.3
Sharpsburg	Edgecombe, Nash, Wilson	997	1,713	2,421	71.8	41.3
Tarboro	Edgecombe	8,741	11,037	11,138	26.3	0.9
Washington	Beaufort	8,418	9,160	9,583	8.8	4.6

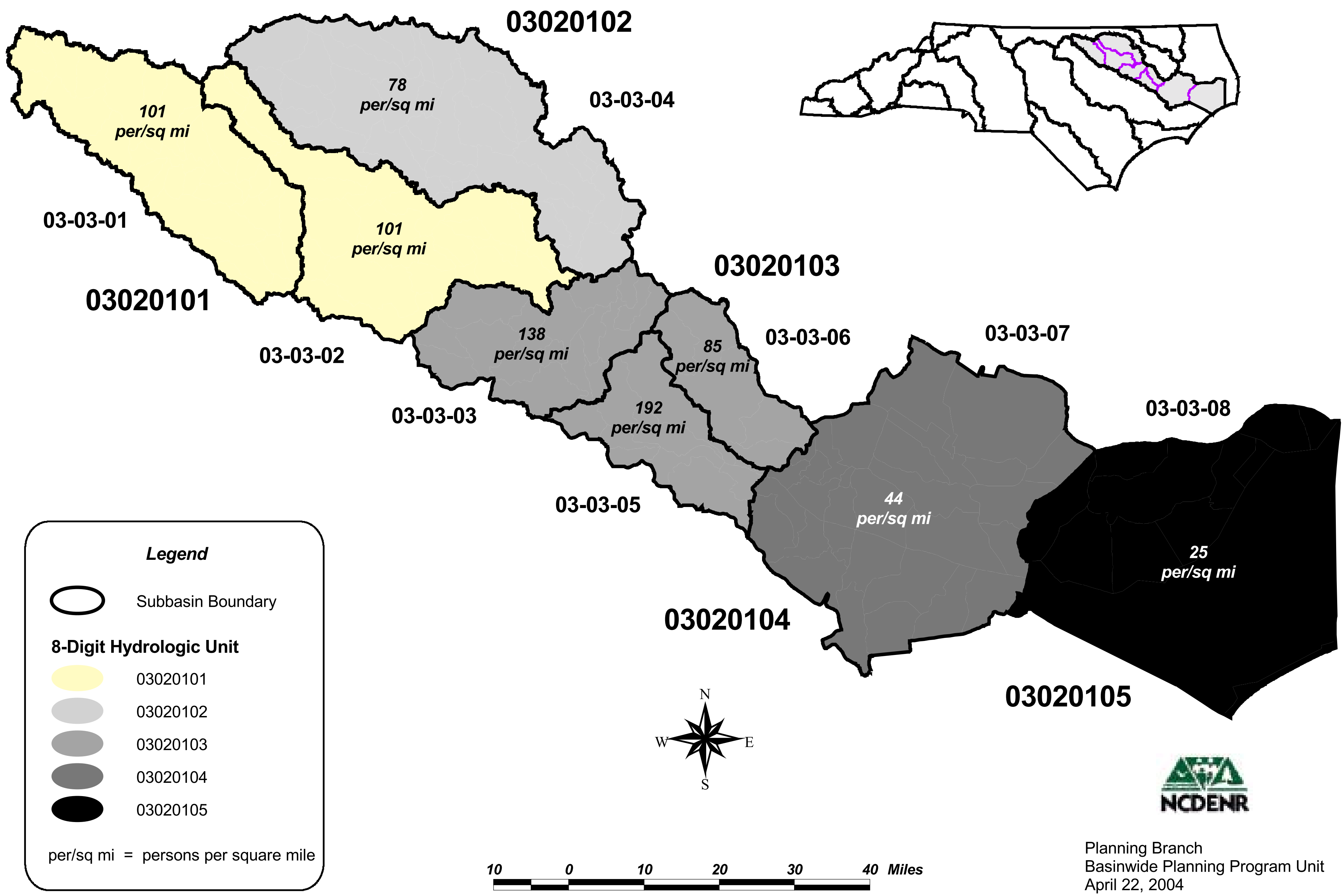
• - The numbers reported reflect municipality population; however, these municipalities are not entirely within the basin. The intent is to demonstrate growth for municipalities located wholly or partially within the basin.

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. Both county and municipal boundaries may extend beyond basin boundaries.

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. This information is presented to estimate population and population density by each subbasin and for the entire basin. County populations are assumed to be distributed evenly throughout each county; therefore, subbasins that are within counties with large urban areas may overestimate the actual population in that portion of the basin. The overall population of the basin based on DWQ analysis is 414,929, with approximately 74.5 persons/square mile. Population density estimated by subbasin is presented in Figure A-5.

Figure A-5 8-Digit Hydrologic Units in the Tar-Pamlico River Basin and Population Density by Subbasin



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2.4 Local Governments and Planning Jurisdictions in the Basin

The Tar-Pamlico River basin encompasses all or portions of 16 counties and 50 municipalities. Table A-7 provides a listing of these local governments, along with the regional planning jurisdiction (Council of Governments). Ten municipalities are located in more than one major river basin.

Table A-7 Local Governments and Planning Units within the Tar-Pamlico River Basin

County	Region	Municipalities
Beaufort	Q	Aurora, Bath, Belhaven, Chocowinity, Pantego, Washington, Washington Park
Dare	R	None
Edgecombe	L	Conetoe, Leggett, Macclesfield, Pinetops, Princeville, Rocky Mount *, Sharpsburg *, Speed, Tarboro, Whitakers *
Franklin	K	Bunn, Centerville, Franklinton, Louisburg, Youngsville ♦
Granville	K	Oxford
Halifax	L	Enfield, Hobgood ♦, Littleton ♦, Scotland Neck ♦
Hyde	R	None
Martin	Q	Bear Grass, Everetts, Parmele, Robersonville
Nash	L	Castalia, Dortches, Momeyer, Nashville, Red Oak, Rocky Mount *, Sharpsburg *, Spring Hope, Whitakers *
Pamlico	P	None
Person	K	None
Pitt	Q	Bethel, Falkland, Fountain ♦, Greenville♦, Grimesland, Simpson
Vance	K	Henderson ♦, Kittrell, Middleburg ♦
Warren	K	Macon ♦, Norlina ♦, Warrenton
Washington	R	None
Wilson	L	Elm City, Sharpsburg *

* 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.

Region	Name	Location
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
R	Albemarle Commission	Hertford

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 Tar-Pamlico 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 Tar-Pamlico 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-8. Figure A-6 provides an illustration of the relative amount of land area that falls into each major cover type for the Tar-Pamlico River basin. Section B of this plan provides land cover data specific to each subbasin based on this information.

Table A-8 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.

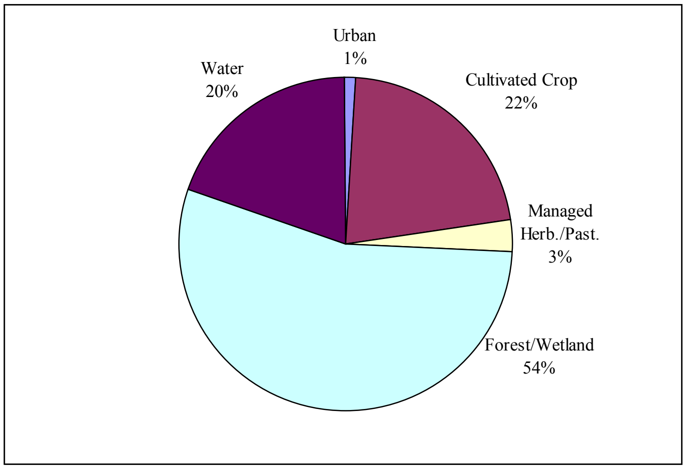


Figure A-6 Percentages within Major CGIA Land Cover Categories in the Tar-Pamlico River Basin

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-NRCS, 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-9 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-10.

Data from 1982 are also provided for a comparison of change over 15 years. During this period, urban and built-up land cover increased by 87,000 acres. Uncultivated cropland and pastureland also increased by 46,000 acres. Forest and cultivated cropland cover significantly decreased by

57,000 and 154,000 acres, respectively. Most land cover change is accounted for in the Pamlico Sound hydrologic unit that includes rapidly growing areas in Hyde and Dare counties. Figure A-7 presents changes in land cover between 1982 and 1997.

Table A-9 Land Cover in the Tar-Pamlico River Basin by Major Watersheds – 1982 vs. 1997
(Source: USDA-NRCS, NRI, updated June 2001)

	MAJOR WATERSHED AREAS													
	Upper Tar River		Fishing River		Lower Tar River		Pamlico River		Pamlico Sound		1997 TOTALS		1982 TOTALS	% change
LAND COVER	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	since 1982
Cult. Crop	151.4	18.7	126.8	22.4	262.9	39.8	173.4	25.3	55.0	4.5	769.5	19.5	923.2	23.3	-16.6
Uncult. Crop	23.8	2.9	3.9	0.7	0.0	0.0	0.0	0.0	0.0	0.0	27.7	0.7	5.8	0.1	377.6
Pasture	90.5	11.2	17.6	3.1	9.5	1.4	1.3	0.2	0.0	0.0	118.9	3.0	94.9	2.4	25.3
Forest	419.0	51.6	379.1	66.9	286.8	43.4	305.1	44.5	118.1	9.7	1508.1	38.2	1565.1	39.5	-3.6
Urban & Built-Up	66.9	8.2	12.1	2.1	63.3	9.6	27.7	4.0	13.1	1.1	183.1	4.6	96.3	2.4	90.1
Federal	0.0	0.0	0.0	0.0	6.2	0.9	19.9	2.9	98.7	8.1	124.8	3.2	80.7	2.0	54.6
Other	59.7	7.4	27.4	4.8	32.5	4.9	158.1	23.1	937.2	76.7	1214.9	30.8	1196.4	30.2	1.5
Totals	811.3	100.0	566.9	100.0	661.2	100.0	685.5	100.0	1222.1	100.0	3947.0	100.0	3962.4	100.0	
% of Total Basin		20.6		14.4		16.8		17.4		31.0		100.0			
SUBBASINS	03-03-01 03-03-02		03-03-04		03-03-03 03-03-05 03-03-06		03-03-07		03-03-07 03-03-08						
8-Digit Hydraulic Units	03020101		03020102		03020103		03020104		3020105 **						

* = 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, updated June 2001

** Pasquotank River Subbasin 03-01-55 is contained in hydraulic unit 03020105.
Neuse River Subbasin 03-04-13 is contained in hydraulic unit 03020105.
The hydraulic unit 03020105 is discussed in the Tar-Pamlico River Basin Water Quality Plan.

Table A-10 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	<u>Rural Transportation</u>: 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). *<u>Small Water Areas</u>*: Waterbodies less than 40 acres; streams less than 0.5 miles wide. *<u>Census Water</u>*: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than 0.5 miles in width. *<u>Minor Land</u>*: Lands that do not fall into one of the other categories.

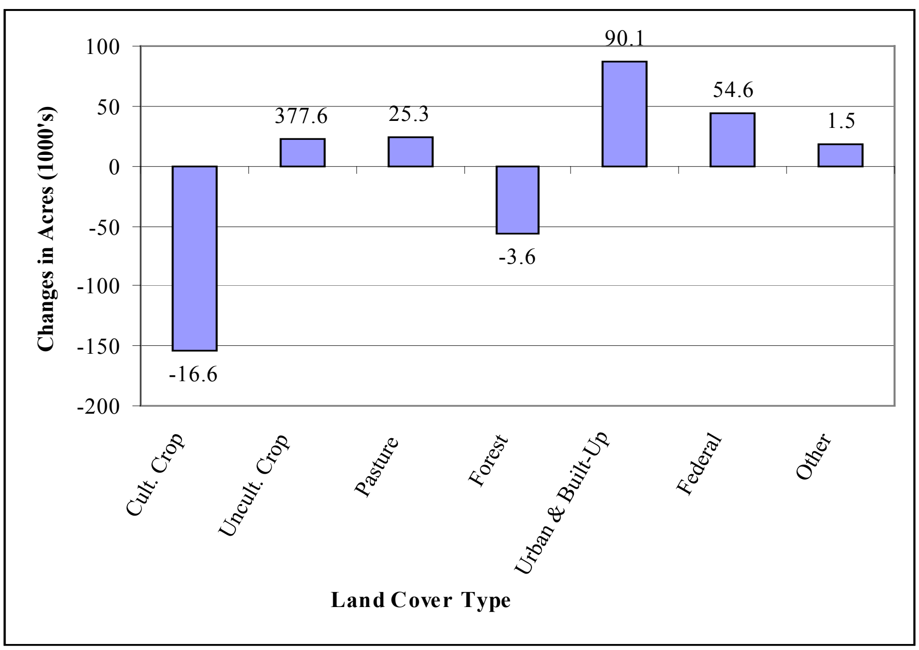


Figure A-7 Land Cover Changes from 1982 to 1997 for the Tar-Pamlico River Basin
(Source: USDA-NRCS, NRI, updated June 2001)

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 commercial 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 68 permitted wastewater discharges in the Tar-Pamlico River basin. Table A-11 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. 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 Tar-Pamlico River basin is from major municipal wastewater treatment plants. Nonmunicipal discharges also contribute substantial wastewater flow into the Tar-Pamlico River basin. Facilities, large or small, where recent data show problems with a discharge are discussed in each subbasin chapter in Section B.

Table A-11 Summary of NPDES Dischargers and Permitted Flows for the Tar-Pamlico River Basin (as of 09/26/01)

	Tar-Pamlico River Subbasin								
Facility Categories	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**Total**
Total Facilities	10	12	5	8	3	3	20	7	68
Total Permitted Flow (MGD)	6.8173	22.973	6.325	3.9767	17.5	2.105	7.4672	0.58226	67.75
Major Discharges	3	1	1	1	1	1	3	0	11
Total Permitted Flow (MGD)	6.54	21.0	5.0	2.0	17.5	1.8	5.45	0.0	59.29
Minor Discharges	7	11	4	7	2	2	17	7	57
Total Permitted Flow (MGD)	0.2773	1.973	1.325	1.9767	0.0	0.305	2.0172	0.58226	8.46
100% Domestic Waste	5	3	0	3	0	1	3	1	16
Total Permitted Flow (MGD)	0.1273	0.045	0.0	0.0217	0.0	0.005	0.06	0.012	0.27
Municipal Facilities	4	2	4	4	1	1	3	0	19
Total Permitted Flow (MGD)	6.69	21.4	6.225	3.955	17.5	1.8	4.32	0.0	61.89
Nonmunicipal Facilities	6	10	1	4	2	2	17	7	49
Total Permitted Flow (MGD)	0.1273	1.573	0.1	0.0217	0.0	0.305	3.1472	0.58226	5.86

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 164 general stormwater permits and 11 individual stormwater permits (see Appendix I for a listing). Refer to page 75 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 Tar-Pamlico River basin.

Key Animal Operation Legislation (1995-2003)

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.

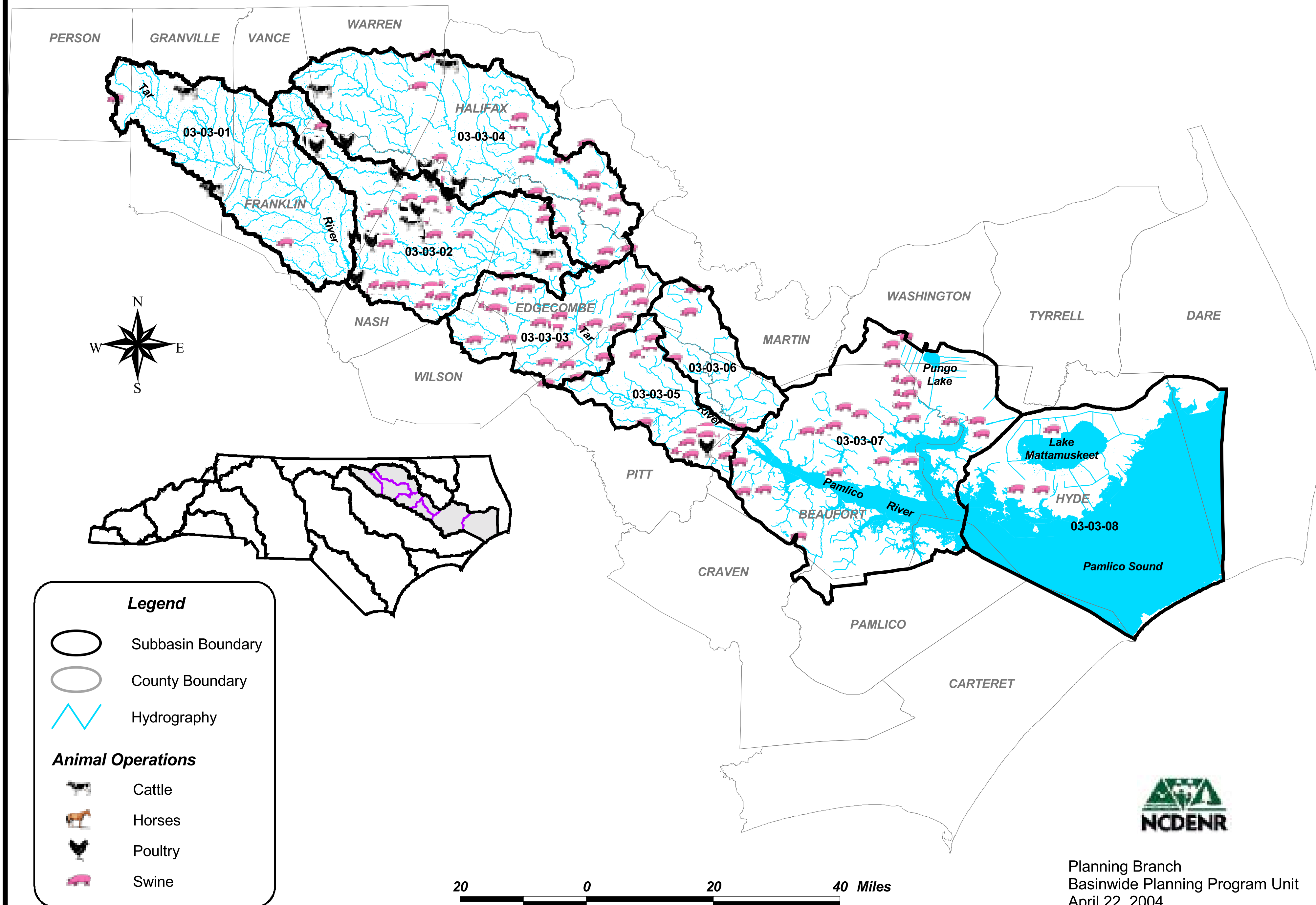
1998 House Bill 1480 extended the moratorium on construction or expansion of swine farms. The bill also requires owners of swine operations to register with DWQ any contractual relationship with an integrator.

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 Smithfield 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).

2001 House Bill 1216 extended (again) the moratorium on new construction or expansion of swine farms.

Figure A-8 Animal Operations in the Tar-Pamlico River Basin



NCDENR

Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table A-12 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight as of March 2003. 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 upper portion of the basin. Registered animal operations where recent data show problems are discussed in the appropriate subbasin chapter in Section B.

Table A-12 Registered Animal Operations in the Tar-Pamlico River Basin (as of 03/14/03)

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*
03-03-01	1	200	280,000	0	0	0	0	0	0
03-03-02	1	150	210,000	12	1,263,719	4,950,876	19	83,707	9,806,075
03-03-03	0	0	0	0	0	0	24	108,221	14,860,033
03-03-04	4	2,580	2,286,000	1	64,000	256,000	16	103,996	14,755,653
03-03-05	0	0	0	0	0	0	16	93,554	12,693,830
03-03-06	0	0	0	0	0	0	4	13,920	2,150,074
03-03-07	0	0	0	0	0	0	18	79,988	12,320,211
03-03-08	0	0	0	0	0	0	4	15,412	2,328,585
Totals	**6**	**2,930**	**2,776,000**	**13**	**1,327,719**	**5,206,876**	**101**	**498,798**	**68,914,461**

* Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service guidelines. Since the amount of waste produced varies by hog size, this 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-13) was provided by the USDA.

Table A-13 Estimated Populations of Swine, Dairy and Poultry in the Tar-Pamlico 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 (%)
03-03-01	18,940	17,986	5	2,465	2,585	-5	674,735	768,200	-12
03-03-02	112,110	73,543	52	360	420	-14	8,740,013	6,346,832	38
03-03-03	61,362	53,458	15	0	0	0	1,001,418	903,300	11
03-03-04	106,444	93,191	14	531	531	0	2,169,829	2,007,067	8
03-03-05	118,074	62,118	90	0	0	0	1,357,196	1,215,800	12
03-03-06	3,376	13,630	-75	0	0	0	52,000	52,000	0
03-03-07	87,240	94,794	-8	118	328	-64	33,570	46,570	-28
03-03-08									
TOTALS	507,546	408,720	24	3,474	3,864	-10	14,028,761	11,339,769	24
% of State Total	5%	7%		4%	3%		7%	6%	

2.8 Natural Resources

2.8.1 Ecological Significance of the Tar-Pamlico River Basin

From its headwaters and downstream to the Pamlico Sound, the Tar-Pamlico River basin encompasses a wide variety of species and wetland communities.

Waterways in the Tar-Pamlico River basin support a diversity of freshwater fishes with nearly 100 species found. Because of declining water quality and sedimentation, many aquatic species are now isolated in small areas of streams, creeks and rivers; their confined distribution makes them highly vulnerable to extirpation.

The most significant aquatic habitats in the Tar-Pamlico River basin are in the Piedmont region of the basin. These aquatic habitats -- especially Swift Creek, Fishing Creek, the Upper Tar River, and their tributaries -- support many rare aquatic species, including fish and amphibians such as the Roanoke bass and the Neuse River waterdog. However, the most outstanding biological feature of these waters is the variety of rare freshwater mussel species. In all, there are 13 species of rare freshwater mussels within the Upper Tar River, Swift Creek and Fishing Creek subbasins. At least one species, the Tar River spinymussel, is endemic to North Carolina, which means that it occurs nowhere else on earth.

In the Coastal Plain region, which covers Edgecombe and eastern Halifax counties down to the Pamlico Sound, the most significant ecological features are the numerous wetland communities. These wetland types range from swampy floodplain forests of the Tar River and its tributaries to vast, flat estuarine, tidal and nonriverine wetlands on the margins of Pamlico Sound. Many species, some of them rare, occupy these wetland habitats.

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.

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.

2.8.2 Rare Aquatic and Wetland-Dwelling Animal Species

For information on any of the species listed in Table A-14, please visit the NC Natural Heritage Program website at www.ncsparks.net/nhp or contact the NC Natural Heritage Program.

Table A-14 List of Rare Animals Associated with Aquatic Habitats in the Tar-Pamlico River Basin (as of May 2003)

Taxon	Scientific Name	Common Name	State Status	Federal Status
Amphibian	*Necturus lewisi*	Neuse River waterdog	SC	
Crustacean	*Orconectes carolinensis*	North Carolina spiny crayfish	SC	
Fish	*Fundulus confluentus*	Marsh killifish	SR	
Fish	*Ambloplites cavifrons*	Roanoke bass	SR	
Fish	*Lampetra aepyptera*	Least brook lamprey	T	
Fish	*Acipenser brevirostrum*	Shortnose sturgeon	E	E
Fish	*Lythrurus matutinus*	Pinewoods shiner	SR	FSC
Fish	*Noturus furiosus*	Carolina madtom	SC (PT)	
Insect	*Tortopus incertus*	a mayfly	SR	
Insect	*Baetisca obesa*	a mayfly	SR	
Insect	*Baetisca becki*	a mayfly	SR	
Insect	*Tortopus puella*	a mayfly	SR	
Insect	*Macdunnoa brunnea*	a mayfly	SR	
Mammal	*Trichechus manatus*	West Indian manatee	E	E
Mollusk	*Lampsilis radiata conspicua*	Carolina fatmucket	T	
Mollusk	*Elliptio steinstansana*	Tar River spinymussel	E	E
Mollusk	*Elliptio roanokensis*	Roanoke slabshell	T	
Mollusk	*Lampsilis cariosa*	Yellow lampmussel	E	FSC
Mollusk	*Alasmidonta heterodon*	Dwarf wedgemussel	E	E
Mollusk	*Elliptio lanceolata*	Yellow lance	E	FSC
Mollusk	*Lasmigona subviridis*	Green floater	E	FSC
Mollusk	*Leptodea ochracea*	Tidewater mucket	T	

Mollusk	*Ligumia nasuta*	Eastern pondmussel	T	
Mollusk	*Alasmidonta undulata*	Triangle floater	T	
Mollusk	*Fusconaia masoni*	Atlantic pigtoe	E	FSC
Mollusk	*Lampsilis radiata radiata*	Eastern lampmussel	T	
Mollusk	*Strophitus undulatus*	Squawfoot, creeper	T	
Mollusk	*Villosa delumbis*	Eastern creekshell	SR	
Mollusk	*Villosa constricta*	Notched rainbow	SC	
Reptile	*Malaclemys terrapin terrapin*	Northern diamondback terrapin	SC	FSC
Reptile	*Caretta caretta*	Loggerhead	T	T
Reptile	*Malaclemys terrapin centrata*	Carolina diamondback terrapin	SC	
Reptile	*Alligator mississippiensis*	American alligator	T	T(S/A)

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)

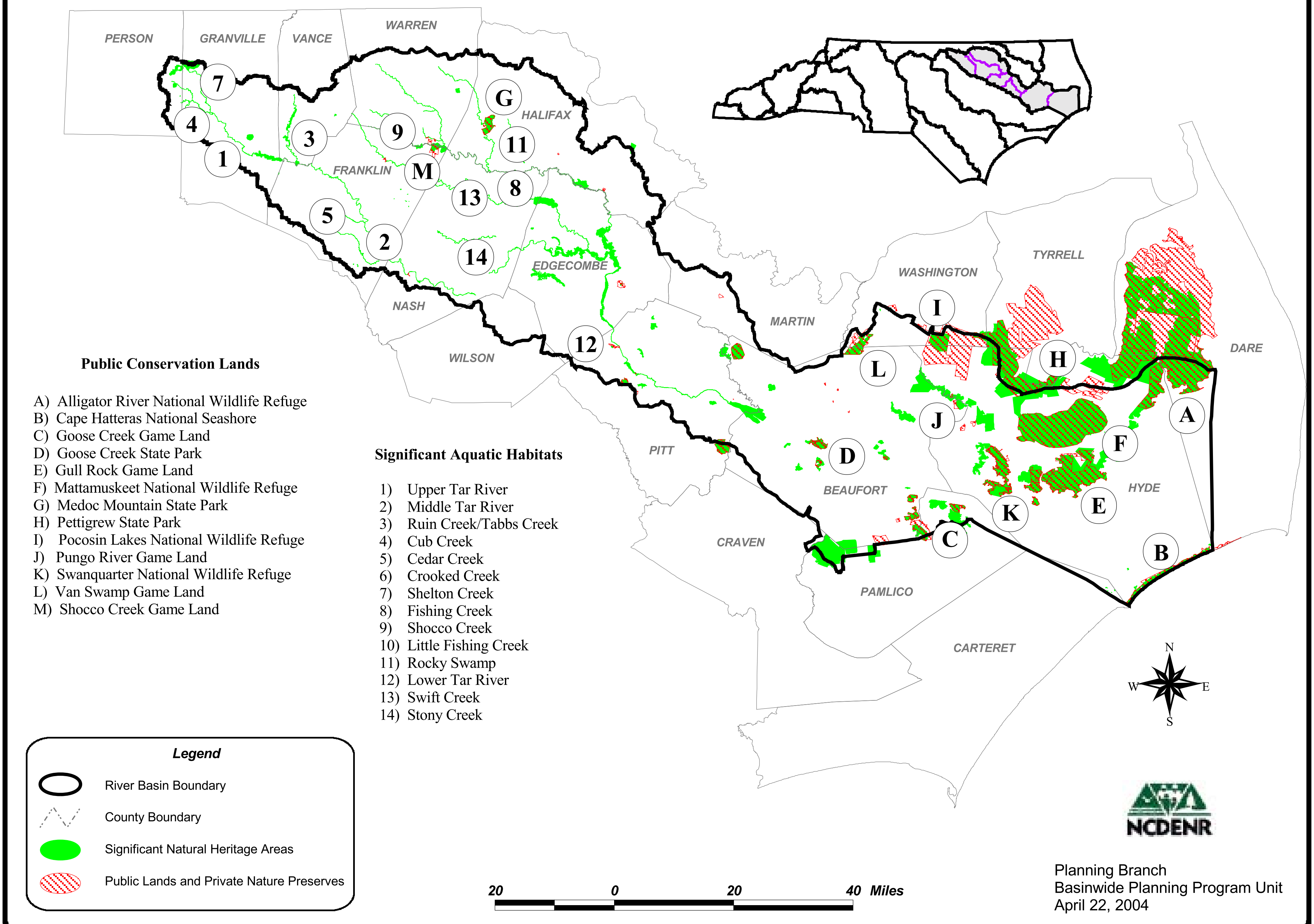
2.8.3 Significant Natural Heritage Areas in the Tar-Pamlico River Basin

Figure A-9 shows the Significant Natural Heritage Areas identified in the Tar-Pamlico River basin. The North Carolina Natural Heritage Program (NHP) compiles a list of Significant Natural Heritage Areas as required by the Nature Preserves Act. 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 special animal habitats. 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. The sites included on this list are the best representatives of the natural diversity of the state, and therefore, have priority for protection. Inclusion on the list does not imply that any protection or public access exists.

Sites that may directly contribute to the maintenance of water quality in the Tar-Pamlico River basin are highlighted on the map and in the following text. The Natural Heritage Program has identified over 100 individual natural areas in the Tar-Pamlico River basin -- too large a number to discuss in detail here. Some of the more important are discussed below.

There are a number of Upland, Riparian and Wetland Significant Natural Heritage Areas not listed here that contribute to Tar-Pamlico River water quality. Contact the NHP to obtain information about these natural areas. Significant Natural Heritage Areas are identified by the NHP, but the identification of a natural area conveys no protection. Protection comes from the landowner.

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



Upper Tar River

The streams and creeks of the Upper Tar River, Swift Creek and Fishing Creek subbasins are outstanding aquatic habitats for many aquatic species, including 12 species of rare freshwater mussels, as well as rare fishes and amphibians.

Swift Creek subbasin, in particular, has been identified as containing one of the most important aquatic ecosystems in North Carolina. The Natural Heritage Program has identified an 89-river mile reach of this stream, which possesses some of the finest ecosystems of their kind in the entire United States. No other stream in the state has as high a diversity of native mussels, nor such abundant populations. It contains populations of ten rare freshwater mussel species, as well as two rare fish species, one rare amphibian, one rare crustacean, and two rare insects. However, the numbers alone do not provide the full picture of the species diversity present in the Swift Creek subbasin. Although the Swift Creek subbasin covers less than 300 square miles, it provides habitat for more than 7 percent of the fish species found on the North American continent north of Mexico and provides habitat for nearly 29 percent of the fish species present in the Atlantic drainages in North Carolina.

Protection of water quality is crucial to maintaining the outstanding freshwater biodiversity of the Upper Tar River basin. Toward that goal, efforts have been made to protect the riparian buffers along the waterways of the Upper Tar River basin. Champion International, a forest products company, pledged to maintain 32 miles of riparian buffer within their ownership in these subbasins. Although ownership has changed, the new owner of these lands, International Paper, is maintaining these important riparian buffers. The North Carolina Clean Water Management Trust Fund has dedicated funds to purchase conservation easements on properties adjoining the waterways to protect them from uses that would impact the quality of the waters. The Division of Soil and Water Conservation, in cooperation with other farm agencies, has encouraged the use of best management practices (BMPs) on farms to reduce the amount of sediment and nutrients entering waterways.

Floodplain Habitats

The floodplain forests of Swift Creek, Fishing Creek, and the Tar River in Edgecombe County contain areas of extensive, high quality natural wetland communities. The best quality swamps contain collections of characteristic swamp forest species, and a few examples exhibit tremendous diversity, with over 45 species of trees in the canopy. Some also contain rare plants, such as yellow water-crowfoot. The floodplain communities in this area consist of Coastal Plain Levee Forest, Coastal Plain Bottomland Hardwoods, Cypress-Gum Swamp, Coastal Plain Small Stream Swamps, as well as other bottomland communities.

Several of the individual sites that make up the Tar River floodplain forests include: the Tar River Floodplain, Swift Creek Swamp Forest, Fishing Creek/Enfield Bottomland, Conetoe Creek Bottomland Forest, Fishing Creek Floodplain Forest and Tar River/Blue Banks Farm Slopes. Additional high quality bottomland sites may remain to be discovered.

Nonriverine Wetlands

Several examples of high quality nonriverine wetlands are found within the Coastal Plain of the Tar-Pamlico River basin. Some of the rarest nonriverine wetlands are found on mineral soils and are dominated by oak trees. These are referred to as Nonriverine Wet Hardwood Forests, and high quality examples in the basin include Bethel-Grindle Hardwoods in Pitt County and Scranton Hardwoods in Hyde County. There are very few Nonriverine Wet Hardwoods in North Carolina -- or anywhere else -- that have been protected for conservation. These examples in the Tar-Pamlico River basin are some of the best examples remaining.

Nonriverine wetlands on organic soils include Nonriverine Swamp Forests and Pocosins. One high quality Nonriverine Swamp Forest recently protected by the Wildlife Resources Commission is Van Swamp, a 3500-acre swamp. Several extensive pocosin communities, such as New Lake Fork Pocosin, are protected within the Pocosin Lakes National Wildlife Refuge, which lies to the north of Lake Mattamuskeet. Pocosins consist of low trees and shrubs atop several feet of peat soil and are found almost exclusively in North and South Carolina. The central part of the Pamlimarle peninsula consists primarily of vast peatlands, punctuated by large natural lakes and the several forks of the upper Alligator River. Most of the area is covered by various pocosin communities. This area is the largest and one of the best examples of an integrated peatland landscape complex in the Southeast.

Upper Pungo River Wetlands
The upper part of the Pungo River supports high quality natural wetlands of a diversity of types. They show a gradient from brackish marshes near Pamlico Sound to fresh marshes upstream. Inland, freshwater swamps of several types can be found. Reintroduction of periodic fire and some hydrological restoration may be needed to maintain the quality and diversity of these wetlands.

Southern Pamlimarle Marshes and Swamps
Like the Upper Pungo River wetlands, the northern edge of Pamlico Sound supports a large complex of high quality natural wetlands. This area is one of the largest expanses of brackish marsh in the state. Other high quality wetlands include some pocosins and Nonriverine Swamp Forests. Much of the area is protected as National Wildlife Refuge by the US Fish and Wildlife Service (i.e., Swanquarter and Alligator River National Wildlife Refuges) or as game land by the NC Wildlife Resources Commission (i.e., Gull Rock Game Land).

2.8.4 Significant Aquatic Habitats in Tar-Pamlico River Basin

The Natural Heritage Program also collaborates with other agencies and organizations to identify Significant Aquatic Habitats in North Carolina. They are stream segments or other bodies of water that contain significant natural resources, such as a high diversity of rare aquatic animal species. The Significant Aquatic Habitats of the Tar-Pamlico River basin are discussed below.

Upper Tar River Aquatic Habitat
The headwaters of the Tar River basin are a Nationally Significant Aquatic Habitat which lies between SR 1565 in Person County and the confluence of the Tar River and Gibbs Creek near the Granville-Vance county line. One of only two known sites in NC for the federally endangered *Harperella* is located along the river in shoals in the central part of the county. Several sites for dwarf wedge mussel, a federally endangered species, are also present. Other rare animals include several mussels: green floater, yellow lance, Atlantic pigtoe, yellow lampmussel, triangle floater, squawfoot, notched rainbow and Eastern creekshell, as well as the Roanoke bass and Neuse River waterdog.

Middle Tar River Aquatic Habitat
Another high quality aquatic ecosystem, the Middle Tar River Aquatic Habitat includes the main stem of the Tar River as it crosses most of Franklin and Nash counties. The Nationally Significant Middle Tar River Aquatic Habitat lies primarily in the Piedmont Province. Rare species present include: Tar River spiny mussel, yellow lance, Atlantic pigtoe, yellow lampmussel, notched rainbow, North Carolina spiny crayfish, Neuse River waterdog, pinewoods shiner, Roanoke bass and Carolina madtom.

Ruin Creek/Tabbs Creek Aquatic Habitat
Ruin Creek flows south in southwestern Vance County and empties into Tabbs Creek in the Tar River system. Five rare mollusks are found in the creek – the federally endangered dwarf wedgemussel, squawfoot, yellow lance, triangle floater and yellow lampmussel. However, most of the populations are in poor condition.

Cub Creek Aquatic Habitat
Site for three rare mussels: the federally endangered dwarf wedgemussel, the yellow lampmussel and the Atlantic pigtoe.

Cedar Creek Aquatic Habitat
Cedar Creek flows through Franklin County and empties directly into the Tar River, which contains the federally listed dwarf wedgemussel and the Neuse River waterdog.

Crooked Creek (Franklin) Aquatic Habitat
Crooked Creek, which flows through Franklin County and empties directly into the Tar River, is of state significance. Rare animals found here include five mussels (dwarf wedgemussel, yellow lance mussel, triangle floater, creeper, notched rainbow) and the Neuse River waterdog.

Shelton Creek Aquatic Habitat
State significant Shelton Creek flows southeastward to join the Tar River in western Granville County. It contains six rare mollusks – dwarf wedgemussel, triangle floater, Carolina fatmucket, creeper, notched rainbow and Eastern creekshell.

Fishing Creek Aquatic Habitat
The nationally significant Fishing Creek is one of the larger tributaries of the Tar River. The biologically significant section of the stream contains abundant rare mussels (Tar River spinymussel, dwarf wedgemussel, yellow lance, Atlantic pigtoe, triangle floater, yellow lampmussel, eastern lampmussel, notched rainbow); the Neuse River waterdog; the North Carolina spiny crayfish; several rare fish (Roanoke bass, pinewoods shiner, least brook lamprey, Carolina madtom); and a rare mayfly.

Shocco Creek Aquatic Habitat
Shocco Creek flows to the east in southern Warren County to join Fishing Creek. Also of national significance, Shocco Creek contains two rare fishes (Roanoke bass and least brook lamprey); one rare amphibian (Neuse River waterdog); five rare mollusks (dwarf wedgemussel, yellow lance, Tar River spinymussel, Atlantic pigtoe, and notched rainbow); and two rare aquatic plants (cypress knee sedge (*Carex decomposita*) and water purslane (*Didiplis diandra*)).

The site contains two federally endangered mollusks–Tar River spinymussel and the dwarf wedgemussel.

Little Fishing Creek Aquatic Habitat

Little Fishing Creek supports a large number of rare aquatic animals, including mussels (Atlantic pigtoe, Tar River spinymussel, yellow lampmussel, Roanoke slabshell, notched rainbow, yellow lance and squawfoot); two fish (Carolina madtom and Roanoke bass); and the Neuse River waterdog.

Rocky Swamp Aquatic Habitat

This creek flows into the Fishing Creek Aquatic Habitat and includes populations of least brook lamprey, pinewoods shiner, dwarf wedgemussel, triangle floater and notched rainbow.

Lower Tar River Aquatic Habitat

The Lower Tar River Aquatic Habitat is located entirely in the Coastal Plain. The federally endangered Tar River spiny mussel is found here near Tarboro. Other rare animals in this high quality aquatic ecosystem include: yellow lance, Atlantic pigtoe, yellow lampmussel, green floater, triangle floater, Roanoke bass, Carolina madtom and Neuse River waterdog.

Swift Creek Aquatic Habitat

There is more than one ecologically significant Swift Creek in North Carolina; this Tar River basin "Swift Creek" flows through Vance, Warren, Franklin, Nash and Edgecombe counties and is of national significance. Swift Creek supports populations of the federally endangered Tar River spiny mussel and dwarf wedgemussel; other rare mussels such as yellow lance, yellow lampmussel, Atlantic pigtoe; triangle floater, Roanoke slabshell, squawfoot, eastern lampmussel and notched rainbow; the endemic Neuse River waterdog; and two fish -- pinewoods shiner and Carolina madtom.

Stony Creek Aquatic Habitat

Stony Creek originates at the confluence of Big and Little Peachtree Creeks in western Nash County. The significant aquatic habitat lies between Boddies Millpond and SR 1527 east of Nashville. Rare species include a number of mussels (dwarf wedge mussel, yellow lance, yellow lampmussel, squawfoot and notched rainbow) and the Neuse River waterdog.

2.8.5 Fisheries

During 1999 and 2000, the NC Wildlife Resources Commission (NCWRC) sampled the resident fish community using boat-mounted electrofishing gear in the Tar River at Greenville and Grimesland as well as in Tranters Creek. At sites along the mainstem Tar River, the number of species collected ranged from 13-23 with a mean of 17 species, while 13-15 species were collected in Tranters Creek. Freshwater fish species of recreational importance found in the Tar River and tributaries included largemouth bass, bluegill, redear sunfish, redbreast sunfish, pumpkinseed, warmouth, black crappie, channel catfish, white catfish, chain pickerel *Esox niger*, redfin pickerel, yellow perch 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, creek chubsucker, gizzard shad, golden shiner, ironcolor shiner, spottail shiner, satinfin shiner, redhorse and tessellated darter.

Largemouth bass support popular fisheries year-round throughout the river; however, peak fishing is in late spring and early summer. Sunfish are also abundant in the river and its larger tributaries. In particular, Fishing and Swift Creeks provide excellent redbreast sunfish fishing in late April and May. 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 Tar River from Greenville to Washington. Tar River Reservoir, a 1,860-acre impoundment west of Rocky Mount, also provides good largemouth bass and crappie fishing.

Anadromous species found within the Tar-Pamlico River basin include striped bass, American shad, hickory shad, blueback herring and alewife. Although striped bass are caught year-round in the lower Tar-Pamlico River near Washington, these species mainly support seasonal fisheries as they migrate into freshwater reaches of the Tar River to spawn each spring. Anadromous species, in particular striped bass and American shad, migrate upstream as far as Rocky Mount Mills Dam, but the extent of upstream migration in a given year is highly dependent on river flows. The Rocky Mount area from middle March through June is a hot spot for American shad, while striped bass are typically found from Rocky Mount to Tarboro from early April through May. Hickory shad, blueback herring and alewife are generally found downstream of Tarboro. In 2000, the Tar-Pamlico River from the N&S Railroad at Washington upstream to Rocky Mount Mills Dam in Beaufort, Pitt, Edgecombe and Nash counties was designated by the NCWRC as an Inland Primary Nursery Area (15A NCAC 10C .0503).

Data for marine fisheries do not exactly coincide with the Tar-Pamlico River basin and include the Pamlico River as well as large portions of the Pamlico Sound. Finfish harvests averaged almost 400,000 pounds since 1992 with a high of over 500,000 pounds in 1992. Shellfish harvests averaged over 5 million pounds from 1992 to 2002 with noted low harvest years from 1999 to 2002. Variation in harvests pounds was not analyzed.

2.8.6 Public Lands

Figure A-9 shows public conservation lands within the Tar-Pamlico River basin. The basin contains some significant public lands, particularly in the Coastal Plain. Federal lands include: Alligator River, Mattamuskeet, Pocosin Lakes and Swanquarter National Wildlife Refuges; and the Ocracoke section of Cape Hatteras National Seashore.

The state lands include Pettigrew, Medoc Mountain and Goose Creek State Parks; and Pungo River, Shocco Creek, Goose Creek, Gull Rock and Van Swamp Game Lands. The NC Department of Transportation also has at least seven wetland mitigation sites within the Tar-Pamlico River basin, ranging from 4 acres to over 700 acres. These areas are protected in perpetuity and will benefit water quality.

Key players in future protection efforts will be private conservation organizations such as the North Carolina Coastal Land Trust, Tar River Land Conservancy, and The Nature Conservancy. Although not shown on the map, these organizations have protected significant acreage in the Tar-Pamlico River basin using conservation easements and other innovative strategies which benefit both landowners and the environment. Conservation organizations will continue to work with landowners in a number of ways to protect important natural areas, as well as the "open space" of agricultural lands.

2.8.7 Forestry in the Tar-Pamlico River Basin

Forest Resources

North Carolina's citizens own a majority of the forests found in the Tar-Pamlico River basin. They control more than 68 percent of the approximately two million acres of forestland in the basin. Approximately 18 percent of the forestland is owned by the forest industry. The public owns 14 percent (USDA-Forest Service, 2000, *Forest Statistics for the Northern Coastal Plain of North Carolina*, Southern Research Station Resource Bulletin SRS-83). The forestland in public ownership primarily consists of the Mattamuskeet National Wildlife Refuge (50,180 acres) and Swanquarter National Wildlife Refuge (16,411 acres).

Forest management is a major economic driver within the Tar-Pamlico River basin. For the period January 1998 through December 2002, nearly 92,000 acres, or about 5 percent, of the privately-owned forestland in the basin were planted in trees, with a majority (about 80%) of these acres utilizing cost shared funding through various state or federal programs. More than 4,600 forest management plans were developed to support sustainable forests on 229,000 acres of forestland owned by nonindustrial private landowners within this same time period.

Currently, there are 45 tracts in the basin that contain more than 9,400 acres certified as Forest Stewardship Forests. The Town of Franklinton and City of Greenville are certified as Tree City USA communities. From the most recent wood product utilization data available (March 2003), 23 different businesses reside in the Tar-Pamlico River basin that are considered "Primary Processors" of forestry-related raw material (i.e., sawmill, veneer mill, oriented strand board mill, chip mill, paper mill, etc.). Seventy-six businesses purchase forestry-related raw material from the Tar-Pamlico River basin, which represents more than 25 percent of the primary processors in North Carolina. Weyerhaeuser, Coastal Lumber, Georgia-Pacific, New South Lumber and International Paper are among the largest primary processors to utilize forestry-related raw material from this river basin.

The long-term goals of the NC Division of Forest Resources (DFR), commonly known as the North Carolina Forest Service, include the planned creation of new Educational State Forests (ESFs) within the Tar-Pamlico River basin. The priority locations for ESF development within this basin include the areas around the City of Greenville in Pitt County and Warren County between Roanoke Rapids and Henderson. North Carolina's ESFs are designed to teach the public, especially school children, about the forest environment. Each ESF typically features self-guided trails with information about kiosks, exhibits, tree identification signs, a forest education center, forestry BMP demonstration areas, and a talking tree trail. Specially trained rangers are available to conduct classes for school and other youth groups. More information about the Division's ESFs can be found at www.dfr.state.nc.us.

DFR has a county ranger's office located in each county found in the Tar-Pamlico River basin. The county ranger is responsible for forest management in their respective county. In addition, they are responsible for county forest protection (i.e., insect/disease and fire control). The DFR responded to more than 1,500 wildfires that burned about 6,000 acres from January 1998 to December 2002 in the nine counties located in the basin. More information on forest protection is available on the DFR website at www.dfr.state.nc.us or the US Forest Service website at www.fs.fed.us.

Forestry Regulation in North Carolina

Forestry operations in North Carolina are subject to regulation under the Sedimentation Pollution Control Act of 1973 (G.S. Chapter 113A Article 4 referred to as "SPCA") and amendments thereof. However, forestry operations are exempt from the permit requirements of the SPCA, if the operations comply with performance standards outlined in the *Forest Practices Guidelines Related to Water Quality* (15A NCAC 1I .0101 - .0209, referred to as "FPGs") and North Carolina General Statutes that addresses stream obstruction (G.S. 77-13 and G.S. 77-14). Additionally, the Tar-Pamlico River basin has a basinwide riparian buffer rule that must be complied with in order to harvest timber. Detailed information on maintaining compliance with the above forestry regulations is available on the DFR Water Quality Section website at www.dfr.state.nc.us.

DFR is delegated the authority, by the NC Division of Land Resources, to monitor and evaluate forestry operations for compliance with these aforementioned laws. In addition, DFR works to resolve FPG and buffer rule compliance questions brought to its attention through citizen complaints. Violations of the FPG performance standards that cannot be resolved by the DFR are referred to the Division of Land Resources for enforcement action. Violations of the riparian buffer rules are referred to DWQ. In 2002, DWQ delegated DFR the authority to conduct surface water identification within the Tar-Pamlico River and Neuse River basins specific to forestry operations. Only DFR personnel that are registered foresters and have been trained and certified by DWQ may make stream identifications in support of buffer rule compliance. During the calendar years of 1998 through 2002, DFR conducted 2,873 FPG inspections of forestry and/or timber harvesting activities in the Tar-Pamlico River basin; 96 percent of the sites inspected were in compliance with the FPG performance standards. Four harvested sites were referred to DWQ for possible noncompliance with the Tar-Pamlico River basin riparian buffer rules.

Three Water Quality Foresters cover the majority of the Tar-Pamlico River basin. Created in 1999, Water Quality Forester positions are assigned to seven of the DFR's 13 districts across the state. The Water Quality Foresters conduct FPG inspections, develop preharvest plans, and provide training opportunities for landowners, loggers and the public regarding soil conservation and water quality protection practices related to forestry. Service foresters and county rangers also handle water quality issues in the remainder of the basin, along with their other forest management and fire control responsibilities. Contact information for each district and/or county can be found on DFR's website at www.dfr.state.nc.us. DFR field staff is supported by central office water quality staff that provide technical guidance, assistance, publication development and special project support.

In addition to the FPGs and Tar-Pamlico River basin buffer rules, the DFR monitors the implementation and compliance of the following:

- The US Army Corps of Engineers' (USACE) Section 404 Dredge and Fill exemption for forestry activities.
- The USACE's best management practices to satisfy the exemption related to forest road construction in wetlands.
- The USACE's best management practices for mechanical site preparation in support of pine plantation silviculture in southeastern wetlands.
- The Management Measures applicable to NC's Coastal Nonpoint Source Management Program as identified in the 1993 US EPA publication, "Guidance Specifying Management Measures for Source of Nonpoint Source Pollution in Coastal Waters".

Forestry Best Management Practices

The implementation of forestry BMPs is encouraged by DFR in order to efficiently and effectively protect the water resources of North Carolina. The *Forestry Best Management Practices Manual* (NRCD-DFR, 1989) describes recommended techniques that may be used to comply with the state's forestry laws and help protect water quality. The BMP Manual is being revised at this time, with a revised BMP Manual expected in 2004. The second edition of the manual will be printed in a condensed pocket-sized version as well as a comprehensive desktop text. The pocket-sized, condensed version will allow for greater distribution and on-site use by loggers and equipment operators.

Among the BMPs promoted for timber harvesting is the use of bridgemats for establishing temporary stream crossings. The DFR provides bridgemats for short-term loan to loggers for use in a major portion of the Tar-Pamlico River basin. DFR's Bridgemat Loan and Education Program is an educational and protection project promoting the benefits of using portable bridges instead of culverts or hard surface crossings for stream crossings. Culverts and hard surface stream crossings have a greater potential to result in stream sedimentation. All bridgemat purchases for the DFR's program are funded by grant awards from the USEPA's Nonpoint Source Pollution Management Program. Further information on DFR's Bridgemat Loan Program can be found on the DFR website at www.dfr.state.nc.us.

Since the last basin plan was issued, DFR has implemented the following programs in an ongoing effort to improve compliance with forest regulations and in turn minimize nonpoint source pollution from forestry operations:

- Established Water Quality Forester positions in the Tar-Pamlico River basin.
- Implemented internal and external water quality training programs specific to FPG and BMP performance.
- Established the Forestry Nonpoint Source Unit at the Raleigh Central Office.
- Completed North Carolina's Forestry BMP Implementation Survey (2000-2003) field data collection and interim report. Final report development is ongoing.
- Expanded the Bridge Mat Loan and Education Program and completed a three-year summary report.
- Encouraged the use of forestry BMPs through the ProLogger education and water quality programs offered by the NC Forestry Association.
- Undertaking revision of the North Carolina's Forestry BMP Manual (2^{nd} Edition).

- Established a new water quality website for the forestry community and North Carolina residents.
- Increased exposure of temporary bridging statewide by use of a Bridge Mat Loan and Education Program.

The DFR continues its efforts to protect water quality through education and training programs, demonstrations, and research projects. Projects that address forestry NPS pollution prevention can be found online www.h2o.enr.state.nc.us/nps. Progress reports on these forestry projects will be made available at DFR website at www.dfr.state.nc.us.

Section A - Chapter 3

Summary of Water Quality Information for the Tar-Pamlico 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) 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 and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

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.

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.

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.

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-15 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-15 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 (Class HQW)

There are approximately 168 acres of HQW waters (Figure A-10) in the Tar-Pamlico River basin. Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

Criteria for HQW Classification

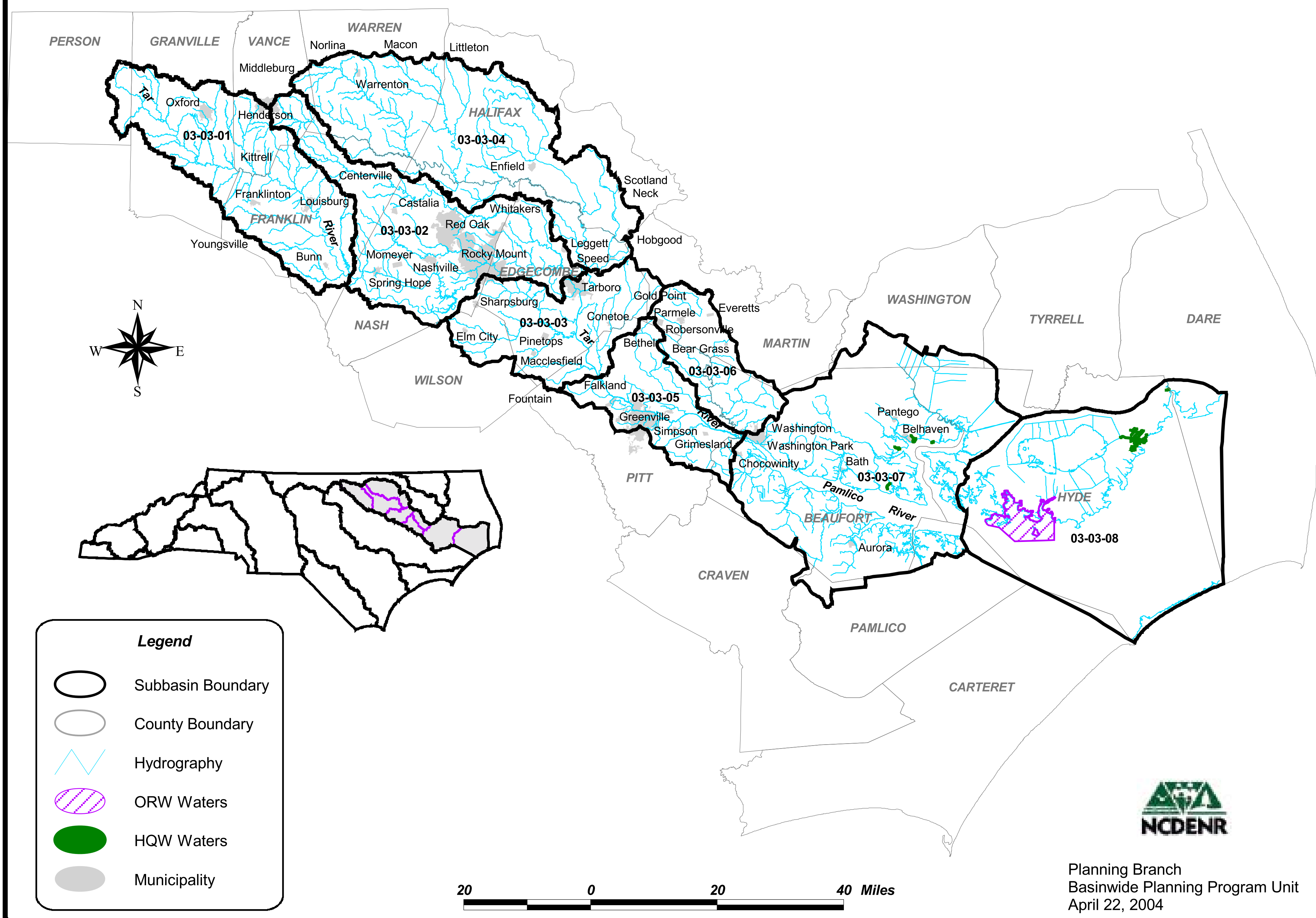
- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native or special native trout waters by the Wildlife Resources Commission.
- Waters designated as primary nursery areas or other functional nursery areas by the Division of Marine Fisheries.
- Waters classified by DWQ as WS-I, WS-II or SA.

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. The low density option requires a 30-foot vegetated buffer between development activities and the stream; whereas, the high density option requires structural stormwater controls. In addition, the Division of Land Resources requires more stringent erosion controls for land-disturbing projects within one mile of and draining to HQWs.

Outstanding Resource Waters (Class ORW)

There are 24,178 acres of ORW waters (Figure A-10) in the Tar-Pamlico River basin. These waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource.

Figure A-10 ORWs and HQWs in the Tar-Pamlico River Basin



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 618 freshwater acres, 50,092 estuarine acres, 82 stream miles and 17.3 miles of Atlantic coastline classified for primary recreation in the Tar-Pamlico River basin. Primary recreation is also a classified use of Class SA waters.

Water Supply Watersheds (Class WS)

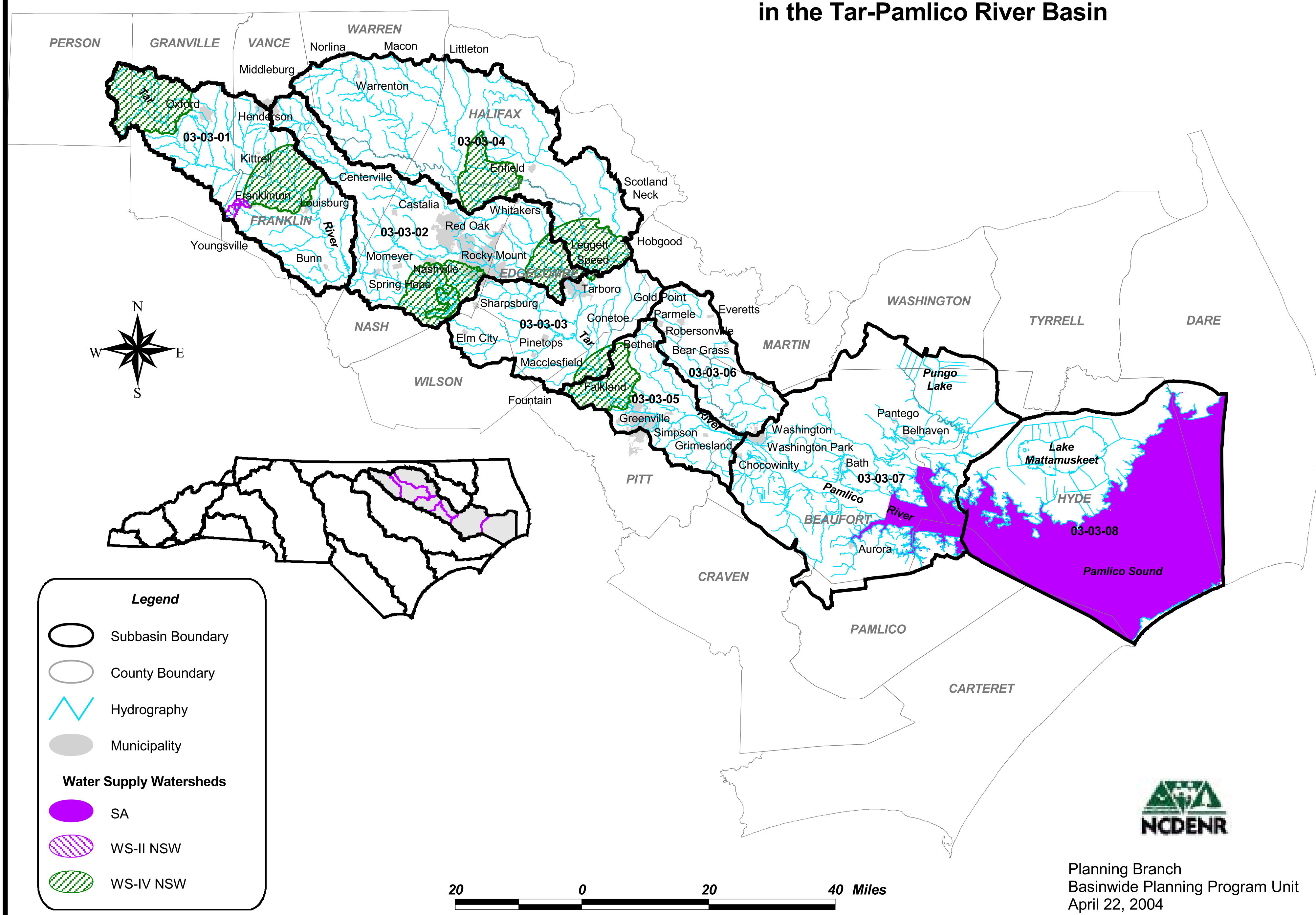
There are 821 freshwater lake acres and 481 stream miles within 566.4 square miles of water supply watershed in the Tar-Pamlico River basin (Figure A-11). The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local 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 to water supplies.

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. The Tar-Pamlico River basin currently contains only WS-II and WS-IV water supply watersheds.

Shellfish Harvesting (Class SA)

There are 564,938.6 acres of estuarine waters classified for shellfish harvesting (Figure A-11) in the Tar-Pamlico 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

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



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Basinwide Planning Program Unit
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bacteria 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 (Class NSW)

All waters in the Tar-Pamlico River basin have a supplemental classification of NSW. 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 the water quality impacts associated with excess nutrients. For more information on NSW waters and nutrient strategies in the Tar-Pamlico River basin, refer to page 61.

Pending and Recent Reclassifications in the Tar-Pamlico River Basin

A portion of Swift Creek and a portion Sandy Creek, in Nash County, were reclassified from C NSW to C ORW NSW in August 2003 per House Bill 566. This segment has excellent water quality and endangered species (page 34). Sandy Creek above SR 1004 was reclassified from C NSW to C NSW "+" at the same time. The + indicates that the special management strategy in place in the downstream ORW section will also be implemented in the entire Sandy Creek watershed. House Bill 566 was introduced in 2003 to not include the lower portion of Swift Creek (from SR 1003 to Tar River) as part of the reclassification, although this segment was part of the public hearing process and was approved to have the management strategy by the EMC. A site-specific water quality plan to protect the endangered species in the lower portion of Swift Creek is being developed for submission to the Environmental Review Commission as directed by HB 566. For more information on surface water classifications, visit the website at http://h2o.enr.state.nc.us/csu/.

3.3 DWQ Water Quality Monitoring Programs in the Tar-Pamlico 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 Tar-Pamlico 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 Tar-Pamlico 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 Tar-Pamlico 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, coastal plain and swamp) within North Carolina. Bioclassifications fall into five categories in the mountains, piedmont and coastal plain, and three categories in swamp areas.

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

Appendix II lists all the benthic macroinvertebrate collections in the Tar-Pamlico River basin between 1983 and 2002, giving site location, collection date, taxa richness, biotic index values and bioclassifications. There were 46 benthic samples collected during this assessment period. Table A-16 lists the most recent bioclassifications (by subbasin) for all benthos sites in the Tar-Pamlico River basin. Benthos sampling may slightly overestimate the proportion of Fair, Poor and Severe Stress 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 2002.

Table A-16 Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent rating for each site) in the Tar-Pamlico River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Natural	Moderate Stress	Severe Stress	Not Rated	Total
03-03-01		2	4		1					7
03-03-02		1	4				1		2	8
03-03-03	1			1	1		2	5	3	13
03-03-04		2	1				2		1	6
03-03-05			1			1	1	1	1	5
03-03-06						2	3			5
03-03-07							1		1	2
03-03-08										0
Total (#)	**1**	**5**	**10**	**1**	**2**	**3**	**10**	**6**	**8**	**46**
Total (%)	**2**	**10.8**	**21.7**	**2**	**4**	**6.5**	**21.7**	**13**	**17.4**	100

3.3.2 Fish Assessments

Historical studies of fish communities in the Tar-Pamlico River basin were conducted primarily by the North Carolina Wildlife Resources Commission (NCWRC) in the 1960s and late 1970s. 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.

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.

Overview of Fish Community Data

Appendix II lists all of the fish community collections in the Tar-Pamlico River basin between 1990 and 2002, giving site location, collection date and NCIBI rating. Fish community samples have been collected at 31 sites in eight of the Tar-Pamlico River subbasins during this assessment period. Table A-17 lists the most recent ratings since 1990, by subbasin, for all fish community sites.

Table A-17 Summary of NCIBI Categories for All Freshwater Fish Community Sites (using the most recent rating for each site) in the Tar-Pamlico River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
03-03-01	5	6	1				12
03-03-02		2	1			3	6
03-03-03						1	1
03-03-04	2	4					6
03-03-05						4	4
03-03-06							0
03-03-07						2	2
03-03-08							0
Total (#)	**7**	**12**	**2**			**10**	**31**
Total (%)	**22.5**	**38.7**	**6.4**			**32.3**	100

Tar-Pamlico River Basin Fish Kills

DWQ has systematically tracked reported fish kill events across the state since 1996. From 1996 to 2002, DWQ field investigators reported 70 fish kill events in the Tar-Pamlico River basin.

Several of these fish kills were extensive. Total fish mortality was under 100,000 from 1996 to 1998 and again in 2002. Mortality was just over 100,000 in 1999, over 200,000 in 2000, and over 500,000 in 2001. The 23 events and over 500,000 mortality in 2001 suggest that fish kills continue to be of concern in the Tar-Pamlico River basin. Refer to Figure A-12 for a summary of fish kills in the Tar-Pamlico River basin. Many of the fish kills occurred in the Pamlico 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 the website at http://www.esb.enr.state.nc.us/Fishkill/2002killrep.pdf.

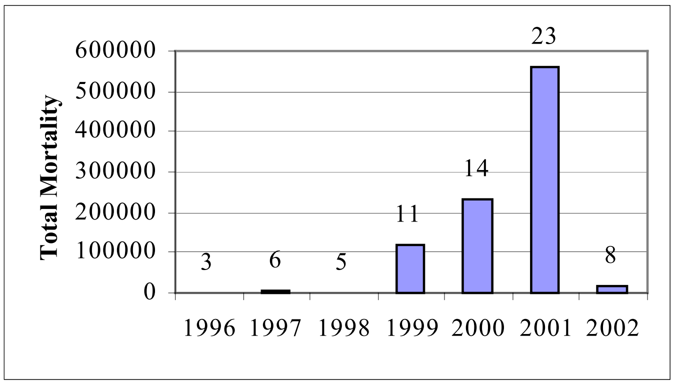


Figure A-12 Tar-Pamlico River Basin Fish Kill Summary 1996-2002
(Number above bar represents number of reported events.)

Overview of Fish Tissue Sampling

Fish tissue surveys were conducted by DWQ at three stations within the basin in 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 Tar-Pamlico River basin in 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 chain pickerel. 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 90.

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 (WET) by their NPDES permit or by administrative letter. Other facilities may also be tested by DWQ's Aquatic Toxicology Unit (ATU). Per Section 106 of the Clean Water Act, the ATU is required to test at least 10 percent of the major discharging facilities over the course of the federal fiscal year (FFY). However, it is ATU's target to test 20 percent of the major dischargers in the FFY. This means that each major facility would get evaluated over the course of their five-year permit. There are no requirements or targets for minor dischargers.

In addition, the ATU maintains a compliance summary for all facilities required to perform tests and provides monthly updates 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.

Thirty NPDES permits in the Tar-Pamlico River basin currently require WET testing. Twenty-one 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 WET has increased steadily since 1987, the first year that WET limits were written into permits in North Carolina. The compliance rate has risen as well. Since 1996, the compliance rate has stabilized at approximately 85-90 percent. Figure A-13 summaries WET monitoring compliance in the Tar-Pamlico River basin from 1987 to 1999. Facilities with toxicity problems during the most recent two-year review period are discussed in Section B subbasin chapters.

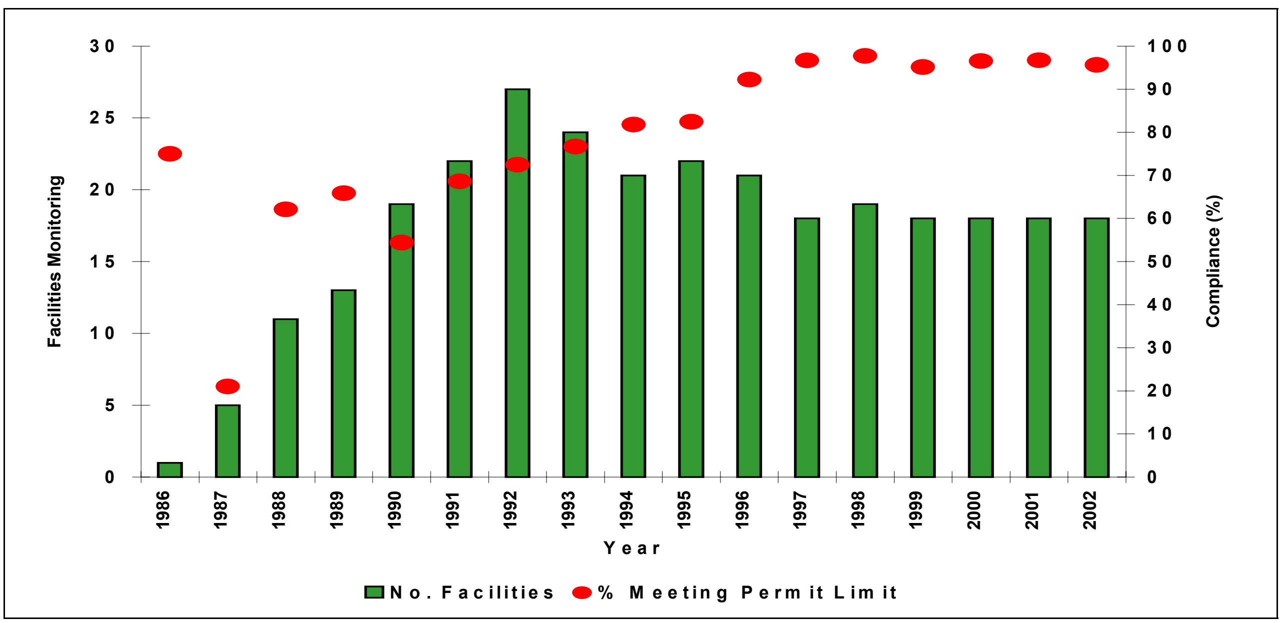


Figure A-13 Summary of Compliance with Aquatic Toxicity Tests in the Tar-Pamlico River Basin

3.3.4 Lakes Assessment Program

Three lakes in the Tar-Pamlico River basin (Tar River Reservoir, Lake Mattamuskeet and Devin Lake) were sampled as part of the Lakes Assessment Program in summer of 2002. Lakes with noted water quality impacts are discussed in the appropriate subbasin chapter in Section B.

3.3.5 Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collections of physical and chemical water quality data. North Carolina has approximately 380 water chemistry monitoring stations statewide, including 46 stations in the Tar-Pamlico River basin. The location of these stations is shown on individual subbasin maps in Section B. Notable ambient water quality parameters are discussed in the subbasin chapters by station.

There were no notable changes detected in levels of dissolved oxygen at ambient stations in the Tar-Pamlico River basin over the five-year assessment period. The stations where dissolved oxygen exceeded water quality standards are located in swampy areas where low dissolved oxygen levels and low pH are likely natural conditions. There was also no long-term increasing or decreasing pattern in turbidity levels observed at ambient stations in the basin.

Fecal coliform bacteria geometric means decreased from the last assessment period from 237 colonies/100ml water to 80 colonies/100ml water in the Tar River near Bunn. This decrease may be related to drought. Fecal coliform bacteria levels are generally lower in the lower subbasins than in subbasins 03-03-01 and 03-03-02.

A separate nutrient trend analysis was completed by DWQ in June of 2003 (page 63). Refer to *2003 Tar-Pamlico River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html for more 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 Impaired categories in the Integrated Report (303(d) list). Methodology for soliciting and evaluating outside data is presented in *North Carolina's 2002 Integrated Report* http://h2o.enr.state.nc.us/tmdl/2002%20Integrated%20Rept.pdf. The next data solicitation period for the Tar-Pamlico River is planned for fall 2006.

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.

East Carolina University collected 1,900 chlorophyll *a* samples during the assessment period at 11 locations in the Pamlico estuary. These generally agree with DWQ ambient monitoring data but were not used directly in use support assessments.

3.5 Use Support Assessment

3.5.1 Introduction to Use Support Assessment

Surface waters are classified according to their best-intended uses as described earlier in Part 3.2 of this chapter. Determining how well a waterbody supports the best-intended uses (use support assessment) is an important method of interpreting water quality data. A use support rating is assigned during use support assessment and refers to whether the best-intended uses of the water (such as water supply, aquatic life protection, shellfish harvesting and recreation) are being supported. For example, waters with a healthy biological community (Excellent, Good or Good-Fair) are *Supporting*, and waters with an unhealthy biological community (Fair or Poor) are *Impaired*. Waters with inconclusive data (biological community Not Rated) are *Not Rated*. Waters lacking data are not assigned a use support rating and listed as *No Data*. Specific details on use support assessment and assigning use support ratings can be found in Appendix III.

There are six use categories: aquatic life, fish consumption, recreation, shellfish harvesting, water supply and "other" uses. A use support rating is assigned to applicable categories depending on the surface water classification or best-intended use. For example, all waters with appropriate data are assigned a use support rating in the aquatic life, recreation and fish consumption categories. Class WS waters are assigned a use support rating for the water supply category as well as for the aquatic life, recreation and fish consumption categories. A single waterbody could potentially be assigned a use support rating in all six categories, though most waters are assigned a use support rating for the aquatic life, recreation and fish consumption categories. For many waters, a category will not be applicable to the best-intended use of that water (e.g., the shellfish harvesting category does not apply to Class C, SC, B, SB or WS waters) and no assessment is made in that category. 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 assessment methodology, refer to 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 assigns the following use support ratings: 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.

3.5.2 Comparison of Use Support Rating to Streams on 2002 Integrated Report

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 a use support rating of Impaired. 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. Currently, there are 13 segments and eight growing areas listed on the *North Carolina's 2002 Integrated 305(b) and 303(d) Report* in the Tar-Pamlico River basin. These waters are listed for fish consumption advisories related to mercury, chlorophyll *a*, fecal coliform bacteria and unknown causes. Refer to Appendix III for more information. Refer to the website at http://h2o.enr.state.nc.us/tmdl/ for the report.

3.5.3 Use Support Assessment in the Tar-Pamlico River Basin

Aquatic Life Category

The aquatic life category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. Biological, chemical and physical monitoring data collected between September 1997 and August 2002 were used to assign a use support rating in this category. Use support ratings by subbasin are summarized in Section B.

Approximately 32.9 percent of stream miles (845.5 miles) were monitored. Impaired stream miles (64.1 miles) accounted for 2.5 percent of all stream miles and 7.6 percent of monitored stream miles. Approximately 29.8 percent of freshwater acres (1,186.5 acres) were monitored. Impaired freshwater acres (369.9) accounted for 9.3 percent of all freshwater acres and 31.1 percent of monitored acres. Approximately 91.5 percent of estuarine acres (607,211.4 acres) were monitored. Impaired estuarine acres (6,070.9) accounted for 0.95 percent of all estuarine acres and 1.0 percent of monitored acres. No data were collected along the 17.3-mile coastline to assess water quality in the aquatic life category. Table A-18 summarizes aquatic life use support ratings in the Tar-Pamlico River basin.

Table A-18 Aquatic Life Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Aquatic Life Ratings/Basis	**Freshwater**		**Estuarine Acres**	**Coastline Miles**
	Miles	**Acres**		
Impaired/Monitored	64.1	369.9	6,070.9	0.0
Supporting/Monitored	699.3	816.6	598,786.2	0.0
Not Rated/Monitored	82.1	0.0	2,354.2	0.0
Total Monitored	**845.5**	**1,186.5**	**607,211.4**	**0.0**
Supporting/Evaluated	153.4	0.0	77.0	0.0
Not Rated/Evaluated	153.0	0.0	690.4	0.0
No Data	1,414.5	2,790.3	55,614.4	17.3
Total Unmonitored	**1,720.9**	**2,790.3**	**56,381.8**	**17.3**
Total	**2,566.4**	**3,976.8**	**663,593.2**	**17.3**

Aquatic Life Summary Percentages	**Freshwater**		**Estuarine Acres**	**Coastline Miles**
	Miles	**Acres**		
Percent of Total Monitored	32.9	29.8	91.5	0.0
Percent of Monitored/Impaired	7.6	31.1	1.0	0.0
Percent of Total Impaired	2.5	9.3	0.95	0.0

Recreation Category

Like the aquatic life category, the recreation category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. DWQ fecal coliform monitoring data and DEH Recreational Water Quality Monitoring Program data collected between September 1997 and August 2002 were used to assign use support ratings in this category. Use support ratings by subbasin are summarized in Section B.

Approximately 9.4 percent of stream miles (242.4 miles) were monitored. There were no Impaired stream miles in this category. No freshwater acres were monitored. Approximately 14.7 percent of estuarine acres (97,266.4 acres) were monitored. Impaired estuarine acres (2.8) were less than one percent of all estuarine acres. Table A-19 summarizes recreation use support ratings in the Tar-Pamlico River basin.

Table A-19 Recreation Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Recreation Ratings and Basis	Freshwater		Estuarine Acres	Coastline Miles
	Miles	Acres		
Impaired/Monitored	0.0	0.0	2.8	0.0
Supporting/Monitored	242.4	0.0	97,266.4	0.0
Not Rated/Monitored	0.0	0.0	0.0	0.0
Total Monitored	**242.4**	**0.0**	**97,269.2**	**0.0**
Supporting/Evaluated	0.0	0.0	0.0	0.0
Not Rated/Evaluated	0.0	0.0	0.0	0.0
No Data	2,324.0	3,976.8	566,324.0	17.3
Total Unmonitored	**2,324.0**	**3,976.8**	**566,324.0**	**17.3**
Total	**2,566.4**	**3,976.8**	**663,593.2**	**17.3**
Recreation Summary Percentages	**Freshwater**		**Estuarine Acres**	**Coastline Miles**
	Miles	**Acres**		
Percent of Total Monitored	9.4	0.0	14.7	0.0
Percent of Monitored/Impaired	0.0	0.0	<1	0.0
Percent of Total Impaired	0.0	0.0	<1	0.0

Fish Consumption Category

Like the aquatic life and recreation categories, the fish consumption category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,566.4 freshwater miles, 3,976.8 freshwater acres, 663,593.4 estuarine acres, and 17.3 Atlantic coastline miles in the Tar-Pamlico River basin. The Department of Health and Human Services Fish Consumption Advice was used to assign a use support rating in this category. Use support ratings by subbasin are summarized in Section B.

Fish tissue data were collected on 28.6 miles of the Tar River and for 17.3 Atlantic coastline miles. These waters are Impaired/Monitored in the fish consumption category. All waters in the basin are Impaired/Evaluated because of widespread fish consumption advice (page 90).

Shellfish Harvesting Category

There are 564,938.6 estuarine acres classified for shellfish harvesting (Class SA) in the Tar-Pamlico River basin. All were monitored during the past five years by DEH Shellfish Sanitation (refer to page 51). DEH growing area classifications were used to assign a use support rating in this category. Impaired estuarine acres accounted for 1.3 percent (7,515.9 acres) of the estuarine acres in the shellfish harvesting category. Use support ratings by subbasin are summarized in

Section B. Table A-20 summarizes shellfish harvesting use support ratings in the Tar-Pamlico River basin.

Table A-20 Shellfish Harvesting Use Support Ratings Summary for Waters in the Tar-Pamlico River Basin (1997-2002)

Shellfish Harvesting Status and Basis	Estuarine Acres
Impaired/Monitored	7,515.9
Supporting/Monitored	557,422.7
Total Monitored	**564,938.6**
Shellfish Harvesting Summary Percentages	**Estuarine Acres**
Percent of Monitored/Impaired	1.3
Percent of Total Impaired	1.3

Water Supply Category

There are 481.3 freshwater stream miles and 821.0 freshwater acres currently classified for water supply in the Tar-Pamlico River basin. All water supply waters have been assigned a use support rating of Supporting/Evaluated based on reports from DEH regional water treatment consultants. The reports are used to evaluate the ability of water treatment plants to provide potable water to consumers for Class WS waters. Raw water quality is not assessed in this category.

Impaired Waters

Table A-21 presents Impaired waters (in all categories) in the Tar-Pamlico River basin that were monitored by DWQ within the last five years. The 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. Current status and recommendations for restoration of water quality for each water are discussed in detail in the appropriate subbasin chapter. Maps showing current use support ratings for waters in the Tar-Pamlico River basin are presented in each subbasin chapter in Section B.

Table A-21 Impaired Monitored Waters within the Tar-Pamlico River Basin (1997 to 2002) [1]

Name	Assessment Unit	Class	Subbasin	Miles	Acres	Category
Fishing Creek	28-11c	C NSW	03-03-01	0.9	0.0	Aquatic Life
Fishing Creek	28-11d	C NSW	03-03-01	1.0	0.0	Aquatic Life
Cokey Swamp	28-83-3a	C NSW	03-03-03	8.6	0.0	Aquatic Life
Bynums Mill Creek	28-83-4	C NSW	03-03-03	9.7	0.0	Aquatic Life
Conetoe Creek	28-87-(0.5)d	C NSW	03-03-03	6.7	0.0	Aquatic Life
Conetoe Creek	28-87-(0.5)b	C NSW	03-03-03	5.9	0.0	Aquatic Life
Crisp Creek	28-87-1	C NSW	03-03-03	8.7	0.0	Aquatic Life
Ballahack Canal	28-87-1.2	C NSW	03-03-03	8.4	0.0	Aquatic Life
Chicod Creek	28-101	C NSW	03-03-05	14.1	0.0	Aquatic Life
TAR RIVER	28-(102.5)	C NSW	03-03-07	0.0	338.0	Aquatic Life
Kennedy Creek	28-104	C NSW	03-03-07	0.0	32.0	Aquatic Life
PAMLICO RIVER	29-(1)	SC NSW	03-03-07	0.0	739.5	Aquatic Life
Rodman Creek	29-4-(2)	SC NSW	03-03-07	0.0	19.1	Aquatic Life
PAMLICO RIVER	29-(5)a	SB NSW	03-03-07	0.0	1,765.6	Aquatic Life
Chocowinity Bay	29-6-(1)	SC NSW	03-03-07	0.0	389.6	Aquatic Life
Chocowinity Bay	29-6-(5)	SB NSW	03-03-07	0.0	503.2	Aquatic Life
Pantego Creek	29-34-34-(2)	SC NSW	03-03-07	0.0	952.4	Aquatic Life
Pungo Creek	29-34-35	SC NSW	03-03-07	0.0	1,701.6	Aquatic Life
Pungo River	29-34-(12)b	SB NSW	03-03-07	0.0	2.8	Recreation
TAR RIVER	28-(66.5)	WS-IV NSW CA	03-03-02	0.7	0.0	Fish Consumption
TAR RIVER	28-(80)	C NSW	03-03-03	14.8	0.0	Fish Consumption
TAR RIVER	28-(94)	C NSW	03-03-05	13.1	0.0	Fish Consumption
Atlantic Ocean	99-(6)	SB	03-03-08	17.3	0.0	Fish Consumption
South Creek	29-28-(6.5)	SA NSW	03-03-07	0.0	3,073.5	Shellfish Harvesting
Whitehurst Creek	29-28-7-(2)	SA NSW	03-03-07	0.0	15.6	Shellfish Harvesting
Jacks Creek	29-28-8-(2)	SA NSW	03-03-07	0.0	8.8	Shellfish Harvesting
Little Creek	29-28-9-(2)	SA NSW	03-03-07	0.0	21.3	Shellfish Harvesting
Jacobs Creek	29-28-10-(2)	SA NSW	03-03-07	0.0	13.4	Shellfish Harvesting
Drinkwater Creek	29-28-10-3-(2)	SA NSW	03-03-07	0.0	10.3	Shellfish Harvesting
Short Creek	29-28-11	SA NSW	03-03-07	0.0	6.5	Shellfish Harvesting
Tooley Creek	29-28-12-(2)	SA NSW	03-03-07	0.0	15.4	Shellfish Harvesting
Long Creek	29-28-13-(2)	SA NSW	03-03-07	0.0	30.4	Shellfish Harvesting
Schooner Creek	29-28-14	SA NSW	03-03-07	0.6	0.0	Shellfish Harvesting

Bond Creek	29-28-15-(2)	SA NSW	03-03-07	0.0	373.2	Shellfish Harvesting
Alligator Gut	29-28-15-3	SA NSW	03-03-07	0.0	3.2	Shellfish Harvesting
Flannigan Gut	29-28-15-4	SA NSW	03-03-07	0.0	4.0	Shellfish Harvesting
Muddy Creek	29-28-15-5-(2)	SA NSW	03-03-07	0.0	97.2	Shellfish Harvesting
Robin Gut	29-28-15-5-3	SA NSW	03-03-07	0.0	0.2	Shellfish Harvesting
Wilson Gut	29-28-15-5-4	SA NSW	03-03-07	0.0	0.1	Shellfish Harvesting
Sheepskin Creek	29-28-15-5-5	SA NSW	03-03-07	0.0	1.6	Shellfish Harvesting
North Creek	29-29-(2)a	SA NSW	03-03-07	0.0	162.0	Shellfish Harvesting
Garrett Gut	29-29-4	SA NSW	03-03-07	0.0	8.0	Shellfish Harvesting
Eastham Creek	29-33-3a	SA NSW	03-03-07	0.0	62.5	Shellfish Harvesting
Alligator Creek	29-33-3-1	SA NSW	03-03-07	0.0	1.8	Shellfish Harvesting
Long Creek	29-33-3-2	SA NSW	03-03-07	0.0	1.1	Shellfish Harvesting
Slade Creek	29-34-40a	SA NSW	03-03-07	0.0	591.0	Shellfish Harvesting
Jones Creek	29-34-40-1	SA NSW	03-03-07	0.0	15.1	Shellfish Harvesting
Jarvis Creek	29-34-40-2	SA NSW	03-03-07	0.0	8.0	Shellfish Harvesting
Raffing Creek	29-34-40-3	SA NSW	03-03-07	0.0	5.0	Shellfish Harvesting
Becky Creek	29-34-40-4	SA NSW	03-03-07	0.0	19.6	Shellfish Harvesting
Neal Creek	29-34-40-5	SA NSW	03-03-07	0.0	68.0	Shellfish Harvesting
Wood Creek	29-34-40-6	SA NSW	03-03-07	0.0	26.7	Shellfish Harvesting
Spellman Creek	29-34-40-7	SA NSW	03-03-07	0.0	15.2	Shellfish Harvesting
Speer Creek	29-34-40-8	SA NSW	03-03-07	0.0	10.7	Shellfish Harvesting
Jordan Creek	29-34-41a	SA NSW	03-03-07	0.0	90.0	Shellfish Harvesting
Satterthwaite Creek	29-34-48a	SA NSW	03-03-07	0.0	85.8	Shellfish Harvesting
Wrights Creek	29-34-49	SA NSW	03-03-07	0.0	40.1	Shellfish Harvesting
North Prong Wrights Creek	29-34-49-1	SA NSW	03-03-07	0.0	37.6	Shellfish Harvesting
South Prong Wrights Creek	29-34-49-2	SA NSW	03-03-07	0.0	45.2	Shellfish Harvesting
Bradley Creek	29-34-49-2-1	SA NSW	03-03-07	0.0	9.6	Shellfish Harvesting
Oyster Creek	29-35a	SA NSW	03-03-07	0.0	117.6	Shellfish Harvesting
Bill Daniels Gut	29-35-1	SA NSW	03-03-07	0.0	1.7	Shellfish Harvesting
Bill Gut	29-35-2	SA NSW	03-03-07	0.0	6.2	Shellfish Harvesting
River Ditch	29-35-3	SA NSW	03-03-07	0.0	8.4	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)e	SA	03-03-08	0.0	48.9	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)c	SA	03-03-08	0.0	0.4	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)b	SA	03-03-08	0.0	48.7	Shellfish Harvesting
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)d	SA	03-03-08	0.0	120.0	Shellfish Harvesting
Germantown Bay	29-42-1a	SA	03-03-08	0.0	179.7	Shellfish Harvesting

Long Creek	29-42-1-1	SA	03-03-08	0.0	53.6	Shellfish Harvesting
Midgette Creek	29-42-1-2	SA	03-03-08	0.0	8.4	Shellfish Harvesting
Rose Bay	29-44a	SA	03-03-08	0.0	318.0	Shellfish Harvesting
Rose Bay Creek	29-44-1	SA	03-03-08	0.0	154.3	Shellfish Harvesting
Swanquarter Bay	29-49a	SA ORW	03-03-08	0.0	136.2	Shellfish Harvesting
Oyster Creek	29-49-3a	SA ORW	03-03-08	0.0	35.3	Shellfish Harvesting
Juniper Bay	29-52a	SA ORW	03-03-08	0.0	66.6	Shellfish Harvesting
Northwest Creek	29-52-2	SA	03-03-08	0.0	19.4	Shellfish Harvesting
Wysocking Bay	29-60a	SA	03-03-08	0.0	126.3	Shellfish Harvesting
Middle Town Creek	29-66	SA	03-03-08	0.0	71.5	Shellfish Harvesting
Cedar Creek	29-67	SA	03-03-08	0.0	12.2	Shellfish Harvesting
Lone Tree Creek	29-69	SA	03-03-08	0.0	1.8	Shellfish Harvesting
Far Creek	29-70-(4)	SA	03-03-08	0.0	389.5	Shellfish Harvesting
Waupopin Creek	29-70-5-(3)	SA	03-03-08	0.0	96.2	Shellfish Harvesting
Oyster Creek	29-70-6	SA	03-03-08	0.0	50.1	Shellfish Harvesting
Berrys Bay	29-71a	SA	03-03-08	0.0	12.5	Shellfish Harvesting
Long Shoal River	29-73-(2)a	SA	03-03-08	0.0	419.8	Shellfish Harvesting
Long Shoal River	29-73-(2)c	SA	03-03-08	0.0	35.2	Shellfish Harvesting

* Although all waters in the basin are considered Impaired for the fish consumption category, only the Tar River (28.6 miles) and the Atlantic coastline (17.3 miles) were monitored. Refer to Appendix III for a description of the Impaired segments.

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

4.1 Introduction

Parts 4.2 through 4.5 review the status of specific recommendations and strategies made for multiple watersheds in the 1999 Tar-Pamlico River Basinwide Water Quality Plan. Part 4.6 reviews current stormwater programs in the Tar-Pamlico River basin. Parts 4.7 and 4.8 discuss agricultural issues related to water quality. Part 4.9 discusses issues related to shellfish harvesting waters. Parts 4.10 and 4.11 provide overviews of water quality issues related to the extreme meteorological events that have occurred during the assessment period. Part 4.12 discusses issues related to sedimentation and erosion control. Part 4.13 describes monitoring coalition development in the basin. Parts 4.14 through 4.18 describe water quality problems identified in the basin. Part 4.19 discusses management strategies for threatened and endangered species, and Part 4.20 discusses the NC Source Water Assessment Program.

4.2 Tar-Pamlico River Nutrient Sensitive Waters (NSW) Strategy

4.2.1 Introduction

Recurring nutrient-related problems have been documented in the Pamlico River estuary through the latter half of the 20th century. The frequency of reports of diseased fish in the Pamlico estuary increased significantly in the late 1970s and early 1980s. The state documented greatly increasing numbers of fish kills in the estuary from the mid-70s through the early 1990s. In 1988, Governor Martin established the Pamlico Environmental Response Team to investigate the increasing presence of fish and crab diseases, algal blooms, hypoxic conditions, loss of aquatic vegetation, and degradation of the region's water quality. The team operated for two years and made recommendations on controlling urban and agricultural pollution and on further studies. In 1998, Governor Hunt established the Pamlico River Response Team (PRRT) to investigate algal blooms and fish kills along the Pamlico River and its tributaries. PRRT enabled the algal monitoring program to track algal responses to nutrients and weather events in the brackish Pamlico River throughout the year.

Researchers who studied the river system intensively since the 1960s estimated that there was a several-fold increase in nitrogen inputs to the basin during the last century. Most of the increases were attributed to increased crop fertilization and production, particularly since the 1950s. Increases in farm animals and municipal and industrial discharges also contributed to the rise in nitrogen inputs. Recent studies have shown that nitrogen levels instream have decreased somewhat in the last thirty years. However, they are still considered to be sufficiently high to foster harmful algal blooms.

Phosphorus loading to the estuary decreased significantly as a result of two events beginning in the late 1980s. Effective January 1, 1988, the NC General Assembly adopted a statewide phosphate detergent ban, which resulted in significant drops in stream phosphorus concentrations statewide. Also, in the fall of 1992, PCS Phosphate, located on the Pamlico River estuary in Aurora, began a wastewater recycling program that reduced its phosphorus discharge by about 94 percent.

NSW Strategy, Phase I

In December 1989, responding to the estuary's nutrient problems, the NC Environmental Management Commission (EMC) designated the Tar-Pamlico River basin as Nutrient Sensitive Waters (NSW), requiring a basin-scale nutrient strategy. The first phase of the strategy largely targeted wastewater treatment plants and other point sources. The Phase I Agreement, from 1990 through 1994, included an innovative nutrient 'trading' program between point and nonpoint sources that served as a nationwide benchmark. A coalition of 16 point source dischargers called the Tar-Pamlico Basin Association (Association), comprising approximately 93 percent of permitted point source flows, agreed to a collective annual, incrementally decreasing, combined nitrogen and phosphorus loading cap. If they exceeded their cap, they would pay a per-kilogram offset fee to fund agricultural nutrient best management practices (BMPs) to be targeted within the basin under the state's Agriculture Cost Share Program.

The Phase I Agreement yielded the following progress:

- In each year, 1990 through 1994, the Association steadily decreased nutrient loading beneath the annually decreasing cap, reducing combined nitrogen and phosphorus load by about 20 percent, despite flow increases due to growth of about 7 percent. They did so initially by implementing nutrient removal-optimizing procedures at all facilities, then by installing biological nutrient removal processes at individual facilities as other plant modifications became necessary.
- An estuary model funded by a federal grant to the Association was completed, allowing establishment of an overall reduction goal for the estuary based on exceedances of the chlorophyll *a* standard.
- The Association provided up-front funding of almost $1 million worth of agricultural BMPs, in large part through a federal EPA grant. They banked credit from this funding against future cap exceedances.

NSW Strategy, Phase II

Adopted by the EMC in December 1994, Phase II covered the period 1995-2004. Based on the estuary model, a 30 percent reduction in total nitrogen loads to the estuary from 1991 conditions was set as an interim goal for Phase II, along with no increase in phosphorus loads. Based on these goals, the Association, expanded to 14 members, received separate, steady nitrogen and phosphorus caps for the duration of Phase II. Cap exceedances would continue to follow the offset payment approach established in Phase I; however, the offset rate was adjusted based on basin-specific agricultural BMP cost-effectiveness data.

The Phase II Agreement also placed restrictions on dischargers who chose not to join the Association. All dischargers above 0.5 MGD were required to meet 6 mg/l TN and 1 mg/l TP limits within five years, and any new loading from expanding or new facilities would have to be mitigated using the offset payment scheme established for the Association.

Nonpoint sources were also addressed in Phase II. In December 1995, the EMC adopted a plan that relied on existing programs to achieve the Phase II goals voluntarily through better targeting, coordination, and increased effort. It included action plans for nine different nonpoint source categories. The EMC received annual status reports on implementation.

Nonpoint Source Rules

In July 1998, after two years of implementing the voluntary nonpoint source plan, the EMC determined that progress was inadequate and initiated what became a lengthy rule-making process for nonpoint sources. Staff conducted a set of intensive stakeholder meetings to develop draft rules during winter 1998, followed by a formal public hearing and comment stage over the latter half of 1999. The EMC adopted a series of nonpoint source rules as detailed in Table A-22. For more information on the rules and their implementation, visit the website at http://h2o.enr.state.nc.us/nps/tarpam.htm.

Table A-22 Tar-Pamlico NSW Rules Summary

Rule Subject	Rule Number 15A NCAC 2B	Date Adopted by EMC	Effective Date of Permanent Rule
1. Riparian Buffers:			
❑ Buffer Protection	.0259	Dec. 1999	Aug. 1, 2000*
❑ Buffer Mitigation	.0260	Dec. 1999	Aug. 1, 2000*
❑ Buffer Delegation	.0261	Dec. 1999	Aug. 1, 2000*
2. Nutrient Management	.0257	July 2000	April 1, 2001
3. Stormwater Management	.0258	July 2000	April 1, 2001
4. *Agriculture:*			
❑ *Nutrient Goals*	.0255	Oct. 2000	April 1, 2001
❑ Agriculture Strategy	.0256	Oct. 2000	Sept 1, 2001**

* Temporary buffer rules were effective January 1, 2000.
** Session Law 2001-355 (House Bill 570), signed into law by Governor Easley August 10, 2001, established this effective date and made certain changes to the rule.

4.2.2 TMDLs for Nitrogen and Phosphorus

Current Status

The EPA approved TMDLs for nitrogen and phosphorus in August 1995 based on the results of estuarine response modeling. The TMDLs called for reducing nitrogen loading at Washington, NC by 30 percent from current levels to 1991 levels and holding phosphorus loading to 1991 levels. These values were based on minimizing exceedances of the 40 µg/l chlorophyll *a* standard for estuarine waters. The TMDL established these as interim goals. It recognized that further loading reductions may be needed, but progress toward the stated loading goals would be needed before more exact targets could be established. It also recognized the need for additional monitoring, BMP accounting, and estuary and fate and transport modeling.

One gauge of overall progress of the nutrient strategy is the evaluation of trends in instream nutrient levels where the Tar River meets the estuarine Pamlico River. In 2003, DWQ staff performed a statistical evaluation of the reduction in nutrient concentrations instream at the top of the estuary. Staff used statistical techniques to minimize the effects of flow and seasonal factors on nutrient concentrations. For the 12-year period of 1991-2002, there were statistically significant reductions in both total nitrogen and total phosphorus, with an estimated 18 percent reduction in nitrogen concentration (Figure A-14).

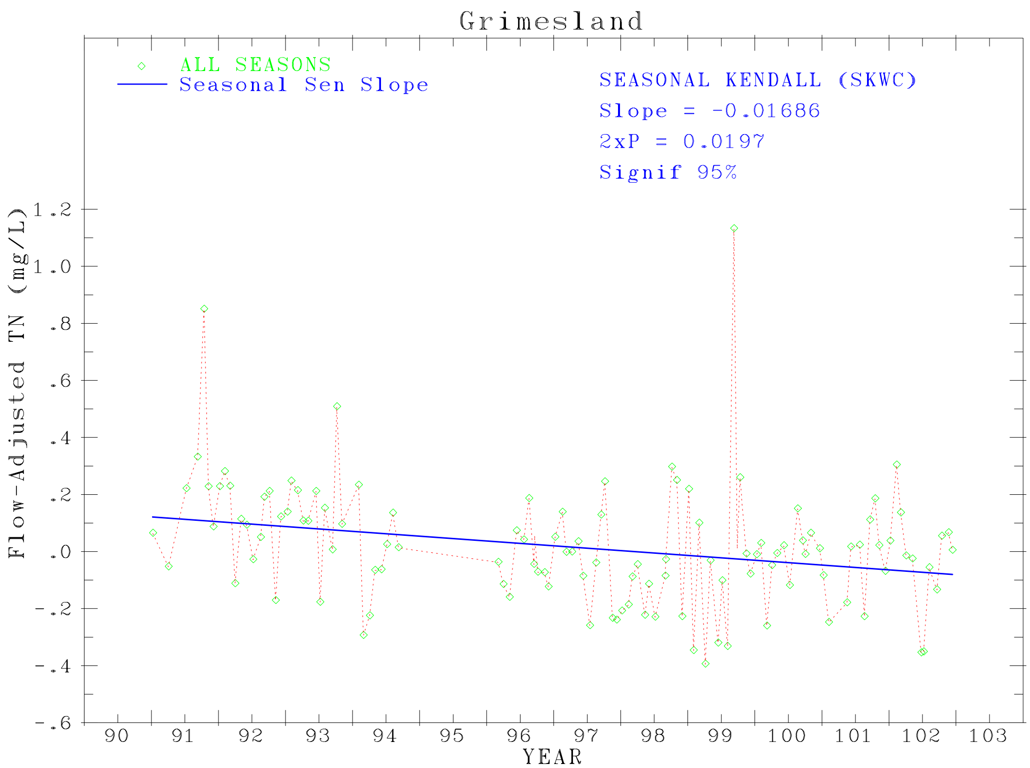


Figure A-14 Flow Adjusted Total Nitrogen at Grimesland, Trend Analysis from 1990 to 2002

2004 Recommendations

DWQ is using an adaptive management approach to implement the Tar-Pamlico estuary nitrogen and phosphorus TMDLs. Recent trend assessment indicates significant reductions in nitrogen and phosphorus loading to the estuary since 1991 (Figure A-14). The adaptive management approach recognizes that different elements of the strategy are occurring under varying schedules. Nonpoint source rules will be substantially implemented by late 2006, but some elements of the urban stormwater rule will phase in as late as 2011, and the need for additional agricultural BMP implementation to meet the phosphorus goal has not been determined. The point source agreement, operating since 1991, will be revisited prior to the initiation of a third phase in January 2005.

As discussed in the Phase II Agreement and the 1999 basinwide plan, the original estuary modeling runs suggested that more than a 30 percent total nitrogen reduction may be needed to stem eutrophication effects in the estuary, but that progress toward the loading goals would be needed first to enable better assessment. Monitoring will continue and modeling will be improved and updated in the coming years. Nutrient monitoring will continue at various points in the river to determine compliance with the reduction goals, and estuarine monitoring will be used to continue evaluating success in meeting the chlorophyll *a* response criterion. As nonpoint source rules are implemented, a second estuary modeling effort is planned to evaluate the need to revise and refine the nitrogen and phosphorus reduction goals. DWQ expects to conduct additional watershed and fate and transport modeling to support the establishment of a Phase III point source agreement.

It is important to recognize the long-term time constraints associated with restoring nutrient over-enriched waters. Nutrient loading to the estuary may be the most direct measure of progress, but changes in nutrient management on the land may take years to fully express themselves instream. Once instream, nutrient inputs may take time to appear in measured loading at the estuary due to year-to-year variations in precipitation and flow. Changes in the causal variable nutrient loading serve as one indicator of progress, but ultimately, we must look beyond that to the estuary's response over time. Estuarine response involves so many other variables that short-term assessments of progress are fraught with great uncertainty, and we must continue monitoring over longer time periods for better informed decision-making.

4.2.3 Protection and Maintenance of Existing Riparian Buffers

Current Status
The purpose of the riparian buffer rule is to maintain the nutrient removal functions 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 and estuarine waters. This 50-foot area would consist of the first 30 feet of virtually undisturbed natural vegetation, typically wooded, and the outer 20 feet of grass, vegetation or trees that could be managed to some extent. This rule does not apply to portions of the 50-foot zone where uses existed prior to the rule and remain ongoing. It does apply when type of use within the buffer changes. DWQ received some funding to help staff the Raleigh and Washington Regional Offices to enforce the buffer rule.

2004 Recommendations
Because the buffer rule protects existing buffers but does not require existing uses within the 50 feet to be returned to a vegetated buffer, the rule will largely serve to hold the line against increases in loading that would result from loss of buffers and from more nutrient-intensive adjacent land uses. The rule will result in small net gains in protection where land use in the buffer changes, prompting new buffer establishment. DWQ will continue to enforce this rule. It is also recommended that local governments in high growth areas adopt more stringent buffer rules extending to ephemeral stream protection. Local governments and individuals should also identify areas where buffers can be reestablished.

4.2.4 Wastewater Discharge Requirements

Current Status
As described in the introduction to this section, Phase II of a collective nutrient loading compliance agreement was established with the Tar-Pamlico Basin Association through 2004. Requirements

were also imposed on non-association facilities in the Phase II Agreement and through a follow-up rule, 15A NCAC 2B .0229 and .0237, that was effective April 1997.

The Association's annual combined nutrient caps and loads, as well as flows, from 1991 through 2002 are shown in Figure A-15. To date in Phase II, as in Phase I, the Association has not exceeded its nitrogen or phosphorus cap. Association loads of both nutrients have decreased steadily through Phase II, even while flows increased steadily. Nitrogen loads decreased to the range of mid-60s percent of the nitrogen cap by 2002, while phosphorus loads showed a similar trend, reaching the mid-40s percent of that cap through 2002. The Association accomplished this through its continued commitment to having individual facilities incorporate biological nutrient removal at cost-effective opportunities. Step increases in the caps at the outset of Phase II and in 2001 are visible in the figure. These increases resulted from the initial Phase II cap-setting process using an instream chlorophyll *a* response target and the addition of Robersonville, respectively.

As of June 2003, the Association numbered 15 members, and the addition of a 16^{th}, Scotland Neck, was anticipated in the near future. This membership would comprise 93 percent of all individually permitted point source flows in the basin.

For non-association facilities, NPDES permit renewals issued by DWQ following approval of the 1999 basinwide plan were subject to the non-association requirements embodied in the Phase II Agreement and the offset rule. No facilities met the criteria for receiving new 6 mg/l TN and 1 mg/l TP limits. The several potentially subject facilities either joined the Association during Phase II or connected flows to an association member. Further, there were no new facilities or expansions that would generate new loads requiring mitigation through offset payments.

2004 Recommendations

The Phase II Agreement will be revisited with the Association and environmental groups prior to the initiation of a third phase in January 2005. DWQ expects to revisit the nutrient caps, including the use of fate and transport and watershed modeling to refine load delivery estimates. The offset payment rate should also be revisited, considering changes in agricultural BMP emphasis, better cost-effectiveness information, BMP longevity, and establishment of a separate rate for phosphorus cap exceedances.

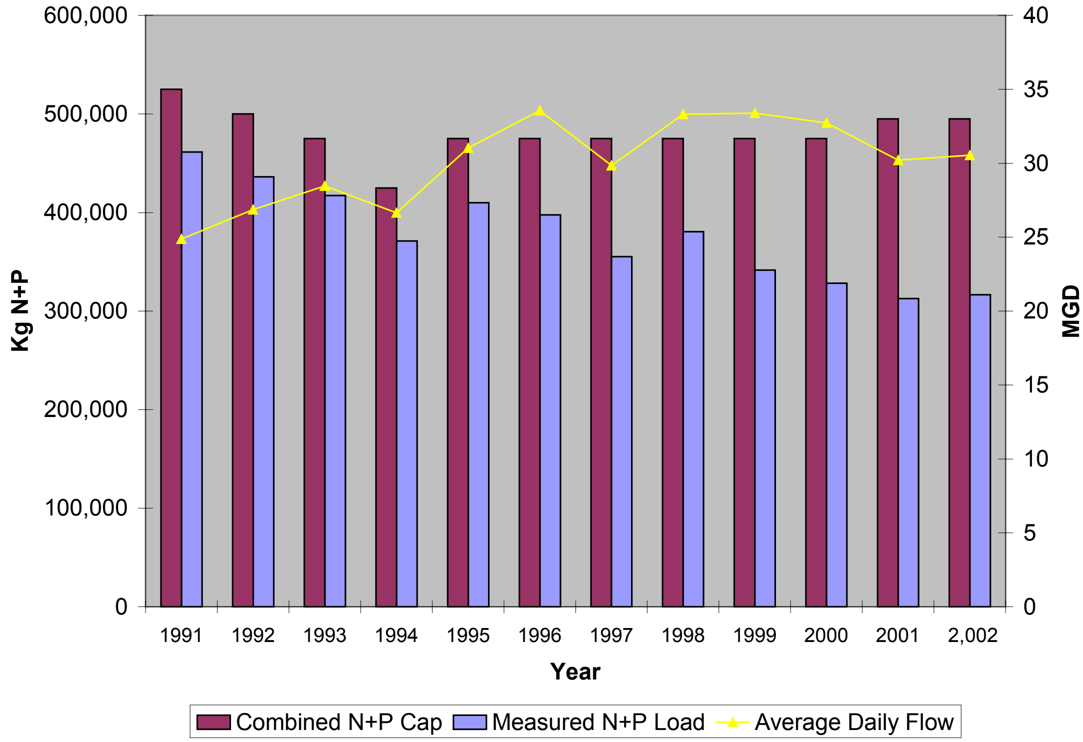


Figure A-15 Tar-Pamlico Basin Association Combined Nutrient Loads and Caps

4.2.5 Local Government Stormwater Requirements

<u>*Current Status*</u>
The objectives of the stormwater rule are to meet the Phase II nitrogen and phosphorus goals on new development lands, to control runoff volumes from new development to protect receiving streams from degradation, and to minimize nutrient loading from existing developed areas. The rule requires six municipalities and five counties in the Tar-Pamlico River basin, capturing the bulk of new development in the basin, to develop and implement stormwater programs. The municipalities are: Greenville, Henderson, Oxford, Rocky Mount, Tarboro and Washington. The counties are: Beaufort, Edgecombe, Franklin, Nash and Pitt. These local governments were identified based on their potential nutrient contributions to the Pamlico estuary. The EMC may add other local governments in the future through rule making based on criteria specified in the rule.

Local programs are to include the following:

- A permitting program requiring new development to reduce nitrogen runoff by 30 percent compared to predevelopment levels, and to keep phosphorus inputs down to predevelopment levels. Also, new development must avoid eroding receiving waters; peak discharge rates cannot exceed predevelopment rates for the 1-year, 24-hour storm.
- Ensure that new development complies with the riparian buffer protection rule.
- Identification and removal of illicit discharges in a phased 10-year cycle.

- A program to educate citizens on minimizing runoff pollution and to educate and train developers on rule requirements.
- Efforts toward treating runoff from existing developed areas; at minimum, identify and prioritize retrofit opportunities in developed areas.

DWQ worked with the affected local governments and other stakeholders during 2002 to develop a model local program, which was approved by the EMC in February 2003. Local governments were required to submit their programs for EMC approval by February 2004 and begin implementing them by August 2004.

2004 Recommendations

The rule is expected to achieve the Phase II nitrogen and phosphorus loading goals for lands that are converted from other uses to new development within the subject jurisdictions, aside from vested projects, once local programs are underway in August 2004. It is hoped that some loading reductions will be achieved from existing developed areas within these jurisdictions through education of homeowners and businesses and by removal of illicit discharges. Additional loading reductions from existing developed areas could be obtained by implementing retrofitting projects, which are encouraged by the rule. It is recommended that local governments in the basin identify and pursue funding sources to implement such retrofits. DWQ will assist local governments in developing and implementing their programs. Local governments must submit annual reports to DWQ so that implementation progress can be tracked and evaluated.

4.2.6 Agricultural Nutrient Reduction Strategy

Current Status

The agriculture rule calls on farmers in the basin to implement best management practices (BMPs) that achieve the Phase II nutrient goals as follows: 1) a 30 percent reduction in nitrogen loading from 1991 baseline levels within five to eight years of the rule's effective date; and 2) control of phosphorus levels at or below 1991 levels within four years of the approval of a phosphorus accounting method called for in the rule.

Rule implementation relies on cooperation between a Basin Oversight Committee and, in each of 16 counties, a Local Advisory Committee. The Basin Oversight Committee, or BOC, is to develop a tracking and accounting methodology that Local Advisory Committees, or LACs, will use to gauge progress toward the nitrogen and phosphorus goals from implementation of BMPs. The BOC reviews and approves local nitrogen strategies and summarizes them for EMC approval. The BOC determines steps needed to satisfy the phosphorus goal and calls on LACs to implement them. The BOC also establishes minimum requirements for annual progress reporting by LACs. The BOC is a ten-member board with representation from DWQ, DSWC, NC Department of Agriculture, NRCS, NC Cooperative Extension Service, and environmental, farming and scientific communities.

Each LAC was to conduct a registration process for the farmers in its county within one year of the rule's effective date and develop a strategy within two years of the rule's effective date for achieving the nutrient goals. Each LAC is made up of representatives of local agricultural agencies and five to ten area farmers. Each local strategy was to establish baseline nitrogen loading conditions in 1991, reductions achieved to date through implementation of best management practices (BMPs), and project the additional acreage that farmers in the county will need to treat with various BMPs to achieve the nutrient goals. LACs are also responsible for reporting their progress annually to the BOC.

Farmers who are involved in the commercial production of crops or horticultural products, or whose livestock or poultry holdings exceed rule-specified numbers are subject to the rule and were required to register with their LAC during the first year the rule was in effect, by September 1, 2002. Registration was intended to help farmers get details on rule options and on technical and cost share assistance, as well as providing LACs a listing of the farmers they have to work with.

Not all farmers are required to implement specific practices in the first five years, but each LAC as a whole is to achieve its nitrogen goal within that five years through farmer BMP implementation. Farmers have the option of implementing standard BMPs or getting approval from their LAC for site-specific BMPs. Farmers who implement standard or sufficient site-specific BMPs approved by their LAC within five years will not be subject to any additional requirements under the rule. If a LAC does not meet its nitrogen goal within five years, then the EMC may call for additional BMP implementation to meet the goal within eight years, relying on farmers who do not implement standard or other LAC-approved BMPs within the first five years.

As mentioned above, the agriculture rule underwent a legislative negotiation process following its adoption to resolve concerns raised by the pasture community. The process yielded certain changes to the rule, as established in a bill, Session Law 2001-355. The changes call for the following:

- Raise threshold numbers of rule applicability for all livestock species except cattle.
- Expand the definition of agriculture to include a one-time allowance for tree harvesting within riparian buffers under specific circumstances.
- Require the SWCC to approve BMPs for pasture operations, to establish a point system that defines options for pasture operations, and to include pasture and other interests in the process.
- Ensure full farmer representation on Local Advisory Committees by raising the minimum number of farmers from two to five, by having commodity groups in each county nominate farmers, and by having the Commissioner of Agriculture appoint the farmer members.

While no new resources were allocated to facilitate rule implementation, LACs conducted farmer registration to the best of their ability. It is believed that most farmers were eventually registered. The EMC approved the use of the agricultural accounting tool developed for the Neuse agriculture rule, the Nitrogen Loss Estimation Worksheet, or NLEW, for overall accounting in October 2002. In February 2003, the EMC approved a spreadsheet accounting process for the point system to be used by pasture operations. The Soil and Water Conservation Commission began approving pasture BMPs and standard BMPs in July 2002.

During September 2003, the BOC reviewed and approved 14 local strategies for achieving the rule's basinwide nitrogen goal of a 30 percent reduction in loading from baseline 1991 levels.

The EMC approved these strategies on October 9, 2003. From 1992 through 2001, ten of 14 counties estimated that they exceeded their individual 30 percent reduction goals, with nitrogen loss reduction estimates ranging from 39 percent to 56 percent. Altogether, basin counties achieved an estimated aggregate 34 percent reduction in nitrogen loss. Approximately 16 percent, or almost half, of the reduction resulted from fertilization rate decreases across most crops. BMP implementation accounted for an estimated 6 percent, or about one-fifth, of the reduction. The remainder of the reduction came from a decrease in cropland acreage (5%) and a cropping shift from corn and other crops into cotton, which lowered fertilization rates greatly on the affected acres. The crop shift, which accounted for almost one-quarter of the aggregate 34 percent reduction, is susceptible to economic pressures over time. Four counties remain significantly below 30 percent, ranging from 12 percent to 24 percent. These counties' Local Advisory Committees (LACs) have proposed BMP implementation strategies for achieving 30 percent reductions.

In reviewing reduction estimates made by the LACs, the BOC noted that the basinwide 34 percent reduction, representing the period of 1992 through 2001, was achieved almost entirely prior to the effective date of the agriculture rule, September 2001. While the role of the rule-making effort in facilitating progress would be difficult to quantify, the administrative and accounting structure established by the rule has provided perhaps the most thorough quantification of progress achievable. Other benefits include better understanding of the magnitudes of different factors contributing to reductions and consequently how to shift management focus, a better ability to geographically target areas where implementation should be augmented, increased efforts to address long-term maintenance of progress, and ongoing tracking of progress by county and basinwide.

One indicator of efforts made by the agricultural community to improve water quality is the expenditures by government cost share and incentive programs on nutrient reducing farm practices. One such program is the NC Agriculture Cost Share Program, administered by DSWC. Between 1992 and 2003, the ACSP spent an estimated $12.5 million on nutrient reducing BMPs on cropland, pastureland and animal operations, affecting approximately 224,000 acres. Another DSWC-administered program, the federal Conservation Reserve Enhancement Program, has obligated approximately $33.1 million in the Tar-Pamlico River basin since its inception in 1998 to establish about 11,350 acres of riparian buffers in 30-year and permanent conservation easements. The Clean Water Act's Section 319 grant program funds improvements in agricultural and other nonpoint source activities. Between 1995-2003, approximately $2,670,000 in Section 319 expenditures were directed toward NPS projects in the Tar-Pamlico River basin. This funding supported a variety of activities, including BMP demonstration and implementation, technical assistance and education, GIS mapping, development and dissemination of accounting tools, and monitoring. Of the total, approximately $935,000 was directed toward agricultural BMPs.

Unlike the adjacent Neuse River basin nutrient strategy, no new resources were allocated to facilitate implementation of the Tar-Pamlico rules. The BOC recognized the difficulties created for agriculture rule implementation by the lack of new resources at both local and basin levels. The Section 319 grant funding described above was sought to help fill gaps, but resource limitations continue to present challenges in efforts to fully meet rule mandates.

2004 Recommendations
LACs have until September 2006 to achieve 30 percent nitrogen reductions before the EMC would be requested to determine the need for additional actions by the agriculture community. The BOC is pleased with the progress demonstrated by the agricultural community and believes that the current rule framework will continue to serve its intended purpose. The BOC has recognized the primary importance of continuing to improve monitoring, accounting and reporting, as well as targeting of increased implementation efforts. Specific priorities for implementation of the agriculture rule following October 2003 EMC approval of the local strategies are as follows:

- The four LACs with less than 30 percent nitrogen reductions to date will implement their strategies to achieve the goal by September 2006.
- The BOC will work with conditionally approved LACs to refine estimates of implementation to date and increase BMP implementation that will reduce the role of crop shifts in maintaining their reductions.
- All LACs will work to increase BMP implementation to ensure lasting reductions, improve nutrient management practices, ensure BMP maintenance, and track BMP contract expirations and changes in cropping.
- LACs will report their progress annually through the BOC to the EMC.
- They will be assisted by newly established Technician positions, which are being combined with Neuse River Basin Technician positions for a total of 9½ positions covering all or portions of 24 counties.
- Development and implementation will continue on pasture BMPs and the pasture accounting system.
- The BOC will coordinate a technical committee to develop recommendations on the need for additional actions to meet the phosphorus goal.

4.2.7 Nutrient Management

Current Status
The nutrient management rule requires people who apply fertilizer in the basin, except residential landowners who apply fertilizer to their own property, to either take state-sponsored nutrient management training or have a nutrient management plan in place for the lands to which they apply fertilizer. Applicators are required to comply with one of these two options within five years of the rule's effective date, or April 1, 2006. For residential fertilizer users, the Division of Water Quality will develop and implement an education program within three years of the rule's effective date. The rule applies to fertilizer applicators, people who own or manage fertilized lands, and consultants who provide nutrient management advice.

Cooperative Extension Service staff of North Carolina State University provided "train the trainer" sessions for local extension staff in fall 2003. Local extension then began offering training sessions for applicators to various crops periodically at dates of their choosing, with advance publicity. Those who choose to have a plan for the lands to which they apply will need to ensure that the plan is approved by a technical specialist designated by the Soil and Water Conservation Commission.

2004 Recommendations
DWQ will continue to work with extension to offer periodic training from county extension offices. DWQ has developed educational materials and will conduct outreach efforts to homeowners on nutrient management in the coming years. DWQ will also work with local governments toward this end. For those who choose training, registration forms are available at county Cooperative Extension Service offices, or people can register at the sessions.

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.

2004 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 Division of Marine Fisheries to insure compliance.

4.4 Implementation of EEP Watershed Restoration and Local Watershed Plans

Current Status
For the Tar-Pamlico River basin, the North Carolina Ecosystem Enhancement Program (page 168) has integrated information normally found separately in EEP Watershed Restoration Plans into this basinwide water quality plan. A separate version of the watershed restoration plan for the Tar-Pamlico River basin will be available online at the EEP website by the spring of 2004. These plans identify Targeted Local Watersheds within which EEP will focus restoration efforts.

2004 Recommendations
DWQ will continue to integrate EEP restoration planning efforts into the basinwide process. An overview of the program is presented on page 168. Table C-3 on page 171 lists all the Targeted Local Watersheds selected by the EEP, arranged by DWQ subbasins. This section also includes a description of the EEP Local Watershed Planning initiative. The EEP 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 EEP hopes to expand their Local Watershed Planning efforts into more areas of the state, as additional compensatory mitigation resources become available.

4.5 Biological Criteria for Assessment of Aquatic Life

4.5.1 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.

4.5.2 Assessing Benthic Macroinvertebrates in Swamp Streams

Current Status
Extensive evaluation, conducted by DWQ, of swamp streams across eastern North Carolina suggested 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. 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.

2004 Recommendations
DWQ has developed biological criteria to assign bioclassifications to these streams (as is currently done for other streams and rivers across the state). Refer to Appendix II for more information on swamp criteria and assigning bioclassifications. The Tar-Pamlico River basin is the first basin where the swamp criteria were used to assign bioclassifications to the benthic communities. Use support ratings for swamp streams presented in this plan were determined based on the swamp bioclassifications. DWQ will continue to refine the criteria used to assign bioclassifications in swamp streams.

4.5.3 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.

2004 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. Refer to Appendix II for more information on assigning bioclassifications.

4.5.4 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 12 parameters or metrics. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score.

2004 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. Refer to Appendix II for more information on assigning bioclassifications.

4.6 DWQ Stormwater Programs

4.6.1 Introduction

There are many different stormwater programs administered by DWQ. One or more of these programs affects many communities in the Tar-Pamlico 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. These 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, Tar-Pamlico River basin NSW stormwater requirements, 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-23.

4.6.2 NPDES Phase I

Current Status
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.

There are no NPDES Phase I stormwater permits issued to communities in the basin. There are currently 11 individual stormwater permits issued to facilities in the Tar-Pamlico River basin and 164 facilities that have general permit coverage. These facilities are mapped in each subbasin chapter in Section B and listed in Appendix I.

2004 Recommendations
DWQ recommends continued implementation of the current stormwater programs as well as implementation of the Phase II requirements. Development and implementation of local stormwater programs that go beyond the minimum requirements will be needed to restore aquatic life to Impaired urban streams.

4.6.3 NPDES Phase II

Current Status
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.

Three municipalities and three counties (see Table A-23) in the basin are automatically required (based on 1990 US Census Designated Urban Areas) to obtain a NPDES stormwater permit under the Phase II rules. Greenville, Rocky Mount and Winterville have turned in applications to be covered by the Phase II program. The three counties have certified that they do not have a storm sewer system.

Results of the 2000 US Census expanded coverage of automatically designated areas, adding two municipalities and one county. Applications for these communities were due in May 2004. Nashville has submitted an application to be covered by the program; Dortches and Franklin County have yet to submit applications. DWQ is currently developing criteria that will be used to determine whether other municipalities should be required to obtain a NPDES permits 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.

2004 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. 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.

4.6.4 Tar-Pamlico River Basin NSW Stormwater Requirements

Because of the water quality problems in the Tar-Pamlico estuary related to nutrient overloading, six municipalities and five counties in the Tar-Pamlico River basin (Table A-23) 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. For more information on this program, refer to the Tar-Pamlico River basin NSW strategy (page 61).

4.6.5 State Stormwater Program

Current Status

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 20 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 (BMPs) to collect and treat stormwater runoff from the project. High density BMPs 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.

Table A-23 shows the one municipality and three coastal counties in the Tar-Pamlico 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.

2004 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.

Table A-23 Communities in the Tar-Pamlico River with Stormwater Requirements

Local Government	NPDES Phase I	NPDES Phase II*	Tar-Pamlico NSW Stormwater Rules	Coastal Stormwater Rules	State Stormwater Program	Water Supply Watershed Stormwater Requirements
Municipalities						
Greenville		**X**	**X**			**X**
Henderson			**X**			
Rocky Mount		**X**	**X**			**X**
Tarboro			**X**			**X**
Winterville		**X**				**X**
Oxford			**X**			
Dortches		**2000**				
Washington			**X**	**X**		
Louisburg					**X**	**X**
Franklinton						**X**
Leggett						**X**
Nashville		**2000**				**X**
Speed						**X**
Falkland						**X**
Pantego				**X**		
Belhaven				**X**		
Chocowinity				**X**		
Bath				**X**		
Aurora				**X**		
Washington Park				**X**		
Counties						
Edgecombe		**X**	**X**			**X**
Nash		**X**	**X**			**X**
Pitt		**X**	**X**			**X**
Franklin		**2000**	**X**			**X**
Hyde				**X**	**X**	
Beaufort			**X**	**X**	**X**	
Vance						**X**
Granville						**X**
Halifax						**X**
Washington				**X**		
Terrell				**X**		
Pamlico				**X**	**X**	
Martin						**X**
Wilson						**X**
Person						**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.

4.6.6 Water Supply Watershed Stormwater Rules

Current Status
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.

All communities in the Tar-Pamlico River basin in water supply watersheds have EMC approved water supply watershed protection ordinances.

2004 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.

4.7 Agriculture and Water Quality in the Tar-Pamlico River Basin

Current Status
Agriculture in the form of row crops and livestock make up a significant economic resource in the Tar-Pamlico River basin. Approximately 767,434 (22%) acres were in cultivated cropland and 101,137 acres were in pasture/managed herbaceous land covers (CGIA, 1996; page 18). The NRI (page 19) reported a 153,000-acre (16%) decrease in cultivated cropland from 1982 to 1997. There are also 120 registered animal operations (mostly swine) in the basin (page 23). Between 1994 and 1998, there was an increase in swine and poultry production and a decrease in dairy production (page 23).

Impacts to streams from row crop agriculture can include excessive nutrient loading, pesticide and herbicide contamination, bacterial contamination and sedimentation. In the coastal plain, many agricultural areas are ditched, increasing the delivery of contaminants to larger water bodies. Animal waste lagoons can also cause water quality problems if breeched, and over application of waste onto spray fields can contaminate surface waters as well.

There are currently over 106 stream miles that are Impaired in areas where agriculture is the predominant land use. DWQ biologists have noted sedimentation, nutrient loading, channelization and pesticides as potential stressors to the biological communities in these streams. Agriculture is also a contributor of nutrients that can stimulate algal blooms that can cause chlorophyll *a* levels to exceed the water quality standard in downstream estuarine waters in the basin. Over 6,000 estuarine acres are Impaired because of exceedances of the chlorophyll *a* criterion. Bacterial runoff from agricultural land may also contribute to closures of shellfish harvesting waters as well. Water quality problems that are specific to a stream are discussed in the subbasin chapters in Section B.

There are several water quality programs implemented by state and federal agencies that affect agriculture in the Tar-Pamlico River basin. The NSW strategy sets forth rules for agriculture to reduce nutrients by implementation of BMPs (page 61) and also to develop nutrient management plans (page 61). There are also rules that address animal operations of a certain size and recent legislation that extended a moratorium on new swine operations (page 23).

The Clean Water Act Section 319 has provided funding for technical assistance to the DSWC (page 166) and the NCCES to help in implementation of the NSW requirements. The Agricultural Cost Share Program (page 166) spent almost six million dollars in the basin between 1997 and 2002 affecting over 116,000 acres of agricultural land. Funds have been requested through the Agricultural Sediment Initiative to address localized agricultural impacts (page 166). Farmers and ranchers in the Tar-Pamlico River basin are also eligible to enroll in the EQIP program (page 165) to help address soil, water and natural resource concerns.

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.

2004 Recommendations
DWQ will identify streams where agricultural land use may be impacting water quality and aquatic habitat. This information will be related to local 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 and increased. Refer to Appendix VI for agricultural nonpoint source agency contact information.

4.8 Confined Animal Operations

Current Status
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.

Some portion of nitrogen in swine waste is emitted to the air as ammonia from hog houses, lagoons and spray fields. 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.

2004 Recommendations
DWQ recommends that the agricultural community associated with confined animal operations work to research and implement best management practices to address the atmospheric

deposition. See also page 61 for more information on the Tar-Pamlico River basin NSW strategy.

4.9 Shellfish Harvesting in Class SA Waters

Current Status

In the 1998 Tar-Pamlico River basin use support assessment, approved shellfish harvesting waters were fully supporting (FS) and prohibited waters were partially supporting (PS). In the 1998 assessment, there were 552,489 acres rated FS and 4,825 acres rated PS. Class SA acres were reported by the nine Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section (page 51) growing areas (e.g., G1: Goose Creek, 300 acres).

DWQ and DEH 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 were not available for use support assessment in Class SA waters during this planning cycle. 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.

2004 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 or the presence of stormwater outfalls.

4.10 Water Quality Problems Resulting from Hurricanes

Current Status

The Natural Resources Conservation Services (NRCS) Emergency Watershed Protection (EWP) Program 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 program's intent is to consider environmental concerns.

The activity of debris removal is of 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, is 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.

2004 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.

4.11 Water Quality Issues Related to Drought

Water quality problems associated with rainfall events usually involve degradation of aquatic habitats because the high flows may carry increased loadings of substances like metals, oils, herbicides, pesticides, sand, clay, organic material, bacteria and nutrients. These substances can be toxic to aquatic life (fish and insects) or may result in oxygen depletion or sedimentation. During drought conditions, these pollutants become more concentrated in streams due to reduced flow. Summer months are generally the most critical months for water quality. Dissolved oxygen is naturally lower due to higher temperatures; algae grow more due to longer periods of sunlight, and streamflows are reduced. In a long-term drought, these problems can be greatly exacerbated and the potential for water quality problems to become catastrophic is increased. This section discusses water quality problems that can be expected during low flow conditions.

The frequency of acute impacts due to nonpoint source pollution (runoff) is actually minimized during drought conditions. However, when rain events do occur, pollutants that have been collecting on the land surface are quickly delivered to streams. When streamflows are well below normal, this polluted runoff becomes a larger percentage of the water flowing in the stream. Point sources may also have water quality impacts during drought conditions even though permit limits are being met. Facilities that discharge wastewater have permit limits that are based on the historic low flow conditions. During droughts these wastewater discharges make up a larger percentage of the water flowing in streams than normal and might contribute to lowered dissolved oxygen concentrations and increased levels of other pollutants.

As streamflows decrease, there is less habitat available for aquatic insects and fish, particularly around lake shorelines. There is also less water available for irrigation and for water supplies. The dry conditions and increased removal of water for these uses further increase strain on the resource. With less habitat, naturally lower dissolved oxygen levels and higher water temperatures, the potential for large kills of fish and aquatic insects is very high. These conditions may stress the fish to the point where they become more susceptible to disease and where stresses that normally would not harm them result in mortality.

These are also areas where longer retention times due to decreased flows allow algae to take full advantage of the nutrients present resulting in algal blooms. During the daylight hours, algae greatly increase the amount of dissolved oxygen in the water, but at night algal respiration and die off can cause dissolved oxygen levels to drop low enough to cause fish kills. Besides increasing the frequency of fish kills, algae blooms can also cause difficulty in water treatment resulting in taste and odor problems in finished drinking water.

4.12 Sedimentation Pollution Control

Current Status

One of the most commonly noted types of habitat degradation in the Tar-Pamlico River basin was 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.

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 Tar-Pamlico 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 Tar-Pamlico River basin must also adhere to the riparian buffer protection rules (page 61). 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 Tar-Pamlico 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 Tar-Pamlico River NSW strategy (page 61), agriculture operations are required to address nutrients using BMPs. Many of these BMPs will also reduce sediment delivery into adjacent waters.

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 preconstruction 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.

2004 Recommendations

DWQ will continue to work cooperatively with DLR and other agencies that administer 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 Tar-Pamlico 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.

4.13 Developing a Monitoring Coalition in the Tar-Pamlico River Basin

DWQ has combined NPDES instream monitoring requirements with watershed based monitoring to evaluate the instream impact of member dischargers and produce quality ambient data. The discharge monitoring coalition program was developed to better utilize the resources spent by NPDES permit holders and provide an effective way of assessing water quality. Each coalition's data is collected and analyzed by a state certified laboratory and all data are readily available in an electronic format. The monitoring program is designed to fit the specific river basin and discharger group. The monitoring locations are coordinated with the state's existing ambient and biological monitoring network. In exchange for participation in a discharge monitoring coalition, members are exempted from instream monitoring requirements in NPDES permits. Effluent monitoring requirements are not altered in any way by this program. DWQ is working with the Tar-Pamlico Basin Association (page 178) to develop a monitoring coalition that will start collecting ambient water quality data in 2005.

4.14 Algal Blooms

Algae are aquatic, microscopic plants, which respond to nutrients, temperature and light, and are an important food source for fish and other aquatic animals. Algae also contain pigments, including chlorophyll, which enable them to photosynthesize and produce oxygen. During summer, algae respond to warm temperatures, high light and nutrients washed into waterways after rain events. When temperatures and nutrient concentrations are elevated, algae reproduce to high concentrations ("bloom"). When this occurs at a particular site, chlorophyll *a*, dissolved oxygen (DO) and pH increase. When a site experiences dissolved oxygen concentrations >9.0 mg/l, DO percent saturation >110%, pH >8.0, or chlorophyll *a* concentrations exceed the state standard of 40 µg/l, the site is likely experiencing an algal bloom. 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. Algal blooms have been a problem in lakes, reservoirs and estuaries that are overloaded with nutrients. In 2001, over 500,000 fish died in 23 reported kill events. In the early 1990s, some estuarine fish kills within the Pamlico River were attributed to the toxic dinoflagellate, *Pfiesteria*, but no *Pfiesteria* related fish kills have been reported in the Tar-Pamlico River basin since 1997. Not all fish kill events are associated with algal blooms.

2004 Recommendations

Continued implementation of the Tar-Pamlico River basin NSW strategy (page 61) will help to reduce the potential for fish kills in the Tar-Pamlico River estuary.

4.15 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 Tar-Pamlico River basin, a large floodplain drainage system and flow management from upstream impoundments also influence DO. The DO 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 DO 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.

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.

4.16 Habitat Degradation

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 Tar 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 increase processing efficiency.

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

2004 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 Tar-Pamlico 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.

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).

4.17 Fecal Coliform

Fecal coliform bacteria live in the digestive tract of warm-blooded animals (humans as well as other mammals) and are excreted in their waste. Fecal coliform bacteria do not actually pose a danger to people or animals. However, where fecal coliform are present, disease-causing bacteria may also be present, and water that is polluted by human or animal waste can harbor other pathogens that may threaten human health.

The presence of disease-causing bacteria tends to affect humans more than aquatic creatures. High levels of fecal coliform bacteria can indicate high levels of sewage or animal wastes, which could make water unsafe for human contact (swimming) or the harvesting and consumption of shellfish. Fecal coliform bacteria and other potential pathogens associated with waste from warm-blooded animals are not harmful to fish and aquatic insects. However, high levels of fecal coliform bacteria may indicate contamination that increases the risk of contact with harmful pathogens in surface waters. In the Tar-Pamlico River basin, data from DWQ's ambient monitoring stations in subbasin 03-03-01 showed somewhat high levels of fecal coliform bacteria. Many areas in the coastal region of the basin (subbasins 03-03-07 and 03-03-08) are Impaired because of shellfish harvesting area closures. 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.

Pathogens associated with fecal coliform bacteria can cause diarrhea, dysentery, cholera and typhoid fever in humans. Some pathogens can also cause infection in open wounds.

Under favorable conditions, fecal coliform bacteria can survive in bottom sediments for an extended period (Howell et al., 1996; Sherer et al., 1992; Schillinger and Gannon, 1985). Therefore, concentrations of bacteria measured in the water column can reflect both recent inputs as well as the resuspension of older inputs.

Reducing fecal coliform bacteria in wastewater requires a disinfection process, which typically involves the use of chlorine and other disinfectants. Although these materials may kill the fecal coliform bacteria and other pathogenic disease-causing bacteria, they also kill bacteria essential to the proper balance of the aquatic environment, and thereby, endanger the survival of species dependent on those bacteria.

Water quality standards for fecal coliform bacteria are intended to ensure safe use of waters for recreation and shellfish harvesting (refer to Administrative Code Section 15A NCAC 2B .0200). The North Carolina fecal coliform standard for freshwater is 200 colonies/100ml based on the geometric mean of at least five consecutive samples taken during a 30-day period and not to exceed 400 colonies/100ml in more than 20 percent of the samples during the same period. The 200 colonies/100ml standard is intended to ensure that waters are safe for water contact through recreation.

The standard for Class SA waters (waters used for shellfishing) is a median or geometric mean fecal coliform Most Probable Number (MPN) not greater than 14 MPN/100ml. In addition, not more than 10 percent of the samples can be in excess of 43 MPN/100ml. Many areas closed to shellfish harvesting have median levels below 14 MPN/100ml, but fail to meet the second criteria due to periodic contamination that occurs after moderate to heavy rainfall events.

The North Carolina Division of Environmental Health (DEH) has subdivided all of the state's coastal waters into shellfish growing areas in which a sanitary survey is conducted every three years. Beginning in the summer of 1997, DEH began assessing fecal coliform levels in coastal recreation waters. These assessments provide a gauge of water quality along the North Carolina coast over the short and long-term.

If a certain area along the coast is found to have potential water quality problems related to stormwater pipes or high levels of indicator bacteria, health officials will post signs recommending that people not swim there or harvest shellfish from the area. The location will be listed on the DEH website at (http://www.deh.enr.state.nc.us/shellfish/), and local media and county health departments will be notified.

Sources of Fecal Coliform in Surface Waters

- Urban stormwater
- Wild animals and domestic pets
- Improperly designed or managed animal waste facilities
- Livestock with direct access to streams
- Improperly treated discharges of domestic wastewater, including leaking or failing septic systems and straight pipes

The state does not encourage swimming in surface waters since a number of factors, which are beyond the control of any state regulatory agency, contribute to elevated levels of disease-causing bacteria. To assure that waters are safe for swimming indicates a need to test waters for pathogenic bacteria. Although fecal coliform standards have been used to indicate the microbiological quality of surface waters for swimming and shellfish harvesting for more than 50 years, the value of this indicator is often questioned. Evidence collected during the past several decades suggests that the coliform group may not adequately indicate the presence of pathogenic viruses or parasites in water.

The detection and identification of specific pathogenic bacteria, viruses and parasites such as *Giardia*, *Cryptosporidium* and *Shigella* are expensive, and results are generally difficult to reproduce quantitatively. Also, to ensure the water is safe for swimming would require a whole suite of tests for many organisms, as the presence/absence of one organism would not document the presence/absence of another. This type of testing program is not possible due to resource constraints.

4.18 Fish Consumption Advice

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.

The NC Department of Health and Human Services issues fish consumption advisories and advice for those fish species which have median and/or average methyl mercury 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) in North Carolina waters south and east of Interstate 85. See *Fish Consumption Advice* below. Refer to Appendix III for more information regarding use support ratings and assessment methodology.

DWQ has sampled fish tissue from three locations on the Tar River mainstem. Refer to subbasin Chapters 3 and 5 for more information on these waters.

Fish Consumption Advice

Fish is an excellent source of protein and other nutrients. However, several varieties of 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. A "meal" is defined as six ounces of cooked fish for adults and children 15 years or older and two ounces of cooked fish for younger children.

FDA and EPA Advisory
On March 19th, 2003, the Food and Drug Administration and EPA issued a joint consumer advisory about mercury in fish and shellfish. The advice is for women who might become pregnant, women who are pregnant, nursing mothers, and young children. Aside from being issued jointly by two federal agencies, this advisory is important because it emphasizes the positive benefits of eating fish and gives examples of commonly eaten fish that are low in mercury. In the past, FDA issued an advisory on consumption of commercially caught fish, while EPA issued advice on recreationally caught fish.

By following these three recommendations for selecting and eating fish or shellfish, women and young children will receive the benefits of eating fish and shellfish and be confident that they have reduced their exposure to the harmful effects of mercury:

- ◊ **Do not eat** shark, swordfish, king mackerel or tilefish because they contain high levels of mercury.
- ◊ Eat up to 12 ounces (2 average meals) a week of a variety of fish and shellfish that are lower in mercury.
- ◊ Five of the most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollock and catfish.
- ◊ Another commonly eaten fish, albacore ("white") tuna has more mercury than canned light tuna. So, when choosing your two meals of fish and shellfish, you may eat up to 6 ounces (one average meal) of albacore tuna per week.
- ◊ Check local advisories about the safety of fish caught by family and friends in your local lakes, rivers and coastal areas. If no advice is available, eat up to 6 ounces (one average meal) per week of fish you catch from local waters, but do not consume any other fish during that week.

For more detailed information, visit EPA's internet site at http://www.epa.gov/waterscience/fish/ or visit http://www.cfsan.fda.gov/seafood1.html or call the FDA's food information line toll-free at 1-888-SAFEFOOD.

NCDHHS Advice
The NC Department of Health and Human Services updated the following advice on April 16th, 2002.

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 often 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 often high in mercury.
◊ Eat up to four meals per week of other fish.

* A meal is 6 ounces of cooked fish for adults and 2 ounces of cooked fish for children under 15.

For more information and detailed listing of site-specific advisories, visit the NC Department of Health and Human Services website at http://www.schs.state.nc.us/epi/fish/current.html or call (919) 733-3816.

2004 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.

NC Eastern Regional Mercury Study
In an effort to better manage state waters that may have methyl mercury issues, DWQ initiated a study using grant funding from EPA Region IV. 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: methyl mercury translators to evaluate water quality criteria.
- Develop site-specific water to fish bioaccumulation factors.
- Determine levels of mercury in treatment plant effluent.

DWQ will make these results available to the public when complete. For more information, contact the DWQ Planning Branch Modeling/TMDL Supervisor at (919) 733-5083.

DWQ Mercury Workgroup
DWQ is committed to characterizing methyl mercury exposure levels and determining if NPDES sources need to be controlled. DWQ formed an internal Mercury Workgroup to improve communication from all programs that 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.

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 methyl mercury from associated wetlands along these streams.

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. Pollution prevention efforts are being investigated on a state and federal level to reduce mercury emissions.

NPDES Mercury Requirement, Implementation of EPA Method 1631
NPDES permittees have worked with the state to reduce potential risks from this pollutant, including tasks associated with collecting and reporting more accurate data. The most commonly used laboratory analysis for total mercury (EPA Method 245.1) has a method detection level of 0.2 μg/l, while the current water quality standard is an order of magnitude lower at 0.012 μg/l. Thus, true compliance with the water quality standard could not be judged. A more recently approved laboratory method (EPA Method 1631) has a detection level below the water quality standard (0.0005 μg/l), which would allow the Division to assess potential water quality impacts from dischargers more accurately.

A total of 155 facilities statewide will be required to use EPA Method 1631 (or subsequent low level mercury methods approved by EPA in 40 CFR 136) when analyzing for total mercury beginning September 1, 2003. These facilities are subject to this new requirement because of either criteria: 1) the facility has a current total mercury limit in its NPDES permit that is <0.20 μg/l; or 2) the facility has limited instream dilution (i.e., the instream waste concentration (IWC) is >6 percent). This requirement complies with 15 A NCAC 2B.0505(e)(4), which requires that "test procedures must produce detection and reporting levels below the permit discharge requirements".

The State of North Carolina alone cannot eliminate the atmospheric deposition of mercury over surface waters. Actions for reducing atmospheric mercury will also be needed at the national and international levels. The Mercury Report to Congress (EPA, 1997) lists initiatives under the Clean Air Act that may reduce atmospheric mercury emissions from industrial sources. The most significant initiative is emission limits for municipal waste combustors and medical waste incinerators.

4.19 Management Strategies for Federally Threatened and Endangered Species

The Tar River spinymussel (https://ecos.fws.gov/species_profile/SpeciesProfile?spcode=F015) and the Dwarf wedgemussel are federally-listed endangered species in certain waters within the Tar-Pamlico River basin and are subject to a new rule (Administrative Code: 15A NCAC 02B

.0110) requiring the development of site-specific management strategies by DWQ. The intent of these strategies is to provide for maintenance and recovery of the water quality conditions required to sustain these species.

Considerable information on these species, as well as the waters in which they are found, is needed for the development of appropriate management strategies as required by the rule. DWQ currently has neither the resources nor the expertise to gather this information alone. Therefore, the US Fish and Wildlife Service, the NC Wildlife Resources Commission, the NC Natural Heritage Program, and other interested parties are collaborating on a process that will ensure successful development and implementation of appropriate management strategies to protect these species. DWQ held an initial meeting in July 2002 between the agencies to discuss the rule and its applications to the Tar-Pamlico River basin. A work group has been formed and plan development is proceeding.

4.20 North Carolina Source Water Assessment Program

The 1996 Safe Drinking Water Amendments required that all states establish Source Water Assessment Programs (SWAP) and submit a plan to the Environmental Protection Agency (EPA) by February 6, 1999. The EPA provided guidance to the states describing the required content of a Source Water Assessment Program Plan, requirements for public participation, and linkages to other federal programs. The State of North Carolina convened a Technical and Citizens Advisory Committee comprised of a variety of stakeholders that met three times during the fall of 1998 and provided valuable input and review during the development of the North Carolina Source Water Assessment Program Plan. Source water assessments will allow the state to systematically address issues of potential contamination of public water supplies using existing data from established environmental programs.

As described in the SWAP Plan, North Carolina has been proactive in the prevention of contamination of the state's drinking water supplies through the establishment and implementation of the state's Wellhead Protection Program and Water Supply Watershed Protection Program. The SWAP allows North Carolina to build upon these existing programs, to assess the susceptibility of drinking water supplies to contamination, and to provide a sound basis for planning future source water protection strategies. For more information on SWAP and other Public Water Supply programs, visit the website at http://www.deh.enr.state.nc.us/pws/.

Section B

Water Quality Data
and
Information by Subbasin

Section B - Chapter 1
Tar-Pamlico River Subbasin 03-03-01
Tar River, Fishing Creek, Cedar Creek, Coon Creek and Tabbs Creek

1.1 Subbasin Overview

Subbasin 03-03-01 at a Glance

Land and Water Area
Total area: 642 mi^2
Land area: 635 mi^2
Water area: 7 mi^2

Population
2000 Est. Pop.: 65,205 people
Pop. Density: 101 persons/mi^2

Land Cover (percent)

Forest/Wetland:	76
Water:	1
Urban:	2
Cultivated Crop:	12
Pasture/ Managed Herbaceous:	9

Counties
Franklin, Granville, Person and Vance

Municipalities
Bunn, Franklinton, Henderson, Kittrell, Louisburg and Oxford

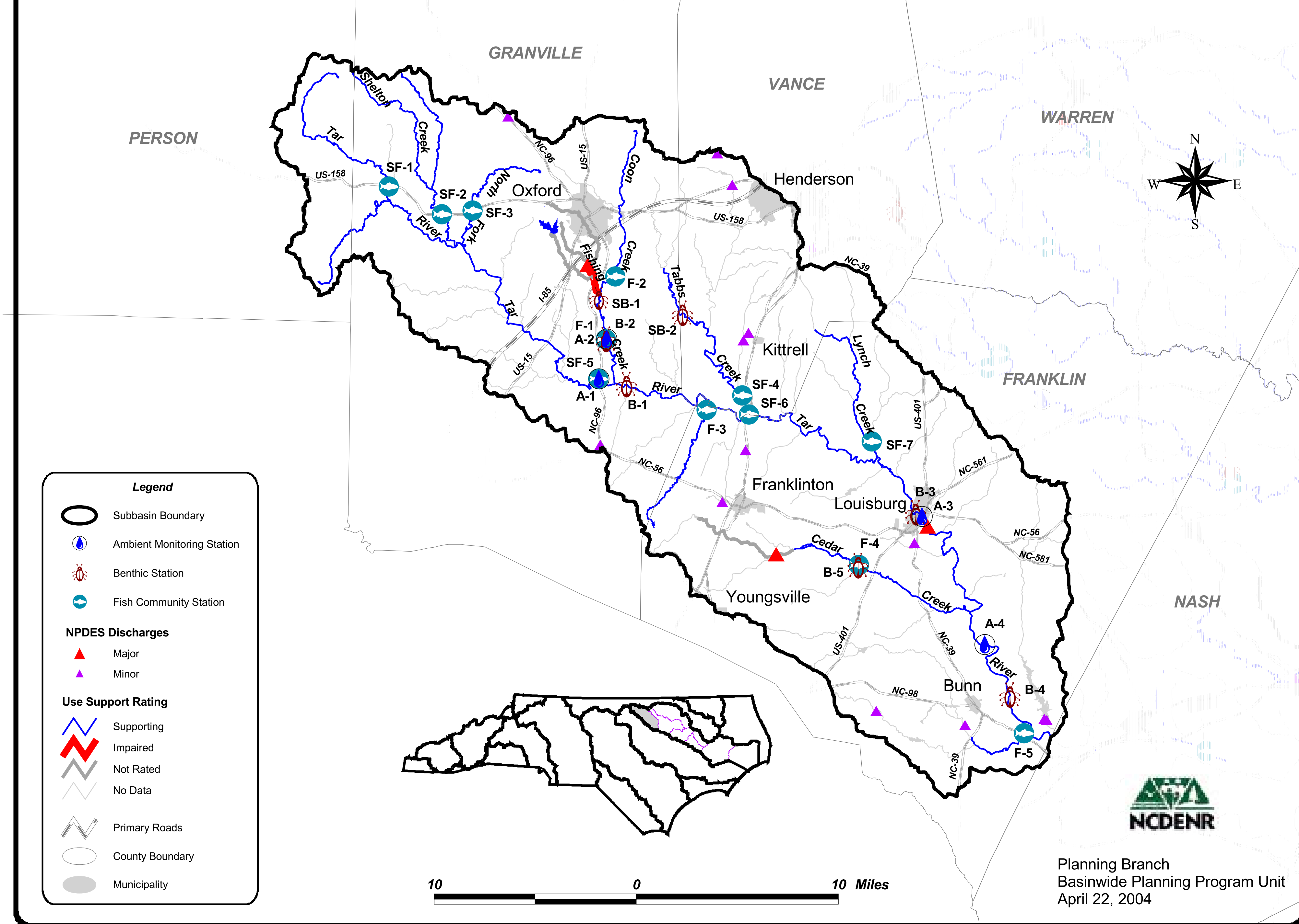
Population growth in this subbasin is occurring between Franklinton and Louisburg on the border with the Neuse River basin and along the I-85 corridor near Oxford and Henderson. Population growth from 1990 to 2000 in the four counties with land area in this subbasin ranges from 10 percent in Vance County to nearly 30 percent in Franklin County. The population in these four counties is expected to increase by 60,000 people (34%) by 2020.

There are 10 individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 6.8 MGD (Figure B-1). The largest are Franklin County WWTP (3 MGD), Louisburg WWTP (1.37 MGD) and City of Oxford WWTP (2.7 MGD). There are also ten general NPDES wastewater discharge permits, five individual NPDES stormwater permits, and 30 general NPDES stormwater permits issued in this subbasin. Refer to Appendix I for more information on NPDES permit holders.

The Town of Henderson and Nash County will be required to develop stormwater programs under Phase II (page 75). Henderson and Oxford, and Franklin and Nash counties will also have to submit model stormwater ordinances as required by the Tar-Pamlico NSW strategy stormwater rules (page 61). 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 is also one registered animal operation in this subbasin.

There were seven benthic macroinvertebrate community samples and 12 fish community samples (Figure B-1 and Table B-1) collected during this assessment period. Four sites improved, 11 sites remained the same, one site had a lower bioclassification, and three sites were sampled for the first time during this assessment period. Data were also collected from four ambient monitoring stations as well. Refer to *2003 Tar-Pamlico 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 Tar-Pamlico River Subbasin 03-03-01



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table B-1 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-01

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results: Biological	Ambient	Other	Use Support Rating: 2004	1998
TAR RIVER	28-(1)	WS-IV NSW	20.1 mi	AL	SF-1 E--99			S	ST
Shelton Creek	28-4	WS-IV NSW	13.9 mi	AL	SF-2 E--99			S	FS
North Fork Tar River	28-5	WS-IV NSW	8.8 mi	AL	SF-3 G--99			S	ST
TAR RIVER	28-(5.3)	WS-IV NSW CA	0.5 mi	AL	SF-5 E--97	A-1 nce		S	FS
TAR RIVER	28-(5.7)	WS-V NSW	20.5 mi	AL	SF-5 E--97 B-1 G--02	A-1 nce		S	FS
Fishing Creek	28-11e	C NSW	6.1 mi	AL	F-1 G--02			S	PS
Fishing Creek	28-11c	C NSW	0.9 mi	AL	SB-1 P--99			I	NS
Fishing Creek	28-11d	C NSW	1.0 mi	AL	SB-1 P--99			I	PS
Hachers Run (Devin Lake)	28-11-3-(1)	WS-II NSW CA	98.9 ac	AL			L-1 nce	S	FS
Coon Creek	28-11-5	C NSW	10.1 mi.	AL	F-2 E--02			S	NR
Middle Creek	28-15	C NSW	8.4 mi.	AL	F-3 G--02			S	FS
TAR RIVER	28-(15.5)	WS-IV NSW	14.8 mi.	AL	SF-6 G--97			S	FS
Tabbs Creek	28-17-(0.5)b	C NSW	12.0 mi.	AL	SF-4 G--99 SB-2 GF--99			S	ST
Lynch Creek	28-21-(0.7)	WS-IV NSW	9.2 mi.	AL	SF-7 G--99			S	FS
TAR RIVER	28-(24.3)	WS-IV NSW CA	0.6 mi.	AL	B-3 GF--02	A-3 nce		S	ST
TAR RIVER	28-(24.7)a	WS-V NSW	20.3 mi.	AL	B-3 GF--02 B-4 G--02	A-4 nce		S	ST
TAR RIVER	28-(24.7)a	WS-V NSW	20.3 mi.	REC		A-3 nce A-4 nce		S	N/A
Cedar Creek	28-29-(2)b	C NSW	12.1 mi.	AL	F-4 E--02 B-5 GF--02			S	ST
Crooked Creek	28-30b	C NSW	5.4 mi.	AL	F-5 GF--02			S	ST
TAR RIVER	28-(5.7)	WS-V NSW	20.5 mi.	REC		A-1 nce		S	N/A
Fishing Creek	28-11e	C NSW	6.1 mi.	REC		A-2 nce		S	N/A

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
L - Lakes Assessment
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-01 are summarized in Part 1.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 1.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 1.4 below. 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. Refer to Appendix III for a complete list of monitored waters and for more information on Supporting monitored waters.

1.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-01 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 469.3 stream miles (35 percent) and 98.9 freshwater acres (100 percent) monitored during this assessment period in the aquatic life category. Approximately 1.9 stream miles (1.1 percent) are Impaired. Refer to Table B-2 for a summary of use support ratings for waters in subbasin 03-03-01.

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

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	162.8 mi 98.9 ac	0	46.9 mi	0
Impaired	1.9 mi	0	0	0
Not Rated	0	0	0	0
Total	**164.8 mi 98.9 ac**	**0**	**46.9 mi**	**0**
Unmonitored Waters				
Supporting	15.2 mi	0	0	182.7 mi 98.9 ac
Impaired	0	469.3 mi 98.9 ac	0	0
Not Rated	18.5 mi	0	0	0
No Data	270.7 mi	0	422.4 mi 98.9 ac	0
Total	**304.5 mi**	**469.3 mi 98.9 ac**	**422.4 mi 98.9 ac**	**182.7 mi 98.9 ac**
Totals				
All Waters*	**469.3 mi 98.9 ac**	**469.3 mi 98.9 ac**	**469.3 mi 98.9 ac**	**182.7 mi 98.9 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

1.3 Status and Recommendations of Previously Impaired Waters

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

1.3.1 Fishing Creek [AU# 28-11a through 28-11e]

1999 Recommendations
It was recommended that no new or expanding wastewater dischargers be connected to the Oxford wastewater treatment plant.

Current Status
Fishing Creek (1.9 miles) is currently Impaired from the Oxford WWTP outfall #1 to Coon Creek [AU# 28-11c] because of a Poor bioclassification at site SB-1 in 1999. SB-1 was also

Poor in 1990. The entire length (11 miles) of Fishing Creek was Impaired in 1999. In 1997, the Oxford WWTP was upgraded and water quality improvements were observed downstream. Site F-1 improved from Good-Fair in 1997 to Good in 1999 and 2002. Site B-1 also improved from Fair in 1999 to Good-Fair in 2002. Above the WWTP, Fishing Creek and Foundry Branch are impacted by urban runoff from the City of Oxford. Oxford WWTP was placed under a moratorium after the Poor bioclassification in 1999. The requirements of a prior Special Order by Consent (SOC) have been met and the associated moratorium has been lifted. Overflows from the collection system have been reduced due to pipe replacement/rehabilitation work. However, Oxford WWTP has continued to have problems with overflows, specifically at the headworks of the WWTP. For approximately 11 months of the assessment period, Oxford WWTP exceeded permit limits for selenium. An industrial user was determined to be the source of selenium. Oxford also modified a pretreatment permit of a significant industrial user to address selenium violations. The industrial user is now using a chemical that does not contain selenium.

2004 Recommendations
DWQ will continue to monitor water quality in the Fishing Creek watershed. DWQ Raleigh Regional Office staff will continue to work with Oxford WWTP to remedy plant problems that may be adversely impacting water quality in Fishing Creek including influent overflows and infiltration and inflow in the Foundry Branch watershed. Oxford WWTP is expanding from 2.17 MGD to 3.5 MGD and will receive permit limits of 5 mg/l BOD_5 and 1 mg/l NH_3-N down from 15 mg/l BOD_5 and 4 mg/l NH_3-N, representing a decrease in loading of these two parameters. The new limits as well as those improvements being implemented by Oxford (see below) should further reduce impacts to Fishing Creek.

Oxford is also required to address nutrients in stormwater as part of the Tar-Pamlico NSW strategy (page 73) and should take the opportunity to address the more acute impacts to Fishing Creek when developing a stormwater program.

Current Water Quality Initiatives
Oxford WWTP received a state-revolving loan of $813,514 in January 2001 to rehabilitate the outfall to Fishing Creek and is awaiting a loan of $10,000,000 to upgrade and expand the plant. The proposed upgrade will include biological nutrient removal as well as upgrades to the Coon Creek lift station.

1.4 Status and Recommendations of Newly Impaired Waters

There are no newly Impaired waters in subbasin 03-03-01. 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 not Impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

1.5.1 Cedar Creek [AU# 28-29-(2)b]

Current Status and 2004 Recommendations
The benthic bioclassification of lower Cedar Creek (12.15 miles) has been Good-Fair at site B-5 since 1990. The fish community bioclassification at site F-4 improved to Excellent in 2002. The upper segment of Cedar Creek [AU# 28-29-(2)a] receives a discharge from the Franklin WWTP which had three WET test failures during the assessment period. This segment (6.18 miles) is currently Not Rated. A pretreatment audit was performed in 2002 by DWQ staff to determine if the one significant industrial user was the source of toxicity. There has not been a WET test fail since 2002. DWQ will continue to work with the Franklin WWTP. Cedar Creek also crosses the rapidly growing area of NC 401 between Raleigh and Louisburg. Water quality should be considered during planning and development activities in this watershed.

1.5.2 Hatchers Run (Devin Lake) [AU# 28-11-3-(1)]

Current Status and 2004 Recommendations
Hatchers Run (Devin Lake) is a 98.9-acre impoundment west of Oxford that was a water supply until 1993. During lake monitoring in 2002, the reservoir was stratified with hypoxic conditions three meters from the surface. Chemical monitoring and observed green water color suggested that algal blooms were occurring although the chlorophyll *a* criterion was not exceeded. Nutrient levels were greater than observed in 1997, and copper was higher than the action level. Water quality in Hatchers Run should be considered during land development activities, and BMPs should be implemented on all land use activities to reduce the potential for algal blooms.

1.5.3 Tar River [AU# 28-(24.7)a]

Current Status and 2004 Recommendations
This 20.3-mile segment of the Tar River is currently Supporting because of Good-Fair and Good bioclassifications at sites B-3 and B-4, respectively. The change in bioclassification at site B-3 (from Good in 1997) is likely related to the drought of 1998 to 2002 and does not indicate any real changes in water quality. Water quality standards were not exceeded at sites A-3 and A-4.

DWQ will continue to monitor this segment of the Tar River. This area is experiencing growth from the Neuse River basin to the south. Louisburg received a $252,000 CWMTF grant to acquire 50 acres to add to the existing greenway system at Joyner Town Park. Louisburg has also been offered a $2,295,500 grant through DWQ Construction Grants and Loans for rehabilitation of the existing WWTP and a wastewater reuse project.

1.5.4 Billys Creek [AU# 28-20]

Current Status and 2004 Recommendations

The current use support rating of Billys Creek is No Data. Billys Creek has never been monitored by DWQ; however, EEP (page 168) has a planned project in this local watershed. This is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

1.5.5 Bear Swamp Creek [AU# 28-23]

Current Status and 2004 Recommendations

The current use support rating of Bear Swamp Creek is No Data. Bear Swamp Creek has never been monitored by DWQ; however, EEP (page 168) has a planned project in this local watershed. This is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

1.5.6 Wolfpen Creek [AU# 28-27]

Current Status and 2004 Recommendations

The current use support rating of Wolfpen Creek is No Data. Wolfpen Creek has never been monitored by DWQ; however, EEP (page 168) has a planned project in this local watershed. This is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

2.1 Subbasin Overview

Subbasin 03-03-02 at a Glance

Land and Water Area

Total area:	663 mi^2
Land area:	654 mi^2
Water area:	9 mi^2

Population Statistics

2000 Est. Pop.: 91,606 people
Pop. Density: 101 persons/mi^2

Land Cover (percent)

Forest/Wetland:	64
Surface Water:	1
Urban:	3
Cultivated Crop:	27
Pasture/ Managed Herbaceous:	4.6

Counties

Edgecombe, Franklin, Nash, Vance, Warren and Wilson

Municipalities

Centerville, Nashville, Henderson, Rocky Mount, Spring Hope, Tarboro and Whitakers

Population growth is occurring around Rocky Mount, which is the largest urbanized area in the subbasin. The fastest growing area is Franklin County near the boundary with subbasin 03-03-01. Much of the subbasin, which includes the Swift Creek watershed, is rural and little development is occurring.

There are 12 individual NPDES wastewater discharge permits in this subbasin with a permitted flow of 23 MGD (Figure B-2). The largest is the Tar River Regional WWTP (21 MGD). There are also 15 general NPDES wastewater permits, two individual NPDES stormwater permits, and 58 general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders.

Henderson, Nashville, Rocky Mount, Tarboro, as well as Edgecombe, Franklin and Nash counties, will be required to develop stormwater programs under Phase II (page 75). Henderson, Nashville, Rocky Mount, Tarboro, and Edgecombe, Nash and Franklin counties will also have to submit model stormwater ordinances as required by the Tar-Pamlico NSW strategy (page 61) stormwater rules. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also 32 registered animal operations in this subbasin.

There were eight benthic macroinvertebrate community samples and seven fish community samples (Figure B-2 and Table B-3) collected in 2002 as part of basinwide monitoring. Two sites improved; one site remained the same, and three sites had lower bioclassifications. Seven sites were monitored for the first time, and there were two special study samples collected in the subbasin during the assessment period. Data were collected from nine ambient monitoring stations and one lake was monitored as well.

Refer to *2003 Tar-Pamlico 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-2 Tar-Pamlico River Subbasin 03-03-02

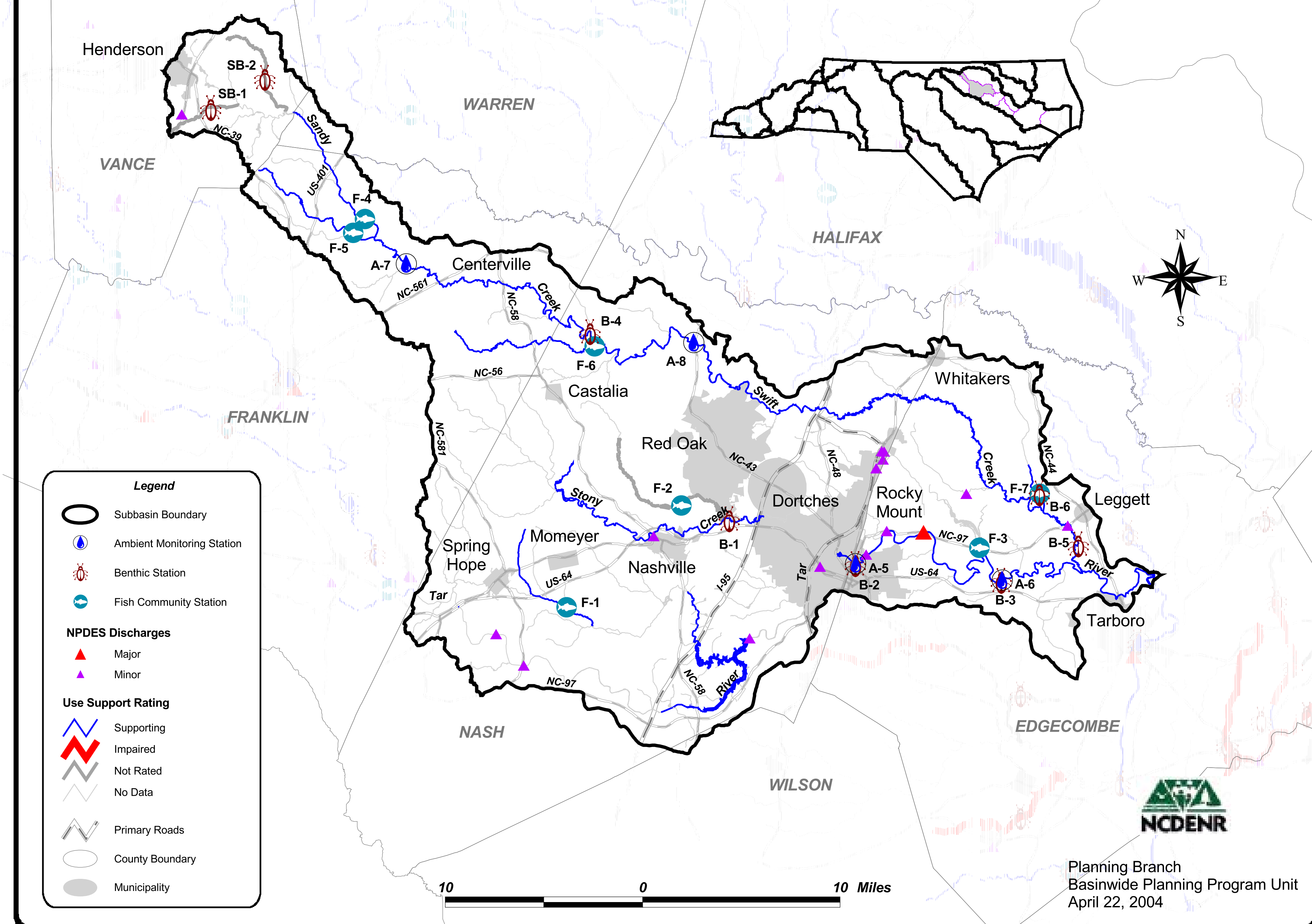


Table B-3 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-02

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results: Biological	Ambient	Other	Use Support Rating: 2004	1998
Sapony Creek	28-55-(1)	C NSW	7.7 mi	AL	F-1 NR--02			S	NR
TAR RIVER (Reservoir)	28-(63)	WS-IV NSW CA	98.8 ac.	AL			L-1 nce	S	ST
TAR RIVER	28-(66.5)	WS-IV NSW CA	0.7 mi.	FC	FT-1 ce			I	N/A
Stony Creek	28-68a	C NSW	19.4 mi	AL	B-1 GF--02			S	PS
Pigbasket Creek	28-68-3-(2)	C NSW	11.2 mi	AL	F-2 NR--02			NR	NR
TAR RIVER	28-(69)	C NSW	11.3 mi	AL	B-2 GF--02	A-5 nce		S	ST
TAR RIVER	28-(69)	C NSW	11.3 mi.	REC		A-5 nce		S	N/A
TAR RIVER	28-(74)a	WS-IV NSW	21.0 mi	AL	B-3 GF--02	A-6 nce		S	FS
TAR RIVER	28-(74)a	WS-IV NSW	21.0 mi.	REC		A-6 nce		S	N/A
Beech Branch	28-75-(4)	WS-IV NSW	1.0 mi	AL	F-3 NR--02			NR	FS
Swift Creek	28-78-(0.5)	C NSW	37.7 ac	AL		A-8 nce A-9 nce		S	FS
Swift Creek	28-78-(0.5)	C NSW	37.7 mi.	REC		A-8 nce A-9 nce		S	N/A
Martin Creek	28-78-1-3	C NSW	4.2 mi.	AL	SB-1 NR--02			NR	NR
Weaver Creek	28-78-1-7	C NSW	6.5 mi.	AL	SB-2 NR--02			NR	ST
Sandy Creek	28-78-1-(8)b	B NSW	11.3 mi.	AL		A-7 nce		S	PS
Sandy Creek	28-78-1-(8)b	B NSW	11.3 mi.	REC		A-7 nce		S	N/A
Sandy Creek	28-78-1-(8)a	B NSW	3.8 mi.	AL	F-4 GF--02			S	PS
Flatrock Creek	28-78-1-12	B NSW	9.1 mi.	AL	F-5 G--02			S	NR
Sandy Creek	28-78-1-(14)	C NSW	20.3 mi.	AL	B-4 GF--02			S	FS
Red Bud Creek	28-78-1-17	C NSW	10.6 mi.	AL	F-6 G--02			S	FS
Swift Creek	28-78-(6.5)	WS-IV NSW	10.0 mi.	AL	B-5 G--02			S	FS
Whiteoak Swamp	28-78-7-(2)	WS-IV NSW	2.8 mi.	AL	B-6 MS--02 F-7 NR--02			S	FS

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
L - Lakes Assessment
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-02 are summarized in Part 2.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 2.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 2.4 below. 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. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

2.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-02 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). Also, 0.7 miles of the Tar River are Impaired in the fish consumption category based on fish tissue monitoring data. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 187.9 stream miles (37 percent) and 717.6 freshwater acres (99 percent) monitored during this assessment period in the aquatic life category. There were no Impaired waters in this use category. Refer to Table B-4 for a summary of use support ratings for waters in subbasin 03-03-02.

Table B-4 Summary of Use Support Ratings by Category in Subbasin 03-03-02

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	165.0 mi 717.6 ac	0	81.2	0
Impaired	0	0.7	0	0
Not Rated	22.9	0	0	0
Total	**187.9 mi 717.6 ac**	**0.7**	**81.2 mi**	**0**
Unmonitored Waters				
Supporting	0	0	0	129.3 mi 722.0 ac
Impaired	0	510.5 722.0	0	0
Not Rated	0	0	0	0
No Data	323.3 mi 4.4 ac	0	430.0 mi 722 ac	0
Total	**323.3 mi 4.4 ac**	**510.5 722.0**	**422.4 98.9**	**129.3 mi 722.0 ac**
Totals				
All Waters	**511.2 mi 722 ac**	**511.2 mi 722 ac**	**511.2 mi 722 ac**	**129.3 mi 722.0 ac**

2.3 Status and Recommendations of Previously Impaired Waters

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

2.3.1 Sandy Creek [AU# 28-78-1-(8)a, b and 28-78-1-(14)]

1999 Recommendations
It was recommended that Sandy Creek be resampled to determine if the water quality impacts noted in 1997 were related to the 1996 Hurricane Fran.

Current Status
Sandy Creek (35.4 miles) from NC 401 to Swift Creek is currently Supporting in the aquatic life category because of Good-Fair bioclassifications at sites B-4 and F-4 in 2002. No criteria were

exceeded at site A-7. Based on bacteriological monitoring (site A-7), Sandy Creek [AU# 28-78-1-(8)b only] is Supporting in the recreation category.

In the 1999 plan, Sandy Creek was Impaired from NC 401 to NC 561 (15.1 miles). Possible causes of the impairment were thought to be related to the hurricane and possibly to logging and a milldam just upstream of site B-4. Intolerant species were collected in 2002, indicating reduced impact to the stream. The biological community may also have been adversely impacted by the four-year drought, although nonpoint source runoff impacts may have been minimized during this time.

The High Roost Poultry Farm has been an inactive operation since 1998. The farm lagoon has had overflows during some rain events and there have been civil penalty assessments against the farm.

2004 Recommendations
DWQ will continue to monitor water quality in Sandy Creek to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Sandy Creek watershed. The Sandy Creek watershed is also part of a proposed ORW management strategy to protect water quality in downstream portions of Swift Creek. The Raleigh Regional Office staff will continue to monitor the High Roost farm. Additionally, DWQ will continue to work with the Office of the Attorney General in pursuit of obtaining corrective actions to cease the overflows and will also work with farm owners and other agencies to find a permanent solution.

2.3.2 Stoney Creek [AU# 28-68a]

1999 Recommendations
Because of low flow in 1997, Stoney Creek was not resampled in 1997, although it remained on the 303(d) list of Impaired waters. No recommendations were made to address water quality issues in the 1999 plan.

Current Status
Stoney Creek (Boddies Mill Pond 19.4 miles) from the source to Lassiters Creek is currently Supporting because of a Good-Fair bioclassification at site B-1. No data were collected on the lower segment from Lassiters Creek to the Tar River (segment runs through urban areas in southwest Rocky Mount). Although most of the watershed is in forest and agricultural land use, there is development occurring both upstream and downstream of site B-1. The cause of the depressed bioclassification is likely habitat degradation, as there was little riparian area and moderate to severe bank erosion noted at site B-1. Also, drought conditions limited available habitat in Stoney Creek during monitoring (page 82).

2004 Recommendations
DWQ will continue monitoring Stoney Creek to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities. Water quality should be considered during land-disturbing activities, and BMPs should be implemented to minimize or prevent future impacts to water quality in the Stoney Creek watershed.

Current Water Quality Initiatives
Because of previous impairment and current water quality degradation, this is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts.

2.4 Status and Recommendations of Newly Impaired Waters

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

2.4.1 Tar River [AU# 28-(66.5)]

Current Status
The Tar River (0.7 miles) is currently Impaired in the fish consumption category from Maple Creek to Old Rocky Mount water intake because fish tissue collected in this segment exceeded the state criterion of 0.4 µg of methylmercury per gram of fish tissue. Five of 13 large mouth bass collected in this segment also exceeded this criterion. There is also statewide consumption advice for mercury in fish tissue that is applied to waters east and south of I-85.

2002 Recommendations
Contamination of fish tissue with mercury is a regional issue. Refer to page 90 for more information on plans to address mercury.

2.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

2.5.1 White Oak Swamp [AU# 28-78-7-(2)]

<u>*Current Status and 2004 Recommendations*</u>
White Oak Swamp (2.8 miles) is currently Supporting because of a moderate stress bioclassification at site B-6 in 2002. The stream was channelized in the past, but habitat is good and the stream appears to be recovering.

DWQ will continue to monitor White Oak Swamp to assess further recovery. Water quality should be considered during land-disturbing activities, and BMPs should be implemented to minimize or prevent future impacts to water quality in the White Oak Swamp watershed.

2.5.2 Beech Branch [AU# 28-75-(4)]

<u>*Current Status and 2004 Recommendations*</u>
The current use support rating of Beech Branch is Not Rated because site F-3 could not be rated as criteria for assigning bioclassifications to fish community samples have not been developed for coastal plain streams (page 73). Past channelization was noted at site F-3 and the area had been recently logged. The fish community was diverse; however, and more fish were collected here than at other coastal plain sites.

DWQ will continue to monitor Beech Branch to assess changes in the fish community that might be related to land-disturbing activities. Water quality should be considered during land-disturbing activities, and BMPs should be implemented to minimize or prevent future impacts to water quality in the Beech Branch watershed. DWQ will continue to develop criteria to assign bioclassifications for coastal plain fish communities.

2.5.3 Tar River Reservoir [AU# 28-(63) and 28-(36)]

<u>*Current Status and 2004 Recommendations*</u>
The Tar River Reservoir is Supporting in the aquatic life category based on monitoring during the summer of 2002. Because of the drought, water levels dropped four feet during the summer, and nutrients and chlorophyll *a* increased during the summer. Increased turbidity levels were likely (from 1997 levels) related to the lower lake levels. DWQ will continue to monitor the lake.

Because of the potential water quality problems noted above and because the Tar River Reservoir is a public water supply, it has been identified by EEP as one of 27 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

2.5.4 Tar River [AU# 28-(69) and 28-(74)a]

<u>*Current Status and 2004 Recommendations*</u>
The current use support rating of the Tar River from Rocky Mount Mills to the subbasin boundary is Supporting because of Good-Fair bioclassifications at sites B-2 and B-3 in 2002. Both of these bioclassifications are lower than in 1997. Trash was noted as well as eroding

streambanks at site B-2. The lower bioclassification at site B-3 is attributed to drought. No stoneflies were present at site B-2, indicating some water quality problems in this segment. No criteria were exceeded at sites A-5 and A-6, although total suspended solids and total phosphorus were elevated at both sites.

DWQ will continue to monitor the Tar River to determine if the lower bioclassifications were because of drought or other water quality problems related to land disturbances or discharges.

2.5.5 Pig Basket Creek [AU# 28-68-3-(1) and (2)]

Current Status and 2004 Recommendations
The lower portion of Pig Basket Creek is currently Not Rated because a bioclassification could not be assigned at site F-2 in 2002. Low dissolved oxygen levels were noted at F-2 as well. There is currently no data available to assign use support ratings to the upper portion of Pig Basket Creek.

Production Enterprises poultry farm has had overflows of the treatment lagoon near the source of Pig Basket Creek. The facility is presently abandoned by its owners and has had no poultry since 2001. The Raleigh Regional Office staff will continue to monitor the Production Farm. Additionally, DWQ will continue to work with the Office of the Attorney General in pursuit of obtaining corrective actions to cease the overflows and will also work with farm owners and other agencies to find a permanent solution.

2.5.6 Red Bud Creek [AU# 28-78-1-17]

Current Status and 2004 Recommendations
Red Bud Creek (10.6 miles) from the source to Sandy Creek is currently Supporting in the aquatic life category because of Good bioclassification at site F-6 in 2002. The Yang Poultry Farm has had overflows of the treatment lagoon near an unnamed tributary to Red Bud Creek. The facility was assessed a civil penalty for a discharge in 2000. This farm was depopulated of birds in October of 2003 and is presently abandoned.

The Raleigh Regional Office staff will continue to monitor the Yang Farm. Additionally, DWQ will continue to work with the Office of the Attorney General in pursuit of obtaining corrective actions to cease the overflows and will also work with farm owners and other agencies to find a permanent solution.

2.6 Additional Water Quality Issues within Subbasin 03-03-05

2.6.1 Swift Creek and Sandy Creek

Portions of these two creeks have been reclassified to ORW because of excellent water quality. Refer to page 41 for more information on this reclassification.

Section B - Chapter 3

Tar-Pamlico River Subbasin 03-03-03

Tar River, Cokey Swamp, Bynums Creek and Conetoe Creek

3.1 Subbasin Overview

Subbasin 03-03-03 at a Glance

Land and Water Area

Total area:	423.4 mi²
Land area:	420.5 mi²
Water area:	2.9 mi²

Population Statistics

2000 Est. Pop.: 91,606 people
Pop. Density: 138 persons/mi²

Land Cover (percent)

Forest/Wetland:	54.7
Surface Water:	0.40
Urban:	2.1
Cultivated Crop:	40.5
Pasture/ Managed Herbaceous:	2.3

Counties

Edgecombe, Martin, Nash, Pitt and Wilson

Municipalities

Tarboro, Falkland, Pinetops and Sharpsburg

Population growth of the subbasin is concentrated around Tarboro in the northern portion along the Tar River. Tarboro experienced rapid growth in the 1980s but has since slowed, and the remainder of the subbasin is experiencing very little growth. The predominant land cover is forest and wetland, with extensive cultivated cropland as well.

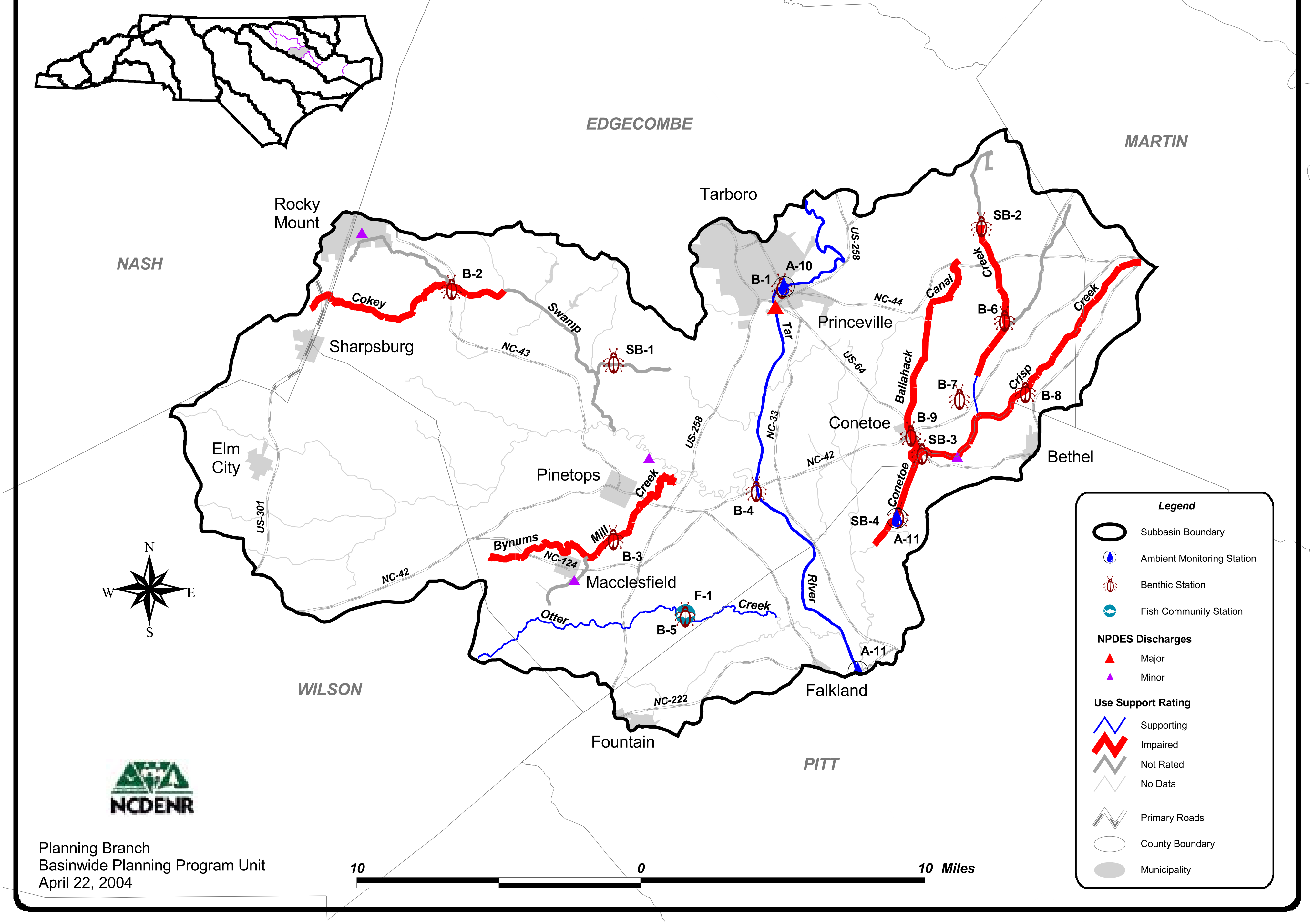
There are five NPDES wastewater discharge permits in this subbasin with a total permitted flow of 6.3 MGD (Figure B-3). The largest is Tarboro WWTP (5.0 MGD). There are also four general NPDES wastewater permits, one individual NPDES stormwater permit, and 19 general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders.

Tarboro, as well as Edgecombe and Pitt counties, will be required to develop stormwater programs under Phase II (page 75) and will also have to submit model stormwater ordinances as required by the Tar-Pamlico NSW strategy (page 61) stormwater rules. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also 24 registered animal operations in this subbasin.

There were 12 benthic macroinvertebrate community samples (Figure B-3 and Table B-5) collected in 2002 as part of basinwide monitoring. Six sites maintained the same bioclassification. Three sites were monitored for the first time, and there were three special study samples collected in the subbasin during the assessment period. Data were collected from three ambient monitoring stations and one fish tissue site as well.

Refer to *2003 Tar-Pamlico 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 Tar-Pamlico River Subbasin 03-03-03



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

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

Waterbody	Assessment	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results: Biological	Ambient	Other	Use Support Rating: 2004	1998
TAR RIVER	28-(79.5)	WS-IV NSW CA	0.5 mi	AL	B-1 G--02			S	FS
TAR RIVER	28-(80)	C NSW	14.8 mi	AL	B-1 G--02 B-4 E--02	A-10 nce		S	ST
TAR RIVER	28-(80)	C NSW	14.8 mi.	REC		A-10 nce		S	N/A
TAR RIVER	28-(80)	C NSW	14.8 mi.	FC	FT-2 ce			I	N/A
Cokey Swamp	28-83-3a	C NSW	8.6 mi	AL	B-2 SS--02			I	FS
Sasnett Mill Branch	28-83-3-3	C NSW	3.1 mi	AL	SB-1 NR--01			NR	FS
Bynums Mill Creek	28-83-4	C NSW	9.7 mi	AL	B-3 SS--02			I	ST
TAR RIVER	28-(84)a	WS-IV NSW	6.3 mi	AL		A-11 nce		S	NS
TAR RIVER	28-(84)a	WS-IV NSW	6.3 mi.	REC		A-11 nce		S	N/A
Otter Creek	28-86-(0.3)	C NSW	13.9 mi	AL	B-5 MS--02			S	PS
Conetoe Creek	28-87-(0.5)c	C NSW	1.5 ac	AL	B-7 MS--02			S	FS
Conetoe Creek	28-87-(0.5)d	C NSW	6.7 mi.	AL	SB-3 F--01 SB-4 P--01	A-12 nce		I	NR
Conetoe Creek	28-87-(0.5)d	C NSW	6.7 mi.	REC		A-12 nce		S	N/A
Conetoe Creek	28-87-(0.5)a	C NSW	3.9 mi.	AL	SB-2 NR--01			NR	FS
Conetoe Creek	28-87-(0.5)b	C NSW	5.9 mi.	AL	B-6 SS--02			I	FS
Crisp Creek	28-87-1	C NSW	8.7 mi.	AL	B-8 SS--02			I	ST
Ballahack Canal	28-87-1.2	C NSW	8.4 mi.	AL	B-9 SS--02			I	FS

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-03 are summarized in Part 3.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 3.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 3.4 below. 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. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

3.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-03 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). Also, 14.8 miles of the Tar River are Impaired in the fish consumption category based on fish tissue monitoring data. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 94.2 stream miles (37 percent) monitored during this assessment period in the aquatic life use category. There were 48.0 (30 percent) Impaired stream miles in this use category. Refer to Table B-6 for a summary of use support ratings by use category for waters in subbasin 03-03-03.

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

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	39.2 mi	0	27.8 mi	0
Impaired	48.0 mi	14.8 mi	0	0
Not Rated	6.9	0	0	0
Total	**94.2 mi**	**14.8 mi**	**27.8 mi**	**0**
Unmonitored Waters				
Supporting	15.2 mi	0	0	21.2 mi
Impaired	0	239.9 mi	0	0
Not Rated	20.2 mi	0	0	0
No Data	140.3 mi	0	226.9 mi	0
Total	**160.5 mi**	**239.9 mi**	**226.9 mi**	**21.2 mi**
Totals				
All Waters	**254.7 mi**	**254.7 mi**	**254.7 mi**	**21.2 mi**

3.3 Status and Recommendations of Previously Impaired Waters

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

3.3.1 Conetoe Creek [AU# 28-87-(0.5)a, b, c and d]

1999 Recommendations
It was recommended that the Town of Bethel cooperate with DWQ and the City of Greenville to connect Bethel WWTP to the Greenville sewer system. It was also recommended that nonpoint sources of pollution be investigated in this watershed.

Current Status
Conetoe Creek (12.6 miles) is currently Impaired from SR 1516 to just north of NC 42 and from Crisp Creek to SR 1414 because of a Severe Stress bioclassification at site B-6 [AU# 28-87-(0.5)b] and a Fair bioclassification at site SB-3 [AU# 28-87-(0.5)d]. A bioclassification could not be assigned at site SB-2 [AU# 28-87-(0.5)a] near the source, and no data were collected in the lowest segment [AU# 28-87-(2)]. A 1.5-mile segment above NC 42 is currently Supporting because of a Moderate Stress bioclassification at site B-7 [AU# 28-87-(0.5)c].

Most of the data collected in this watershed during the assessment period was part of the DWQ Watershed Assessment and Restoration Program funded by CWMTF. The study area included the Conetoe Creek watershed and its two major tributary streams, Ballahack Canal and Crisp Creek (discussed below). The watershed land cover is 60 percent agriculture including row crops and swine production. Over 95 miles of stream were channelized in the 1960s with intermittent de-snagging and dredging since then. Woody debris is sparse and the habitat is generally poor throughout the watershed.

The study found that aquatic organisms are impacted by toxicity, habitat degradation and organic enrichment causing low dissolved oxygen levels. Agricultural chemicals are thought to be the cause of toxicity and channelization the cause of the habitat degradation. Nutrient overloading is also widespread. Bethel is in the process of closing out the wastewater treatment plant and is sending its wastewater to the Greenville WWTP.

2004 Recommendations
DWQ will continue to monitor water quality in the Conetoe Creek watershed. DWQ will work with the appropriate agricultural agencies and local farmers to better understand the toxic impacts to the stream. DWQ will work with the drainage district and NRCS to reduce habitat degradation during clearing and de-snagging operations. DWQ is currently working with the local advisory committees (LACs) to reduce nutrient inputs through the Tar-Pamlico NSW strategy (page 61). Reestablishment of buffers along the intermittent and perennial streams should be encouraged to reduce nutrient inputs and provide habitat for aquatic organisms.

EEP has also started development of local watershed plans that will include the Conetoe Creek watershed. These plans will seek to identify sources of water quality impacts and make recommendations to address these impacts. For more information, refer to page 170.

Current Water Quality Initiatives
Because of the water quality impairment noted above, Conetoe Creek has been identified by EEP as one of 27 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

The Town of Bethel received a CWMTF grant of $1,500,000 to rehabilitate the wastewater collection system. Bethel WWTP has connected to the Greenville WWTP and no longer discharges into Conetoe Creek.

3.3.2 Otter Creek [AU# 28-86-(0.3)]

1999 Recommendations
It was recommended that Otter Creek be resampled using swamp criteria to determine if the stream is Impaired.

Current Status
Otter Creek (13.9 miles) is currently Supporting from its source to just upstream of Kitten Creek because of a Moderate Stress bioclassification at site B-5. The habitat in Otter Creek was in good condition at the sample site, and the reduced bioclassification may have been because of drought conditions.

2002 Recommendations
DWQ will continue to monitor water quality in Otter Creek to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Sandy Creek watershed.

3.3.2 Little Cokey Swamp [AU# 28-83-3-1]

1999 Recommendations
It was recommended that Little Cokey Swamp be resampled to determine if the stream is Impaired.

Current Status
Little Cokey Swamp has not been resampled since 1992 and is currently Not Rated. A sample site on Cokey Swamp at the confluence with Little Cokey Swamp is discussed in Part 3.4.1.

2002 Recommendations
DWQ will address water quality issues in Little Cokey Swamp with Cokey Swamp (see below).

3.4 Status and Recommendations of Newly Impaired Waters

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

3.4.1 Cokey Swamp [AU# 28-83-3a]

Current Status
Cokey Swamp (8.6 miles) is currently Impaired from its source to Dickinson Creek because of a Severe Stress bioclassification at site B-2. Habitat degradation, as well as high conductivity, was noted at site B-2. There were few riffles and pools at the sample site. Tributaries to this segment drain urban areas in southern Rocky Mount. The downstream extent of the Impaired biological community is not known.

2004 Recommendations
DWQ will continue to monitor water quality in the Cokey Swamp watershed. DWQ will work with the Town of Rocky Mount in developing stormwater programs that will reduce future and current impacts to streams in this watershed.

3.4.2 Ballahack Canal [AU# 28-87-1.2]

Current Status
Ballahack Canal (8.4 miles) is currently Impaired from its source to Conetoe Creek because of a Severe Stress bioclassification at site B-9. Ballahack Canal was part of the Conetoe Creek WARP study discussed above in Part 3.3.1.

2004 Recommendations
The WARP study recommended that Ballahack Canal be prioritized for buffer restoration as this watershed was in worse condition than other streams within the Conetoe Creek watershed. Refer to Part 3.3.1 above for more recommendations to restore water quality in this watershed.

3.4.3 Crisp Creek [AU# 28-87-1]

Current Status
Crisp Creek (8.7 miles) is currently Impaired from its source to Conetoe Creek because of a Severe Stress bioclassification at site B-8. Crisp Creek was part of the Conetoe Creek WARP study discussed above in Part 3.3.1.

2002 Recommendations
Refer to Part 3.3.1 above for more recommendations to restore water quality to this watershed. A local watershed plan is being developed for Crisp Creek by the EEP (page 168).

3.4.4 Bynums Mill Creek [AU# 28-83-4]

Current Status
Bynums Mill Creek (9.7 miles) is currently Impaired from its source to Town Creek because of a Severe Stress bioclassification at site B-3. Excessive algal growth and a braided channel were noted at site B-3. Tributaries to Bynums Mill Creek drain areas of Macclesfield and Pinetops. The Macclesfield WWTP also discharges into Briery Branch above site B-3.

2004 Recommendations
DWQ will continue to monitor water quality in the Bynums Mill Creek watershed. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Bynums Mill Creek watershed.

3.4.5 Tar River [AU# 28-(80)]

Current Status
The Tar River (14.8 miles) is currently Impaired in the fish consumption category from Tarboro water supply intake to Suggs Creek because fish tissue (site FT-2) collected in this segment exceeded the state criterion of 0.4 µg of methylmercury per gram of fish tissue. Seven of 13 large mouth bass collected in this segment exceeded this criterion. There is also statewide consumption advice for mercury in fish tissue that is applied to waters east and south of I-85.

2002 Recommendations
Contamination of fish tissue with mercury is a regional issue. Refer to page 90 for more information on plans to address mercury.

3.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

3.5.1 Hendricks Creek [AU# 28-81]

Current Status and 2004 Recommendations
The current use support rating of Hendricks Creek is No Data. Hendricks Creek has never been monitored by DWQ; however, EEP (page 168) has a planned project in this local watershed. This is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts.

This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

Section B - Chapter 4
Tar-Pamlico River Subbasin 03-03-04
Fishing Creek, Little Fishing Creek, Rocky Swamp and Beech Swamp

4.1 Subbasin Overview

Subbasin 03-03-04 at a Glance

Land and Water Area

Total area:	893 mi^2
Land area:	878.3 mi^2
Water area:	14.7 mi^2

Population Statistics

2000 Est. Pop.:	69,693 people
Pop. Density:	78 persons/mi^2

Land Cover (percent)

Forest/Wetland:	73.8
Surface Water:	0.3
Urban:	0.2
Cultivated Cropland:	22.6
Pasture/ Managed Herbaceous:	3.1

Counties

Edgecombe, Franklin, Halifax, Martin, Nash, Vance and Warren

Municipalities

Middleburg, Warrenton, Littleton and Scotland Neck

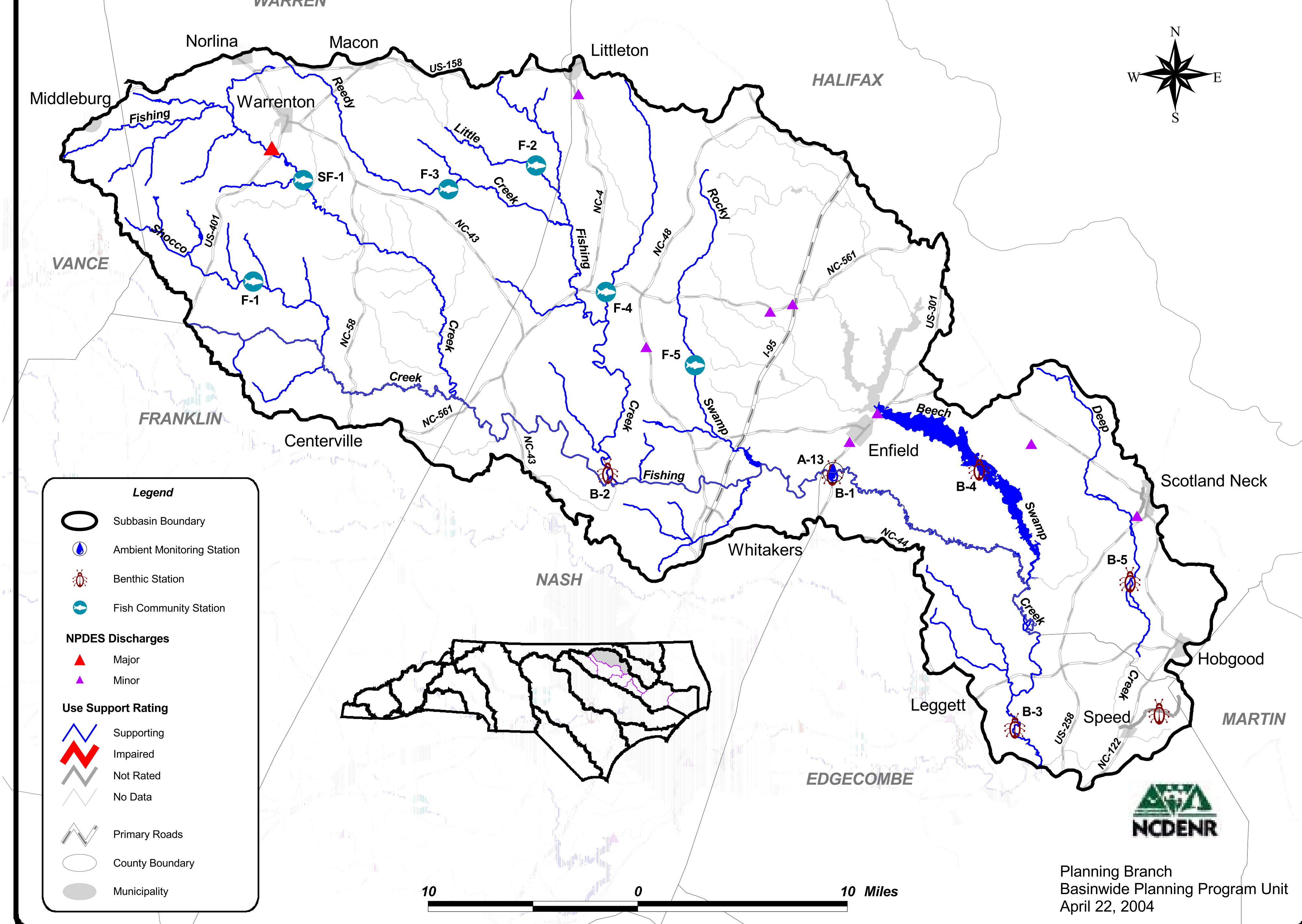
Except for the area immediately around Tarboro in the southern portion of the subbasin, there has been little growth in population. Tarboro experienced rapid growth in the 1980s but has since slowed, and the remainder of the subbasin is experiencing very little growth. The predominant land cover is forest and wetland with extensive cultivated cropland as well.

There are eight NPDES wastewater discharge permits in this subbasin with a total permitted flow of 3.9 MGD (Figure B-4). The largest is Warrenton WWTP (2.0 MGD). There are also two general NPDES wastewater permits, one individual NPDES stormwater permit, and ten general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also 21 registered animal operations in this subbasin.

There were six benthic macroinvertebrate community samples and six fish community samples (Figure B-4 and Table B-7) collected in 2002 as part of basinwide monitoring. One site improved, two sites remained the same, and two sites had lower bioclassifications. Five sites were monitored for the first time, and there were two special study samples collected in the subbasin during the assessment period. Data were collected from one ambient monitoring station as well.

Refer to *2003 Tar-Pamlico 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-4 Tar-Pamlico River Subbasin 03-03-04



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table B-7 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-04

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	**Ambient**	**Other**	**2004**	**1998**
Fishing Creek	28-79-(21)	WS-V NSW	16.7 mi	AL	B-1 GF--02	A-13 nce		S	FS
Shocco Creek	28-79-22	C NSW	28.7 mi	AL	F-1 E--02			S	ST
Little Fishing Creek	28-79-25	C NSW	31.4 mi	AL	B-2 G--02 F-2 G--02			S	FS
Reedy Creek	28-79-25-5	C NSW	20.5 mi	AL	F-3 G--02			S	FS
Bear Swamp	28-79-25-7	C NSW	13.6 mi	AL	F-4 G--02			S	FS
Fishing Creek	28-79-(25.5)	WS-IV NSW	14.7 mi	AL	B-1 GF--02	A-13 nce		S	FS
(Bellamy Lake)	28-79-28-(0.7)	WS-IV NSW	10.6 mi	AL	F-5 G--02			S	ST
Fishing Creek	28-79-(28.5)	WS-IV NSW CA	0.6 ac	AL	B-1 GF--02	A-13 nce		S	FS
Fishing Creek	28-79-(29)	C NSW	24.3 mi.	AL	B-1 GF--02	A-13 nce		S	FS
Fishing Creek	28-79-(29)	C NSW	24.3 mi.	REC		A-13 nce		S	N/A
Beech Swamp	28-79-30	C Sw NSW	13.1 mi.	AL	B-4 MS--02			S	NR
Fishing Creek	28-79-(30.5)	WS-IV NSW	17.1 mi.	AL	B-3 G--02			S	FS
Deep Creek	28-79-32-(0.5)	C NSW	19.8 mi.	AL	B-5 MS--02			S	FS
Savage Mill Run	28-79-32-4	WS-IV NSW	4.2 mi.	AL	SB-1 NR--01			NR	FS

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-04 are summarized in Part 4.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 4.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 4.4 below. Waters with noted water quality impacts are discussed in Part 4.5 below. Water quality issues related to the entire subbasin are discussed in Part 4.6. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

4.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-04 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 251.9 stream miles (44 percent) monitored during this assessment period in the aquatic life category. There were no Impaired waters in this category. Refer to Table B-8 for a summary of use support ratings by category for waters in subbasin 03-03-04.

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

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	247.7 mi	0	24.3 mi	0
Impaired	0	0	0	0
Not Rated	4.2 mi	0	0	0
Total	**251.9 mi**	**0**	**24.3 mi**	**0**
Unmonitored Waters				
Supporting	125.7 mi	0	0	116.4 mi
Impaired	0	572.7 mi	0	0
Not Rated	1.9 mi	0	0	0
No Data	140.3 mi	0	548.4 mi	0
Total	**193.2 mi**	**572.7 mi**	**548.4 mi**	**116.4 mi**
Totals				
All Waters	**572.7 mi**	**572.7 mi**	**572.7 mi**	**116.4 mi**

4.3 Status and Recommendations of Previously Impaired Waters

There were no Impaired streams identified in the 1999 basin plan in this subbasin.

4.4 Status and Recommendations of Newly Impaired Waters

There are no newly Impaired waters in subbasin 03-03-04. Refer to Part 4.5 below for information on waters with noted water quality impacts.

4.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

4.5.1 Fishing Creek [AU# 28-79-(29) and (21)]

Current Status and 2004 Recommendations
Fishing Creek (24.3 miles) is currently Supporting in the aquatic life category from Enfield water supply intake to Beech Swamp because of a Good-Fair bioclassification at site B-1 in 2002. Filamentous algae were covering all habitats and leaf packs were rare at site B-1. The next downstream monitoring site has a Good bioclassification, indicating water quality recovery. Drought may be partially responsible for the lower bioclassification upstream. Total phosphorus and iron were elevated at site A-13 as well.

DWQ will continue to monitor water quality in Fishing Creek to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Fishing Creek watershed.

Because of the potential water quality problems noted above and because Fishing Creek has endangered species present, it has been identified by EEP as one of 27 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

4.5.3 Deep Creek [AU# 28-79-32-(0.5)]

Current Status and 2004 Recommendations

Deep Creek (19.8 miles) is currently Supporting in the aquatic life category from the source to NC 97 because of a Moderate Stress bioclassification at site B-5 in 2002. There was no flow in Deep Creek above Scotland Neck and the stream channel is braided. There are also indicators of stress in Deep Creek. DWQ will continue to monitor water quality in Deep Creek to assess future upgrades at the Scotland Neck WWTP (see below).

4.5.4 Canal Creek [AU# 28-79-32-1]

Current Status and 2004 Recommendations

Scotland Neck WWTP discharges into Canal Creek just upstream of Deep Creek. Scotland Neck WWTP failed four whole effluent toxicity tests in the last two years of the assessment period and exceeded permit limits for both chlorine and ammonia on occasions in 2002. DWQ will continue to evaluate the Scotland Neck discharge. Scotland Neck will receive $3,000,000 through DWQ Construction, Grants and Loans Program for collection system rehabilitation and for spray irrigation of some of the effluent. Scotland WWTP will also start treating wastewater from individual onsite wastewater treatment systems in Hobgood. A Special Order by Consent between Scotland Neck and DWQ is being finalized. It requires upgrades on specific equipment at their WWTP, as well as collection system rehabilitation that will reduce inflow and infiltration.

Section B - Chapter 5
Tar-Pamlico River Subbasin 03-03-05
Tar River, Chicod Creek, Grindle Creek and Tranters Creek

5.1 Subbasin Overview

Subbasin 03-03-05 at a Glance

Land and Water Area

Total area:	297.4 mi^2
Land area:	293.4 mi^2
Water area:	4 mi^2

Population Statistics

2000 Est. Pop.:	57,247 people
Pop. Density:	192 person/mi^2

Land Cover (percent)

Forest/Wetland:	60.6
Surface Water:	1.1
Urban:	2.3
Cultivated Crop:	33
Pasture/ Managed Herbaceous:	3.0

Counties
Beaufort, Edgecombe, Martin and Pitt

Municipalities
Greenville, Winterville and Grimesland

Population growth in the subbasin is concentrated around Greenville and Pitt County. The population of Pitt County is expected to grow from around 133,000 to over 187,000 by 2020. Although the largest urban area in the basin is centered in this subbasin, the predominant land cover is forest and wetland with extensive cultivated cropland as well.

There are three NPDES wastewater discharge permits in this subbasin with a total permitted flow of 17.5 MGD (Figure B-5). The largest is Greenville WWTP. There are also three general NPDES wastewater permits, one individual NPDES stormwater permit, and 20 general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders.

Greenville and Winterville, as well as Pitt County, will be required to develop stormwater programs under Phase II (page 75) and will also have to submit model stormwater ordinances as required by the Tar-Pamlico NSW strategy (page 61) stormwater rules. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also 16 registered animal operations in this subbasin.

There were four benthic macroinvertebrate community samples and four fish community samples (Figure B-5 and Table B-9) collected in 2002 as part of basinwide monitoring. Six sites maintained the same bioclassifications. Two sites were monitored for the first time during the assessment period. Data were collected from two ambient monitoring stations and one fish tissue site was sampled as well.

Refer to *2003 Tar-Pamlico 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 Tar-Pamlico River Subbasin 03-03-05

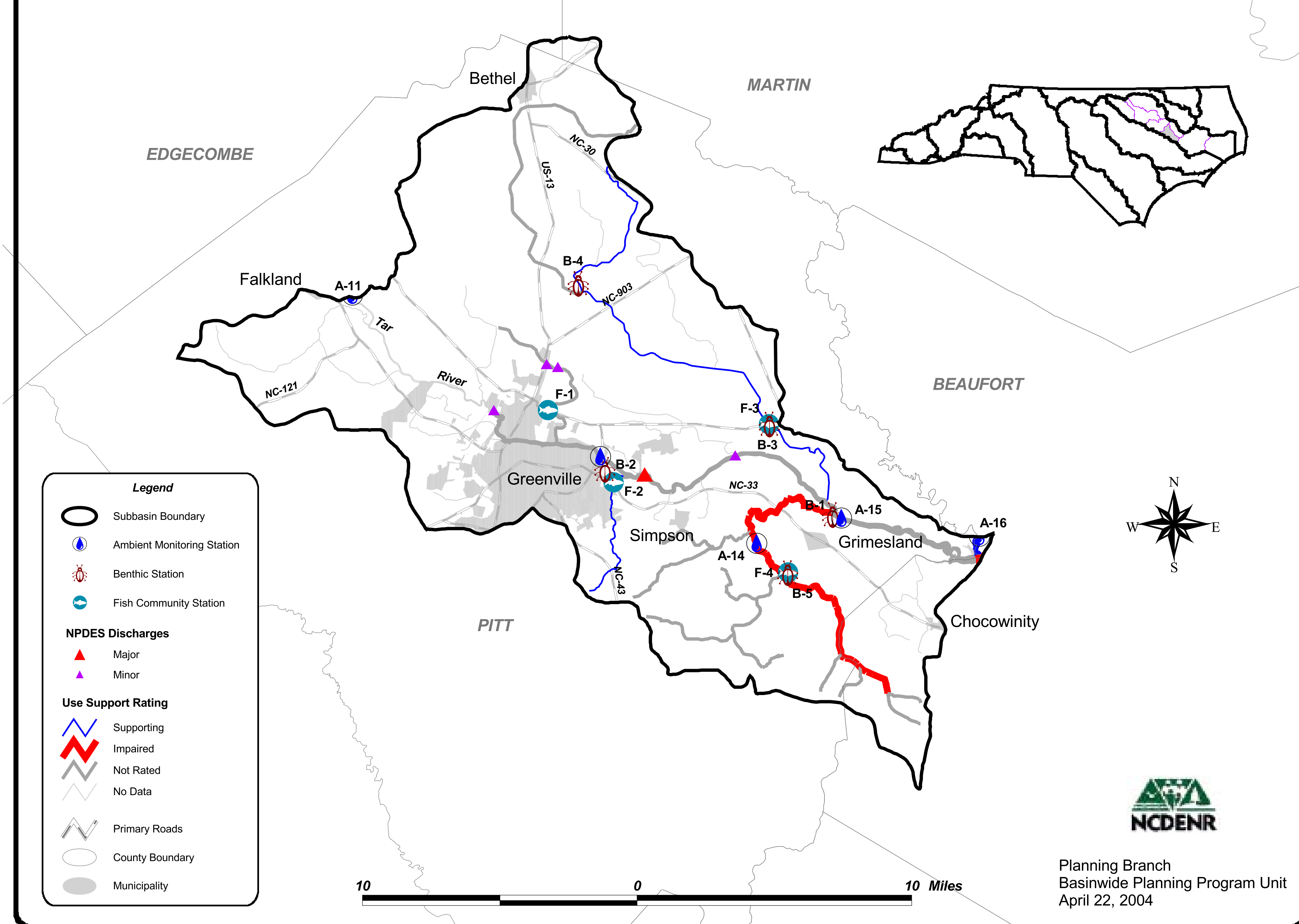


Table B-9 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-05

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results: Biological	Ambient	Other	Use Support Rating: 2004	1998
TAR RIVER	28-(94)	C NSW	13.1 mi.	FC	FT-3 ce			I	N/A
Parker Creek	28-95	C NSW	7.3 mi	AL	F-1 NR--02			NR	
Hardee Creek	28-97	C NSW	5.6 mi	AL	B-2 N--02 F-2 NR--02			S	
TAR RIVER	28-(99.5)	B NSW	10.3 mi	AL	B-1 NR--02	A-15 nce		NR	
TAR RIVER	28-(99.5)	B NSW	10.3 mi	REC		A-15 nce		S	N/A
Grindle Creek	28-100b	C NSW	14.2 mi	AL	B-3 GF--02 F-3 NR--02			S	
Whichard Branch	28-100-2	C NSW	6.6 mi	AL	B-4 MS--02			S	
Chicod Creek	28-101	C NSW	14.1 mi	AL	B-5 SS--02 F-4 NR--02	A-14 nce		I	
Chicod Creek	28-101	C NSW	14.1 ac	REC		A-14 nce		S	N/A

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-05 are summarized in Part 5.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 5.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 5.4 below. Waters with noted water quality impacts are discussed in Part 5.5 below. Water quality issues related to the entire subbasin are discussed in Part 5.6. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

5.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-05 in the aquatic life, recreation, fish consumption and water supply categories. All waters are Impaired on an evaluated basis in the fish consumption use category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). Also, 13.1 miles of the Tar River are Impaired in the fish consumption category based on fish tissue monitoring data. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 71.1 stream miles (35 percent) monitored during this assessment period in the aquatic life use category. There were 14.1 (6.8 percent) Impaired stream miles in this category. Refer to Table B-10 for a summary of use support ratings for waters in subbasin 03-03-05.

Table B-10 Summary of Use Support Ratings by Category in Subbasin 03-03-05

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	26.4 mi	0	24.3 mi	0
Impaired	14.1 mi	13.1 mi	0	0
Not Rated	30.6 mi	0	0	0
Total	**71.1 mi**	**13.1 mi**	**24.3 mi**	**0**
Unmonitored Waters				
Supporting	0	0	0	31.8 mi
Impaired	0	191.9 mi	0	0
Not Rated	40.4 mi	0	0	0
No Data	93.5 mi	0	180.7 mi	0
Total	**134.0 mi**	**191.9 mi**	**180.7 mi**	**31.8 mi**
Totals				
All Waters	**205.0 mi**	**205.0 mi**	**205.0 mi**	**31.8 mi**

5.3 Status and Recommendations of Previously Impaired Waters

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

5.3.1 Chicod Creek [AU# 28-101]

1999 Recommendations
Chicod Creek was partially supporting from the source to the Tar River. It was recommended that a more detailed study of the watershed be undertaken to determine possible causes of impairment.

Current Status
Chicod Creek (14.1 miles) from the source to the Tar River is currently Impaired in the aquatic life category because of a Severe Stress bioclassification at site B-5 in 2002. Instream habitats are of high quality at sites B-5 and F-4. High turbidity was noted at site B-5, and total phosphorus was elevated and dissolved oxygen was below 4 mg/l in 48 percent of samples collected during the assessment period at site A-14. The watershed is extensively ditched. There are areas where drain tiles under spray fields are connected directly to mainstream channels.

2004 Recommendations
DWQ will continue to monitor Chicod Creek to assess future impacts related to land use changes in the watershed. BMPs to minimize or prevent future impacts to water quality in the Chicod Creek watershed.

EEP has also started development of local watershed plan that will include the Chicod Creek watershed. These plans will seek to identify sources of water quality impacts and make recommendations to address these impacts. For more information, refer to page 170.

5.4 Status and Recommendations of Newly Impaired Waters

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

5.4.1 Tar River [AU# 28-(94)]

The Tar River (13.1 miles) from Greenville to the mouth of Broad Run is currently Impaired in the fish consumption category because fish tissue (site FT-3) collected in this segment exceeded the state criterion of 0.4 µg of methylmercury per gram of fish tissue. All seven large mouth bass collected in this segment exceeded this criterion. There is also statewide consumption advice for mercury in fish tissue that is applied to waters east and south of I-85.

2004 Recommendations
Contamination of fish tissue with mercury is a regional issue. Refer to page 90 for more information on plans to address mercury.

5.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

5.5.1 Grindle Creek [AU# 28-100]

Current Status and 2004 Recommendations
Grindle Creek (14.2 miles) is currently Supporting because of a Good-Fair bioclassification at site B-3 in 2002. Grindle Creek was channelized and habitat quality was poor at sites F-3 and B-3. The watershed upstream of Whichard Branch has large areas with extensive agricultural ditching. There was noted high diversity in the fish community at site F-3 though the site was Not Rated.

DWQ will continue to monitor water quality in Grindle Creek. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Grindle Creek watershed. DWQ will continue to develop criteria to assign bioclassifications for coastal plain fish communities.

5.5.2 Whichard Branch [AU# 28-100-2]

Current Status and 2004 Recommendations
Whichard Branch (6.6 miles) is currently Supporting because of a Moderate Stress bioclassification at site B-4 in 2002. Whichard Creek had sparse instream habitat and no pools. Streambank erosion was also noted at site B-4. Whichard Branch watershed has some areas with extensive agricultural ditching, though not as much as the Grindle Creek watershed.

DWQ will continue to monitor water quality in Whichard Branch. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Whichard Branch watershed.

5.5.3 Parker Creek [AU# 28-95]

Current Status and 2004 Recommendations
Parker Creek (7.3 miles) is Not Rated because site F-1 could not be rated, as criteria for assigning bioclassifications to fish community samples have not been fully developed for coastal plain streams (page 73). Parker Creek drains parts of northern Greenville and had a low habitat score with high conductivity noted at site F-1. There were also elevated numbers of tolerant macroinvertebrate species, indicating water quality impacts.

DWQ will continue to monitor water quality in Parker Creek. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Parker Creek watershed. DWQ will continue to develop criteria to assign bioclassifications for coastal plain fish communities.

5.5.4 Green Mill Run [AU# 28-96]

Current Status and 2004 Recommendations
The current use support rating of Green Mill Run is No Data. Green Mill Run has never been monitored by DWQ; however, EEP (page 168) has a planned project in this local watershed. This is one of 27 local watersheds in the Tar-Pamlico River basin that has been identified by EEP as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of EEP restoration projects.

5.6 Additional Water Quality Issues within Subbasin 03-03-05

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.

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

Many streams in the subbasin have noted impacts from 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 81 for more information on this issue.

Section B - Chapter 6
Tar-Pamlico River Subbasin 03-03-06
Tranters Creek, Flat Swamp and Latham Creek

6.1 Subbasin Overview

Subbasin 03-03-06 at a Glance

Land and Water Area

Total area:	242.7 mi^2
Land area:	242.5 mi^2
Water area:	0.2 mi^2

Population Statistics

2000 Est. Pop.:	20,560people
Pop. Density:	85 persons/mi^2

Land Cover (percent)

Forest/Wetland:	63.5
Surface Water:	0.3
Urban:	0.6
Cultivated Crop:	31.9
Pasture/ Managed Herbaceous:	3.7

Counties

Beaufort, Martin and Pitt

Municipalities

Gold Point and Everetts

There has been little population growth in this subbasin, and the subbasin is expected to remain mostly rural. The predominant land cover is forest and wetland with extensive cultivated cropland as well.

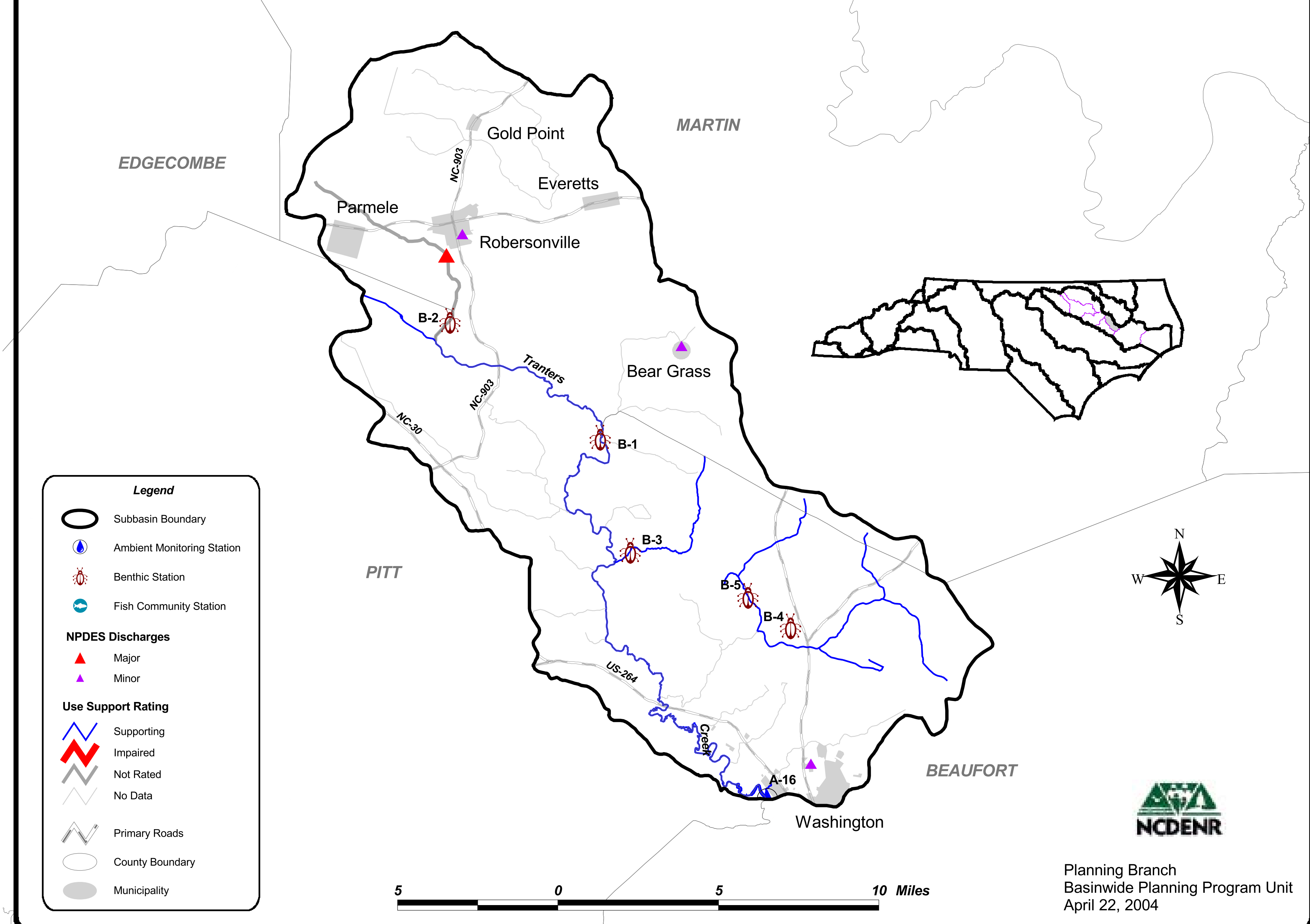
There are three individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 2.1 MGD (Figure B-6). The largest is Robersonville WWTP (1.8 MGD). There are also five general NPDES wastewater permits, one individual NPDES stormwater permit, and six general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also four registered animal operations in this subbasin.

There were five benthic macroinvertebrate community samples (Figure B-6 and Table B-11) collected in 2002 as part of basinwide monitoring. All five sites were monitored for the first time during this assessment period. Data were collected from one ambient monitoring station as well.

Refer to *2003 Tar-Pamlico 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 for all waters in subbasin 03-03-06 are summarized in Part 6.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 6.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 6.4 below. Waters with noted water quality impacts are discussed in Part 6.5 below. Water quality issues related to the entire subbasin are discussed in Part 6.6. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

Figure B-6 Tar-Pamlico River Subbasin 03-03-06



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table B-11 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-06

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
Tranters Creek	28-103b	C Sw NSW	0.9 mi	AL	B-1 MS--02	A-16 nce		S	ST
Tranters Creek	28-103a	C Sw NSW	37.8 mi	REC		A-16 nce		S	N/A
Flat Swamp	28-103-2b	C Sw NSW	1.5 mi	AL	B-2 MS--02			S	ST
Horsepen Swamp	28-103-10	C Sw NSW	6.0 mi	AL	B-3 MS--02			S	ST
Old Ford Swamp	28-103-14-1	C Sw NSW	5.1 mi	AL	B-4 N--02			S	ST
Latham Creek	28-103-14-2	C Sw NSW	2.7 mi	AL	B-5 N--02			S	ST

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

6.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-06 in the aquatic life, recreation and fish consumption categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 54.0 stream miles (35 percent) monitored during this assessment period in the aquatic life category. There were no Impaired waters in this category. Refer to Table B-12 for a summary of use support ratings by category for waters in the subbasin 03-03-06.

Table B-12 Summary of Use Support Ratings by Category in Subbasin 03-03-06

Use Support Rating	Aquatic Life	Fish Consumption	Recreation
Monitored Waters			
Supporting	54.0 mi	0	37.8 mi
Impaired	0	0	0
Not Rated	0	0	0
Total	**54.0 mi**	**0**	**37.8 mi**
Unmonitored Waters			
Supporting	12.4 mi	0	0
Impaired	0	154.3 mi	0
Not Rated	8.1 mi	0	0
No Data	79.9 mi	0	116.5 mi
Total	**100.4 mi**	**154.3 mi**	**116.5 mi**
Totals			
All Waters	**154.3 mi**	**154.3 mi**	**154.3 mi**

6.3 Status and Recommendations of Previously Impaired Waters

There were no Impaired streams identified in the 1999 basin plan in this subbasin.

6.4 Status and Recommendations of Newly Impaired Waters

There are no newly Impaired waters in subbasin 03-03-06. Refer to Part 6.5 below for information on waters with noted water quality impacts.

6.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

6.5.1 Flat Swamp [AU# 28-103-2b]

Current Status and 2004 Recommendations

Flat Swamp (1.5 miles) is currently Supporting from downstream of the Robersonville WWTP to Tranters Creek because of a Moderate Stress bioclassification at site B-2 in 2002. The upper segment is currently Not Rated, although observations suggest that water quality conditions are more degraded closer to the discharge. The biological community suggested organic overloading and toxic conditions in Flat Swamp. Macroinvertebrate species tolerant of pollutants were found, and the stream was channelized. High turbidity, conductivity and low dissolved oxygen levels were noted at site B-2. The Robersonville WWTP had three whole effluent toxicity test failures during the last two years of the assessment period.

DWQ will continue to monitor water quality in Flat Swamp to assess changes in water quality that may be associated with upgrades in treatment at the Robersonville WWTP. DWQ will work with Robersonville to ensure that the discharge has minimum impact to aquatic life in Flat Swamp.

6.5.2 Tranters Creek [AU# 28-103a]

Current Status and 2004 Recommendations

Tranters Creek (37.8 miles) is currently Supporting from the source to the subbasin boundary because of a Moderate Stress bioclassification at site B-1 in 2002. Total phosphorus was elevated at site A-16 as well. The depressed biological community may be associated with drought conditions. The lower portion of the creek is influenced by saltwater during extremely low flow.

DWQ will continue to monitor water quality in Tranters Creek to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities and possibly the Roberson WWTP. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Tranters Creek watershed.

6.5.3 Horsepen Swamp [AU# 28-103-10]

Current Status and 2004 Recommendations

Horsepen Swamp (37.8 miles) is currently Supporting from the source to the subbasin boundary because of a Moderate Stress bioclassification at site B-3 in 2002. The depressed biological community may be associated with drought conditions.

DWQ will continue to monitor water quality in Horsepen Swamp to determine if the cause of the depressed biological community is from extreme meteorological events or land use activities. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Horsepen Swamp watershed.

6.6 Additional Water Quality Issues within Subbasin 03-03-06

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 81.

Section B - Chapter 7
Tar-Pamlico River Subbasin 03-03-07
Pamlico River, Pungo River and Pantego Creek

7.1 Subbasin Overview

Subbasin 03-03-07 at a Glance

Land and Water Area
Total area: 1,190.0 mi²
Land area: 997.4 mi²
Water area: 192.6 mi²

Population Statistics
2000 Est. Pop.: 44,232 people
Pop. Density: 44 persons/mi²

Land Cover (percent)
Forest/Wetland: 55.5
Surface Water: 17.5
Urban: 0.5
Cultivated Crop: 25.5
Pasture/
Managed Herbaceous: 1.0

Counties
Beaufort, Craven, Hyde, Pamlico, Tyrrell and Washington

Municipalities
Washington, Belhaven, Bath and Aurora

There has been little population growth in this subbasin, although there has been growth along the north shore of the Pamlico River. Washington is the largest town in the subbasin. The predominant land cover is forest and wetland with extensive cultivated cropland as well.

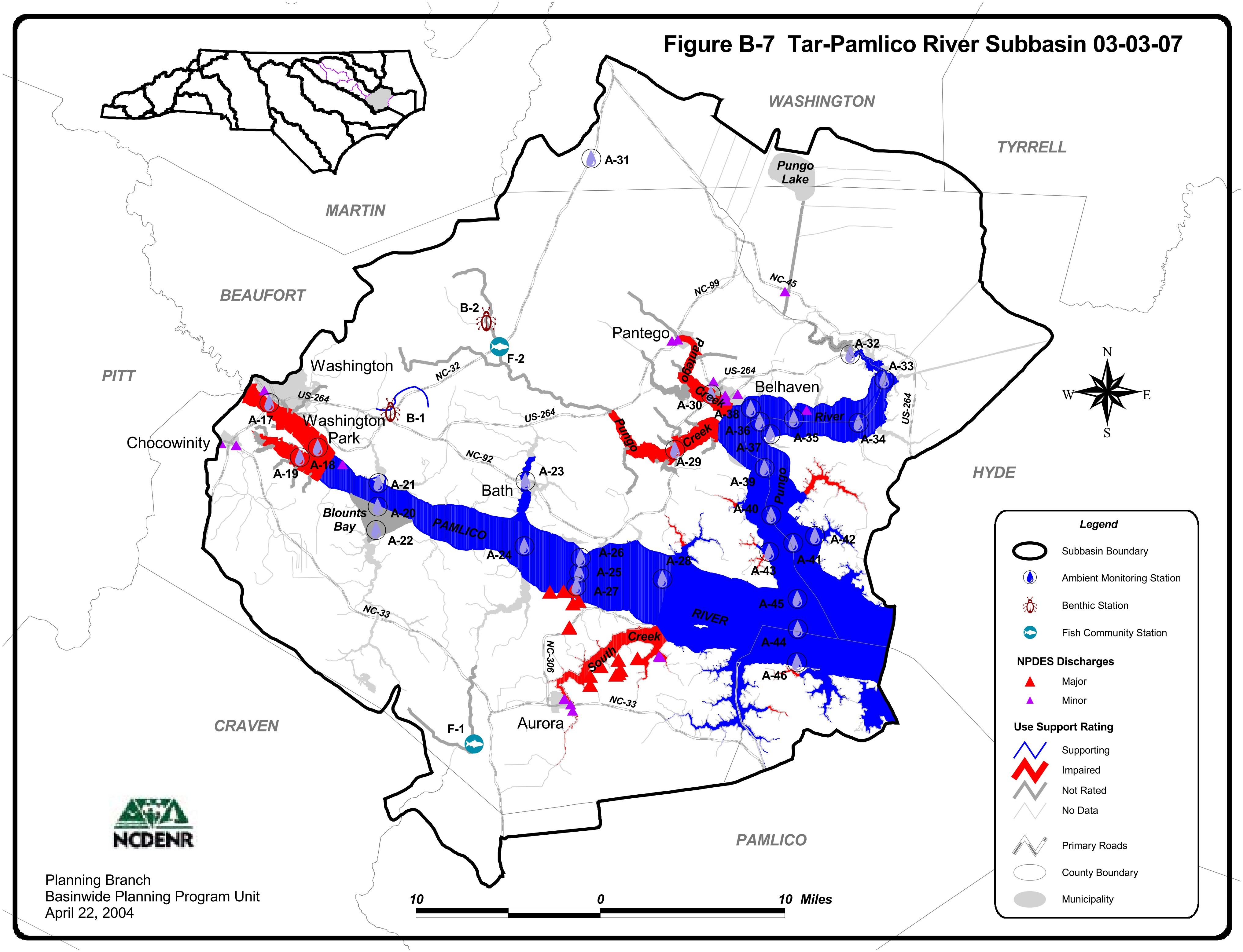
There are 20 individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 7.5 MGD (Figure B-7). The largest is Washington WWTP (3.2 MGD). There are also 11 general NPDES wastewater permits, one individual NPDES stormwater permit, and 20 general NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders.

Washington will have to submit a model stormwater ordinance as required by the Tar-Pamlico NSW strategy (page 75) stormwater rules. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also 18 registered animal operations in this subbasin.

There were two benthic macroinvertebrate community samples and two fish community samples (Figure B-7 and Table B-13) collected in 2002 as part of basinwide monitoring. Two sites remained the same and two sites were monitored for the first time during the assessment period. Data were collected from 30 ambient monitoring stations as well. DEH samples at 13 swimming areas and six shellfish growing areas.

Refer to *2003 Tar-Pamlico 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 Tar-Pamlico River Subbasin 03-03-07



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table B-13 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-07

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
Kennedy Creek	28-104	C NSW	32.0 ac	AL		A-17 ce	P-1	I	PS
PAMLICO RIVER	29-(1)	SC NSW	739.5 ac	AL		A-17 ce	P-1	I	PS
Rodman Creek	29-4-(2)	SC NSW	19.1 ac	AL		A-17 ce	P-1	I	PS
PAMLICO RIVER	29-(5)a	SB NSW	1,765.6 ac	AL		A-18 ce		I	PS
PAMLICO RIVER	29-(5)b	SB NSW	28,452.2 ac	AL		A-21 nce A-24 to A-28 nce	P-3 P-4	S	ST
Chocowinity Bay	29-6-(1)	SC NSW	389.6 ac	AL		A-19 nce		I	PS
Chocowinity Bay	29-6-(5)	SB NSW	503.2 ac	AL		A-19 nce		I	PS
Blounts Bay (inside a line from Hill Point to Mauls Point)	29-9	SB NSW	2,101.2 ac	AL		A-20 nce A-22 nce	P-2	NR	ST
Beaverdam Swamp	29-10-2	C NSW	4.3 mi.	AL	B-1 MS--02			S	ST
Bath Creek	29-19-(5.5)	SB NSW	861.2 ac	AL		A-23 nce		S	ST
Durham Creek	29-21-(1)	C NSW	9.9 mi.	AL	F-1 NR--02			NR	NR
PAMLICO RIVER	29-(27)	SA NSW	33,766.4 ac	AL		A-44 to A-46 nce		S	ST
Pungo River	29-34-(5)	SC NSW	253.1 ac	AL		A-32 nce		NR	ST
Pungo River	29-34-(12)a	SB NSW	15,409.8 ac	AL		A-33 to A-39 nce		S	ST
Pungo River	29-34-(12)b	SB NSW	2.8 ac	AL		A-38 nce		S	ST
Pantego Creek	29-34-34-(2)	SC NSW	952.4 ac	AL		A-30 nce		I	ST
Pungo Creek	29-34-35	SC NSW	1,701.6 ac	AL		A-29 nce		I	ST
Acre Swamp	29-34-35-1-1	C Sw NSW	7.5 mi.	AL	B-2 NR--02 F-2 NR--02			NR	ST
Pungo River	29-34-(38)	SA NSW	10,367.8 ac	AL		A-40 to A-43 nce		S	ST
PAMLICO RIVER	29-(5)a	SB NSW	1,765.6 ac	REC		A-18 nce	DEH nce	S	N/A
PAMLICO RIVER	29-(5)b	SB NSW	28,452.2 ac	REC		A-21 nce A-24 to A-28 nce	DEH nce	S	N/A

Table B-13 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-07 (continued)

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
Chocowinity Bay	29-6-(5)	SB NSW	503.2 ac	REC		A-19 nce		S	N/A
Blounts Bay (inside a line from Hill Point to Mauls Point)	29-9	SB NSW	2,101.2 ac	REC		A-20 nce A-22 nce	DEH nce	S	N/A
Broad Creek	29-10-(3)	SB NSW	368.1 ac	REC			DEH nce	S	N/A
Little Goose Creek	29-11-(2)	SC NSW	141.2 ac	REC			DEH nce	S	N/A
Bath Creek	29-19-(5.5)	SB NSW	861.2 ac	REC		A-23 nce	DEH nce	S	N/A
PAMLICO RIVER	29-(27)	SA NSW	33,766.4 ac	REC		A-44 to A-46 nce		S	N/A
Pungo River	29-34-(12)a	SB NSW	15,409.8 ac	REC		A-33 to A-39 nce		S	N/A
Pungo River	29-34-(12)b	SB NSW	2.8 ac	REC			DEH ce	I	N/A
Pantego Creek	29-34-34-(2)	SC NSW	952.4 ac	REC		A-30 nce		S	N/A
Pungo Creek	29-34-35	SC NSW	1,701.6 ac	REC		A-29 nce		S	N/A
Pungo River	29-34-(38)	SA NSW	10,367.8 ac	REC		A-40 to A-43 nce		S	N/A
See Appendix III	122 segments	SA NSW	51,801.2 ac	SH			DEH nce	S	N/A
See Appendix III	41 segments	SA NSW	5,111.3 ac	SH			DEH ce	I	N/A

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
FT - Fish Tissue Site
P - Phytoplankton Monitoring Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

Use support ratings for all waters in subbasin 03-03-07 are summarized in Part 7.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 7.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 7.4 below. 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. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

7.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 03-03-07 in the aquatic life, recreation, fish consumption and shellfish harvesting categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this use category to basins east and south of I-85 (page 90).

There were 21.7 stream miles (7 percent), 369.9 freshwater acres (13 percent), and 97,285.4 estuarine acres (84 percent) monitored during this assessment period in the aquatic life category. There were 369.9 freshwater acres and 6,070.9 estuarine acres Impaired in this category. There were also 2.8 estuarine acres Impaired in the recreation category and 5,111.3 estuarine acres Impaired in the shellfish harvesting category. Refer to Table B-14 for a summary of use support ratings for waters in subbasin 03-03-07.

Table B-14 Summary of Use Support Ratings by Use Category in Subbasin 03-03-07

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Shellfish Harvesting
Monitored Waters				
Supporting	4.3 mi 88,860.2 Est ac	0	97,130.2 Est ac	51,801.2 Est ac
Impaired	369.9 fw ac 6,070.9 Est ac	0	2.8 Est ac	5,111.3 Est ac
Not Rated	17.4 mi 2,354.2 Est ac	0	0	0
Total	**21.7 mi 369.9 fw ac 97,285.4 Est ac**	**0**	**97,133.0 Est ac**	**56,912.5 Est ac**
Unmonitored Waters				
Supporting	0	0	0	0
Impaired	0	327.8 mi 3,155.5 fw ac 114,805.0 Est ac	0	0
Not Rated	35.4 mi 690.4 Est ac	0	0	0
No Data	270.7 mi 2,785.6 fw ac 16,829.2 Est ac	0	327.8 mi 3,155.5 fw ac 17,672.0 Est ac	0
Total	**306.2 mi 2,785.6 fw ac 17,519.6 Est ac**	**327.8 mi 3,155.5 fw ac 114,805.0 Est ac**	**327.8 mi 3,155.5 fw ac 17,672.0 Est ac**	**0**
Totals				
All Waters	**327.8 mi 3,155.5 fw ac 114,805.0 Est ac**	**327.8 mi 3,155.5 fw ac 114,805.0 Est ac**	**327.8 mi 3,155.5 fw ac 114,805.0 Est ac**	**56,912.5 Est ac**

fw = freshwater Est ac = estuarine acres

7.3 Status and Recommendations of Previously Impaired Waters

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

7.3.1 Tar River [AU# 28-(102.5)]
Pamlico River [AU# 29-(1) and (5)a]
Chocowinity Bay [AU# 29-6-(1) and (5)]
Kennedy Creek [AU# 28-104]
Rodman Creek [AU# 29-4-(2)]

1999 Recommendations

It was recommended that efforts continue to reduce nitrogen loads to this portion of the estuary from both point and nonpoint sources of pollution.

Current Status

Tar River (338 acres), Pamlico River (2,505.1 acres), Chocowinity Bay (891.8 acres), Kennedy Creek (32 acres) and Rodman Creek (19.1 acres) are currently Impaired because the chlorophyll *a* criterion was exceeded in 17 percent of samples collected at site A-19 during the assessment period. ECU research also indicated high levels of chlorophyll *a* in the Pamlico River near Washington.

Algae were also monitored during February, June through September, and November 1998-2002. Algal blooms and fish kills were also investigated along the river throughout each year. Effects from hurricanes and droughts were apparent as algal concentrations fluctuated over time and were most noticeable at site A-20. Post-hurricane flushing events during summer 1998 and from September 1999 through spring 2000 prevented algae from remaining in the river for long periods of time, so algal concentrations decreased. This trend was especially noticeable after Hurricane Floyd when algal concentrations were much lower than usual from late 1999 to early 2000. When the region began to experience droughts during 2000-2002, low rainfall reduced flow rates which allowed algae to remain in the river and absorb nutrients.

During 2001, algal concentrations increased. However, the prolonged lack of rainfall by 2002 likely suppressed new nutrients from entering the river because algal concentrations decreased during 2002. Species community composition was similar among the four sites and dinoflagellates (unicellular flagellates) and diatoms (unicellular or chain-forming species encased in silica) were often prevalent. The most upstream station, site A-17, usually had the lowest algal concentrations in comparison to the other sites, but was the only site to experience an algal bloom mid-way through the 2001-2002 drought. Site A-20 had the highest number of recorded blooms along the river. This may have been due to its location near a bay, which possibly had longer retention times than the downstream mid-channel sites. Algal concentrations decreased downstream at sites A-24 and A-28.

A TMDL for this segment has been approved by EPA to help address nutrient overloading into these waters (page 61). The Tar-Pamlico River basin NSW strategy (page 61) has also been developed to address these water quality problems.

2004 Recommendations

DWQ will continue to monitor nutrient loading into this portion of the Tar-Pamlico estuary to assess the success of implementation of the Tar-Pamlico River basin NSW strategy. Because of the complex nature of the estuarine waters, longer periods of data collection and monitoring of management strategies will be needed before water quality goals are met. Algal monitoring in and around the Pamlico River will also continue during the next five years.

7.3.2 Impaired Class SA Waters

Portions of Class SA waters were partially supporting in the 1999 basin plan because they were classified as prohibited to shellfish harvesting by DEH SS. No specific recommendations were made to address bacterial contamination in these waters in the 1999 basin plan. Because of changes in use support methodology, there are changes in the acreages and areas that are Impaired in the shellfish harvesting category. These waters are discussed below in Part 7.4.4.

7.4 Status and Recommendations of Newly Impaired Waters

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

7.4.1 Pungo River [AU# 29-34-(12)b]

Current Status
Pungo River (2.8 acres) is currently Impaired in the recreation category because DEH Recreational Water Quality Monitoring had posted swimming advisories for greater than 61 days of the assessment period. The Town of Belhaven has experienced sanitary sewer overflows (SSOs) during the assessment period as well as exceeding fecal coliform bacteria permit limits at the WWTP. Although swimming advisories were posted in only one area near Belhaven, other areas may also have periodically high bacteria levels.

2004 Recommendations
DEH will continue to monitor this area and post advisories when needed. DWQ and DEH are continuing to work to develop better methods of identifying the extent of water quality problems near swimming areas to assure that these areas are monitored and to identify possible sources of contamination. DWQ will also work with Belhaven to reduce SSO frequency and improve reporting of SSOs. Belhaven has been assessed for fecal coliform violations at the outfall.

7.4.2 Pungo Creek [AU# 29-34-35]

Current Status
Pungo Creek (1,701.6 acres) is currently Impaired because the chlorophyll *a* criterion was exceeded in 17.6 percent of samples collected at site A-29 during the assessment period. There were also indications of swamp waters influence, as the pH was lower at this site. The Pungo Creek watershed has an extensive ditch network that drains large agricultural areas.

2004 Recommendations

DWQ will continue to implement the Tar-Pamlico River basin NSW strategy to reduce nutrient loading into Pungo Creek that may be causing algal blooms that result in exceedances of the chlorophyll *a* standard.

7.4.3 Pantego Creek [AU# 29-34-34-(2)]

Current Status

Pantego Creek (952.4 acres) is currently Impaired because the chlorophyll *a* criterion was exceeded in 23.5 percent of samples collected at site A-30 during the assessment period. There were also indications of swamp waters influence, as the pH was lower at this site. The Pantego Creek watershed has an extensive ditch network that drains large agricultural areas. Pantego Creek also receives wastewater from a few small discharges in the watershed.

2004 Recommendations

DWQ will continue to implement the Tar-Pamlico River basin NSW strategy to reduce nutrient loading into Pantego Creek that may be causing algal blooms that exceed the chlorophyll *a* criterion.

7.4.4 Impaired Shellfish Harvesting Waters (Class SA)

Current Status

The following groups of waters are Impaired in the shellfish harvesting category. The current status is discussed briefly for each below. Recommendations are presented at the end of this section for all the Impaired waters. Refer to Appendix III for descriptions of the specific assessment units areas.

South Creek and Tributaries [AU# 29-28]

South Creek and tributaries (3,674 acres) were Not Rated in 1999, but are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). South Creek and tributaries are part of DEH shellfish growing area G-12.

North Creek and Garrett Gut [AU# 29-29]

North Creek (162 acres) and Garrett Gut (7.9 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). North Creek is on the north shore of the Pamlico River (DEH area G-1). DEH sanitary surveys indicate good clam production in G-1, with no oyster production.

Eastham Creek and Tributaries [AU# 29-33-3]

Eastham Creek and tributaries (65.3 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Eastham Creek and tributaries are part of DEH shellfish growing area G-1. Eastham Creek is a tributary to Goose Creek in the southern portion of DEH area G-1. DEH sanitary surveys indicate good clam production in G-1, with no oyster production.

Slade Creek and Tributaries [AU# 29-34-40]

Slade Creek and tributaries (759.3 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Slade Creek and tributaries are part of DEH shellfish growing area G-8. DEH sanitary surveys indicate good clam production in G-8, with poor oyster production.

Jordan Creek [AU# 29-34-41a]
Jordan Creek (90 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Jordan Creek is part of DEH shellfish growing area G-8. DEH sanitary surveys indicate good clam production in G-8, with poor oyster production.

Oyster Creek and Tributaries [AU# 29-35]
Oyster Creek and tributaries (133.8 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Oyster Creek and tributaries are part of DEH shellfish growing area G-2. DEH sanitary surveys indicate good clam production in G-2, with no oyster production.

2004 Recommendations
DEH SS will continue to monitor bacterial water quality. DWQ, DEH and DCM are currently developing tools to better track water quality changes, make use support assessments, and support research in shellfish harvesting waters of North Carolina. The North Carolina Coastal Nonpoint Source Program (page 176) is developing a series of programs to help local governments address bacterial contamination in coastal waters. DWQ is also cooperating with DCM to assure that water quality problems identified in basinwide water quality plans are considered in development local land use plans in coastal counties.

7.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

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

7.5.1 Acre Swamp [AU# 29-34-35-1-1]

Current Status and 2002 Recommendations
Acre Swamp (7.5 miles) is currently Not Rated because sites F-2 and B-2 could not be assigned bioclassifications. Criteria for assigning bioclassifications to fish community samples have not been developed for coastal plain streams (page 73). The very low pH at site B-2 precluded

assigning a bioclassification to the benthic community. The stream is heavily channelized, has eroding streambanks, no riparian zone and little instream habitat.

DWQ will continue to monitor Acre Swamp to assess changes in the biological community that might be related to land disturbance activities. Water quality should be considered during land-disturbing activities, and BMPs should be implemented to minimize or prevent future impacts to water quality in the Acre Swamp watershed. DWQ will continue to develop criteria to assign bioclassifications for coastal plain fish communities.

7.5.2 Beaver Dam Swamp [AU# 29-10-2]

Current Status and 2004 Recommendations
Beaver Dam Swamp (4.3 miles) is currently Supporting because of a Moderate Stress bioclassification at site B-1 in 2002. The stream was channelized and habitat conditions are not ideal, although the stream appears to be recovering.

DWQ will continue to monitor water quality in Beaver Dam Swamp. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in Beaver Dam Swamp watershed.

7.5.3 Blounts Bay [AU# 29-9]

Current Status and 2004 Recommendations
Blounts Bay (2,101.2 acres) is currently Not Rated in the aquatic life category because chlorophyll *a* data at sites A-20 and A-22 were not conclusive. Chlorophyll *a* was above 40 µg/l in 8 percent of samples at site A-20 and 25 percent of samples at site A-22. Only four samples were collected at site A-22, which did not meet the minimum of ten needed to assign a use support rating. Six fish kills lasting between one and three days have been investigated in Blounts Bay since 1999. The largest was over 86,000 fish in 1999 near Core Point. In two fish kills, the suspected cause was low dissolved oxygen levels.

DEH monitors one swimming area in Blounts Bay, and no swimming advisories were posted during the assessment period. Therefore, Blounts Bay is Supporting in the recreation category.

DWQ and DEH will continue to monitor water quality in Blounts Bay. DWQ will continue implementation of the Tar-Pamlico NSW strategy (page 61) to address nutrient overloading that may be stimulating algal blooms that exceed the chlorophyll *a* criterion.

7.6 Additional Water Quality Issues within Subbasin 03-03-07

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 81.

Section B - Chapter 8
Tar-Pamlico River Subbasin 03-03-08
Pamlico Sound, Lake Mattamuskett and Swanquarter Bay

8.1 Subbasin Overview

Subbasin 03-03-08 at a Glance

Land and Water Area

Total area:	1,220.0 mi^2
Land area:	356.1 mi^2
Water area:	863.9 mi^2

Population Statistics

2000 Est. Pop.:	9,053 people
Pop. Density:	25 persons/mi^2

Land Cover (percent)

Forest/Wetland:	21.3
Surface Water:	71.0
Urban:	0.2
Cultivated Crop:	7.3
Pasture/ Managed Herbaceous:	0.2

Counties

Carteret, Dare, Hyde and Pamlico

Municipalities

Swanquarter and Englehard

With the exception of the Outer Banks, this subbasin is one of the most rural on the coast. Lake Mattamuskeet and the Swanquarter National Wildlife Refuges also cover large areas in this subbasin. The predominant land cover is forest and wetland with some cultivated cropland.

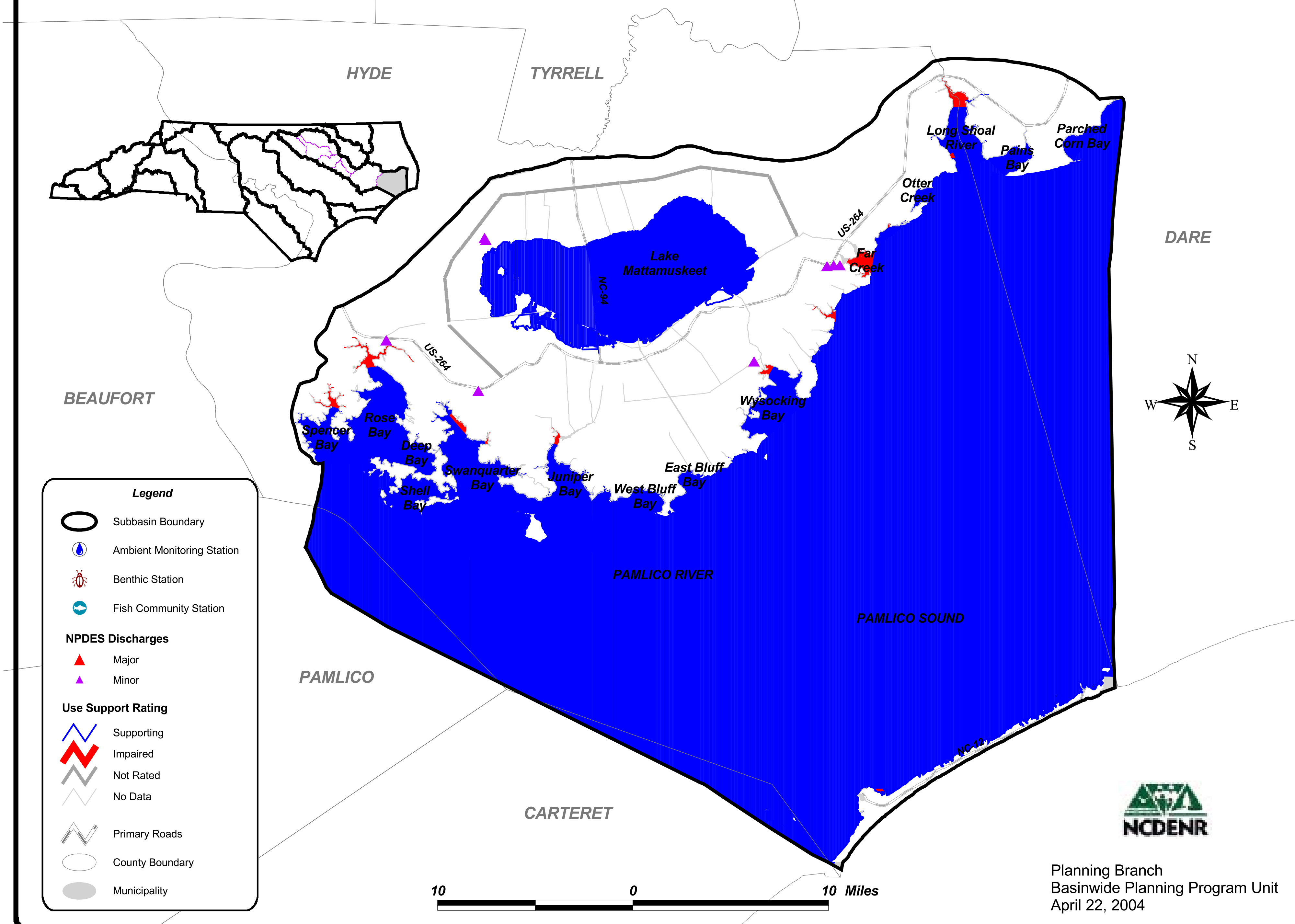
There are seven NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.58 MGD (Figure B-8). There is also one general NPDES stormwater permit in the subbasin. Refer to Appendix I for identification and more information on individual NPDES permit holders. Significant issues related to compliance with NPDES permit conditions are discussed below. There are also four registered animal operations in this subbasin.

Fish tissue data have been from the Atlantic Ocean in this subbasin. DEH monitors four swimming areas and five shellfish growing areas in the basin as well (Figure B-8 and Table B-15).

Refer to *2003 Tar-Pamlico 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 for all waters in subbasin 03-03-08 are summarized in Part 8.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 8.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 8.4 below. Waters with noted water quality impacts are discussed in Part 8.5 below. Water quality issues related to the entire subbasin are discussed in Part 8.6. Refer to Appendix III for a complete list of monitored waters and more information on Supporting monitored waters.

Figure B-8 Tar-Pamlico River Subbasin 03-03-08



Planning Branch
Basinwide Planning Program Unit
April 22, 2004

Table B-15 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 03-03-08

Waterbody	Assessment Unit Number	DWQ Classification	Length/ Area	Category	Data Type with Map Number and Data Results			Use Support Rating	
					Biological	Ambient	Other	2004	1998
Pamlico Sound Swanquarter Bay/Juniper Bay ORW Area, including the Northeast Swanquarter Bay Area	29-46.5	SA ORW	11,670.0 ac	AL		A-44 to A-46 nce		S	
Lake Mattamuskeet	29-57-1-1	SC	40,314.1 ac	AL			L-1 nce	S	
Swanquarter Bay	29-49a	SA ORW	136.2 ac	REC			DEH nce	S	
Atlantic Ocean	99-(6)	SB	17.3 mi	FC				I	
See Appendix III	89 segments	SA	505621.5 ac	SH			DEH nce	S	
See Appendix III	23 segments	SA	2404.6 mi	SH			DEH ce	I	

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

Use Categories:
AL - Aquatic Life
REC - Recreation
FC - Fish Consumption

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site
L - Lakes Assessment
FT - Fish Tissue Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
N - Natural
MS - Moderate Stress
SS - Severe Stress

Ambient Data
nce - no criteria exceeded
ce - criteria exceeded

Use Support Ratings 2004:
S - Supporting, I - Impaired, NR - Not Rated

Use Support Ratings 1998:
FS - fully supporting, ST - supporting but threatened,
PS - partially supporting, NS - not supporting,
NR - not rated, N/A - not applicable

8.2 Use Support Assessment Rating Summary

Use support ratings were assigned for waters in subbasin 03-03-08 in the aquatic life, recreation, fish consumption and shellfish harvesting categories. All waters are Impaired on an evaluated basis in the fish consumption category because of statewide fish consumption advice for mercury that is applied in this category to basins east and south of I-85 (page 90). Also, 17.3 Atlantic coastline miles are Impaired in the fish consumption category based on fish tissue monitoring data.

There were 509,926.1 estuarine acres (93 percent) monitored during this assessment period in the aquatic life category. There were no Impaired acres in the aquatic life category. There are 2,404.6 estuarine acres Impaired in the shellfish harvesting category. Refer to Table B-16 for a summary of use support ratings for waters in the subbasin 03-03-08.

Table B-16 Summary of Use Support Ratings by Category in Subbasin 03-03-08

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Shellfish Harvesting
Monitored Waters				
Supporting	509,926.1 Est ac	0	136.2 Est ac	505,621.5 Est ac
Impaired	0	17.3 coastline mi	0	2,404.6 Est ac
Not Rated	0	0	0	0
Total	**509,926.1 Est ac**	**17.3 coastline mi**	**136.2 Est ac**	**508,026.1 Est ac**
Unmonitored Waters				
Supporting	77.0 Est ac	0	0	0
Impaired	0	71.3 mi 548,788.2 Est ac	0	0
Not Rated	28.5 mi	0	0	0
No Data	42.7 mi 38,785.1 Est ac 17.3 coastline mi	0	**71.3 mi 548,652.0 Est ac 17.3 coastline mi**	0
Total	**71.3 mi 38,862.2 Est ac 17.3 coastline mi**	**71.3 mi 548,788.2 Est ac**	**71.3 mi 548,652.0 Est ac 17.3 coastline mi**	**0**
Totals				
All Waters	**71.3 mi 548,788.2 Est ac 17.3 coastline mi**	**71.3 mi 548,788.2 Est ac 17.3 coastline mi**	**71.3 mi 548,788.2 Est ac 17.3 coastline mi**	**508,026.1 Est ac**

8.3 Status and Recommendations of Previously Impaired Waters

8.3.1 Impaired Class SA Waters

Portions of Class SA waters were partially supporting in the 1999 basin plan because they were classified as prohibited to shellfish harvesting by DEH SS. No specific recommendations were made to address bacterial contamination in these waters in the 1999 basin plan. Because of changes in use support methodology, there are changes in the acreages and areas that are Impaired in the shellfish harvesting use category. These waters are discussed below in Part 8.4.2.

8.4 Status and Recommendations of Newly Impaired Waters

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

8.4.1 Atlantic Ocean [AU# 99-(6)]

Current Status and 2002 Recommendations

The Atlantic Ocean (17.3 coastline miles) is currently Impaired in the fish consumption category because there is a statewide consumption advice for mercury in fish tissue that is applied to waters east and south of I-85, including the Atlantic Ocean where king mackerel fish tissue was analyzed in 1999.

8.4.2 Impaired Shellfish Harvesting Waters (Class SA)

Current Status

The following groups of waters are Impaired in the shellfish harvesting category. The current status is discussed briefly for each below. Recommendations are presented at the end of this section for all the Impaired waters. Refer to Appendix III for descriptions of the specific assessment units areas.

Pamlico River [AU# 29-(40.5) b, c, d and e]

Portions of the Pamlico River (759.3 acres) adjacent to Middle Town, Long and Far Creeks near Ocracoke are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Middle Town Creek and Far Creek are part of DEH shellfish growing area G-5. The Long Creek area is part of DEH shellfish growing area G-3. The Ocracoke area is part of DEH shellfish growing area G-6. DEH sanitary surveys indicate fair clam and oyster production in G-6, and good oyster production in G-5 and G-3.

Rose Bay [AU# 29-44a] and Rose Bay Creek [AU# 29-44-1]
Rose Bay and Rose Bay Creek (472.3 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). These segments are part of DEH shellfish growing area G-3. DEH sanitary surveys indicate good oyster production in G-3, with no clam production.

Germantown Bay and Tributaries [AU# 29-42-1a]
Germantown Bay and tributaries (241.6 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Germantown Bay and tributaries are part of DEH shellfish growing area G-3. DEH sanitary surveys indicate good oyster production in G-3, with no clam production.

Swanquarter Bay [AU# 29-49a]
Swanquarter Bay and tributaries (171.5 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Swanquarter Bay and tributaries are part of DEH shellfish growing area G-3. DEH sanitary surveys indicate good oyster production in G-3, with no clam production.

Juniper Bay [AU# 29-52a]
Juniper Bay and tributaries (86.0 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Juniper Bay and tributaries are part of DEH shellfish growing area G-4. DEH sanitary surveys indicate fair oyster production in G-4, with no clam production.

Wysocking Bay [AU# 29-60a]
Wysocking Bay (126.3 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Wysocking Bay is part of DEH shellfish growing area G-4. DEH sanitary surveys indicate fair oyster production in G-4, with no clam production.

Middle Town Creek [AU# 29-66]
Middle Town Creek (71.5 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Middle Town Creek is part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

Cedar Creek [AU# 29-67]
Cedar Creek (12.1 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Cedar Creek is part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

Lone Tree Creek [AU# 29-69]
Lone Tree Creek (1.8 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Lone Tree Creek is part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

Far Creek and Tributaries [AU# 29-70-(4)]
Far Creek and tributaries (545.8 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Far Creek and tributaries are part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

Berrys Bay [AU# 29-71a]
Berrys Bay (1.8 acres) is currently Impaired because this area is prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Berrys Bay is part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

Long Shoal River [AU# 29-73-(2) a and c]
Long Shoal River and tributaries (455 acres) are currently Impaired because these areas are prohibited or permanently closed to shellfish harvesting by DEH SS (page 51). Long Shoal River and tributaries are part of DEH shellfish growing area G-5. DEH sanitary surveys indicate good oyster production in G-5, with no clam production.

2004 Recommendations
DEH SS will continue to monitor bacterial water quality. DWQ, DEH, DCM are currently developing tools to better track water quality changes, make use support assessments, and support research in shellfish harvesting waters of North Carolina. The North Carolina Coastal Nonpoint Source Program (page 176) is developing a series of programs to help local governments address bacterial contamination in coastal waters. DWQ is also cooperating with DCM to assure that water quality problems identified in basinwide water quality plans are considered in development of local land use plans in coastal counties.

8.5 Status and Recommendations for Waters with Noted Impacts

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

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns have been documented for these waters based on this assessment. While these waters are not Impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

8.5.1 Lake Mattamuskeet [AU# 29-57-1-1]

Current Status and 2004 Recommendations
Lake Mattamuskeet (40,314 acres) is currently Supporting in the aquatic life category based on lakes monitoring data at site L-1. Both nitrogen and turbidity were elevated during monitoring

in 2002. Lake levels were low during the drought and bottom material may have been mixed readily into the water column.

DWQ will continue to monitor water quality in Lake Mattamuskeet. Land-disturbing activities should implement BMPs to minimize or prevent future impacts to water quality in the Lake Mattamuskeet watershed.

8.5.2 Boundary Canal [AU# 29-70-5-2-1]

Current Status and 2004 Recommendations
Boundary Canal (28.5 miles) is currently Not Rated in the aquatic life category because of six whole effluent toxicity failures at the Hyde County-Fairfield water treatment plant during the last two years of the assessment period.

DWQ is working with Hyde County to minimize potential impacts to aquatic life that may be caused by the discharge.

8.6 Additional Water Quality Issues within Subbasin 03-03-08

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.

8.6.1 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 81.

Section C

Current and Future Water Quality Initiatives

Section C - Chapter 1
Current Water Quality Initiatives

1.1 Workshop and Public Meeting Summaries

In March and April 2003, there were four workshops held by DWQ in the Tar-Pamlico River basin at Louisburg, Nashville, Greenville and Washington. There were 167 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.

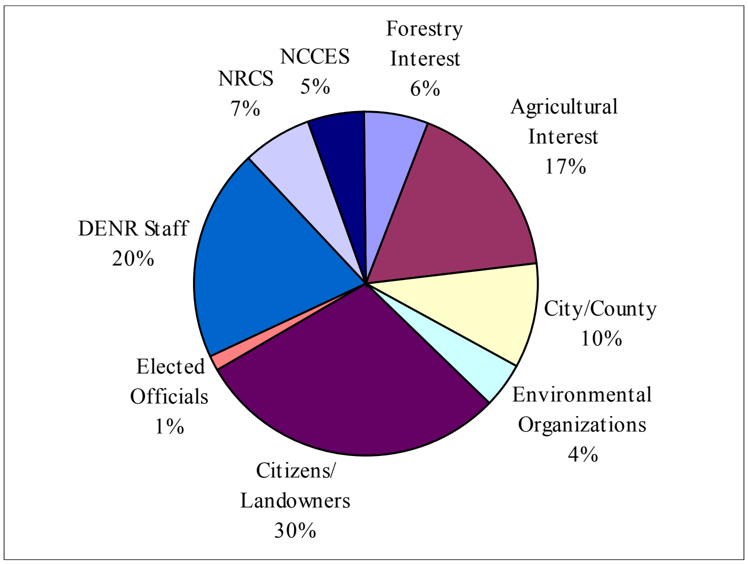


Figure C-1 Percent of Total Attendance by Various Interests at DWQ Water Quality Workshops in the Tar-Pamlico River Basin (2003)

DWQ staff gave presentations about general water quality in the Tar-Pamlico 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 Tar-Pamlico 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 Identified at Workshops

The most important issues identified by workshop participants were related to development. Increasing development was a concern identified in the upper basin in Franklin County. There were also concerns that NSW rules were not being enforced. 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.

Important Issues Identified Through Public Meetings

In December 2003, there were four public meetings held by DWQ in the Tar-Pamlico River basin at Louisburg, Nashville, Greenville and Washington. There were 73 people in attendance representing a variety of interests. Concerns were expressed over the cost of BMP implementation, implementation of the buffer rules, and DOT construction activities. There were also concerns that agriculture related water quality issues were difficult to find in the basin plan. A single summary section was added to condense some of this information.

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 (see Table C-1). 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 21 projects in the Tar-Pamlico River basin that have been funded (federal Section 319 money must be matched with nonfederal dollars) through the Section 319 Program between 1997 and 2002.

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.

Descriptions of the projects listed below and other Section 319 Program information are available online 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	Description
1997	Outdoor Education Center	Franklin SWCD	General Educational
1997	Tar-Pam Coordinator	DSWC	Agriculture Staffing
1998	Tar-Pam Coordinator	DSWC	Agriculture Staffing
1998	Decision Making for TP SW Rules	NCSU	Urban Stormwater Facilitation
1998	Model Local Stormwater Program	NSCU	Urban Stormwater Facilitation
1999	Tar-Pam Coordinator	DSWC	General Staffing
1999	Cover Crop Establishment Project	Nash SWCD	Agriculture Innovative BMP Demonstration
1999	Nutrient Management Project – Teaching How to Write NMP	Beaufort SWCD	Agriculture Education and BMP installation
2000	Tar-Pam Coordinator	DSWC	Agriculture Staffing
2000	Delineating Ag in Tar-Pamlico River Basin	NCSU Soil Science	Agriculture BMP Modeling
2001	Tar-Pamlico Coordinator	DSWC	Agriculture Staffing
2001	Tar-Pamlico TMDL Technical Support for TMDL Implementation	DSWC	TMDL Staffing
2002	Tar-Pamlico Coordinator	DSWC	Agriculture Staffing
2002	Effects of Drainage Ditches and Roads on Watershed Ecology Hydrology, and Water Quality within the Emily and Richardson Pryer-Buckridge Coastal Reserve	DCM and NCSU	Wetlands and Hydrologic Modification and Wetlands Enhancement
2002	NPS Land Use Data Collection and Inventory Development	DSWC	Agriculture Mapping/GIS
2002	Delineating Ag in Tar-Pamlico River Basin	NCSU Soil Science	Agriculture BMP Modeling
2002	Tar-Pamlico Technical Assistance - Agricultural Nutrient Reduction	DSWC & DWQ	Agriculture Staffing
2002	Small Watershed Monitoring for Effectiveness of Tar-Pamlico and Neuse Agriculture Rules	DSWC & DWQ	Urban Stormwater Monitoring
2003	Tar-Pam Coordinator	DSWC	General Staffing
2003	Retrofitting Stormwater BMPS in the Neuse and Tar-Pamlico River Basins	NCSU	Urban Stormwater BMP Demonstration
2003	Tar-Pamlico Ag BMP Implementation	DSWC	Agriculture TMDL Implementation

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 Tar-Pamlico 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 the North Carolina Department of Environment and Natural Resources (NCDENR) and the US Environmental Protection Agency (EPA) in cooperation with the Virginia Department of Conservation and Recreation (DCR). This unique program 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 a regional council in each of the five major river basins within the Albemarle-Pamlico watershed. The purpose for establishing the regional councils was to engage the public in the implementation of CCMP management actions, and in 1995, an Executive Order was issued by the Governor of North Carolina calling for their creation.

The APNEP is administered by program staff located in Raleigh, Washington and Greenville, NC and Suffolk, Virginia. Staff work closely with the EPA to implement the many objectives and key management actions contained in the Comprehensive Conservation and Management Plan.

Tar-Pamlico River Basin Regional Council

The river basin 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 group. The council is charged with identifying and implementing a demonstration project that utilizes innovative or unique management strategies to address a priority watershed problem. The council provides a forum for public involvement in the APNEP.

For more information regarding the Albemarle-Pamlico National Estuary Program, the Tar-Pamlico River Basin Regional Council, or the Comprehensive Conservation and Management Plan, visit the website at http://www.apnep.org.

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 1997 to 2003, $5,797,748 was provided for projects in counties wholly or partially in the Tar-Pamlico River basin. The projects affected over 116,000 acres (NCDENR-DSWC, October 2003, personal communication).

Soil and Water Conservation District contacts for the Tar-Pamlico 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.

Agricultural Sediment Initiative

In 2000, the NC Association of Soil and Water Conservation Districts and the NC Soil and Water Conservation Commission initiated an effort to assess stream channels and watersheds of streams on the state's 2000 303(d) list due to sediment where agriculture was included as a potential source. The primary objective of the Agricultural Sediment Initiative is to evaluate 303(d) listed waters in order to assess the severity of sedimentation associated with agricultural activities within the watershed and to develop local strategies for addressing sedimentation both in stream and in the watershed. The initiative involved 47 Impaired stream segments in 34 counties and 11 river basins.

In 2001, the Soil and Water Conservation Commission allocated $1 million of Agriculture Cost Share Funds to 17 soil and water conservation districts to implement agricultural BMPs in selected watersheds of Impaired streams. This funding was complemented by funds from the Clean Water Management Trust Fund ($1 million for agricultural BMPs in the Haw River and Ararat River watersheds in Alamance and Surry counties) and the EPA Section 319 Program ($367,900 for agricultural BMPs in six soil and water conservation districts).

Table C-2 summarizes the results of Agricultural Sediment Surveys for three watersheds in three counties in the Tar-Pamlico River basin. District staff requested approximately $161,000 for restoration and protection work in the Chicod Creek watershed.

Table C-2 Summary of Agricultural Sediment Initiative Surveys

Stream	County	Problems Identified	Funds Requested by District
Chicod Creek	Pitt	• Streambank erosion • Development causing increased stormwater runoff	$161,000
Fishing Creek	Granville	Assessment not yet completed	

Stony Creek	Nash	Assessment not yet completed	

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 Tar-Pamlico 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 email at mike.street@ncmail.net. You may also visit the DMF website at http://www.ncfisheries.net/habitat/chpp1.htm.

1.3.4 Ecosystem Enhancement Program

In July 2003, the NC Wetlands Restoration Program was officially merged with compensatory mitigation resources of the NCDOT to become the Ecosystem Enhancement Program (EEP). EEP is administered as a new program area within NCDENR and has essentially replaced the WRP. EEP's central mission includes the same goals of the former WRP. The Memorandum of Agreement of July 2003 between NCDENR, NCDOT and the Army Corps of Engineers further stipulates that EEP mitigation projects will be: 1) provided in advance of the permitted NCDOT impacts; 2) designed to address functional replacement of stream, buffer and wetlands impacts; and 3) identified and implemented within the context of a watershed approach based on multiple scales of planning.

The EEP planning approach will continue to include the development of *Watershed Restoration Plans* on a basinwide scale, GIS-based screening analyses of 8-digit cataloguing units (CUs), and local watershed planning (LWP) initiatives applied at the scale of 14-digit hydrologic units (HUs) and component subwatersheds. A new *Planning Guide* will be prepared in 2004 to describe the updated EEP approach to watershed restoration planning at these various scales, including the selection of *Targeted Local Watersheds*, which will continue to play a key role in our program's watershed restoration strategies.

EEP 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 EEP 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 EEP 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 EEP resources can be most efficiently focused for maximum restoration benefit. The EEP Watershed Restoration Plans are updated every five years 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 EEP restoration project sites. However, these targeted HUs are given higher priority than nontargeted HUs in considering the selection of EEP 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 EEP can perform restoration projects cooperatively with other state or federal programs or environmental groups. For example, the EEP'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 and habitat benefits of the project. The EEP actively seeks landowners within the Tar-Pamlico River basin that have restorable wetland, riparian and stream sites.

For more information about the EEP 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-3 below lists the EEP's Targeted Local Watersheds [stream names and 14-digit HU codes] in the Tar-Pamlico 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, EEP 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.

The EEP 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 and habitat improvements and other environmental benefits to local watersheds. The EEP 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 EEP planning process for the Basinwide Watershed Restoration Plans.

The plans 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 the local watershed. There is currently one local watershed planning effort underway in the Tar-Pamlico River basin and it is described below.

<u>Tar-Pamlico Local Watershed Plan</u>

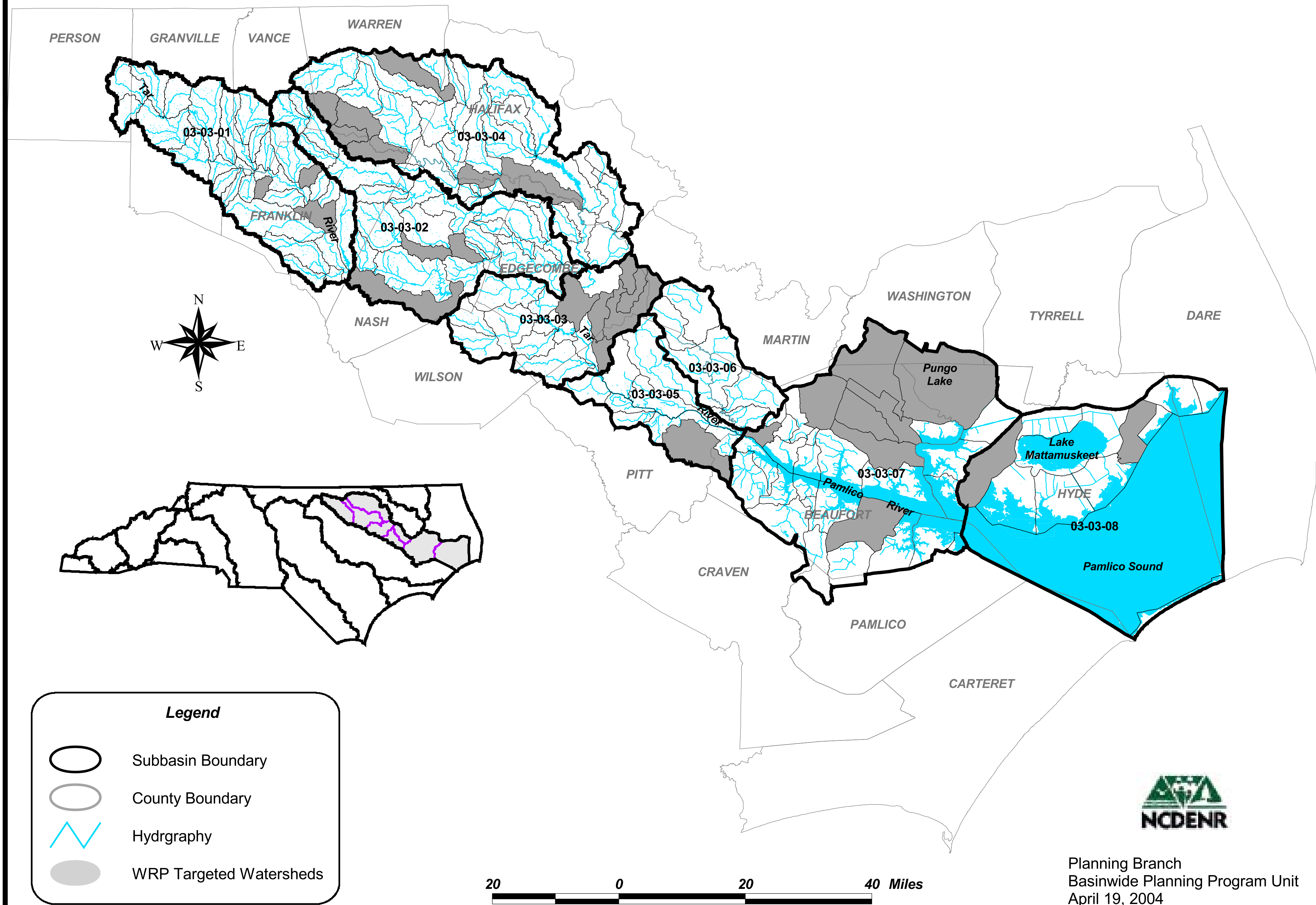
The EEP initiated a Local Watershed Planning effort in August 2003 to identify watershed functional deficits and assets with an emphasis on water quality, aquatic and terrestrial habitat, and hydrology within the Tar-Pamlico watershed. The watershed area encompasses Hendricks Creek; Crisp Creek, a tributary of Conetoe Creek; Greens Mill Run; and Cow Swamp, a major tributary of Chicod Creek; as well as the towns of Princeville and Tarboro and the City of Greenville. The end result of this planning effort will yield wetland, stream and riparian buffer enhancement and restoration projects, best management practice projects, as well as some policy and protection recommendations. Several of the creeks and streams within this area are classified as Nutrient Sensitive Waters; and thus, restoration and functional rehabilitation efforts are likely to be focused on this key degradation issue. The technical assessment for this effort will be completed in 2004, and the Local Watershed Plan will be completed in 2005.

Table C-3 Ecosystem Enhancement Program Targeted Local Watersheds (2004)

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Local Resource Professional Recommendation
03-03-01	03020101040020 Billys Creek	No	No	No	No	No	Yes EEP	
03-03-01	03020101040060 Bear Swamp Creek	No	No	No	No	No	Yes EEP	
03-03-01	03020101040070 Wolfpen Branch	No	No	No	No	No	Yes EEP	
03-03-02	03020101000020 Stony Creek	Yes	No	No	No	No	No	
03-03-02	03020101000040 Stony Creek	Yes	No	No	No	No	No	
03-03-02	03020101080020 Tar River Reservoir	No	Yes	No	No	No	No	
03-03-03	03020103050010 Conetoe Creek	Yes	No	No	No	No	Yes EEP	
03-03-03	03020103050020 Conetoe Creek	Yes	No	No	No	No	Yes EEP	
03-03-03	03020103050030 Conetoe Creek	Yes	No	No	No	No	Yes EEP	
03-03-03	03020103050040 Conetoe Creek	Yes	No	No	No	No	Yes EEP	
03-03-03	03020103050050 Conetoe Creek	Yes	No	No	No	No	Yes EEP	
03-03-03	03020103010020 Hendricks Creek	No	No	No	No	No	Yes EEP	
03-03-04	03020102010010 Shocco Creek	No	No	No	No	Yes	No	Yes
03-03-04	03020102010020 Shocco Creek	No	No	No	No	Yes	No	Yes

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Public Water Supply	SA Waters	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Local Resource Professional Recommendation
03-03-04	03020102010030 Little Shocco	No	No	No	No	Yes	No	Yes
03-03-04	03020102010040 Shocco Creek	No	No	No	No	Yes	No	Yes
03-03-04	03020102030030 Little Fishing Creek	No	No	No	No	Yes	No	Yes
03-03-04	03020102040010 Fishing Creek	No	No	No	No	Yes	No	Yes
03-03-05	03020103080010 Chicod Creek	Yes	No	No	No	No	Yes SWCD	No
03-03-07	03020104020020 Kennedy Creek	Yes	No	No	No	No	No	No
03-03-07	03020104060020 South Creek	Yes	No	Yes	No	No	No	No
03-03-07	03020104110010 Upper Pungo Creek	Yes	No	No	No	No	No	No
03-03-07	03020104110020 Lower Pungo Creek	Yes	No	Yes	No	No	No	No
03-03-07	03020104010010 Middle Pantego Creek	Yes	No	Yes	No	No	No	No
03-03-07	03020104010020 Lower Pantego Creek	Yes	No	Yes	No	No	No	No
03-03-07	03020104080010 Upper Pantego River	No	No	No	No	No	No	No
03-03-07	03020104090010 Pungo River	No	No	No	No	No	No	No
03-03-08	03020105070010 Waupopin Creek	Yes	No	Yes	Yes	No	No	No
03-03-08	03020105030010 Germantown Bay	Yes	No	Yes	Yes	No	No	No

Figure C-2 EEP Targeted Watersheds Map of the Tar-Pamlico River Basin



Planning Branch
Basinwide Planning Program Unit
April 19, 2004

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 Tar-Pamlico River basin, 20 projects have been funded for a total of $16,911,235 (Table C-4). For more information on the CWMTF or these grants, call (252) 830-3222 or visit the website at www.cwmtf.net.

Table C-4 Projects in the Tar-Pamlico River Basin Funded by the Clean Water Management Trust Fund (as of 6/03)

Project Number	Application Name	Proposed Project Description	Amount Funded
1997B-501	Bethel – Sewer Rehabilitation	Rehabilitate Bethel's existing wastewater collection system in order to reduce groundwater and rainwater inflow and infiltration into the sanitary sewer system.	$1,531,000
2001B-009	Greenville – Acquisition & Greenway / Tar River and Town Creek	Acquire through fee simple purchase 1.1 acres along one side of the Tar River and Town Creek. Land to become part of an existing greenway system.	$74,000
1997A-018	Grimesland – Wastewater Collection System	Eliminate failing septic systems in Grimesland (230 users – residential, commercial and one school) adjacent to Chicod Creek. CWMTF to provide 15 percent of funds to establish community sewer collection system (30,000 LF) to deliver waste to Greenville WTTP.	$425,000
2001B-012	Louisburg – Acquisition & Greenway / Joyner Town Park / Tar River	Acquire 50 acres through fee simple purchase along the Tar River. Incorporate property into existing greenway system.	$252,000
1999A-704	Mid-East RC&D – Stormwater and Restoration and BMPs / Mill Creek	Construct instream wetland, install water control structures, acquire buffers, and monitor above and below project. Education also.	$333,535
2002A-506	Nash-Rocky Mount Schools – Wastewater Reuse	Eliminate Southern Nash Middle School's discharge, combine with discharge from the Boys and Girls Club and land apply. Includes donation of a permanent conservation easement and greenway trail on 37.5 riparian acres.	$408,000
2000A-007	Nature Conservancy – Acquisition / Fishing Creek	Acquire through fee simple purchase (105 acres) and a permanent conservation easement (100 acres) 201 acres along Fishing Creek.	$210,000
2002A-022	NC Coastal Land Trust – Acquisition / Smith Creek	Acquire 261 acres through fee simple purchase along Smith Creek. CWMTF would fund purchase of 58 percent of the tract.	$313,000
1999A-004	NC Coastal Land Trust – Otter Creek and Tar River Acquisition	Acquire through fee simple purchase 136 acres of riparian buffer along Otter Creek and the Tar River. Total protected acreage of 285 acres includes donated permanent conservation easements on an additional 149	$258,000

		acres.	
2001A-014	NC Coastal Land Trust – Springers Point / Ocracoke Island Acquisition	Acquire through fee simple purchase 31 acres along Pamlico Sound and Old Slough on Ocracoke Island.	$2,016,000
2000A-012	NC Wildlife Resources Commission – Acquisition / Shocco Creek and Maple Branch	Acquire through fee simple purchase 1,623 acres along Shocco Creek. CWMTF funds to acquire the 468 acres of riparian buffers.	$1,132,000
2001A-021	NC Wildlife Resources Commission – Goose Creek Acquisition	Acquire through fee simple purchase 303 acres (Windsong Tract) along Smith, Campbell and Carrie Creeks.	$1,045,000
1999A-006	NC Wildlife Resources Commission – Hyde Co Acquisition / Pamlico Sound and Alligator River	Acquire two tracts through fee simple purchase totaling 8,848 acres along Pamlico Sound and Lake Mattamuskeet.	$2,710,000
1999B-012	NC Wildlife Resources Commission – Van Swamp Tract Acquisition	Acquire through fee simple purchase 5,784 acres along Van Swamp.	$1,172,700
1997B-011	Pamlico -Tar River Foundation – Restor / Local Outreach / Swift and Fishing Creek	Educate landowners on buffers and restoration. Restore Gupton property ($8,000) on Sandy/Swift Creeks with water control, moving streamside road, and planting buffer.	$27,000
1997A-010	Rocky Mount – Acquisition / Tar River	Acquire a buffer strip of approximately 412 acres along 8.5 miles of the Tar River between the Tar River Reservoir and the Sunset Avenue Water Treatment Plant.	$200,000
2000A-516	Scotland Neck – Sewer Rehabilitation	Rehabilitate Scotland Neck's existing wastewater collection system (8,000 LF) and repair 19 manholes in order to reduce groundwater and rainwater inflow and infiltration into the sanitary sewer system.	$430,000
2001A-507	Scotland Neck – WWTP Improvements	Replace obsolete and failing components of the wastewater treatment plant (WWTP) including: refurbishment of an in-plant pump station, repair of the grit removal auger, and renovation of one clarifier.	$100,000
2001A-508	Spring Hope – Sewer Rehabilitation	Replace 2,179 linear feet of a partially collapsed sewer line in Spring Hope.	$201,000
1998B-706	Washington – Constructed Wetlands / Pamlico River	Make major modifications to stormwater management system to cease direct discharges, and reroute stormwater through a grassed swale into a created wetlands for treatment of one third of city's drainage. Replace road with greenway.	$4,073,000
		Total Funded	$16,911,235

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, citizen's 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. For more information on Stream Watch, call (919) 715-5433 or visit the website at 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 Source Program (CNPSP). 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 (first five items) and that provide tools to address the various sources of nonpoint pollution (last item):

- *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 program is called the Coastal Nonpoint Pollution Control Program and is administered jointly by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA). Within North Carolina, the state program is administered by the Division of Water Quality (DWQ) and the Division of Coastal Management (DCM) and is referred to as the Coastal Nonpoint Source Program. The state program currently has one full time permanent staff person and one temporary employee, both located in the Nonpoint Source Planning Unit of DWQ.

The 56 Management Measures are defined in Section 6217(g)(5) of CZARA as: "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through application of the best available nonpoint pollution control practices technologies, processes, siting criteria, operating methods or other alternatives." Detailed descriptions of the management measures, where they are intended to be applied, their effectiveness, and their costs can be found in EPA's *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* at the following website: http://www.epa.gov/owow/nps/MMGI/.

North Carolina received approval from NOAA and EPA for its state program on August 13, 2003. To receive this approval, North Carolina had to identify that we have enforceable policies and mechanisms for the 56 Management Measures and establish our program boundary. We are now required to develop a strategy to ensure all applicable Management Measures to protect and restore water quality are implemented within 15 years.

North Carolina is relying on existing authorities and programs and proposed projects to meet federal requirements, but it may become apparent in the future that additional Management Measures and new regulations are needed to address significant sources of nonpoint sources. If a need arises for new or modified regulations, they would be proposed under existing agency frameworks.

The core of the state's CNPSP is increased communication and coordination between DWQ and key state agencies that have regulatory responsibilities for controlling nonpoint sources of pollution. This increased dialogue is facilitated in part by the state's CNPSP Coordinator and promotes identification of gaps, duplications, inadequacies and/or inefficiencies of existing programs and policies. Responsibilities of the state program coordinator also include developing the 15-year Strategy Plan, serving as a liaison between DWQ and DCM, and participating in the development of nonpoint source outreach and educational activities. For more information, contact the NC Coastal Nonpoint Source Program Coordinator at (919) 733-5083, ext. 567 or gloria.putnam@ncmail.net.

1.3.8 North Carolina Flood Plain Mapping Program

The State of North Carolina, through the Federal Emergency Management Agency's (FEMA's) Cooperating Technical Partnership initiative, has been designated as the first Cooperating Technical State (CTS). As a CTS, the state will assume primary ownership and responsibility of the National Flood Insurance Program (NFIP). Flood Insurance Rate Maps (FIRMs) for North Carolina CTS Flood Mapping Program will include conducting flood hazard analyses and producing updated, digital FIRMs. For more specific information on the Tar-Pamlico River basin efforts, visit the website at http://www.ncfloodmaps.com/pubdocs/Final_Basin_Plan_TarPamlico.pdf.

1.4 Regional Initiatives

1.4.1 Tar River Land Conservancy and Upper Tar River Collaboration

The Tar River Land Conservancy (TRLC) was founded in 2000 as a 501c(3), and its mission is to preserve the natural and cultural resources of the Tar River basin by working in partnership with private landowners, businesses, public agencies and others to protect rural landscapes and riparian corridors. Its governing board of directors represents a diverse cross-section of landowners, government agencies, business people and industry from across the watershed. TRLC maintains an office at 211 N. Main Street in Louisburg and works primarily in the following counties: Edgecombe, Franklin, Granville, Halifax, Nash, Person, Vance and Warren.

Since inception, TRLC has protected over 1,500 acres of land, with a goal for the next five years to protect 5,000 acres more.

TRLC focuses its land protection work along riparian corridors in Swift Creek, Fishing Creek and the headwaters of the Tar River (that portion of the Tar River West of Highway 85). TRLC concentrates on these areas in order to protect aquatic biodiversity and preserve open space. TRLC's efforts are guided by Riparian Corridor Conservation Plans for Swift Creek and Fishing Creek subbasins; these plans identify priority tracts for both restoration and preservation and are catalogued in an extensive GIS database. TRLC is working on the plan for the Tar River headwaters section that will be completed by late 2003. Land protection is accomplished primarily in the form of conservation easements with private landowners.

Tar River Land Conservancy serves as the coordinating entity for the Upper Tar River Collaboration, a group of individuals who have a strong interest in protecting the Tar River and its natural resources. Collaborators include US Fish and Wildlife Service, NC Wildlife Resources Commission, The Nature Conservancy, NC Department of Environment and Natural Resources, NC Natural Heritage Program, Natural Resource Conservation Service, NC Division of Forest Resources, county representatives, the Council of Governments, Conservation Reserve Enhancement Program, Department of Transportation and other individuals. The group works to address resource needs in the Upper Tar River through information sharing, collaboration on grants and future planning needs, and partnerships on land protection projects. Results from the collaboration include funding by the US Fish and Wildlife Service Private Stewardship Program for an incentive project to fence cattle out of Fishing Creek and Swift Creek. For more information, visit the website at http://www.tarriver.org/.

1.4.2 Pamlico Tar River Foundation

The Pamlico Tar River Foundation was founded in 1981. It is a private, nonprofit organization dedicated to protecting, preserving and promoting the environmental quality of the Tar-Pamlico River and its watershed. PTRF is a grassroots organization, supported by nearly 1,400 citizen members -- "River Givers". PTRF achieves its mission through education, advocacy and research. Starting in 2003, the foundation started sponsoring the Tar-Pamlico Riverkeeper®. For more information or to get involved, visit the website at http://www.ptrf.org/ or contact the Riverkeeper at riverkeeper@ptrf.org.

1.4.3 Tar-Pamlico Basin Association

A coalition of 16 point source dischargers called the Tar-Pamlico Basin Association (Association), comprising approximately 93 percent of permitted point source flows, agreed to a collective annual, incrementally decreasing, combined nitrogen and phosphorus loading cap. If they exceeded their cap, they would pay a per-kg offset fee to fund agricultural nutrient best management practices (BMPs) to be targeted within the basin under the state's Agriculture Cost Share Program. See also page 61 for further information. The Association is forming a monitoring coalition (page 85).

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Appendix I

NPDES Dischargers
and
Individual Stormwater Permits
in the
Tar-Pamlico River Basin

NPDES Dischargers for the Tar-Pamlico River Basin (as of March 3, 2003)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0020231	Town of Louisburg	Louisburg Town / WWTP	Franklin	Raleigh	Municipal , Large	Major	1.37	03-03-01	Tar River
NC0002852	Town of Franklinton	Franklinton WTP	Franklin	Raleigh	Water Plants and Water Conditioning	Minor	Not Limited	03-03-01	Taylors Creek
NC0042269	Town of Bunn	Bunn WWTP	Franklin	Raleigh	Municipal , < 1MGD	Minor	0.15	03-03-01	Crooked Creek
NC0042510	Total Environmental Solutions	Lake Royale WWTP	Franklin	Raleigh	100% Domestic < 1MGD	Minor	0.08	03-03-01	Cypress Creek
NC0069311	Franklin County	Franklin County WWTP	Franklin	Raleigh	Municipal , Large	Major	3.0	03-03-01	Cedar Creek
NC0043109	Granville County Board of Education	Wilton Elementary School WWTP	Granville	Raleigh	100% Domestic < 1MGD	Minor	0.0053	03-03-01	Tar River
NC0025054	City of Oxford	City of Oxford WWTP	Granville	Raleigh	Municipal , Large	Major	2.17	03-03-01	Fishing Creek
NC0047279	C&J Bradshaw LLC	Heritage Meadows WWTP	Granville	Raleigh	100% Domestic < 1MGD	Minor	0.01	03-03-01	North Fork Tar River
NC0029131	Kittrell Job Corps Center	Kittrell Job Corps Center	Vance	Raleigh	100% Domestic < 1MGD	Minor	0.025	03-03-01	Long Creek
NC0048631	Interstate Property Management, Inc.	Long Creek Court WWTP	Vance	Raleigh	100% Domestic < 1MGD	Minor	0.007	03-03-01	Long Creek
NC0084697	Phillips Petroleum	Amoco Fabrics & Fibers site	Edgecombe	Raleigh	Groundwater Remediation	Minor	Not Limited	03-03-02	Tar River
NC0050415	Edgecombe County Schools	Phillips Middle School	Edgecombe	Raleigh	100% Domestic < 1MGD	Minor	0.01	03-03-02	Moccasin Creek
NC0050431	Edgecombe County Schools	North Edgecombe High School	Edgecombe	Raleigh	100% Domestic < 1MGD	Minor	0.02	03-03-02	Swift Creek
NC0077437	Cogentrix Energy Inc	Battleboro Cogen plant	Edgecombe	Raleigh	Industrial Process & Commercial	Minor	0.904	03-03-02	Tar River
NC0030317	City of Rocky Mount	Tar River Regional WWTP	Edgecombe	Raleigh	Municipal , Large	Major	21.0	03-03-02	Tar River
NC0020061	Town of Spring Hope	Spring Hope WWTP	Nash	Raleigh	Municipal , < 1MGD	Minor	0.4	03-03-02	Tar River
NC0079227	Schlage Lock Company	Nash remediation site	Nash	Raleigh	Groundwater Remediation	Minor	0.124	03-03-02	Beech Branch
NC0037885	Nash/Rocky Mount Schools	Southern Nash Junior High School	Nash	Raleigh	100% Domestic < 1MGD	Minor	0.015	03-03-02	Tar River
NC0072125	City of Rocky Mount	Tar River WTP	Nash	Raleigh	Water Plants and Water Conditioning	Minor	Not Limited	03-03-02	Tar River
NC0072133	City of Rocky Mount	Sunset Avenue WTP	Nash	Raleigh	Water Plants and Water Conditioning	Minor	Not Limited	03-03-02	Tar River
NC0001589	Abbott Laboratories	Abbott Laboratories - RM 1	Nash	Raleigh	Industrial Process & Commercial	Minor	Not Limited	03-03-02	Beech Branch
NC0083038	Saint-Gobain Containers	Saint-Gobain Containers	Vance	Raleigh	Industrial Process & Commercial	Minor	0.5	03-03-02	Martin Creek
NC0020605	Town of Tarboro	Tarboro WWTP	Edgecombe	Raleigh	Municipal , Large	Major	5.0	03-03-03	Tar River
NC0020435	Town of Pinetops	Pinetops WWTP	Edgecombe	Raleigh	Municipal , < 1MGD	Minor	0.3	03-03-03	Town Creek
NC0050661	Town of Macclesfield	Macclesfield Town - WWTP	Edgecombe	Raleigh	Municipal , < 1MGD	Minor	0.175	03-03-03	Bynums Mill Creek
NC0001503	CSX Transportation	CSX Transportation	Edgecombe	Raleigh	Industrial Process & Commercial	Minor	0.1	03-03-03	Little Cokey Swamp
NC0061514	Town of Bethel	Bethel WWTP	Pitt	Washington	Municipal , < 1MGD	Minor	0.75	03-03-03	Conetoe Creek

NPDES Dischargers for the Tar-Pamlico River Basin (as of March 3, 2003)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0023337	Town of Scotland Neck	Scotland Neck WWTP	Halifax	Raleigh	Municipal , < 1MGD	Minor	0.675	03-03-04	Canal Creek
NC0025691	Town of Littleton	Littleton WWTP	Halifax	Raleigh	Municipal , < 1MGD	Minor	0.28	03-03-04	Butterwood Creek
NC0025402	Town of Enfield	Enfield WWTP	Halifax	Raleigh	Municipal , < 1MGD	Minor	1.0	03-03-04	Fishing Creek
NC0084034	Town of Enfield	Enfield WTP	Halifax	Raleigh	Water Plants and Water Conditioning	Minor	Not Limited	03-03-04	Fishing Creek
NC0038580	Halifax County Schools	Eastman Middle School WWTP	Halifax	Raleigh	100% Domestic < 1MGD	Minor	0.0048	03-03-04	Little Fishing Creek
NC0038610	Halifax County Schools	Pittman Elementary School WWTP	Halifax	Raleigh	100% Domestic < 1MGD	Minor	0.0096	03-03-04	Burnt Coat Swamp
NC0038644	Halifax County Schools	Dawson Elementary School WWTP	Halifax	Raleigh	100% Domestic < 1MGD	Minor	0.0073	03-03-04	Deep Creek
NC0020834	Town of Warrenton	Warrenton WWTP	Warren	Raleigh	Municipal , Large	Major	2.0	03-03-04	Fishing Creek
NC0023931	Greenville Utilities Commission	GUC WWTP	Pitt	Washington	Municipal , Large	Major	17.5	03-03-05	Tar River
NC0082139	Greenville Utilities Commission	Greenville WTP	Pitt	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-05	Tar River
NC0001058	Catalytica Pharmaceuticals	Catalytica Pharmaceuticals	Pitt	Washington	Industrial Process & Commercial	Minor	Not Limited	03-03-05	Parker Creek
NC0026042	Town of Robersonville	Robersonville WWTP	Martin	Washington	Municipal , Large	Major	1.8	03-03-06	Flat Swamp
NC0037231	Martin County Schools	Bear Grass Elementary School WWTP	Martin	Washington	100% Domestic < 1MGD	Minor	0.005	03-03-06	Turkey Swamp
NC0051195	Gibbs, Roebuck & Smith LLC	Gibbs, Roebuck & Smith LLC	Martin	Washington	Industrial Process & Commercial	Minor	0.3	03-03-06	Flat Swamp
NC0036919	Town of Pantego	Pantego WWTP	Beaufort	Washington	100% Domestic < 1MGD	Minor	0.006	03-03-07	Pantego Creek
NC0083216	Town of Chocowinity	Hughes Street WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	Maple Branch
NC0083224	Town of Chocowinity	Edgewood Drive WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	Maple Branch
NC0087041	Town of Chocowinity	Hill Road WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	Chocowinity Bay
NC0002925	Town of Belhaven	Mill Street WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	Pantego Creek
NC0026492	Town of Belhaven	Belhaven WWTP	Beaufort	Washington	Municipal , < 1MGD	Minor	1.0	03-03-07	Battalina Creek
NC0086584	Town of Belhaven	Belhaven WTP #2	Beaufort	Washington	Water Plants and Water Conditioning	Minor	0.22	03-03-07	Pantego Creek
NC0021521	Town of Aurora	Aurora WWTP	Beaufort	Washington	Municipal , < 1MGD	Minor	0.12	03-03-07	South Creek
NC0046647	Sea Safari Ltd	Sea Safari Limited	Beaufort	Washington	Industrial Process & Commercial	Minor	0.088	03-03-07	Pantego Creek
NC0003255	PCS Phosphate Co Inc	PCS Phosphate Co - Aurora	Beaufort	Washington	Industrial Process & Commercial	Major	Not Limited	03-03-07	Pamlico River
NC0040584	Pantego Rest Home	Pantego Rest Home	Beaufort	Washington	100% Domestic < 1MGD	Minor	0.004	03-03-07	Pantego Creek
NC0001627	National Spinning Company	Washington Mill	Beaufort	Washington	Industrial Process & Commercial	Major	2.25	03-03-07	Tar River
NC0069426	Dowry Creek Community Assoc	Dowry Creek Community Assoc	Beaufort	Washington	100% Domestic < 1MGD	Minor	0.05	03-03-07	Pungo River

NPDES Dischargers for the Tar-Pamlico River Basin (as of March 3, 2003)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0020648	City of Washington	Washington WWTP	Beaufort	Washington	Municipal , Large	Major	3.2	03-03-07	Tar River
NC0081191	City of Washington	Washington WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	0.42	03-03-07	Pamlico River
NC0004057	Carolina Seafood	Carolina Seafood	Beaufort	Washington	Industrial Process & Commercial	Minor	Not Limited	03-03-07	Muddy Creek
NC0087491	Beaufort County Water District VI	Chocowinity/Richland Township WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	Pamlico River
NC0084808	Beaufort Co Water	Richland WTP	Beaufort	Washington	Water Plants and Water Conditioning	Minor	Not Limited	03-03-07	South Creek
NC0004081	Aurora Packing Company Inc	Aurora Packing Company	Beaufort	Washington	Industrial Process & Commercial	Minor	0.0012	03-03-07	South Creek
NC0077992	Hyde County Water System	Ponzer WTP	Hyde	Washington	Water Plants and Water Conditioning	Minor	0.108	03-03-07	Pungo Lake Canal
NC0070211	Rose Bay Oyster Company	Rose Bay Oyster Company	Hyde	Washington	Industrial Process & Commercial	Minor	Not Limited	03-03-08	Rose Bay Creek
NC0041530	Ocracoke Sanitary District	Ocracoke Reverse Osmosis WTP	Hyde	Washington	Water Plants and Water Conditioning	Minor	0.45	03-03-08	Pamlico Sound
NC0035751	Mid-East Regional Housing Authority	Mid East Regional Housing Authority	Hyde	Washington	100% Domestic < 1MGD	Minor	0.012	03-03-08	Swanquarter Bay
NC0068233	Hyde County Water System	Fairfield WTP	Hyde	Washington	Water Plants and Water Conditioning	Minor	0.1	03-03-08	Lake Mattamuskeet
NC0076571	Gullrock Seafood	Gullrock Seafood	Hyde	Washington	Industrial Process & Commercial	Minor	0.005	03-03-08	Gray Ditch
NC0085502	Eastern Fuels, Inc.	W. H. Cox Service Center	Hyde	Washington	Groundwater Remediation	Minor	0.01526	03-03-08	Far Creek
NC0000744	Captain Charlie's Inc	Captain Charlie's Incorporated	Hyde	Washington	Industrial Process & Commercial	Minor	Not Limited	03-03-08	Far Creek

NPDES Individual Stormwater Permits in the Tar-Pamlico River Basin (as of April 10, 2003)

Permit #	Facility Name	Receiving Stream	Subbasin	County
NCS000281	Bandag, Inc.	UT Fishing Creek	03-03-01	Granville
NCS000140	Certainteed Corporation	Hachers Run & Fishing Creek	03-03-01	Granville
NCS000171	Kennametal, Inc.	Joes Branch & Martin Creek	03-03-01	Vance
NCS000115	Novo Nordisk Biochem	UT Buffalo Creek	03-03-01	Franklin
NCS000307	Zuma, LLC	Ruin Creek/Joes Branch	03-03-01	Vance
NCS000362	American Fibers and Yarns Company	Tar River	03-03-02	Edgecombe
NCS000302	Braswell Milling Company	Nashville MSSS to UT Sapony Creek	03-03-02	Nash
NCS000363	Quality Forest Products, Inc	Fishing Creek	03-03-04	Halifax
NCS000305	Catalytica Pharmaceuticals	Parker Creek	03-03-05	Pitt
NCS000164	Perdue Farms Incorporated	UT Flat Swamp	03-03-06	Martin
NCS000370	Bridgestone/Firestone, Inc.	UT Toisnot Swamp & White Swamp	03-04-07 & 03-03-03	Wilson

Appendix II

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 Biological Assessment Unit'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 (NCDENR, 2001a). The samples are picked "on-site". 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 or 2 specimens), Common (3-9 specimens), or Abundant (≥10 specimens).

Benthic macroinvertebrates can also be collected using an EPT sampling procedure. [Note: "EPT" is an abbreviation for Ephemeroptera + Plecoptera + Trichoptera, insect groups that are generally intolerant of many kinds of pollution.] 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.

Several data-analysis summaries (metrics) can be produced from standard qualitative and EPT samples to detect water quality problems (Tables 1 and 2).

Table 1 Benthos Classification Criteria for Flowing Water Systems in the Piedmont Ecoregion

Metric	Sample Type	Bioclass	Score
EPT S	10-Sample Qualitative	Excellent	>31
		Good	24 - 31
		Good-Fair	16 - 23
		Fair	8 - 15
		Poor	0 - 7
	4-Sample EPT	Excellent	>27
		Good	21 - 27
		Good-Fair	14 - 20
		Fair	7 - 13
		Poor	0 - 6
BI (Range 0 - 10)	10-Sample Qualitative	Excellent	<5.19
		Good	5.19 - 5.78
		Good-Fair	5.79 - 6.48
		Fair	6.49 - 7.48
		Poor	>7.48

Table 2 Benthos Classification Criteria for Freshwater Wadeable and Flowing Water Coastal A Systems in the Coastal Plain Ecoregion

Metric	Sample Type	Bioclass	Score
EPT S	10-Sample Qualitative	Excellent	>27
		Good	21 - 27
		Good-Fair	14 - 20
		Fair	7 - 13
		Poor	0 - 6
	4-Sample EPT	Excellent	>23
		Good	18 - 23
		Good-Fair	12 - 17
		Fair	6 - 11
		Poor	0 - 5
BI (Range 0 - 10)	10-Sample Qualitative	Excellent	<5.47
		Good	5.47 - 6.05
		Good-Fair	6.06 - 6.72
		Fair	6.73 - 7.73
		Poor	>7.73

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.

For standard qualitative samples, EPT taxa richness (EPT S) is used with the NCDWQ criteria to assign water quality scores. Higher EPT S 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 or BI).

Tolerance values for individual species and the final BI values range between 0 and 10, with higher numbers indicating more tolerant species or more polluted conditions. Water quality scores assigned with the BI are combined with EPT S scores to produce a final bioclassification. EPT abundance (EPT N) and total taxa richness (Total S) calculations also are used to help examine between-site differences in water quality. If the EPT S score and the BI differ by one rating, the EPT N value is used to determine the final site rating.

EPT S and BI values also can be affected by seasonal changes. Criteria for assigning bioclassification are based on summer sampling, June - September. For samples collected at other times, EPT S is adjusted by deleting winter/spring Plecoptera or another adjustment based on resampling of the summer site. The BI values also are seasonally adjusted.

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each 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 freshwater rivers that are deep (nonwadeable) with little or no visible current under normal or low flow conditions. Other characteristics may include open canopy, low pH and low dissolved oxygen. These rivers include the lower sections of the Alligator, Chowan, Meherrin, Neuse, Pasquotank, Perquimans, Roanoke, Tar, South, Black, Waccamaw, Wiccacon, Northeast Cape Fear, and Cape Fear Rivers. A boat is required to sample these rivers and in such places, petite Ponar grab sampling replaces kick-net samples. All other standard qualitative collections techniques are still used.

Ten composite samples are collected per site: 3 Ponar samples; 3 bank sweeps, 1 leafpack sample, 2 epifaunal collections of macrophytes and well-colonized logs, and visual collections from macrophytes, logs along the shore, and logs in the current.

There are limited data on Coastal B rivers, and staff have had a difficult time gathering more data. Criteria have been developed based only on EPT S (Table 3), although using BI and Total S values were also evaluated. The criteria will continue to be evaluated and any bioclassifications derived from them should be considered tentative and not used for use support decisions.

Table 3 Benthos Classification Criteria for Freshwater, Nonwadeable Coastal B Systems in the Coastal Plain Ecoregion

Bioclassification	**EPT S**
Excellent	>11
Good	9 - 11
Good-Fair	6 - 8
Fair	3 - 5
Poor	>3

Swamp Streams

Swamp streams are located in the coastal plain area and cease flowing during summer low flow periods. This seasonal interruption in flow limits the diversity of the fauna, requiring special criteria to properly rate such streams. The swamp stream sampling method utilizes a variety of collection techniques to inventory the macroinvertebrate fauna at a site. A total of nine sweep samples (one series of three by each field team member) are collected from each of the following habitat types: macrophytes, root mats/undercut banks, and detritus deposits. If one of these habitat types is not present, a sweep from one of the other habitats should be substituted. A sweep for the swamp method is defined as the area that can be reached from a given standing location. Three log/debris washes also are collected. Visual collections are the final technique used at each site.

Samples are picked on site. The primary output for this sampling method is a taxa list with an indication of relative abundance (Rare, Common or Abundant) for each taxon. Sampling during

winter flow periods provides the best opportunity for detecting impacts, and only winter benthos (February and March) data can be used to evaluate swamp streams.
Criteria were separately developed for five swamp ecoregions, with three of these regions found in the Tar-Pamlico River basin:

- Region C -- This area lies to the east of the Suffolk Scarp, within the Chesapeake-Pamlico Lowlands and Tidal Marshes ecoregion. Sampleable swamp streams have been located only in the Pasquotank River basin. No undisturbed catchments exist in this area. EPT taxa are rare or absent in these swamp streams, although they may be present in the larger rivers and low-salinity estuaries.
- Region B -- This area generally coincides with the Mid-Atlantic Flatwoods ecoregion, bounded on the south by the Neuse River and on the east by the Suffolk Scarp. It also includes some of the Floodplains and Low Terraces. A small section is also located along the southern coast. This ecoregion is generally defined by a lack of Heptageniid mayflies, especially *Stenonema*. *Stenonema modestum*, however, sometimes is found in Coastal A streams within Region B.
- Region A -- This area constitutes the remainder of the swamp streams, located in the Atlantic Southern Loam Plains ecoregion and the Rolling Coastal Plain ecoregion. This area also contains many Coastal A streams.

Swamp stream criteria evaluate a stream based on three benthic macroinvertebrate metrics (Total taxa richness, EPT taxa richness, and Biotic Index) and one habitat metric (overall habitat score).

Metric scores are divided into three groups: Natural conditions, Moderate Stress, and Severe Stress. As with many multi-metric scoring systems, a score of 5 is assigned to Natural, a score of 3 is assigned to Moderate Stress, and a score of 1 is assigned to Severe Stress. The final site score is derived by the formula:

$$\text{Site Score} = [(2*\text{BI} + \text{ST} + \text{EPT S} + \text{Habitat}) - 5]/2$$

where BI = Biotic Index score, ST = Total taxa richness score, EPT S = EPT taxa richness score, and Habitat = Habitat score.

The BI is given greater weight than the other metrics (multiplied by 2) because this was shown to be the most reliable way to compare swamp streams. A value of 5 is subtracted from the sum of the scores (so that the lowest score is zero), and the sum is divided by 2 (as there were no odd numbers in the initial scores). This calculation produced a range of site scores from 0 to 10.

Most references sites (95 percent) had a site score of 9-10, and this range was established as the criterion for Natural conditions. The remaining scores were separated into Moderate Stress (4-8) and Severe Stress ($\leq$3). The Severe Stress rating was set so that at least 2 of the 4 metrics must separately indicate severe stress (a score of "1"), unless the BI metric scored a "1".

Corrections for the four metrics are:

- Total taxa richness is corrected (+8) if the stream has a braided channel. Criteria for streams with representative pH values are given in Table 4.

- Biotic Index values generally did not generally show a clear relationship between pH and channel type and did not require any correction (Table 5). Slightly elevated BI values are expected in streams with pH < 4.0. This suggested these streams may be more difficult to evaluate than streams with pH > 4.0.
- EPT taxa richness is corrected (+2) if the streams have a braided channel. EPT S was not clearly related to pH for streams in Region B, so criteria for these streams are independent of pH (Table 6).
- The habitat metric (range = 0-100) did not require any modification for ecoregion or stream type. Based on reference sites, the criteria are: Natural > 79, Moderate Stress 60 – 79, and Severe Stress < 60.

Table 4 Stress Ratings Based on Total Taxa Richness for Swamp Streams (ND = No Data)

				Region			
	A	A	A	B	B	B	C
				pH			
Stress	4.5	5.0	>5.5	4.5	5.0	>5.5	All pH
Natural	>25	>36	>51	>20	>28	>38	>34
Moderate	<25	20 - 35	35 - 51	≤20	≤28	25 - 38	≤34
Severe	ND	<20	<35	ND	ND	<25	ND

Table 5 Stress Ratings Based on Biotic Index for Swamp Streams

		Region	
Stress	A	B	C
Natural	<6.8	<7.0	<7.2
Moderate	6.8 - 7.5	7.0 - 7.9	7.2 - 8.1
Severe	>7.5	>7.9	>8.1

Table 6 Stress Ratings Based on EPT Taxa Richness for Swamp Streams (ND = No Data)

		Region		
	A	A	A	B
		pH		
Stress	4.5	5.0	>5.5	All pH
Natural	>4	>8	>17	>5
Moderate	ND	<9	7 - 17	2 - 4
Severe	ND	ND	0 -6	0 - 1

Table 7 Benthic Macroinvertebrate Data Collected in the Tar-Pamlico River Basin, 1983-2002 (Current basinwide sites are in bold font.)

Subbasin/ Waterbody	Location	County	Index No.	Date	Total S	EPT	BI	EPT BI	BioClass
03-03-01									
Tar R	SR 1138	Granville	28-(1)	2/2/89	---	25	---	3.78	Good
Tar R	SR 1150	Granville	28-(1)	7/21/97	---	14	---	5.60	Good-Fair
				9/9/92	65	12	6.45	4.90	Fair
Shelton Cr	US 158	Granville	28-4	7/27/92	---	15	---	5.02	Good-Fair
N Fk Tar R	US 158	Granville	28-5	7/21/97	---	17	---	5.33	Good-Fair
				7/27/92	---	8	---	6.26	Fair
Tar R	NC 96	Granville	28-(5.7)	7/21/97	73	24	5.74	4.96	Good
				7/27/92	77	18	6.01	5.61	Good-Fair
				7/12/89	86	20	6.18	5.56	Good-Fair
				7/8/86	59	7	6.28	5.92	Fair
				9/7/84	78	25	5.65	5.07	Good
Tar R	SR 1622	Granville	28-(5.7)	7/22/02	78	23	5.74	4.69	Good
				7/21/97	76	28	5.18	4.63	Good
				1/3/97	72	32	5.10	4.17	Good
				7/27/92	89	23	5.44	5.06	Good
Fishing Cr	SR 1649	Granville	28-11	9/19/90	55	11	7.45	6.65	Fair
				6/13/89	27	0	8.97	0.00	Poor
Fishing Cr	be WWTP	Granville	28-11	6/13/89	16	0	9.15	0.00	Poor
Fishing Cr	SR 1608	Granville	28-11	5/18/99	41	5	7.91	6.11	Poor
				9/19/90	54	3	7.96	7.60	Poor
Fishing Cr	SR 1643	Granville	28-11	7/22/02	62	16	5.69	5.13	Good-Fair
				5/18/99	11	11	5.63	5.63	Fair
				7/21/97	61	18	5.77	5.34	Good-Fair
				7/27/92	79	18	6.08	5.35	Good-Fair
				9/19/90	11	11	5.27	5.27	Fair
Coon Cr	SR 1515	Granville	28-11-5	6/13/89	---	19	---	4.32	Good-Fair
Tabbs Cr	SR 1101	Vance	28-17-(4)	5/18/99	22	21	5.06	5.06	Good-Fair
Tar R	SR 1229	Franklin	28-(24.7)	7/22/02	82	24	6.49	5.42	Good-Fair
				7/27/97	74	28	5.48	4.64	Good
Tar R	US 401	Franklin	28-(24.7)	9/10/92	74	27	5.74	4.84	Good
				7/11/86	73	24	6.25	5.08	Good-Fair
				7/13/83	58	17	6.36	4.96	Good-Fair
Tar R	SR 1609	Franklin	28-(24.7)	7/23/02	68	26	5.15	4.65	Good
				8/27/97	73	23	5.23	4.62	Good
Cedar Cr	SR 1116	Franklin	28-29-(2)	7/29/92	---	14	---	5.21	Good-Fair
				9/7/90	72	15	6.31	5.24	Good-Fair
Cedar Cr	ab WWTP (~SR 1116)	Franklin	28-29-(2)	10/27/94	47	10	6.38	4.60	Good-Fair
Cedar Cr	be WWTP (~SR 1116)	Franklin	28-29-(2)	10/27/94	54	15	5.96	4.02	Good-Fair
Cedar Cr	SR 1105	Franklin	28-29-(2)	7/29/92	---	13	---	4.83	Fair
				9/7/90	80	18	5.88	5.26	Good-Fair
Cedar Cr	SR 1109	Franklin	28-29-(2)	7/22/02	---	15	---	4.99	Good-Fair
				7/28/97	---	14	---	4.39	Good-Fair
Crooked Cr	NC 98	Franklin	28-30	7/28/97	---	12	---	5.42	Fair
				7/29/92	16	16	5.06	5.06	Good-Fair
03-03-02									
Tar R	SR 1001	Nash	28-(24.7)	2/2/89	---	15	---	5.24	Fair
Tar R	US 64	Nash	28-(24.7)	9/10/92	---	19	---	4.43	Good-Fair
Tar R	NC 581	Nash	28-(24.7)	5/17/86	79	22	5.05	3.98	Good-Fair
Stoney Cr	SR 1603	Nash	28-68	7/24/02	22	13	6.02	5.68	Good-Fair
				7/23/92	---	9	---	5.30	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	Total S	EPT	BI	EPT BI	BioClass
Tar R	NC 97	Edgecombe	28-(69)	7/24/02	89	24	6.00	4.96	Good-Fair
				7/22/97	71	26	5.93	4.95	Good
				7/23/92	79	24	5.88	4.81	Good-Fair
				7/12/90	77	23	5.55	4.68	Good
				7/8/87	17	17	5.01	5.01	Good-Fair
				7/6/87	63	18	5.80	5.16	Good-Fair
				5/12/86	78	25	5.84	4.98	Good-Fair
				7/24/85	79	21	6.35	4.85	Good-Fair
				8/26/83	62	17	6.01	4.71	Good-Fair
Tar R	ab WWTP	Edgecombe	28-(69)	10/27/94	65	18	5.65	5.06	Good
				3/2/88	66	15	5.95	4.96	Good-Fair
Tar R	be WWTP	Edgecombe	28-(69)	10/27/94	53	7	7.01	5.07	Fair
Tar R	SR 1243	Edgecombe	28-(74)	7/22/92	81	21	6.35	5.27	Good-Fair
Tar R	SR 1252	Edgecombe	28-(74)	8/1/02	79	19	5.80	4.77	Good-Fair
				7/22/97	68	26	5.36	4.39	Good
				3/2/88	66	14	6.91	5.09	Fair
Swift Cr	SR 1004	Nash	28-78-(0.5)	3/5/96	87	39	4.29	3.14	Excellent
Swift Cr	SR 1310	Nash	28-78-(0.5)	7/23/97	62	20	5.25	4.23	Good
				11/12/96	20	20	4.15	4.15	Good-Fair
				3/5/96	87	33	4.66	2.93	Excellent
				7/18/95	71	26	5.13	4.30	Excellent
				9/10/92	54	16	5.27	4.50	Good
				6/11/91	94	27	5.34	3.87	Excellent
				10/22/90	77	29	5.27	4.04	Excellent
				7/12/90	82	28	5.17	4.56	Excellent
				6/8/90	78	31	5.28	4.48	Excellent
				4/24/90	83	33	5.16	3.89	Excellent
				1/18/90	80	32	5.22	4.09	Excellent
				7/11/89	79	22	5.73	4.34	Good
				5/3/88	25	25	4.46	4.33	Excellent
				7/10/86	92	24	5.61	4.18	Good
				7/18/84	63	22	5.11	4.18	Excellent
Swift Cr	ab Wake Stone	Nash	28-78-(0.5)	3/5/96	67	28	4.64	3.50	Good
				6/10/91	85	26	5.26	4.14	Excellent
				6/7/90	68	27	5.08	4.26	Excellent
Swift Cr	E prop. line Wake Stone	Nash	28-78-(0.5)	6/7/90	65	24	5.63	4.77	Good
Swift Cr	be Wake Stone	Nash	28-78-(0.5)	6/12/91	93	28	5.44	4.04	Excellent
				5/10/91	---	28	---	4.11	Excellent
				6/7/90	22	22	4.85	4.79	Good
Swift Cr	SR 1003	Nash	28-78-(0.5)	3/4/96	90	33	4.76	2.95	Excellent
				2/2/89	---	31	---	3.03	Excellent
Swift Cr	I 95	Nash	28-78-(0.5)	7/18/95	69	23	4.69	3.67	Excellent
				5/10/91	---	23	---	4.02	Good
				6/8/90	---	23	---	4.84	Good
Martin Cr	SR 1519	Vance	28-78-1-3	6/10/02	32	9	5.95	5.34	Not Rated
Weaver Cr	SR 1533	Vance	28-78-1-7	6/10/02	44	6	6.72	5.48	Not Rated
				3/29/95	71	23	5.83	4.95	Good-Fair
Sandy Cr	US 401	Franklin	28-78-1-(8)	5/3/88	27	27	4.52	4.52	Good
Sandy Cr	SR 1412	Franklin	28-78-1-(8)	7/23/97	11	11	4.67	4.67	Fair
Sandy Cr	SR 1436	Franklin	28-78-1-(8)	7/28/92	20	20	4.92	4.92	Good-Fair
Devils Cradle Cr	NC 401	Franklin	28-78-1-12-1	11/16/84	71	15	7.15	5.81	Fair
				6/20/84	80	12	7.11	6.02	Fair
				4/2/84	77	14	6.46	5.25	Fair
				1/25/84	60	13	6.43	5.96	Fair
Sandy Cr	SR 1405	Nash	28-78-1-(14)	6/10/02	61	21	5.30	4.18	Good-Fair
Swift Cr	SR 1253	Edgecombe	28-78-(6.5)	7/25/02	86	24	5.73	4.22	Good
				7/22/97	73	24	4.97	3.68	Excellent
				2/1/89	74	29	5.16	3.76	Excellent

Subbasin/ Waterbody	Location	County	Index No.	Date	Total S	EPT	BI	EPT BI	BioClass
White Oak Swp	SR 1428	Edgecombe	28-78-7-(2)	2/11/02	40	7	6.52	5.58	Moderate Stress
				5/3/88	---	11	---	5.16	Not Rated
03-03-03									
Tar R	US Bus 64	Edgecombe	28-(80)	8/6/02	77	27	5.87	4.70	Good
				8/19/97	79	28	5.35	4.60	Excellent
				7/20/92	81	29	5.79	4.74	Good
				7/20/90	69	28	5.40	4.65	Excellent
				7/11/88	80	21	5.64	4.78	Good
				7/6/87	81	23	5.86	4.98	Good
				7/11/86	92	27	6.10	4.96	Good
				5/12/86	92	27	6.09	5.01	Good
				7/24/85	73	23	5.85	5.11	Good
				7/25/83	78	27	5.88	4.58	Good
Town Cr	SR 1202	Edgecombe	28-83	5/5/92	76	14	6.73	5.73	Fair
Town Cr	SR 1200	Edgecombe	28-83	5/5/92	64	17	6.37	5.37	Good-Fair
Town Cr	SR 1601	Edgecombe	28-83	8/19/97	84	24	5.97	4.78	Good
				7/20/92	64	14	6.13	5.68	Not Rated
Cokey Swp	SR 1141	Edgecombe	28-83-3	4/25/89	36	3	7.89	4.09	Not Rated
Cokey Swp	NC 43	Edgecombe	28-83-3	2/12/02	41	3	7.64	6.4	Severe Stress
Little Cokey Swp	at Branch Cr	Edgecombe	28-83-3-1	4/25/89	26	0	7.66	---	Not Rated
Little Cokey Swp	SR 1614	Edgecombe	28-83-3-1	4/25/89	11	0	8.65	---	Not Rated
Little Cokey Swp	SR 1158	Edgecombe	28-83-3-1	5/1/92	42	0	8.30	---	Not Rated
Little Cokey Swp	be UT	Edgecombe	28-83-3-1	5/1/92	46	1	8.11	6.22	Not Rated
Little Cokey Swp	SR 1141	Edgecombe	28-83-3-1	4/25/89	39	2	8.19	2.95	Not Rated
Sasnett Mill Br	SR 1222	Edgecombe	28-83-4	2/7/01	49	5	6.27	5.50	Not Rated
Bynums Mill Cr	SR 1200	Edgecombe	28-83-4	2/11/02	36	2	8.14	7.45	Severe Stress
				8/16/93	29	2	8.53	7.63	Not Rated
				5/5/93	49	2	8.01	7.97	Not Rated
				2/16/93	51	3	7.92	8.59	Severe Stress
				8/16/92	31	2	8.77	9.23	Not Rated
				5/6/92	44	1	8.09	4.72	Not Rated
				2/19/92	49	4	7.97	7.22	Severe Stress
Briery Br	NC 124	Edgecombe	28-83-4-1-1	9/24/90	51	3	7.47	5.70	Not Rated
Tar R	NC 42	Edgecombe	28-(84)	8/6/02	---	24	---	4.53	Excellent
				8/19/97	---	26	---	4.63	Excellent
				7/20/92	---	26	---	4.21	Excellent
Otter Cr	SR 1614	Edgecombe	28-86	2/11/02	44	5	7.51	6.36	Moderate Stress
				5/5/93	71	10	7.27	5.68	Not Rated
				2/16/93	62	9	7.15	5.55	Moderate Stress
				8/12/92	31	1	8.38	9.84	Not Rated
				5/6/92	62	9	7.20	5.47	Not Rated
				2/20/92	83	15	6.92	5.45	Moderate Stress
UT Otter Cr	SR 1113	Edgecombe	28-86	9/24/90	51	1	7.69	6.22	Not Rated
Conetoe Cr	SR 1516	Edgecombe	28-87- (0.5)	2/6/01	33	2	7.12	6.29	Not Rated
Conetoe Cr	SR 1510	Edgecombe	28-87- (0.5)	2/22/02	47	2	7.45	7.43	Severe Stress
				11/2/00	56	2	7.47	6.25	Not Rated
Conetoe Cr	NC 42	Edgecombe	28-87- (0.5)	2/22/02	53	1	7.14	7.8	Moderate Stress
Conetoe Cr	US 64 Alt	Edgecombe	28-87- (0.5)	2/6/01	51	5	7.20	5.66	Fair
Conetoe Cr	SR 1409	Pitt	28-87- (0.5)	11/2/00	48	4	7.33	6.06	Poor
				8/19/97	38	4	7.65	4.03	Poor
				7/20/92	51	7	6.77	5.65	Fair
				10/25/89	62	13	6.92	5.05	Fair
				7/11/89	62	8	6.65	5.03	Good-Fair
				7/12/88	55	8	6.54	4.95	Good-Fair
				7/23/85	44	7	6.26	5.27	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	Total S	EPT	BI	EPT BI	BioClass
Crisp Cr	SR 1527	Pitt	28-87-1	2/11/02	36	2	7.69	6.34	Severe Stress
				2/7/01	53	4	7.35	5.51	Poor
Ballahack Canal	NC 42	Pitt	28-87-1.2	2/22/02	27	2	8.28	8.9	Severe Stress
03-03-04									
Fishing Creek	Ab Warrenton WWTP	Warren	28-79-(1)	7/28/92	---	10	---	4.80	Fair
Fishing Creek	SR 1600	Warren	28-79-(1)	8/18/97	---	22	---	4.04	Good
				7/28/92	---	18	---	4.22	Good-Fair
Fishing Cr	US 301	Edgecombe	28-79-21	8/5/02	63	15	5.79	4.36	Good-Fair
				8/18/97	86	25	5.73	4.29	Good
				7/22/92	92	26	5.70	4.45	Good
				7/13/88	75	21	6.03	4.72	Good
				7/24/85	88	26	5.48	4.42	Good
				7/25/83	71	27	5.62	4.56	Good
Shocco Cr	SR 1613	Warren	28-97-22	8/18/97	---	16	---	4.61	Good-Fair
				7/28/92	---	15	---	4.28	Good-Fair
Little Fishing Cr	SR 1338	Halifax	28-79-25	8/18/97	85	23	5.36	4.15	Good
				9/10/92	64	18	5.60	4.85	Good-Fair
				7/14/88	89	24	5.34	3.85	Good
Little Fishing Cr	SR 1343	Halifax	28-79-25	8/5/02	86	23	5.58	4.22	Good
Rocky Swp	SR 1002	Halifax	28-79-28-(0.7)	8/18/97	39	13	5.59	4.64	Good-Fair
Fishing Cr	SR 1429	Edgecombe	28-79-29	3/3/89	71	29	4.89	3.44	Good
Fishing Cr	SR 1500	Edgecombe	28-79-29	8/6/02	---	21	---	4.48	Good
				8/18/97	56	28	4.65	3.91	Excellent
				7/22/92	---	23	---	3.79	Good
Beech Swp	SR 1001	Halifax	28-79-30	5/4/92	69	7	7.45	5.47	Not Rated
Beech Swp	US 301	Halifax	28-79-30	5/4/92	34	3	8.70	7.1	Not Rated
Beech Swp	SR 1003	Halifax	28-79-30	2/15/02	37	2	7.2	7.8	Moderate Stress
Deep Cr	SR 1100	Halifax	28-79-32-(0.5)	2/15/02	33	2	8.08	8.8	Moderate Stress
03-03-05									
Tar R	SR 1400	Pitt	28-(84)	11/20/85	75	22	5.72	4.60	Good-Fair
Tar R	SR 1533	Pitt	28-(94)	11/19/85	50	12	6.85	4.30	Fair
Tar R	Rainbow Banks	Pitt	28-(94)	11/20/85	51	9	7.19	4.33	Fair
Tar R	SR 1565	Pitt	28-(94)	8/8/02	43	9	7.92	7.13	Not Rated
				8/21/97	67	13	7.42	5.41	Not Rated
				6/22/92	59	10	7.43	6.26	Good
				7/12/89	66	16	6.92	5.91	Good-Fair
				7/10/86	70	8	7.84	6.91	Good-Fair
				11/19/85	53	10	7.50	4.87	Good-Fair
				7/23/84	74	15	7.17	4.45	Fair
Greens Mill Run	Arlington Rd	Pitt	28-96	5/8/96	44	1	7.69	6.22	Not Rated
Hardee Cr	NC 33	Pitt	28-97	2/19/02	59	7	6.68	5.40	Natural
Hardee Cr	SR 1726	Pitt	28-97	5/8/95	52	6	6.73	5.46	Not Rated
Grindle Cr	US 264	Pitt	28-100	8/7/02	52	12	6.49	4.93	Good-Fair
				8/20/97	67	13	6.68	5.56	Good-Fair
				7/21/92	---	10	---	5.24	Fair
Whichard Br	SR 1521	Pitt	28-100-2	2/12/02	45	6	7	5.75	Moderate Stress
				2/8/01	41	7	6.85	5.47	Not Rated
Chicod Cr	SR 1760	Pitt	28-101	7/15/97	39	2	7.63	7.14	Not Rated
				3/25/97	51	7	7.11	5.87	Fair
				6/29/93	41	4	7.17	6.41	Not Rated
				3/23/93	38	4	7.32	6.23	Fair
				7/21/92	55	4	7.22	6.54	Fair
				7/10/90	42	6	7.20	6.08	Fair

Subbasin/ Waterbody	Location	County	Index No.	Date	Total S	EPT	BI	EPT BI	BioClass
				7/8/87	---	4	---	7.33	Poor
Chicod Cr	SR 1777	Pitt	28-101	3/12/02	51	2	8.30	7.61	Severe Stress
				7/15/97	43	2	7.64	7.45	Not Rated
				3/25/97	45	4	7.03	6	Not Rated
				6/29/93	56	5	6.88	5.58	Fair
				3/24/93	31	4	6.67	6.10	Not Rated
Cow Swp	SR 1756	Pitt	28-101-5	7/15/97	35	4	6.92	5.28	Poor
				3/25/97	30	3	8.14	6.85	Not Rated
				6/29/93	54	4	6.88	5.85	Fair
				3/23/93	45	1	8.34	9.84	Not Rated
Juniper Br	SR 1766	Pitt	28-101-26	7/15/97	35	5	8.14	5.70	Poor
				3/25/97	46	5	6.72	5.51	Not Rated
				6/23/93	47	7	6.85	5.08	Fair
				3/23/93	44	2	7.42	6.41	Not Rated
03-03-06									
Tranters Cr	SR 1552	Edgecombe	28-103	2/12/02	40	3	7.81	9.22	Moderate Stress
Tranters Cr	SR 1403	Beaufort	28-103	8/21/97	52	7	7.97	6.65	Not Rated
				7/12/89	51	8	7.88	6.62	Good-Fair
				7/9/86	36	3	8.39	6.80	Fair
				7/12/83	43	5	8.10	6.97	Fair
Flat Swp	SR 1152	Beaufort	28-103-2	3/12/02	49	1	7.88	6.2	Moderate Stress
Horsepen Cr	SR 1914	Beaufort	28-103-10	2/26/02	27	4	6.49	6.12	Moderate Stress
Old Ford Swp	US 17	Beaufort	28-103-14-1	2/19/02	29	4	6.75	6.48	Natural
Latham Cr	SR 1410	Beaufort	28-103-14-2	2/26/02	48	7	6.90	6.64	Natural
03-03-07									
Freshwater Sites									
Horse Br	SR 1136	Beaufort	29-6-2-1-6-2	7/15/97	37	1	8.01	6.22	Not Rated
Beaverdam Swp	SR 1523	Beaufort	29-10-02	3/11/02	50	4	7.50	7.25	Moderate Stress
Durham Cr	SR 1949	Beaufort	29-21-(1)	2/20/92	48	5	7.57	6.28	Moderate Stress
				7/7/87	38	3	7.51	5.84	Not Rated
Whitehurst Cr	W Pr, SR 1937	Beaufort	29-28-7-(1)	2/12/92	13	1	8.41	2.52	Not Rated
Whitehurst Cr	S Pr, SR 1937	Beaufort	29-28-7-(1)	2/12/92	18	2	8.41	4.37	Not Rated
Whitehurst Cr	SR 1941	Beaufort	29-28-7-(1)	2/12/92	30	2	8.33	3.48	Not Rated
Van Swp	NC 32	Washington	29-34-2-3	2/19/92	30	5	6.83	4.85	Natural
Acre Swp	SR 1532	Beaufort	29-34-35-1-1	3/11/02	40	1	8.09	9.8	Not Rated
Estuarine Sites[1]									
(Not Rated, Data available on request)	39 locations	Beaufort, Hyde		Mostly 1992 and 1997					Not Rated

[1] Detailed discussions of these sites were given in NCDEHNR (1998).

Table 8 Water Quality Measurements at Benthic Macroinvertebrate Basinwide Sites in the Tar-Pamlico River Basin, 2002

Subbasin/ Waterbody	Location	County	Date	Temperature (˚C)	Specific Conductance (µmhos/cm)	Dissolved Oxygen (mg/l)	pH (s.u.)
03-03-01							
Tar R	SR 1622	Granville	07/22/02	26	131	5.9	7.2
Fishing Cr	SR 1643	Granville	07/22/02	23	139	6.0	7.2
Tar R	SR 1229	Franklin	07/22/02	28	176	6.5	7.4
Tar R	SR 1609	Franklin	07/23/02	27	121	5.7	7.4
Cedar Cr	SR 1109	Franklin	07/22/02	27	300	6.4	7.4
03-03-02							
Stoney Cr	SR 1603	Edgecombe	07/24/02	26	105	3.3	7.0
Tar R	NC 97	Edgecombe	07/24/02	30	105	6.6	7.3
Tar R	SR 1252	Edgecombe	08/01/02	31	204	6.2	7.4
Sandy Cr	SR 1405	Nash	06/10/02	23	69	7.8	7.4
Swift Cr	SR 1253	Edgecombe	07/25/02	---	---	---	---
03-03-03							
Tar R	US Bus 64	Edgecombe	08/06/02	29	164	7.8	7.5
Cokey Swp	NC 43	Edgecombe	02/12/02	6	113	9.3	6.3
Bynums Mill Cr	SR 1120	Edgecombe	02/11/02	11	84	5.6	6.1
Tar R	NC 42	Edgecombe	08/06/02	30	173	7.3	8.1
Otter Cr	SR 1614	Edgecombe	02/11/02	13	109	9.9	6.4
Conetoe Cr	SR 1510	Edgecombe	02/22/02	12	99	10	6.3
Conetoe Cr	NC 42	Edgecombe	02/22/02	12	131	9.4	6.5
Crisp Cr	SR 1527	Edgecombe	02/11/02	11	124	8.6	6.0
Ballahack Canal	NC 42	Edgecombe	02/22/02	15	187	10.7	5.8
03-03-04							
Fishing Cr	US 301	Edgecombe	08/05/02	29	108	4.6	7.4
Little Fishing Cr	SR 1343	Halifax	08/05/02	27	111	5.0	7.2
Fishing Cr	SR 1500	Edgecombe	08/06/02	28	106	6.8	7.3
Beech Swp	SR 1003	Halifax	02/15/02	6	91	9.7	6.2
Deep Cr	SR 1100	Halifax	02/15/02	9	93	8.2	6.1
03-03-05							
Tar R	SR 1565	Pitt	08/08/02	29	900	6.5	7.1
Hardee Cr	NC 33	Pitt	02/19/02	7	142	12	6.9
Grindle Cr	US 264	Pitt	08/07/02	24	122	6.0	7.1
Whichard Br	SR 1521	Pitt	02/12/02	7	165	7.4	6.3
Chicod Cr	SR 1777	Pitt	03/12/02	12	89	6.4	6.7
03-03-06							
Tranters Cr	SR 1552	Pitt	02/12/02	9	184	7.4	6.3
Flat Swp	SR 1152	Martin	03/12/02	13	282	8.5	7.2
Horsepen Swp	SR 1914	Beaufort	02/26/02	10	94	8.0	6.0
Old Ford Swp	US 17	Beaufort	02/19/02	8	94	6.7	5.7
Latham Cr	SR 1410	Beaufort	02/26/02	14	115	7.3	6.2
03-03-07							
Beaverdam Swp	NC 32	Beaufort	03/11/02	13	115	8.0	6.2
Acre Swp	SR 1532	Beaufort	03/11/02	4.2	119	8.6	4.2

Fish Community Sampling Methods and Criteria

In 2002, fish community assessments were performed at 24 sites in the basin. Thirteen of the 28 sites which had been previously sampled in 1997 were sampled again, including some which were on the impaired streams list (Table 9).

Table 9 Fish Community Sites Monitored in 2002 that are on the State's 303(d) List of Impaired Waters (NCDENR, 2000a).

Subbasin/ Waterbody	**Reach Affected**	**Suspected Cause**
03-03-01		
Fishing Creek	From SR 1608 to Coon Creek	Cause unknown; potential municipal point sources and urban runoff/storm sewers
03-03-02		
Sandy Creek	From NC 401 to NC 561	Cause unknown; potential sources unknown
03-03-05		
Chicod Creek	From source to Tar River	Historical listing for sediment based upon biological impairment, fecal coliform and low dissolved oxygen from potential agriculture sources

The 10 new sites (Beech Branch, Coon, Middle, Pig Basket, Flatrock, Red Bud, Reedy and Parker Creeks; and White Oak and Bear Swamps) were selected to represent typical channelized and natural channel streams draining rural agricultural and forested watersheds and which may be impacted primarily by nonpoint source pollution.

Some sites that were sampled during the second cycle of basinwide monitoring in 1997 were not resampled in 2002 because:

- There were already sufficient data collected since 1999 to assess these streams (North Fork Tar River and Shelton, Lynch, Tabbs and Fishing Creeks).
- The stream was considered Collection Sensitive Waters by the NC Wildlife Resources Commission and sampling is strictly controlled (Shelton and Swift Creeks, and Little Fishing Creek (at SR 1338, Halifax County)).
- The waterbody is considered a swamp and currently not rateable (Horsepen Swamp).
- The stream was too small to sample (UT Turkey Swamp).
- Effective sampling could only be done under low flow conditions (Tar River and Town Creek).
- The hydrologic regime of the stream was altered by beavers or was not flowing (Big Peachtree Creek and Beaverdam, Cokey and Cow Swamps).

Several 2002 fish community sites had been "desnagged" in the summer of 2000 under the US Department of Agriculture's Emergency Watershed Protection Program: Red Bud, Big Peachtree, Pig Basket, Sapony, Parker and Grindle Creeks, and White Oak Swamp.

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 on the website at http://www.esb.enr.state.nc.us/BAU.html.

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 of the stream from which the sample was collected.

The NCIBI has recently been revised (NCDENR, 2001b). Currently, 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 been recalibrated against regional reference site data (Biological Assessment Unit Memorandum 01052001).

Table 10 Revised Scores and Classes for Evaluating the Fish Community of a Wadeable Stream using the North Carolina Index of Biotic Integrity in the Outer Piedmont (Cape Fear, Neuse, Roanoke and Tar-Pamlico River Basins)

NCIBI Scores	**NCIBI Classes**
54, 56, 58 or 60	Excellent
46, 48, 50 or 52	Good
40, 42 or 44	Good-Fair
34, 36 or 38	Fair
≤32	Poor

Table 11 Regional Reference Sites/Samples Used in Calibrating the North Carolina Index of Biotic Integrity in the Tar-Pamlico River Basin

Subbasin/ Waterbody	Station	County	Date
03-03-01			
Tar River	US 158	Granville	10/14/99
Tar River	US 158	Granville	06/24/99
Tar River	US 158	Granville	04/27/99
Shelton Creek	US 158	Granville	04/06/99
Shelton Creek	US 158	Granville	04/14/97
Shelton Creek	US 158	Granville	04/07/92
Lynch Creek[1]	SR 1235	Franklin	05/24/99
Lynch Creek[1]	SR 1235	Franklin	04/15/97
Lynch Creek[1]	SR 1235	Franklin	06/18/92
03-03-04			
Fishing Creek[1]	SR 1600	Warren	05/24/99
Fishing Creek[1]	SR 1600	Warren	04/16/97
Fishing Creek[1]	SR 1600	Warren	02/04/93
Little Fishing Creek	SR 1509	Warren	04/11/02
Little Fishing Creek	SR 1509	Warren	04/16/97
Little Fishing Creek	SR 1509	Warren	02/03/93
Rocky Swamp	SR 1002	Halifax	04/03/97
Rocky Swamp	SR 1002	Halifax	02/03/93

[1] Later determined not to be a regional reference site.

Criteria and ratings are applicable only to wadeable streams in the Piedmont region of the basin and are the same as those for the Cape Fear, Neuse, and Roanoke River basins. The definition of the Piedmont for these basins is based on a map of North Carolina watersheds by Fels (1997). Metrics and ratings should not be applied to nonwadeable streams and streams in the Coastal Plain region in each of these basins. These streams are currently not rated.

Table 12 Fish Community Data Collected in the Tar-Pamlico River Basin, 1992-2002 (Current basinwide sites are in bold font.)

Subbasin/ Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
03-03-01						
Tar R	US 158	Granville	28-(1)	10/14/99	54	Excellent
				06/24/99	54	Excellent
				04/27/99	52	Good
Tar R	NC 96	Granville	28-(5.7)	09/09/97	56	Excellent
				09/02/92	56	Excellent
Tar R	US 1	Franklin	28-(15.5)	09/09/97	50	Good
				09/02/92	46	Good
Shelton Cr	US 158	Granville	28-4	04/06/99	56	Excellent
				04/14/97	58	Excellent
				04/07/92	54	Excellent
North Fork Tar R	US 158	Granville	28-5	10/14/99	46	Good
				06/24/99	48	Good
				04/06/99	48	Good
				04/14/97	54	Excellent
				04/07/92	46	Good
Fishing Cr	SR 1643	Granville	28-11	04/08/02	50	Good
				04/14/97	52	Good
				04/07/92	42	Good-Fair
Coon Cr	SR 1609	Granville	28-11-5	04/08/02	54	Excellent
Middle Cr	SR 1203	Franklin	28-15	04/08/02	50	Good
Tabbs Cr	SR 1100	Vance	28-17-(0.5)	10/14/99	46	Good
				06/24/99	48	Good
				04/09/99	50	Good
				04/15/97	56	Excellent
				04/08/92	56	Excellent
Lynch Cr	SR 1235	Franklin	28-21-(0.7)	05/24/99	46	Good
				04/15/97	48	Good
				06/18/92	38	Fair
Cedar Cr	SR 1109	Franklin	28-29-(2)	04/10/02	54	Excellent
				04/16/97	50	Good
				04/08/92	48	Good
Crooked Cr	NC 98	Franklin	28-30	04/10/02	42	Good-Fair
				04/17/97	34	Fair
03-03-02						
Sapony Cr	SR 1145	Nash	28-55-(1)	04/18/02	---	Not Rated
				04/02/97	---	Not Rated
Big Peachtree Cr	SR 1321	Nash	28-68-1	04/03/97	52	Good
				02/04/93	46	Good
Pig Basket Cr	SR 1433	Nash	28-68-3-(2)	04/18/02	---	Not Rated
Beech Br	NC 97	Edgecombe	28-75-(4)	04/17/02	---	Not Rated
Swift Cr	SR 1310	Nash	28-78-(0.5)	04/11/97	60	Excellent
				06/19/96	56	Excellent
Swift Cr	SR 1003	Nash	28-78-(0.5)	06/19/96	50	Good
Sandy Cr	SR 1412	Franklin	28-78-1-(8)	04/09/02	40	Good-Fair
				04/15/97	40	Good-Fair
Flatrock Cr	SR 1412	Franklin	28-78-1-12	04/09/02	48	Good
Red Bud Cr	SR 1407	Nash	28-78-1-17	04/09/02	50	Good
White Oak Swp	SR 1428	Edgecombe	28-79-23	04/17/02	---	Not Rated
03-03-03						
Town Cr	NC 43	Edgecombe	28-83	08/28/97	---	Not Rated
				07/08/92	---	Not Rated

Subbasin/ Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Cokey Swp	SR 1135	Edgecombe	28-83-3	04/02/97	---	Not Rated
Otter Cr	SR 1614	Edgecombe	28-86-(0.3)	04/17/02	---	Not Rated
				04/02/97	---	Not Rated
				10/29/96	---	Not Rated
				07/08/92	---	Not Rated
03-03-04						
Fishing Cr	SR 1600	Warren	28-79-(1)	05/24/99	54	Excellent
				04/16/97	60	Excellent
				02/04/93	48	Good
Shocco Cr	SR 1613	Warren	28-79-22	04/09/02	54	Excellent
				04/16/97	50	Good
				06/18/92	46	Good
Little Fishing Cr	SR 1509	Warren	28-79-25	04/11/02	50	Good
				04/16/97	50	Good
				02/03/93	54	Excellent
Little Fishing Cr	SR 1338	Halifax	28-79-25	08/28/97	52	Good
Reedy Cr	SR 1511	Warren	28-79-25-5	04/11/02	52	Good
Bear Swp	NC 561	Halifax	28-79-25-7	04/11/02	52	Good
Beaverdam Swp	NC 561	Halifax	28-79-27	04/03/97	---	Not Rated
Rocky Swp	SR 1002	Halifax	28-79-28-(0.7)	04/12/02	50	Good
				04/03/97	---	Not Rated
				02/03/93	---	Not Rated
03-03-05						
Parker Cr	NC 33	Pitt	28-95	04/16/02	---	Not Rated
Hardee Cr	NC 33	Pitt	28-97	04/16/02	---	Not Rated
				04/01/97	---	Not Rated
Grindle Cr	US 264	Pitt	28-100	04/16/02	---	Not Rated
				04/01/97	---	Not Rated
				07/07/92	---	Not Rated
Chicod Cr	SR 1565	Pitt	28-101	04/15/93	---	Not Rated
Chicod Cr	SR 1777	Pitt	28-101	04/16/02	---	Not Rated
				05/06/93	---	Not Rated
				07/07/92	---	Not Rated
Cow Swp	SR 1756	Pitt	28-101-5	04/15/93	---	Not Rated
Juniper Swp	SR 1766	Pitt	28-101-6	04/15/93	---	Not Rated
03-03-06						
UT Turkey Swp	SR 1134	Martin	28-103-5	04/01/97	---	Not Rated
Horsepen Swp	SR 1001	Beaufort	28-103-10	04/01/97	---	Not Rated
03-03-07						
Horse Br	SR 1136	Beaufort	29-6-2-1-6-2	05/06/93	---	Not Rated
Durham Cr	SR 1932	Beaufort	29-21-(1)	04/15/02	---	Not Rated
				03/31/97	---	Not Rated
Acre Swp	NC 32	Beaufort	29-34-35-1-1	04/15/02	---	Not Rated
				03/31/97	---	Not Rated

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 13). Individual parameter results, which seem to be of potential human health concern, are evaluated by the NC Division of Occupational and Environmental Epidemiology by request from the Water Quality Section.

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 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 and a mercury limit of 0.4 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 4.0 ppt in issuing an advisory.

Table 13 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	USEPA Screening Values	NC Health Director
Metals			
Cadmium		10.0	
Mercury	1.0	0.6	0.4
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	4.0
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.

Table 14 Wet Weight Concentrations of Mercury (Hg), Arsenic (As), Total Chromium (Crt), Cadmium (Cd), Copper (Cu), Nickel (Ni), Lead (Pb) and Zinc (Zn) in Fish Tissue from the Tar-Pamlico River Basin, 2000[1]

Location/ Species	Date	Length (cm)	Weight (g)	Hg (µg/g)	As (µg/g)	Crt (µg/g)	Cu (µg/g)	Ni (µg/g)	Zn (µg/g)
Tar River at Rocky Mount									
Ictalurus catus	05/03/2000	42.0	1780	0.37	ND	ND	0.21	ND	4.5
Lepomis macrochirus	05/03/2000	18.1	150	0.12	ND	ND	0.27	ND	5.3
Lepomis macrochirus	05/03/2000	16.0	94.3	0.10	ND	ND	0.24	0.13	5.8
Lepomis macrochirus	05/03/2000	16.9	113.5	0.10	ND	ND	0.24	0.13	5.8
Lepomis microlophus	05/03/2000	21.5	243	0.13	0.14	ND	0.26	ND	6.1
Lepomis microlophus	05/03/2000	29.0	592	0.22	0.10	ND	0.23	ND	5.2
Micropterus salmoides	05/03/2000	28.4	298	0.26	ND	ND	0.33	ND	4.5
Micropterus salmoides	05/03/2000	31.5	418	0.31	ND	ND	0.27	ND	4.0
Micropterus salmoides	05/03/2000	29.5	393	0.33	ND	ND	0.46	ND	5.4
Micropterus salmoides	05/03/2000	32.0	435	0.35	ND	ND	0.29	ND	4.0
Micropterus salmoides	05/03/2000	32.5	467	0.49	ND	ND	0.44	ND	7.7
Micropterus salmoides	05/03/2000	33.0	574	0.62	ND	ND	2.1	ND	3.2
Micropterus salmoides	05/03/2000	41.2	1025	0.81	ND	0.12	0.22	ND	2.8
Micropterus salmoides	05/03/2000	31.1	431	0.30	ND	0.13	0.41	ND	6.1
Micropterus salmoides	05/03/2000	33.0	570	0.72	ND	0.13	0.39	ND	2.7
Micropterus salmoides	05/03/2000	28.0	287	0.33	ND	0.11	0.46	0.16	6.2
Micropterus salmoides	05/03/2000	37.5	635	0.49	ND	0.38	1.6	0.21	4.7
Micropterus salmoides	05/03/2000	28.2	277	0.28	ND	0.14	0.95	0.36	7.4
Moxostoma collapsum	05/03/2000	40.5	857	0.12	ND	ND	0.18	ND	4.2
Moxostoma collapsum	05/03/2000	45.0	1414	0.09	ND	ND	0.51	ND	16.0
Moxostoma collapsum	05/03/2000	45.0	1414	0.13	ND	0.10	0.32	ND	4.2
Moxostoma collapsum	05/03/2000	41.5	916	0.15	ND	0.11	0.24	ND	4.3
Moxostoma collapsum	05/03/2000	45.0	1092	0.19	ND	0.13	0.35	ND	6.3
Tar River below Tarboro									
Ictalurus punctatus	05/03/2000	33.3	481	0.26	ND	0.11	0.21	ND	2.5
Lepomis macrochirus	05/03/2000	18.5	161	0.37	ND	ND	0.60	0.12	7.6
Lepomis macrochirus	05/03/2000	16.5	106.3	0.15	ND	ND	0.41	0.18	7.3
Lepomis macrochirus	05/03/2000	16.8	102.6	0.19	ND	0.24	0.77	0.58	6.9
Lepomis microlophus	05/03/2000	22.1	199	0.11	ND	ND	0.62	ND	8.4
Lepomis microlophus	05/03/2000	19.1	132.7	0.07	ND	0.11	1.1	ND	7.2
Micropterus salmoides	05/03/2000	31.5	470	0.33	ND	ND	0.84	ND	5.1
Micropterus salmoides	05/03/2000	33.0	527	0.41	ND	ND	0.18	ND	4.7
Micropterus salmoides	05/03/2000	34.5	658	0.33	ND	ND	0.18	ND	3.4
Micropterus salmoides	05/03/2000	35.2	651	0.42	ND	ND	0.17	ND	2.5
Micropterus salmoides	05/03/2000	39.6	1057	0.74	ND	ND	0.20	ND	2.8
Micropterus salmoides	05/03/2000	45.2	1305	0.73	ND	ND	0.26	ND	3.4
Micropterus salmoides	05/03/2000	36.2	714	0.28	ND	0.11	0.19	ND	2.9
Micropterus salmoides	05/03/2000	35.5	617	0.48	ND	0.23	0.18	ND	3.3
Micropterus salmoides	05/03/2000	31.0	428	0.29	ND	ND	0.52	0.25	7.0
Moxostoma anisurum	05/03/2000	46.0	1023	0.45	ND	ND	0.17	ND	3.7
Moxostoma anisurum	05/03/2000	42.0	873	0.24	ND	0.14	0.19	ND	2.5
Moxostoma anisurum	05/03/2000	49.0	1417	0.57	ND	0.14	0.24	ND	3.8
Moxostoma anisurum	05/03/2000	45.0	1067	0.43	ND	ND	0.22	ND	5.3
Tar River off NC 33 near Greenville									
Esox niger	06/01/2000	50.1	858	0.58	ND	ND	0.29	ND	6.5
Lepomis macrochirus	06/01/2000	18.4	133.5	0.16	ND	ND	0.23	ND	5.7
Lepomis macrochirus	06/01/2000	20.5	172.5	0.14	ND	ND	0.41	0.25	6.3
Lepomis microlophus	06/01/2000	21.7	223	0.23	ND	0.10	0.65	ND	6.4
Lepomis microlophus	06/01/2000	23.1	250.3	0.27	ND	0.10	0.40	0.19	7.4
Lepomis microlophus	06/01/2000	22.3	242	0.29	ND	0.19	0.32	0.29	7.3
Lepomis microlophus	06/01/2000	24.2	297	0.39	ND	ND	0.42	0.48	5.5
Micropterus salmoides	06/01/2000	45.1	1381	0.93	ND	ND	0.23	ND	3.5
Micropterus salmoides	06/01/2000	42.0	1071	0.88	ND	ND	0.20	ND	3.0
Micropterus salmoides	06/01/2000	34.5	647	0.57	ND	ND	0.14	ND	3.6
Micropterus salmoides	06/01/2000	36.8	746	0.76	ND	ND	0.15	ND	3.3
Micropterus salmoides	06/01/2000	33.7	462	0.63	ND	ND	0.15	ND	5.0
Micropterus salmoides	06/01/2000	32.2	468	0.56	ND	ND	0.27	ND	4.0
Micropterus salmoides	06/01/2000	32.0	465	0.54	ND	ND	0.30	ND	3.4

[1] Cadmium and lead were non-detectable in all samples.
ND = non detect; detection level for arsenic = 1.0 µg/g, and nickel = 0.5 µg/g.

Lake Assessment Program

Three lakes were monitored as part of the 2002 Lakes Assessment Program (Table 15).

Table 15 Lakes Monitored in the Tar-Pamlico River Basin, 2002

	Lake		
Variable	Lake Devin	Tar River Reservoir	Lake Mattamuskeet
Subbasin	01	02	08
County	Granville	Nash	Hyde
Classification	WS-II, NSW, CA	WS-IV, B, NSW, CA	SC
Surface area (Ac)	125	1,860	42,000
Mean Depth (ft.)	16	17	2
Volume ($X10^6 m^3$)	1.6	16.0	10.2
Watershed (mi^2)	1.2	775	---[1]

[1] Lake Mattamuskeet has no watershed; it receives inflow from precipitation and occasional saltwater intrusion.

Sampling Methods

Monitoring stations are sited to provide representative samples of lake water quality based on morphology, size, and site-specific features such as coves and tributaries. Dissolved oxygen, pH, water temperature and conductivity are made with a calibrated Hydrolab™. Readings are taken at the surface (0.15 meters) and at one-meter increments to the bottom. Secchi depth is measured at each station with a weighted Secchi disk attached to a rope marked off in centimeters. Surface water samples are collected for chloride, hardness, fecal coliform bacteria, and metals.

A Labline™ sampler is used to composite water samples within the photic zone (a depth equal to twice the Secchi depth). Nutrients, chlorophyll *a*, solids, turbidity and phytoplankton are collected at this depth. The sampler is also used to collect a sample near the bottom for nutrients. Samples are collected and preserved in accordance with specified protocols (NCDEHNR, 1996 and subsequent updates).

Data Interpretation

The North Carolina water quality standards (NCAC, 2002) are used in determining if a lake is meeting its designated uses. Lake water quality assessments are also based on information obtained from other lake monitoring programs such as those implemented by municipalities and major hydroelectric companies. Observations and comments from citizens, local government personnel, water treatment facility staff and others are also considered in the assessment process.

In addition to determining use support, data are used to evaluate the trophic state of lakes. An index was developed specifically for North Carolina lakes as part of the state's original Clean Lakes Classification Survey (NCDNRCD, 1983). The North Carolina Trophic State Index (NCTSI) is based on total phosphorus (TP in mg/l), total organic nitrogen (TON in mg/l), Secchi depth (SD in inches), and chlorophyll *a* (CHL in µg/l). Lakewide means for these parameters are used to produce a NCTSI score for each lake, using the equations:

$$TON_{Score} = ((\text{Log}(TON) + 0.45)/0.24)*0.90$$
$$TP_{Score} = ((\text{Log}(TP) + 1.55)/0.35)*0.92$$
$$SD_{Score} = ((\text{Log}(SD) - 1.73)/0.35)*-0.82$$
$$CHL_{Score} = ((\text{Log}(CHL) - 1.00)/0.48)*0.83$$
$$NCTSI = TON_{Score} + TP_{Score} + SD_{Score} + CHL_{Score}$$

In general, NCTSI scores relate to trophic classifications (Table 16). When scores border between classes, best professional judgment is used to assign an appropriate classification. Scores may be skewed by highly colored water typical of dystrophic lakes. Some variation in the trophic state between years is not unusual because of the variability of data, which usually involve sampling a limited number of times during the growing season.

Table 16 Lakes Classification Criteria

NCTSI Score	**Trophic Classification**
< -2.0	Oligotrophic
-2.0 – 0.0	Mesotrophic
0.0 – 5.0	Eutrophic
> 5.0	Hypereutrophic

Oligotrophic lakes are characteristically found in the mountains or in undisturbed watersheds. Many mesotrophic and eutrophic lakes are found in the central piedmont. There are a few hypereutrophic lakes where point or nonpoint sources of pollution contribute to high levels of nutrients.

Appendix III

Use Support Methodology
and
Use Support Ratings

Multiple-Category Use Support Methods

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. Waters are rated as Impaired if these criteria were not met. 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 US Environmental Protection Agency (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 EPA, which uses the rating to identify waters that demonstrate declining water quality conditions (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 use support assessments include biological, chemical/physical, lakes assessments, fish consumption advisories from the NC Department of Health and Human Services, and swimming advisories and shellfish sanitation growing area classifications 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.

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 for the five-year assessment window, 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.

It is also important to understand that use support methods continue to improve over time, and the information and technology used to make use support determinations also continues to become more accurate. These improvements sometimes make it difficult to make generalizations comparing water quality between basin plans. However, technology and methods improvements result in more scientifically sound use support assessments.

C. Assessment Methodology

Beginning in 2003 with the *Lumber River Basinwide Water Quality Plan*, DWQ assesses ecosystem health and human health risk using six use support categories: aquatic life, fish consumption, recreation, water supply, shellfish harvesting 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 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: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina* (15A NCAC 2b .0100 and .0200).

	Use Support Categories					
Primary Classification	**Ecosystem Approach**	**Human Health Approach**				
	Aquatic Life	**Fish Consumption**	**Primary/ Secondary Recreation**	**Water Supply**	**Shellfish Harvesting**	**Other**
C	X	X	X	N/A	N/A	X
SC	X	X	X	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	X	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 record and include, but are 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

Assessments are made on an overall basis of either monitored (M) or evaluated (E), depending on the level of information available. A monitored rating is based on the most recent five-year data window and site-specific data and is therefore treated with more confidence than an evaluated rating.

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 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 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 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 within the regional fish consumption advice area.
Impaired		Evaluated (E)	Only applied to waters in the Fish Consumption use support category in river basins within the regional fish consumption advice area.
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 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.

Supporting ratings are extrapolated up tributaries from monitored streams when there are no problematic dischargers with permit violations or changes in land use/cover. 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.

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 Use Support

The aquatic life use support category is an ecosystem approach to assess whether aquatic life (benthic macroinvertebrates and fish) can live and reproduce in the waters. 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 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 aquatic life protection.

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. This is particularly true when ambient chemical and biological data are conflicting. When these two indicators conflict, additional information is gathered (e.g., land use and land use changes, etc.) and best professional judgement is used to determine an appropriate use support rating.

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 to 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 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, coldwater 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 to 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 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

<u>*Aquatic Toxicity Data*</u>

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 or advice as issued by the NC Department of Health and Human Services (NCDHHS). 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 NCDHHS has developed regional fish consumption advice (all water south and east of I-85) for certain fish species shown to have elevated levels of mercury in their tissue. These fish species include shark, swordfish, king mackerel and tilefish, as well as largemouth bass, bowfin (or blackfish) and chain pickerel (or jack). This regional advice is used to determine use support for the fish consumption category. 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 regional fish consumption advice 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-Pee Dee 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 regional advice from other fish consumption advisories and to identify actual fish 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 methods for assessing the fish consumption use support category is being conducted and these methods may be modified in the future.

Recreation Use Support

This human health related use support category evaluates waters for the support of primary recreation activities such as swimming, water-skiing, skin diving and similar uses usually involving human body contact with water where such activities take place in an organized manner or on a frequent basis. Waters of the state designated for supporting these uses are classified as Class B, SB and SA waters. This use support category also evaluates whether waters support secondary recreation activities such as wading, boating and other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized or incidental basis. Waters of the state designated for supporting these uses are classified as Class C, SC and WS waters. The use support ratings applied to this category are based on the North Carolina water quality standard for fecal coliform bacteria where data are available or where swimming advisories are posted by local and state health agencies.

Water quality standards for fecal coliform bacteria are intended to ensure safe use of waters for recreation (refer to Administrative Code Section 15A NCAC 2B .0200). The North Carolina fecal coliform bacteria standard is not to exceed the geometric mean of 200 colonies per 100 ml of at least five samples over a 30-day period and not to exceed 400 colonies per 100 ml in more than 20 percent of the samples during the same period. The 200 colonies per 100 ml standard is intended to ensure that waters are safe enough for water contact through recreation.

Beginning in the summer of 1997, the Division of Environmental Health (DEH) began testing coastal recreation waters (beaches) for fecal coliform bacteria levels to assess the relative safety of these waters for swimming. The Shellfish Sanitation Section of DEH routinely tests approximately 275 coastal sites once a week during the tourist recreational season (April to September), less often the rest of the year. These tests give researchers and the public a gauge of bacteria levels along the North Carolina coast. If an area has elevated bacteria levels, health officials will advise that people not swim there by posting a swimming advisory in the area, and by notifying the local media and county health department.

The Division of Water Quality (DWQ) does not have a comprehensive weekly monitoring program to assess inland waters for fecal coliform bacteria levels. North Carolina has more than 37,000 miles of inland waters, and resources are not sufficient to perform comprehensive weekly bacteria monitoring. Rather, DWQ conducts monthly ambient water quality monitoring at approximately 375 locations across the state. These monthly samplings include fecal coliform bacteria testing of selected lakes, rivers and streams. Ambient water quality samples are routinely collected and sent to DWQ laboratories for analysis using EPA approved laboratory methods, with the exception that sample holding times are not typically within the prescribed six-hour limit. These data collection and analysis restrictions may impact the quality assurance of the sample results.

Because use support decisions are made in conjunction with the development of DWQ's basinwide water quality management strategies, all available information and data are evaluated for use support ratings using a five-year assessment period. A five-year data 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. However, an annual screening review of all DWQ ambient fecal coliform data is conducted by DWQ to assess the need for additional monitoring or the need for immediate action by the local or state health agencies to protect public health. In most cases, management strategies to correct waters considered to be Impaired due to elevated fecal coliform bacteria levels may require substantial resources and time. Therefore, impairment decisions for bacteria must be made using sound science and data.

Decades of monitoring experience have demonstrated that bacteria concentrations may fluctuate widely in surface waters over a period of time. Thus, a five-year data window and multiple sampling efforts are used to evaluate waters against the North Carolina water quality standard for recreational use support. This level of sampling is needed before waters should be considered Impaired, and therefore, in need of TMDL's or other management strategies. This procedure, however, does not preclude any health agency from immediately posting health advisories to warn recreational users of a temporary increase in health risks related to bacterial contamination or other health related episodes.

Each March, DWQ staff will review bacteria data collections from ambient monitoring stations statewide for the previous sampling year. Locations with annual geometric means greater than 200 colonies per 100 ml, or when more than 20 percent of the samples are greater than 400 colonies per 100 ml, are identified for potential follow-up monitoring conducted five times within 30 days as specified by the state fecal coliform bacteria standard. In addition, appropriate health agencies are notified of these locations. If an initial five times within 30 days sampling indicates a geometric mean greater than 200 colonies per 100 ml, or more than 20 percent of these samples exceed 400 colonies per 100 ml, then the location will continue to be sampled for bacteria persistence. If bacteria concentrations exceed either portion of the state standard, the data are sent to DEH and the local county health director to determine the need for posting swimming advisories. DWQ regional offices will also be notified.

Due to limited resources, and the higher risk to human health, primary recreation waters (Class B, SB and SA) will be given monitoring priority for additional five times within 30 days sampling. Follow-up water quality sampling for Class C waters will be performed as resources permit. Any waters on the 303(d) list of Impaired waters for fecal coliform will receive a low priority for additional monitoring because these waters will be further assessed for TMDL development.

Recreational use support decisions are based on a review of both DWQ and DEH monitoring data for the five-year data window. A formal solicitation for readily available and suitable fecal coliform bacteria monitoring data from other sources is conducted in accordance with EPA Section 303(d) guidance. Recreational use support assessments include an annual review of all readily available DWQ ambient monitoring data and may include additional sampling of five times within 30 days. The use support impairment status of any given water and the resulting listing of that water on the State 303(d) List will be determined using two procedures.

Monitored Class B, SB and SA waters are rated Supporting for primary recreation if the geometric mean over the five-year data window is less than or equal to 200 colonies per 100 ml, and if less than 20 percent of these samples did not exceed 400 colonies per 100 ml. These waters will be rated Impaired if either portion of these state standards are not met, or if additional five times within 30 days sampling exceeded either portion of the state standard. Monitored Class C, SC and WS waters are rated Impaired if a fecal coliform standard has been exceeded for that waterbody during the five-year data window and subsequent monitoring of five times within 30 days exceeded the 200 colonies per 100 ml geomean, or greater than 20 percent of these samples exceeded 400 colonies per 100 ml over the five-year data window. These waters are rated Supporting for secondary recreation if neither portion of the state standard is exceeded. Waters without sufficient fecal coliform data or swimming advisories are Not Rated and waters with no data are noted as having No Data.

DWQ attempts to determine if there are any inland swimming areas monitored by county or local health departments or estuarine (Class SA and SB) waters as assessed by DEH. Each January, DEH, county or local health departments are asked to list those waters which were posted with swimming advisories in the previous year. When reviewing DEH fecal coliform data and local swimming advisories, the same five-year window that ends on August 31 of the year of biological sampling is used. If a water was posted with a swimming advisory for at least two months within the five-year data window, it is further evaluated for the persistence of elevated fecal coliform bacteria levels. Those waters posted with swimming advisories for more than two months in the five-year data window are rated Impaired unless county or state health agencies believe that the cause of the swimming advisory is not persistent. If DEH has no data on an estuarine water, that water will not be rated for recreational uses.

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. These areas tend to be open more frequently than closed.
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. These areas tend to be closed more frequently than open.
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 ten acres are Class SA, only those ten 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 is 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 ten 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, primary/secondary 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 303(d) report and shown in the table below. Level 1 data can be used 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

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

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____. 2000b. *Fish Community Metric Re-Calibration and Biocriteria Development for the Outer Piedmont (Cape Fear, Neuse, Roanoke and Tar River Basins)*. October 17, 2000. *Ibid*.

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Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
TAR RIVER	28-(1)	From source to a point 0.6 mile upstream of Oxford Water Supply	WS-IV NSW	03-03-01	20.1	mi.	S	M			
Shelton Creek	28-4	From source to Tar River	WS-IV NSW	03-03-01	13.9	mi.	S	M			
North Fork Tar River	28-5	From source to Tar River	WS-IV NSW	03-03-01	8.8	mi.	S	M			
TAR RIVER	28-(5.3)	From a point 0.6 mile upstream from Oxford Water Supply to Oxford Water Supply Intake	WS-IV NSW CA	03-03-01	0.5	mi.	S	ME			
TAR RIVER	28-(5.7)	From Oxford Water Supply Intake to a point 0.6 mile upstream of Taylors Creek	WS-V NSW	03-03-01	20.5	mi.	S	M			
Fishing Creek	28-11e	From Coon Creek to Tar River	C NSW	03-03-01	6.1	mi.	S	M	np	Cause Unknown	Major Municipal Point Source,Urban Runoff/Storm Sewers
Fishing Creek	28-11c	From #1 outfall to SR 1608	C NSW	03-03-01	0.9	mi.	I	ME	p, np	Cause Unknown, Selenium	Major Municipal Point Source,Urban Runoff/Storm Sewers
Fishing Creek	28-11d	From SR 1608 to Coon Creek	C NSW	03-03-01	1.0	mi.	I	M	p, np	Cause Unknown	Major Municipal Point Source,Urban Runoff/Storm Sewers
Hachers Run (Devin Lake)	28-11-3-(1)	From source to dam at Devin Lake	WS-II NSW CA	03-03-01	98.9	ac.	S	M	np	Algal blooms	Source Unknown
Coon Creek	28-11-5	From source to Fishing Creek	C NSW	03-03-01	10.1	mi.	S	M	np		
Middle Creek	28-15	From source to Tar River	C NSW	03-03-01	8.4	mi.	S	M		Habitat degradation	Source Unknown
TAR RIVER	28-(15.5)	From a point 0.6 mile upstream of Taylors Creek to a point 0.3 mile downstream of Coole Creek	WS-IV NSW	03-03-01	14.8	mi.	S	M			
Tabbs Creek	28-17-(0.5)b	From Poplar Creek to Vance County SR 1100	C NSW	03-03-01	12.0	mi.	S	M	np	Habitat degradation	Agriculture
Lynch Creek	28-21-(0.7)	From Vance County SR 1547 to Tar River	WS-IV NSW	03-03-01	9.2	mi.	S	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
TAR RIVER	28-(24.3)	From a point 0.3 mile downstream of Coole Creek to Louisburg Water Supply Intake	WS-IV NSW CA	03-03-01	0.6	mi.	S	ME			
TAR RIVER	28-(24.7)a	From Louisburg Water Supply Intake to Cypress Creek	WS-V NSW	03-03-01	20.3	mi.	S	M			
Cedar Creek	28-29-(2)b	From Franklinton Branch to Tar River	C NSW	03-03-01	12.1	mi.	S	M		Habitat degradation	Source Unknown
Crooked Creek	28-30b	From NC 98 to Tar River	C NSW	03-03-01	5.4	mi.	S	M			
TAR RIVER	28-(36)	From Nash County SR 1933 to a point 4,000 feet upstream from dam at City of Rocky Mount Reservoir	WS-IV&B NSW CA	03-03-02	618.8	ac.	S	M		Algal blooms	Source Unknown
Sapony Creek	28-55-(1)	From source to mouth of Gabe Branch	C NSW	03-03-02	7.7	mi.	S	M			
TAR RIVER	28-(63)	From a point 4,000 feet upstream from dam at City of Rocky Mount Reservoir to dam at City of Rocky Mount Reservoir	WS-IV NSW CA	03-03-02	98.8	ac.	S	M		Algal blooms	Source Unknown
Stony Creek (Boddies Millpond)	28-68a	From source to Lassiters Creek	C NSW	03-03-02	19.4	mi.	S	M	np	Habitat degradation	Urban Runoff/Storm Sewers
Pigbasket Creek	28-68-3-(2)	From Nash County SR 1425 to Stony Creek	C NSW	03-03-02	11.2	mi.	NR	M			
TAR RIVER	28-(69)	From dam at Rocky Mount Mills to a point 0.9 mile downstream of Buck Swamp	C NSW	03-03-02	11.3	mi.	S	M	p, np	Habitat degradation	Urban Runoff/Storm Sewers
TAR RIVER	28-(74)a	From a point 0.9 mile downstream of Buck Swamp to Subbasin 03-03-02 / 03-03-03 boundary	WS-IV NSW	03-03-02	21.0	mi.	S	M	p, np	Habitat degradation	Urban Runoff/Storm Sewers
Beech Branch	28-75-(4)	From Falling Run to Tar River	WS-IV NSW	03-03-02	1.0	mi.	NR	M		Habitat degradation	Source Unknown
Swift Creek	28-78-(0.5)	From source to a point 1.4 miles upstream of Edgecombe County SR 1409	C NSW	03-03-02	37.7	mi.	S	M			
Martin Creek	28-78-1-3	From source to Sandy Creek	C NSW	03-03-02	4.2	mi.	NR	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
Weaver Creek	28-78-1-7	From source to Southerlands Pond	C NSW	03-03-02	6.5	mi.	NR	M			
Sandy Creek	28-78-1-(8)b	From NC 401to NC Hwy. 561	B NSW	03-03-02	11.3	mi.	S	M			
Sandy Creek	28-78-1-(8)a	From dam at Southerlands Pond to NC Hwy.401	B NSW	03-03-02	3.8	mi.	S	M	np		
Flatrock Creek	28-78-1-12	From source to Sandy Creek	B NSW	03-03-02	9.1	mi.	S	M			
Sandy Creek	28-78-1-(14)	From NC Hwy. 561 to Swift Creek	C NSW	03-03-02	20.3	mi.	S	M	np		
Red Bud Creek	28-78-1-17	From source to Sandy Creek	C NSW	03-03-02	10.6	mi.	S	M			
Swift Creek	28-78-(6.5)	From a point 1.4 miles upstream of Edgecombe County SR 1409 to Tar River	WS-IV NSW	03-03-02	10.0	mi.	S	M		Habitat degradation	Source Unknown
Whiteoak Swamp	28-78-7-(2)	From a point 1.8 miles upstream of Edgecombe County SR 1428 to Swift Cr.	WS-IV NSW	03-03-02	2.8	mi.	S	M		Habitat degradation	Source Unknown
TAR RIVER	28-(74)b	From subbasin 03-03-02 / 03-03-03 boundary to a point 0.5 mile upstream of Tarboro Water Supply Intake	WS-IV NSW	03-03-03	2.3	mi.	S	ME			
TAR RIVER	28-(79.5)	From a point 0.5 mile upstream of Tarboro Water Supply Intake to Tarboro Water Supply Intake	WS-IV NSW CA	03-03-03	0.5	mi.	S	ME			
TAR RIVER	28-(80)	From Tarboro Raw Water Supply Intake to Suggs Creek	C NSW	03-03-03	14.8	mi.	S	M			
Cokey Swamp	28-83-3a	From source to Dickson Branch	C NSW	03-03-03	8.6	mi.	I	M	np	Habitat degradation	Urban Runoff/Storm Sewers
Sasnett Mill Branch	28-83-3-3	From source to Cokey Swamp	C NSW	03-03-03	3.1	mi.	NR	M			
Bynums Mill Creek	28-83-4	From source to Town Creek	C NSW	03-03-03	9.7	mi.	I	M	p, np	Habitat degradation	Source Unknown
TAR RIVER	28-(84)a	From Suggs Creek to Subbasin 03-03-03 / 03-03-05 boundary	WS-IV NSW	03-03-03	6.3	mi.	S	M			
Otter Creek	28-86-(0.3)	From source to a point 0.7 mile upstream of Kitten Creek	C NSW	03-03-03	13.9	mi.	S	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
Conetoe Creek	28-87-(0.5)a	From source to SR 1516	C NSW	03-03-03	3.9	mi.	NR	M	np	Habitat degradation, Pesticides, Organic Enrichment	Channelization, Agriculture, Concentrated Animal Feeding Operations
Conetoe Creek	28-87-(0.5)d	From Crisp Creek to Pitt County SR 1404	C NSW	03-03-03	6.7	mi.	I	M	np	Habitat degradation, Pesticides, Organic Enrichment	Channelization, Agriculture, Concentrated Animal Feeding Operations
Conetoe Creek	28-87-(0.5)c	From 1350 meters North of NC 42 to Crisp Creek	C NSW	03-03-03	1.5	mi.	S	M	np	Habitat degradation, Pesticides, Organic Enrichment	Channelization, Agriculture, Concentrated Animal Feeding Operations
Conetoe Creek	28-87-(0.5)b	From SR 1516 to 1350 meters North of NC 42	C NSW	03-03-03	5.9	mi.	I	M	np	Habitat degradation, Pesticides, Organic Enrichment	Channelization, Agriculture, Concentrated Animal Feeding Operations
Crisp Creek	28-87-1	From source to Conetoe Creek	C NSW	03-03-03	8.7	mi.	I	M	np	Habitat degradation, Pesticides	Agriculture
Ballahack Canal	28-87-1.2	From source to Conetoe Creek	C NSW	03-03-03	8.4	mi.	I	M	np	Habitat degradation, Pesticides	Agriculture
Fishing Creek	28-79-(1)	From source to Shocco Creek	C NSW	03-03-04	36.7	mi.	S	M			
Fishing Creek	28-79-(21)	From Shocco Creek to Little Fishing Creek	WS-V NSW	03-03-04	16.7	mi.	S	ME			
Shocco Creek	28-79-22	From source to Fishing Creek	C NSW	03-03-04	28.7	mi.	S	M			
Little Fishing Creek	28-79-25	From source to Fishing Creek	C NSW	03-03-04	31.4	mi.	S	M			
Reedy Creek	28-79-25-5	From source to Little Fishing Creek	C NSW	03-03-04	20.5	mi.	S	M			
Bear Swamp	28-79-25-7	From source to Little Fishing Creek	C NSW	03-03-04	13.6	mi.	S	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
Fishing Creek	28-79-(25.5)	From Little Fishing Creek to a point 0.6 mile upstream of Enfield Raw Water Supply Intake	WS-IV NSW	03-03-04	14.7	mi.	S	ME			
Rocky Swamp (Bellamy Lake)	28-79-28-(0.7)	From a point 1.0 mile downstream of NC Hwy. 561 to Fishing Creek	WS-IV NSW	03-03-04	10.6	mi.	S	M			
Fishing Creek	28-79-(28.5)	From a point 0.6 mile upstream of Enfield Raw Water Supply to Enfield Raw Water Supply Intake	WS-IV NSW CA	03-03-04	0.6	mi.	S	ME			
Fishing Creek	28-79-(29)	From Enfield Raw Water Supply Intake to a point 1.7 miles downstream of Beech Swamp	C NSW	03-03-04	24.3	mi.	S	M		Habitat degradation, Pesticides, Algal blooms	Agriculture
Beech Swamp	28-79-30	From source to Fishing Creek	C Sw NSW	03-03-04	13.1	mi.	S	M	np	Cause Unknown	Minor Municipal Point Source
Fishing Creek	28-79-(30.5)	From a point 1.7 miles downstream of Beech Swamp to Tar River	WS-IV NSW	03-03-04	17.1	mi.	S	M	np	Algal blooms	Source Unknown
Deep Creek	28-79-32-(0.5)	From source to a point 1.3 miles upstream of NC Hwy. 97	C NSW	03-03-04	19.8	mi.	S	M		Habitat degradation	Source Unknown
Savage Mill Run	28-79-32-4	From source to Deep Creek	WS-IV NSW	03-03-04	4.2	mi.	NR	M			
TAR RIVER	28-(94)	From Greenville Raw Water Supply Intake to a point 1.2 miles downstream of the mouth of Broad Run	C NSW	03-03-05	13.1	mi.	NR	ME			
Parker Creek	28-95	From source to Tar River	C NSW	03-03-05	7.3	mi.	NR	M		Habitat degradation	Urban Runoff/Storm Sewers
Hardee Creek	28-97	From source to Tar River	C NSW	03-03-05	5.6	mi.	S	M			
TAR RIVER	28-(99.5)	From a point 1.2 miles downstream of the mouth of Broad Run to the upstream side of the mouth of Tranters Creek	B NSW	03-03-05	10.3	mi.	NR	M			
Grindle Creek	28-100b	From Whichard Branch to Tar River	C NSW	03-03-05	14.2	mi.	S	M		Habitat degradation	Agriculture
Whichard Branch	28-100-2	From source to Grindle Creek	C NSW	03-03-05	6.6	mi.	S	M		Habitat degradation	Agriculture

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
Chicod Creek	28-101	From source to Tar River	C NSW	03-03-05	14.1	mi.	I	M	np	Habitat degradation	Agriculture
Tranters Creek	28-103a	From source to subbasin 03-03-05 / 03-03-06 boundary	C Sw NSW	03-03-06	37.8	mi.	S	M			
Tranters Creek	28-103b	From subbasin 03-03-05 / 03-03-06 boundary to Tar River	C Sw NSW	03-03-06	0.9	mi.	S	ME			
Flat Swamp	28-103-2b	From 1.5 miles downstream of Robersonville WWTP discharge to Tranters Creek	C Sw NSW	03-03-06	1.5	mi.	S	M	p, np	Habitat degradation	Other Urban Runoff
Horsepen Swamp	28-103-10	From source to Tranters Creek	C Sw NSW	03-03-06	6.0	mi.	S	M			
Old Ford Swamp	28-103-14-1	From source to Aggie Run	C Sw NSW	03-03-06	5.1	mi.	S	M			
Latham Creek	28-103-14-2	From source to Aggie Run	C Sw NSW	03-03-06	2.7	mi.	S	M			
TAR RIVER	28-(102.5)	From the upstream side of the mouth of Tranters Creek to mouth at US Hwy. 17 bridge at Washington	C NSW	03-03-07	338.0	ac.	I	M	p, np	Chlorophyll *a*	other
Kennedy Creek	28-104	From source to Tar River	C NSW	03-03-07	32.0	ac.	I	ME	p, np	Chlorophyll *a*	other
PAMLICO RIVER	29-(1)	From US Hwy. 17 bridge (mouth of Tar River) at Washington to a line projected from the downstream Corporate Limit Line of the Town of Washington Park in a southwesterly direction across Pamlico River to a Point of Land 800 yards downstream from Rodman Point	SC NSW	03-03-07	739.5	ac.	I	M	p, np	Chlorophyll *a*	other
Rodman Creek	29-4-(2)	From a point one-half mile above mouth to Pamlico River	SC NSW	03-03-07	19.1	ac.	I	ME	p, np	Chlorophyll *a*	other

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
PAMLICO RIVER	29-(5)a	From a line projected from the downstream Corporate Limit Line of the Town of Washington Park in a southwesterly direction across Pamlico River to a Point of Land 800 yards downstream from Rodman Point to a line across Pamlico River 798 meters downstream of Cals Creek on the south shore to 3.75 kilometers upstream of Broad Creek on the north shore.	SB NSW	03-03-07	1,765.6	ac.	I	M	p, np	Chlorophyll *a*	other
PAMLICO RIVER	29-(5)b	From a line across Pamlico River 798 meters downstream of Cals Creek on the south shore to 3.75 kilometers upstream of Broad Creek on the north shore to a line across Pamlico River from Cousin Point to Hickory Point	SB NSW	03-03-07	28,452.2	ac.	S	M			
Chocowinity Bay	29-6-(1)	From source to a line across the Bay from the upstream mouth of Cedar Creek to the upstream mouth of Silas Creek	SC NSW	03-03-07	389.6	ac.	I	ME	p, np	Chlorophyll *a*	other
Chocowinity Bay	29-6-(5)	From a line across the Bay from the upstream mouth of Cedar Creek to the upstream mouth of Silas Creek to Pamlico River	SB NSW	03-03-07	503.2	ac.	I	M	p, np	Chlorophyll *a*	other
Blounts Bay (inside a line from Hill Point to Mauls Point)	29-9	From source to Pamlico River	SB NSW	03-03-07	2,101.2	ac.	NR	M		Chlorophyll *a*	other
Beaverdam Swamp	29-10-2	From source to Broad Creek	C NSW	03-03-07	4.3	mi.	S	M		Habitat degradation	Source Unknown
Bath Creek	29-19-(5.5)	From a line across Bath Creek from Long Point to Pamlico River	SB NSW	03-03-07	861.2	ac.	S	M			
Durham Creek	29-21-(1)	From source to a point 2.0 miles upstream from Tan Swamp	C NSW	03-03-07	9.9	mi.	NR	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
PAMLICO RIVER	29-(27)	From a line across Pamlico River from Cousin Point to Hickory Point to a line across Pamlico River from Roos Point to Persimmon Tree Point	SA NSW	03-03-07	33,766.4	ac.	S	M			
Pungo River	29-34-(5)	From Shallop Creek to US Hwy. 264 at Leechville	SC NSW	03-03-07	253.1	ac.	NR	M			
Pungo River	29-34-(12)a	From US Hwy. 264 at Leechville to a line across Pungo River from Woodstock Point to Quilley Point excluding DEH Swimming area near mouth of Pantego Creek	SB NSW	03-03-07	15,409.8	ac.	S	M			
Pungo River	29-34-(12)b	Area extending 200 feet east and west along the north shore of the Pungo River and extending out 200 feet into the river. The area starts 126 meters east of the mouth Pantego Creek.	SB NSW	03-03-07	2.8	ac.	S	ME			
Pantego Creek	29-34-34-(2)	From US Hwy. 264 at Pantego to Pungo River	SC NSW	03-03-07	952.4	ac.	I	M	np	Chlorophyll *a*	other
Pungo Creek	29-34-35	From source to Pungo River	SC NSW	03-03-07	1,701.6	ac.	I	M	np	Chlorophyll *a*	other
Acre Swamp	29-34-35-1-1	From source to Pungo Swamp	C Sw NSW	03-03-07	7.5	mi.	NR	M			
Pungo River	29-34-(38)	From a line across Pungo River from Woodstock Point to Quilley Point to Pamlico River	SA NSW	03-03-07	10,367.8	ac.	S	M			

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	Source	Problem Parameter(s)	Potential Sources
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)a	From a line across Pamlico River from Roos Point to Persimmon Tree Point to Pamlico Sound and Pamlico Sound within a line beginning at Sandy Point and extending southerly to northeast tip of Ocracoke Island, thence along the Ocean Side of Ocracoke Island to its southwest tip, thence northwesterly to Little Propoise Point, exclusive of the ORW area described below, also excluding DEH closed areas at mouth of Middleton Creek, mouth of Long Creek, at mouth of Far Creek and adjacent to Ocracoke.	SA	03-03-07	457,942.0	ac.	S	ME			
Pamlico Sound Swanquarter Bay/Juniper Bay ORW Area, including the Northeast Swanquarter Bay Area	29-46.5	All waters within a line beginning at Juniper Bay Point and running due South to Lat. 35 18’00", Long 76 13’20", thence due west to Lat. 35 18’00", Long 76 20’00", thence northwest to Shell Point	SA ORW	03-03-07	11,670.0	ac.	S	ME			
Lake Mattamuskeet	29-57-1-1	Entire Lake	SC	03-03-07	40,314.1	ac.	S	M			

NOTES

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"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

M = Monitored	I = Impaired	p = Point Source Pollution (Major source)
S = Supporting	NR = Not Rated	np = Nonpoint Source Pollution

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis
TAR RIVER	28-(5.7)	From Oxford Water Supply Intake to a point 0.6 mile upstream of Taylors Creek	WS-V NSW	03-03-01	20.5	mi	S	M
Fishing Creek	28-11e	From Coon Creek to Tar River	C NSW	03-03-01	6.1	mi	S	M
TAR RIVER	28-(24.7)a	From Louisburg Water Supply Intake to Cypress Creek	WS-V NSW	03-03-01	20.3	mi	S	M
TAR RIVER	28-(69)	From dam at Rocky Mount Mills to a point 0.9 mile downstream of Buck Swamp	C NSW	03-03-02	11.3	mi	S	M
TAR RIVER	28-(74)a	From a point 0.9 mile downstream of Buck Swamp to Subbasin 03-03-02/03-03-03 boundary	WS-IV NSW	03-03-02	21.0	mi	S	M
Swift Creek	28-78-(0.5)	From source to a point 1.4 miles upstream of Edgecombe County SR 1409	C NSW	03-03-02	37.7	mi	S	M
Sandy Creek	28-78-1-(8)b	From NC 401to NC Hwy. 561	B NSW	03-03-02	11.3	mi	S	M
Fishing Creek	28-79-(29)	From Enfield Raw Water Supply Intake to a point 1.7 miles downstream of Beech Swamp	C NSW	03-03-04	24.3	mi	S	M
TAR RIVER	28-(80)	From Tarboro Raw Water Supply Intake to Suggs Creek	C NSW	03-03-03	14.8	mi	S	M
TAR RIVER	28-(84)a	From Suggs Creek to Subbasin 03-03-03/03-03-05 boundary	WS-IV NSW	03-03-03	6.3	mi	S	M
Conetoe Creek	28-87-(0.5)d	From Crisp Creek to Pitt County SR 1404	C NSW	03-03-03	6.7	mi	S	M
TAR RIVER	28-(99.5)	From a point 1.2 miles downstream of the mouth of Broad Run to the upstream side of the mouth of Tranters Creek	B NSW	03-03-05	10.3	mi	S	M
Chicod Creek	28-101	From source to Tar River	C NSW	03-03-05	14.1	mi	S	M
Tranters Creek	28-103a	From source to subbasin 03-03-05/03-03-06 boundary	C Sw NSW	03-03-06	37.8	mi	S	M
PAMLICO RIVER	29-(1)	From US Hwy. 17 bridge (mouth of Tar River) at Washington to a line projected from the downstream Corporate Limit Line of the Town of Washington Park in a southwesterly direction across Pamlico River to a Point of Land 800 yards downstream from Rodman Point	SC NSW	03-03-07	739.5	ac	S	M
PAMLICO RIVER	29-(5)a	From a line projected from the downstream Corporate Limit Line of the Town of Washington Park in a southwesterly direction across Pamlico River to a Point of Land 800 yards downstream from Rodman Point to a line across Pamlico River 798 meters downstream of Cals Creek on the south shore to 3.75 kilometers upstream of Broad Creek on the north shore.	SB NSW	03-03-07	1765.6	ac	S	M
PAMLICO RIVER	29-(5)b	From a line across Pamlico River 798 meters downstream of Cals Creek on the south shore to 3.75 kilometers upstream of Broad Creek on the north shore to a line across Pamlico River from Cousin Point to Hickory Point	SB NSW	03-03-07	28452.2	ac	S	M

Chocowinity Bay	29-6-(5)	From a line across the Bay from the upstream mouth of Cedar Creek to the upstream mouth of Silas Creek to Pamlico River	SB NSW	03-03-07	503.2	ac	S	M
Blounts Bay (inside a line from Hill Point to Mauls Point)	29-9	From source to Pamlico River	SB NSW	03-03-07	2101.2	ac	S	M
Broad Creek	29-10-(3)	From a point 1.0 mile above Beaufort County SR 1325 to Pamlico River	SB NSW	03-03-07	368.1	ac	S	M
Little Goose Creek	29-11-(2)	From a point 0.5 mile below Beaufort County SR 1334 to Pamlico River	SC NSW	03-03-07	141.2	ac	S	M
Bath Creek	29-19-(5.5)	From a line across Bath Creek from Long Point to Pamlico River	SB NSW	03-03-07	861.2	ac	S	M
PAMLICO RIVER	29-(27)	From a line across Pamlico River from Cousin Point to Hickory Point to a line across Pamlico River from Roos Point to Persimmon Tree Point	SA NSW	03-03-07	33766.4	ac	S	M
Pungo River	29-34-(12)a	From US Hwy. 264 at Leechville to a line across Pungo River from Woodstock Point to Quilley Point excluding DEH Swimming area near mouth of Pantego Creek	SB NSW	03-03-07	15409.8	ac	S	M
Pungo River	29-34-(12)b	Area extending 200 feet east and west along the north shore of the Pungo River and extending out 200 feet into the river. The area starts 126 meters east of the mouth Pantego Creek.	SB NSW	03-03-07	2.8	ac	I	M
Pantego Creek	29-34-34-(2)	From US Hwy. 264 at Pantego to Pungo River	SC NSW	03-03-07	952.4	ac	S	M
Pungo Creek	29-34-35	From source to Pungo River	SC NSW	03-03-07	1701.6	ac	S	M
Pungo River	29-34-(38)	From a line across Pungo River from Woodstock Point to Quilley Point to Pamlico River	SA NSW	03-03-07	10367.8	ac	S	M
Swanquarter Bay	29-49a	DEH closed area west of Swanquarter	SA ORW	03-03-08	136.2	ac	S	M

NOTES

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ABBREVIATION KEY

p = Point Source Pollution (Major source)

np = Nonpoint Source Pollution

M = Monitored

S = Supporting

I = Impaired

NR = Not Rated

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
PAMLICO RIVER	29-(27)	From a line across Pamlico River from Cousin Point to Hickory Point to a line across Pamlico River from Roos Point to Persimmon Tree Point	SA NSW	03-03-07	33,766.4	ac	S	M	app		
South Creek	29-28-(6.5)	From Deephole Point to Pamlico River	SA NSW	03-03-07	3,073.5	ac	I	M	pro	G-12	Source Unknown
Whitehurst Creek	29-28-7-(2)	From NC Hwy. 306 to South Creek	SA NSW	03-03-07	15.6	ac	I	M	pro	G-12	Source Unknown
Jacks Creek	29-28-8-(2)	From a point 0.2 mile downstream from Beaufort County SR 1942 to South Creek	SA NSW	03-03-07	8.8	ac	I	M	pro	G-12	Source Unknown
Little Creek	29-28-9-(2)	From a point three-fourths mile above mouth to South Creek	SA NSW	03-03-07	21.3	ac	I	M	pro	G-12	Source Unknown
Jacobs Creek	29-28-10-(2)	From a point 0.5 mile above mouth to South Creek	SA NSW	03-03-07	13.4	ac	I	M	pro	G-12	Source Unknown
Drinkwater Creek	29-28-10-3-(2)	From a point 0.5 mile above mouth to Jacobs Creek	SA NSW	03-03-07	10.3	ac	I	M	pro	G-12	Source Unknown
Short Creek	29-28-11	From source to South Creek	SA NSW	03-03-07	6.5	ac	I	M	pro	G-12	Source Unknown
Tooley Creek	29-28-12-(2)	From a point 0.5 mile below Beaufort County SR 1945 to South Creek	SA NSW	03-03-07	15.4	ac	I	M	pro	G-12	Source Unknown
Long Creek	29-28-13-(2)	From a point 1.5 miles above mouth to South Creek	SA NSW	03-03-07	30.4	ac	I	M	pro	G-12	Source Unknown
Schooner Creek	29-28-14	From source to South Creek	SA NSW	03-03-07	0.6	mi	I	M	pro	G-12	Source Unknown
Bond Creek	29-28-15-(2)	From Beaufort County SR 1912 to South Creek	SA NSW	03-03-07	373.2	ac	I	M	pro	G-12	Source Unknown
Alligator Gut	29-28-15-3	From source to Bond Creek	SA NSW	03-03-07	3.2	ac	I	M	pro	G-12	Source Unknown
Flannigan Gut	29-28-15-4	From source to Bond Creek	SA NSW	03-03-07	4.0	ac	I	M	pro	G-12	Source Unknown
Muddy Creek	29-28-15-5-(2)	From Beaufort County SR 1912 to Bond Creek	SA NSW	03-03-07	97.2	ac	I	M	pro	G-12	Source Unknown
Robin Gut	29-28-15-5-3	From source to Muddy Creek	SA NSW	03-03-07	0.2	ac	I	M	pro	G-12	Source Unknown
Wilson Gut	29-28-15-5-4	From source to Muddy Creek	SA NSW	03-03-07	0.1	ac	I	M	pro	G-12	Source Unknown
Sheepskin Creek	29-28-15-5-5	From source to Muddy Creek	SA NSW	03-03-07	1.6	ac	I	M	pro	G-12	Source Unknown

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
North Creek	29-29-(2)b	From mouth of Frying Pan Creek to Pamlico River	SA NSW	03-03-07	190.2	ac	S	M	app		
North Creek	29-29-(2)a	From Beaufort County SR 1722 at Ransomville to mouth of Frying Pan Creek	SA NSW	03-03-07	162.0	ac	I	M	pro	G-1	Source Unknown
Garrett Gut	29-29-4	From source to North Creek	SA NSW	03-03-07	8.0	ac	I	M	pro	G-1	Source Unknown
East Fork North Creek	29-29-5	From source to North Creek	SA NSW	03-03-07	126.0	ac	S	M	app		
Ross Creek	29-29-5-1	From source to East Fork North Creek	SA NSW	03-03-07	77.9	ac	S	M	app		
Bailey Creek	29-29-5-2	From source to East Fork North Creek	SA NSW	03-03-07	78.3	ac	S	M	app		
Frying Pan Creek	29-29-6	From source to North Creek	SA NSW	03-03-07	62.5	ac	S	M	app		
Little Ease Creek	29-29-7	From source to North Creek	SA NSW	03-03-07	31.3	ac	S	M	app		
Davis Creek	29-30	From source to Pamlico River	SA NSW	03-03-07	13.1	ac	S	M	app		
Strawhorn Creek	29-31	From source to Pamlico River	SA NSW	03-03-07	13.8	ac	S	M	app		
Cypress Branch	29-31-1	From source to Strawhorn Creek	SA NSW	03-03-07	16.6	ac	S	M	app		
East Prong Cypress Branch	29-31-1-1	From source to Cypress Branch	SA NSW	03-03-07	4.6	ac	S	M	app		
Reed Hammock Ditch	29-32	From source to Pamlico River	SA NSW	03-03-07	21.5	ac	S	M	app		
Goose Creek	29-33	From source to Pamlico River	SA NSW	03-03-07	1,280.9	ac	S	M	app		
Upper Spring Creek	29-33-1	From source to Goose Creek	SA NSW	03-03-07	427.1	ac	S	M	app		
Intracoastal Waterway	29-33-1-1	From NC Hwy. 304 to Upper Spring Creek	SA NSW	03-03-07	45.9	ac	S	M	app		
Hunting Creek	29-33-1-2	From source to Upper Spring Creek	SA NSW	03-03-07	1.2	mi	S	M	app		
Cow Gallus Creek	29-33-1-3	From source to Upper Spring Creek	SA NSW	03-03-07	3.4	ac	S	M	app		
Campbell Creek	29-33-2-(2)	From NC Hwy. 33 to Goose Creek	SA NSW	03-03-07	487.6	ac	S	M	app		
Lee Creek	29-33-2-12	From source to Campbell Creek	SA NSW	03-03-07	14.8	ac	S	M	app		
Carrie Creek	29-33-2-13	From source to Campbell Creek	SA NSW	03-03-07	2.2	ac	S	M	app		
Smith Creek	29-33-2-14	From source to Campbell Creek	SA NSW	03-03-07	20.7	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Camphion Gut	29-33-2-15	From source to Campbell Creek	SA NSW	03-03-07	0.2	mi	S	M	app		
Cuff Tarkiln Creek	29-33-2-16	From source to Campbell Creek	SA NSW	03-03-07	12.8	ac	S	M	app		
Myrtle March Gut	29-33-2-17	From source to Campbell Creek	SA NSW	03-03-07	0.6	ac	S	M	app		
Pasture Gut	29-33-2-18	From source to Campbell Creek	SA NSW	03-03-07	7.9	ac	S	M	app		
Eastham Creek	29-33-3a	From source to line 966 meters west of mouth of Eastham Creek	SA NSW	03-03-07	62.5	ac	I	M	pro	G-1	Source Unknown
Eastham Creek	29-33-3b	From line 966 meters west of mouth of Eastham Creek to Goose Creek	SA NSW	03-03-07	192.5	ac	S	M	app		
Alligator Creek	29-33-3-1	From source to Eastham Creek	SA NSW	03-03-07	1.8	ac	I	M	pro	G-1	Source Unknown
Long Creek	29-33-3-2	From source to Eastham Creek	SA NSW	03-03-07	1.1	ac	I	M	pro	G-3	Source Unknown
Slade Landing Creek	29-33-3-3	From source to Eastham Creek	SA NSW	03-03-07	12.7	ac	S	M	app		
Mallard Creek	29-33-3-4	From source to Eastham Creek	SA NSW	03-03-07	8.3	ac	S	M	app		
Otter Creek	29-33-3-5	From source to Eastham Creek	SA NSW	03-03-07	1.0	ac	S	M	app		
Mud Gut	29-33-4	From source to Goose Creek	SA NSW	03-03-07	4.2	ac	S	M	app		
Sand Beach Creek	29-33-5	From source to Goose Creek	SA NSW	03-03-07	2.9	ac	S	M	app		
Snode Creek	29-33-6	From source to Goose Creek	SA NSW	03-03-07	118.0	ac	S	M	app		
Neezar Gut	29-33-6-1	From source to Snode Creek	SA NSW	03-03-07	0.8	ac	S	M	app		
Tetterton Gut	29-33-6-2	From source to Snode Creek	SA NSW	03-03-07	0.6	mi	S	M	app		
Big Pond Gut	29-33-6-3	From source to Snode Creek	SA NSW	03-03-07	0.8	ac	S	M	app		
Schoolhouse Gut	29-33-6-4	From source to Snode Creek	SA NSW	03-03-07	1.8	ac	S	M	app		
Northeast Prong	29-33-6-5	From source to Snode Creek	SA NSW	03-03-07	2.0	ac	S	M	app		
Facing Gut	29-33-6-6	From source to Snode Creek	SA NSW	03-03-07	2.4	ac	S	M	app		
Wilkerson Creek	29-33-7	From source to Goose Creek	SA NSW	03-03-07	3.7	ac	S	M	app		
Peterson Creek	29-33-8	From source to Goose Creek	SA NSW	03-03-07	16.7	ac	S	M	app		
Paton Creek	29-33-9	From source to Goose Creek	SA NSW	03-03-07	13.5	ac	S	M	app		
Dixon Creek	29-33-10	From source to Goose Creek	SA NSW	03-03-07	44.4	ac	S	M	app		
Big Marsh Gut	29-33-10-1	From source to Dixon Creek	SA NSW	03-03-07	2.6	ac	S	M	app		
Convoy Gut	29-33-10-2	From source to Dixon Creek	SA NSW	03-03-07	10.5	ac	S	M	app		
Lower Spring Creek	29-33-11	From source to Goose Creek	SA NSW	03-03-07	151.8	ac	S	M	app		
Pitch Hole Gut	29-33-11-1	From source to Lower Spring Creek	SA NSW	03-03-07	4.7	ac	S	M	app		
Persimmon Tree Landing Gut	29-33-11-2	From source to Lower Spring Creek	SA NSW	03-03-07	3.1	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Tar Landing Gut	29-33-11-3	From source to Lower Spring Creek	SA NSW	03-03-07	2.4	ac	S	M	app		
Gray Gut	29-33-11-4	From source to Lower Spring Creek	SA NSW	03-03-07	4.9	ac	S	M	app		
Mill Creek	29-33-11-5	From source to Lower Spring Creek	SA NSW	03-03-07	5.6	ac	S	M	app		
Betty Creek	29-33-11-6	From source to Lower Spring Creek	SA NSW	03-03-07	33.6	ac	S	M	app		
Overton Creek	29-33-11-7	From source to Lower Spring Creek	SA NSW	03-03-07	14.1	ac	S	M	app		
Old House Cove	29-33-11-8	From source to Lower Spring Creek	SA NSW	03-03-07	3.9	ac	S	M	app		
Hatter Creek	29-33-12	From source to Goose Creek	SA NSW	03-03-07	12.5	ac	S	M	app		
Pungo River	29-34-(38)	From a line across Pungo River from Woodstock Point to Quilley Point to Pamlico River	SA NSW	03-03-07	10,367.8	ac	S	M	app		
Sparrows Gut	29-34-39	From source to Pungo River	SA NSW	03-03-07	1.8	mi	S	M	app		
Slade Creek	29-34-40b	From a line 169 meters north of mouth of Chruch Creek to Pungo River	SA NSW	03-03-07	137.0	ac	S	M	app		
Slade Creek	29-34-40a	From source to a line 169 meters north of mouth of Chruch Creek	SA NSW	03-03-07	591.0	ac	I	M	pro	G-8	Source Unknown
Jones Creek	29-34-40-1	From source to Slade Creek	SA NSW	03-03-07	15.1	ac	I	M	pro	G-8	Source Unknown
Jarvis Creek	29-34-40-2	From source to Slade Creek	SA NSW	03-03-07	8.0	ac	I	M	pro	G-8	Source Unknown
Raffing Creek	29-34-40-3	From source to Slade Creek	SA NSW	03-03-07	5.0	ac	I	M	pro	G-8	Source Unknown
Becky Creek (Becky Branch)	29-34-40-4	From source to Slade Creek	SA NSW	03-03-07	19.6	ac	I	M	pro	G-8	Source Unknown
Neal Creek	29-34-40-5	From source to Slade Creek	SA NSW	03-03-07	68.0	ac	I	M	pro	G-8	Source Unknown
Wood Creek	29-34-40-6	From source to Slade Creek	SA NSW	03-03-07	26.7	ac	I	M	pro	G-8	Source Unknown
Spellman Creek	29-34-40-7	From source to Slade Creek	SA NSW	03-03-07	15.2	ac	I	M	pro	G-8	Source Unknown
Speer Creek	29-34-40-8	From source to Slade Creek	SA NSW	03-03-07	10.7	ac	I	M	pro	G-8	Source Unknown
Church Creek	29-34-40-9	From source to Slade Creek	SA NSW	03-03-07	15.6	ac	S	M	app		
Speer Gut	29-34-40-9-1	From source to Church Street	SA NSW	03-03-07	2.1	ac	S	M	app		
Allison Creek	29-34-40-10	From source to Slade Creek	SA NSW	03-03-07	1.2	mi	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Foreman Creek	29-34-40-10-1	From source to Allison Creek	SA NSW	03-03-07	13.0	ac	S	M	app		
Jordan Creek	29-34-41b	From a line crossing the river 90 meters west of Snederker Gut to Pungo River	SA NSW	03-03-07	43.1	ac	S	M	app		
Jordan Creek	29-34-41a	From source to a line crossing the river 90 meters west of Snederker Gut	SA NSW	03-03-07	90.0	ac	I	M	pro	G-8	Source Unknown
Alligator Gut	29-34-41-1	From source to Jordan Creek	SA NSW	03-03-07	14.7	ac	S	M	app		
Snederker Gut	29-34-41-2	From source to Jordan Creek	SA NSW	03-03-07	3.4	ac	S	M	app		
Spring Creek	29-34-41-3	From source to Jordan Creek	SA NSW	03-03-07	14.7	ac	S	M	app		
Tarkiln Creek Bay	29-34-42	Entire Bay	SA NSW	03-03-07	73.5	ac	S	M	app		
Tarkiln Creek	29-34-42-1	From source to Tarkiln Creek Bay	SA NSW	03-03-07	5.7	ac	S	M	app		
Great Gut	29-34-43	From source to Pungo River	SA NSW	03-03-07	16.7	ac	S	M	app		
Little Gut	29-34-44	From source to Pungo River	SA NSW	03-03-07	8.1	ac	S	M	app		
Island Creek	29-34-45	From source to Pungo River	SA NSW	03-03-07	29.2	ac	S	M	app		
Fortescue Creek	29-34-46	From source to Pungo River	SA NSW	03-03-07	315.9	ac	S	M	app		
Log Creek	29-34-46-1	From source to Fortescue Creek	SA NSW	03-03-07	16.2	ac	S	M	app		
Old Field Creek	29-34-46-2	From source to Fortescue Creek	SA NSW	03-03-07	2.4	ac	S	M	app		
Seer Creek	29-34-46-3	From source to Fortescue Creek	SA NSW	03-03-07	5.3	ac	S	M	app		
Snell Creek	29-34-46-4	From source to Fortescue Creek	SA NSW	03-03-07	21.0	ac	S	M	app		
Cox Creek	29-34-46-5	From source to Fortescue Creek	SA NSW	03-03-07	3.4	ac	S	M	app		
Warner Creek	29-34-46-6	From source to Fortescue Creek	SA NSW	03-03-07	62.0	ac	S	M	app		
Salt Pit Creek	29-34-46-7	From source to Fortescue Creek	SA NSW	03-03-07	2.3	ac	S	M	app		
Pasture Creek	29-34-46-8	From source to Fortescue Creek	SA NSW	03-03-07	15.5	ac	S	M	app		
Dixon Creek	29-34-46-9	From source to Fortescue Creek	SA NSW	03-03-07	26.5	ac	S	M	app		
Liniar Bay	29-34-47	Entire Bay	SA NSW	03-03-07	55.5	ac	S	M	app		
Satterthwaite Creek	29-34-48a	From source to line crossing 520 meters northwest of Pungo River	SA NSW	03-03-07	85.8	ac	I	M	pro	G-2	Source Unknown
Satterthwaite Creek	29-34-48b	From a line crossing 520 meters northwest of Pungo River to the Pungo River	SA NSW	03-03-07	38.2	ac	S	M	app		
Wrights Creek	29-34-49	From source to Pungo River	SA NSW	03-03-07	40.1	ac	I	M	pro	G-2	Source Unknown
North Prong Wrights Creek	29-34-49-1	From source to Wrights Creek	SA NSW	03-03-07	37.6	ac	I	M	pro	G-2	Source Unknown

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
South Prong Wrights Creek	29-34-49-2	From source to Wrights Creek	SA NSW	03-03-07	45.2	ac	I	M	pro	G-2	Source Unknown
Bradley Creek	29-34-49-2-1	From source to South Prong Wrights	SA NSW	03-03-07	9.6	ac	I	M	pro	G-2	Source Unknown
Crooked Creek	29-34-50	From source to Pungo River	SA NSW	03-03-07	31.0	ac	S	M	app		
Hobb Creek	29-34-51	From source to Pungo River	SA NSW	03-03-07	5.5	ac	S	M	app		
Great Gut Bay	29-34-52	Entire Bay	SA NSW	03-03-07	49.9	ac	S	M	app		
Great Gut	29-34-52-1	From source to Great Gut Bay	SA NSW	03-03-07	0.2	mi	S	M	app		
Oyster Creek	29-35b	From a line 274 meters east of Duck Creek to Pamlico River	SA NSW	03-03-07	422.1	ac	S	M	app		
Oyster Creek	29-35a	From source to a line 274 meters east of Duck Creek	SA NSW	03-03-07	117.6	ac	I	M	pro	G-2	Source Unknown
Bill Daniels Gut	29-35-1	From source to Oyster Creek	SA NSW	03-03-07	1.7	ac	I	M	pro	G-2	Source Unknown
Bill Gut	29-35-2	From source to Oyster Creek	SA NSW	03-03-07	6.2	ac	I	M	pro	G-2	Source Unknown
River Ditch	29-35-3	From source to Oyster Creek	SA NSW	03-03-07	8.4	ac	I	M	pro	G-2	Source Unknown
Duck Creek	29-35-4	From source to Oyster Creek	SA NSW	03-03-07	13.8	ac	S	M	app		
Cedar Island Thorofare	29-35-5	From source to Oyster Creek	SA NSW	03-03-07	3.9	ac	S	M	app		
Middle Prong Oyster Creek	29-35-6	From source to Oyster Creek	SA NSW	03-03-07	439.9	ac	S	M	app		
Wallace Caraway Gut	29-35-6-1	From source to Middle Prong Oyster Creek	SA NSW	03-03-07	13.8	ac	S	M	app		
Sampson Landing Creek	29-35-6-2	From source to Middle Prong Oyster Creek	SA NSW	03-03-07	0.5	mi	S	M	app		
James Creek	29-35-6-3	From source to Middle Prong Oyster Creek	SA NSW	03-03-07	144.0	ac	S	M	app		
Israel Gut	29-35-6-3-1	From source to James Creek	SA NSW	03-03-07	14.9	ac	S	M	app		
Horse Island Creek	29-35-6-3-2	From source to James Creek	SA NSW	03-03-07	5.6	ac	S	M	app		
Cow Creek	29-35-6-3-3	From source to James Creek	SA NSW	03-03-07	5.1	ac	S	M	app		
Clark Creek	29-35-6-4	From source to Middle Prong Oyster Creek	SA NSW	03-03-07	127.4	ac	S	M	app		
Little Clark Creek	29-35-6-4-1	From source to Clark Creek	SA NSW	03-03-07	18.0	ac	S	M	app		
Boat Creek	29-35-6-4-2	From source to Clark Creek	SA NSW	03-03-07	9.5	ac	S	M	app		
Abel Bay	29-36	Entire Bay	SA NSW	03-03-07	232.0	ac	S	M	app		
Bell Bay	29-36-1	Entire Bay	SA NSW	03-03-07	76.4	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Bell Creek	29-36-1-1	From source to Bell Bay	SA NSW	03-03-07	1.2	mi	S	M	app		
Berry Creek	29-36-1-2	From source to Bell Bay	SA NSW	03-03-07	25.5	ac	S	M	app		
Box Creek	29-36-1-3	From source to Bell Bay	SA NSW	03-03-07	48.2	ac	S	M	app		
Marie Creek	29-36-2	From source to Abel Bay	SA NSW	03-03-07	5.4	ac	S	M	app		
Boar Creek	29-37	From source to Pamlico River	SA NSW	03-03-07	0.6	mi	S	M	app		
Willow Creek	29-38	From source to Pamlico River	SA NSW	03-03-07	19.1	ac	S	M	app		
Marsh Rock Creek	29-39	From source to Pamlico River	SA NSW	03-03-07	2.3	ac	S	M	app		
Long Creek	29-40	From source to Pamlico River	SA NSW	03-03-07	21.7	ac	S	M	app		
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)e	DEH closed areas adjacent to Ocracoke	SA	03-03-08	48.9	ac	I	M	pro	G-6	Source Unknown
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)c	DEH closed areas at mouth Long Creek	SA	03-03-08	0.4	ac	I	M	pro	G-3	Source Unknown
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)d	DEH closed areas at mouth Far Creek	SA	03-03-08	120.0	ac	I	M	pro	G-5	Source Unknown
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)a	From a line across Pamlico River from Roos Point to Persimmon Tree Point to Pamlico Sound and Pamlico Sound within a line beginning at Sandy Point and extending southerly to northeast tip of Ocracoke Island, thence along the Ocean Side of Ocracoke Island to its southwest tip, thence northwesterly to Little Propoise Point, exclusive of the ORW area described below, also excluding DEH closed areas at mouth of Middleton Creek, mouth of Long Creek, at mouth of Far Creek and adjacent to Ocracoke.	SA	03-03-08	457,942.0	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
PAMLICO RIVER AND PAMLICO SOUND	29-(40.5)b	DEH closed areas at mouth of Middleton Creek	SA	03-03-08	48.7	ac	I	M	pro	G-5	Source Unknown
Mouse Harbor	29-41	Entire Bay	SA	03-03-07	774.4	ac	S	M	app		
Mouse Harbor Ditch	29-41-1	From source to Mouse Harbor	SA	03-03-07	2.0	ac	S	M	app		
Southward Bay	29-41-2	Entire Bay	SA	03-03-07	345.8	ac	S	M	app		
Cedar Creek	29-41-2-1	From source to Southward Bay	SA	03-03-07	2.1	mi	S	M	app		
Island Creeks	29-41-2-2	From sources to Southward Bay	SA	03-03-07	43.8	ac	S	M	app		
Voliva Cove	29-41-2-3	Entire Cove	SA	03-03-07	30.9	ac	S	M	app		
Fate Cove	29-41-2-4	Entire Cove	SA	03-03-07	14.6	ac	S	M	app		
House Cove	29-41-2-5	Entire Cove	SA	03-03-07	28.4	ac	S	M	app		
Hog Cove	29-41-3	Entire Cove	SA	03-03-07	15.5	ac	S	M	app		
Flat Cove	29-41-4	Entire Cove	SA	03-03-07	11.0	ac	S	M	app		
Oak Cove	29-41-5	Entire Cove	SA	03-03-07	15.9	ac	S	M	app		
Long Creek	29-41-6	From source to Mouse Harbor	SA	03-03-07	84.7	ac	S	M	app		
Lighthouse Creek	29-41-7	From source to Mouse Harbor	SA	03-03-07	9.1	ac	S	M	app		
Spencer Bay	29-42	Entire Bay	SA	03-03-08	1,164.3	ac	S	M	app		
Germantown Bay	29-42-1a	From source to a line starting at mouth of Long Creek extending across Bay to a point 77 meters south of Midgette Creek	SA	03-03-08	179.7	ac	I	M	pro	G-3	Source Unknown
Germantown Bay	29-42-1b	Entire Bay except DEH closed area in northern part of bay	SA	03-03-08	319.5	ac	S	M	app		
Long Creek	29-42-1-1	From source to Germantown Bay	SA	03-03-08	53.6	ac	I	M	pro	G-3	Source Unknown
Midgette Creek	29-42-1-2	From source to Germantown Bay	SA	03-03-08	8.4	ac	I	M	pro	G-3	Source Unknown
Little Hammock Creek	29-42-1-3	From source to Germantown Bay	SA	03-03-08	8.7	ac	S	M	app		
Swan Creek (Swine Creek)	29-42-1-4	From source to Germantown Bay	SA	03-03-08	9.7	ac	S	M	app		
Jeanette Creek	29-42-1-5	From source to Germantown Bay	SA	03-03-08	12.0	ac	S	M	app		
Ditch Creek	29-42-1-6	From source to Germantown Bay	SA	03-03-08	13.1	ac	S	M	app		
Chellybelle Creek	29-42-2	From source to Spencer Bay	SA	03-03-08	21.8	ac	S	M	app		
House Creek	29-42-3	From source to Spencer Bay	SA	03-03-08	30.1	ac	S	M	app		
Striking Bay	29-43	Entire Bay	SA	03-03-08	182.2	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Rose Bay	29-44b	Entire Bay except DEH closed area in northern part of bay	SA	03-03-08	7,258.3	ac	S	M	app		
Rose Bay	29-44a	From source to a line 600 meters south of mouth of Rose Bay Creek	SA	03-03-08	318.0	ac	I	M	pro	G-3	Source Unknown
Rose Bay Creek	29-44-1	From source to Rose Bay	SA	03-03-08	154.3	ac	I	M	pro	G-3	Source Unknown
Tooley Creek	29-44-2	From source to Rose Bay	SA	03-03-08	191.2	ac	S	M	app		
Lighwood Snag Bay	29-44-3	Entire Bay	SA	03-03-08	172.1	ac	S	M	app		
Middle Shoal Creek (Mill Show Creek)	29-44-4	From source to Rose Bay	SA	03-03-08	21.2	ac	S	M	app		
Deep Bay	29-44-5	Entire Bay	SA	03-03-08	1,632.4	ac	S	M	app		
Old Haulover	29-44-5-1	From source to Deep Bay	SA	03-03-08	28.9	ac	S	M	app		
The Haulover	29-44-5-2	From Swanquarter Bay to Deep Bay	SA	03-03-08	2.7	ac	S	M	app		
Bernice Creek	29-44-5-3	From source to Deep Bay	SA	03-03-08	21.3	ac	S	M	app		
Middle Creek	29-44-5-4	From source to Deep Bay	SA	03-03-08	11.9	ac	S	M	app		
Drum Cove	29-44-5-5	Entire Cove	SA	03-03-08	39.2	ac	S	M	app		
Tolers Bay	29-45	Entire Bay	SA	03-03-08	120.8	ac	S	M	app		
White Perch Bay	29-46	Entire Bay	SA	03-03-08	97.9	ac	S	M	app		
Pamlico Sound Swanquarter Bay/Juniper Bay ORW Area, including the Northeast Swanquarter Bay Area	29-46.5	All waters within a line beginning at Juniper Bay Point and running due South to Lat. 35 18’00", Long 76 13’20", thence due west to Lat. 35 18’00", Long 76 20’00", thence northwest to Shell Point	SA ORW	03-03-08	11,670.0	ac	S	M	app		
Shell Bay	29-47	Entire Bay	SA ORW	03-03-08	2,063.4	ac	S	M	app		
Judith Narrows	29-47-1	From White Perch Bay to Shell Bay	SA ORW	03-03-08	84.4	ac	S	M	app		
The Blowout	29-47-2	From Bernice Creek to Shell Bay	SA	03-03-08	1.2	ac	S	M	app		
Shell Narrows	29-47-3	From Swanquarter Bay to Shell Bay	SA ORW	03-03-08	298.5	ac	S	M	app		
Smokehouse Cove	29-48	Entire Cove	SA ORW	03-03-08	43.6	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Swanquarter Bay	29-49a	DEH closed area west of Swanquarter	SA ORW	03-03-08	136.2	ac	I	M	pro	G-3	Source Unknown
Swanquarter Bay	29-49b	Entire Bay except for closed area near Swanquarter	SA ORW	03-03-08	4,986.8	ac	S	M	app		
Shingle Creek	29-49-1	From source to Swanquarter Bay	SA ORW	03-03-08	7.4	ac	S	M	app		
Cowpen Creek	29-49-2	From source to Swanquarter Bay	SA ORW	03-03-08	61.0	ac	S	M	app		
Oyster Creek	29-49-3a	From source to a line 990 meters east of Swanquarter Bay	SA ORW	03-03-08	35.3	ac	I	M	pro	G-3	Source Unknown
Oyster Creek	29-49-3b	From a line 990 meters east of Swanquarter Bay to Swanquarter Bay	SA ORW	03-03-08	87.9	ac	S	M	app		
Eastard Bay	29-49-4	Entire Bay	SA ORW	03-03-08	154.5	ac	S	M	app		
Caffee Bay	29-49-5	Entire Bay	SA ORW	03-03-08	477.7	ac	S	M	app		
Island Creek	29-49-5-1	From source to Caffee Bay	SA	03-03-08	14.3	ac	S	M	app		
Crab Cove (Crabb Cove)	29-50	Entire Cove	SA ORW	03-03-08	73.4	ac	S	M	app		
Great Island Narrows	29-51	From Juniper Bay to Swanquarter Bay	SA ORW	03-03-08	1,809.4	ac	S	M	app		
Raccoon Creek	29-51-1	From source to Great Island Narrows	SA	03-03-08	5.8	ac	S	M	app		
Juniper Bay	29-52a	Source to a line crossing the river at mouth of Rattlesnake Creek	SA ORW	03-03-08	66.6	ac	I	M	pro	G-4	Source Unknown
Juniper Bay	29-52b	From mouth of Rattlesnake Creek to Pamlico Sound	SA ORW	03-03-08	1,980.0	ac	S	M	app		
Northwest Creek	29-52-2	From source to Juniper Bay	SA	03-03-08	19.4	ac	I	M	pro	G-3	Source Unknown
Rattlesnake Creek	29-52-3	From source to Juniper Bay	SA	03-03-08	4.4	ac	S	M	app		
Old Haulover	29-52-4	From source to Juniper Bay	SA	03-03-08	19.7	ac	S	M	app		
Doe Creek	29-52-5	From source to Juniper Bay	SA ORW	03-03-08	23.0	ac	S	M	app		
Buck Creek	29-52-6	From source to Juniper Bay	SA ORW	03-03-08	57.3	ac	S	M	app		
Laurel Creek	29-52-7	From source to Juniper Bay	SA ORW	03-03-08	8.4	ac	S	M	app		
Cunning Harbor Bay	29-53	Entire Bay	SA	03-03-08	282.0	ac	S	M	app		
West Bluff Bay	29-54	Entire Bay	SA	03-03-08	1,191.9	ac	S	M	app		
Southwest Bay	29-55	Entire Bay	SA	03-03-08	214.0	ac	S	M	app		
East Bluff Bay	29-56	Entire Bay	SA	03-03-08	499.0	ac	S	M	app		
Harbor Creek	29-56-1	From source to East Bluff Bay	SA	03-03-08	3.8	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Juniper Creek	29-56-2	From source to East Bluff Bay	SA	03-03-08	14.6	ac	S	M	app		
Sage Bay	29-57	Entire Bay	SA	03-03-08	50.1	ac	S	M	app		
Sanger Creek	29-58	From source to Pamlico Sound	SA	03-03-08	8.7	ac	S	M	app		
Middle Creek	29-59	From source to Pamlico Sound	SA	03-03-08	10.0	ac	S	M	app		
Wysocking Bay	29-60b	Entire Bay except for area 1000 meters north of Mackay Point	SA	03-03-08	3,262.2	ac	S	M	app		
Wysocking Bay	29-60a	From source to 1000 meters north of Mackay Point	SA	03-03-08	126.3	ac	I	M	pro	G-4	Source Unknown
Hickory Creek Bay	29-60-1	Entire Bay	SA	03-03-08	35.5	ac	S	M	app		
Hickory Creek	29-60-1-1	From source to Hickory Creek Bay	SA	03-03-08	7.8	ac	S	M	app		
Old Hill Bay	29-60-2	Entire Bay	SA	03-03-08	208.6	ac	S	M	app		
Douglas Bay	29-60-3	Entire Bay	SA	03-03-08	203.4	ac	S	M	app		
Lone Tree Creek	29-60-5	From source to Wysocking Bay	SA	03-03-08	151.7	ac	S	M	app		
Hillerys Cove	29-61	Entire Cove	SA	03-03-08	43.5	ac	S	M	app		
Jeanette Creek	29-64	From source to Pamlico Sound	SA	03-03-08	9.1	ac	S	M	app		
Back Creek	29-65	From source to Pamlico Sound	SA	03-03-08	38.7	ac	S	M	app		
Middle Town Creek	29-66	From source to Pamlico Sound	SA	03-03-08	71.5	ac	I	M	pro	G-5	Source Unknown
Cedar Creek	29-67	From source to Pamlico Sound	SA	03-03-08	12.2	ac	I	M	pro	G-5	Source Unknown
Burrus Creek	29-68	From source to Pamlico Sound	SA	03-03-08	0.9	mi	S	M	app		
Lone Tree Creek	29-69	From source to Pamlico Sound	SA	03-03-08	1.8	ac	I	M	pro	G-5	Source Unknown
Far Creek	29-70-(4)	From a line extending due north and due south across Far Creek at flash beacon #9 to Pamlico Sound	SA	03-03-08	389.5	ac	I	M	pro	G-5	Source Unknown
Waupopin Creek	29-70-5-(3)	From a line beginning on the southwestern side of Waupopin Creek 300 yards from its junction with Far Creek, and running due northeast to the northeastern shore of Waupopin Creek to Far Creek	SA	03-03-08	96.2	ac	I	M	pro	G-5	Source Unknown
Oyster Creek	29-70-6	From source to Far Creek	SA	03-03-08	50.1	ac	I	M	pro	G-5	Source Unknown
Berrys Bay	29-71a	DEH closed area in northern part of bay	SA	03-03-08	12.5	ac	I	M	pro	G-5	Source Unknown

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Berrys Bay	29-71b	Entire Bay except closed area in northern part of bay	SA	03-03-08	395.2	ac	S	M	app		
Otter Creek	29-72b	From southern bay of Otter Creek to Pamlico Sound	SA	03-03-08	377.7	ac	S	M	app		
Otter Creek	29-72a	Southern bay of Otter Creek	SA	03-03-08	56.9	ac	S	M	app		
Long Shoal River	29-73-(2)b	From a line extending river 506 meters south of Deep Creek to Pamlico Sound excluding area at 5th Avenue Pump canal	SA	03-03-08	2,641.0	ac	S	M	app		
Long Shoal River	29-73-(2)c	DEH closed area at 5th Avenue pump canal	SA	03-03-08	35.2	ac	I	M	pro	G-5	Source Unknown
Long Shoal River	29-73-(2)a	From US Hwy. 264 to line extending river 506 meters south of Deep Creek	SA	03-03-08	419.8	ac	I	M	pro	G-5	Source Unknown
Deep Creek	29-73-4	From source to Long Shoal River	SA	03-03-08	45.8	ac	S	M	app		
Muddy Creek	29-73-5	From source to Long Shoal River	SA	03-03-08	49.2	ac	S	M	app		
Clark Creek	29-73-6	From source to Long Shoal River	SA	03-03-08	5.7	ac	S	M	app		
Broad Creek	29-73-7	From source to Long Shoal River	SA	03-03-08	101.6	ac	S	M	app		
Pains Bay	29-74	Entire Bay	SA	03-03-08	4.6	mi	S	M	app		
Pains Creek	29-74-1	From source to Pains Bay	SA	03-03-08	1,205.4	ac	S	M	app		
Parched Corn Bay	29-75	Entire Bay	SA	03-03-08	907.2	ac	S	M	app		
Sandy Bay	29-76	Entire Bay	SA	03-03-08	280.0	ac	S	M	app		
Cockrel Creek	29-77	From source to Pamlico Sound	SA	03-03-08	9.0	ac	S	M	app		
Shingle Creek	29-78	From source to Pamlico Sound	SA	03-03-08	10.7	ac	S	M	app		
North Bitterwash Creek	29-79	From source to Pamlico Sound	SA	03-03-08	6.4	ac	S	M	app		
South Bitterwash Creek	29-80	From source to Pamlico Sound	SA	03-03-08	8.7	ac	S	M	app		
Knoll Creek	29-81	From source to Pamlico Sound	SA	03-03-08	10.8	ac	S	M	app		
Knoll House Creek	29-82	From source to Pamlico Sound	SA	03-03-08	2.4	ac	S	M	app		
Try Yard Creek	29-83	From source to Pamlico Sound	SA	03-03-08	10.1	ac	S	M	app		
Little Swash Opening	29-84	From source to Pamlico Sound	SA	03-03-08	12.1	ac	S	M	app		
Old Hammock Creek	29-85	From source to Pamlico Sound	SA	03-03-08	1.5	ac	S	M	app		

Name	Assessment Unit Number	Description	Class	Subbasin	Length/ Area		Rating	Basis	DEH Class	DEH Area	Potential Source
Island Creek	29-86	From source to Pamlico Sound	SA	03-03-08	1.4	ac	S	M	app		
Sand Hole Creek	29-87	From source to Pamlico Sound	SA	03-03-08	3.9	ac	S	M	app		
Northern Pond	29-88	Entire Pond	SA	03-03-08	4.9	ac	S	M	app		
Mary Anns Pond	29-89	Entire Pond	SA	03-03-08	2.9	ac	S	M	app		
Old Slough	29-91	From source to Pamlico Sound	SA	03-03-08	3.1	ac	S	M	app		

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 streambed scour.

ABBREVIATION KEY

p = Point Source Pollution (Major source)

np = Nonpoint Source Pollution

M = Monitored

S = Supporting

I = Impaired

NR = Not Rated

DEH Class

pro = prohibited to shellfish harvesting

app = approved for shellfish harvesting

Appendix IV

303(d) Listing
and
Reporting Methodology

Integrated 305(b) and 303(d) Report Summary

The *North Carolina Water Quality Assessment and Impaired Waters List* is an integrated report that includes both the 305(b) and 303(d) reports of previous years. The *305(b) Report* is compiled biennially to update the assessment of water quality in North Carolina and to meet the Section 305(b) reporting requirement of the Clean Water Act. The 305(b) reports present how well waters support designated uses (e.g., swimming, aquatic life support, water supply), as well as likely causes (e.g., sediment, nutrients) and potential sources of impairment. The term "Use Support" refers to the process mandated by 305(b). The *303(d) List* is a comprehensive public accounting of all Impaired waterbodies that is derived from the 305(b) Report/Use Support. An Impaired waterbody is one that does not meet water quality uses, such as water supply, fishing or propagation of aquatic life. Best professional judgement along with numeric and narrative standards criteria and anti-degradation requirements defined in 40 CFR 131 are considered when evaluating the ability of a waterbody to serve its uses.

Section 303(d) of the federal Clean Water Act (CWA) which Congress enacted in 1972 requires States, Territories and authorized Tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by Section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the list of Impaired waterbodies and TMDLs to the US Environmental Protection Agency (EPA). Current federal rules require states to submit 303(d) lists biennially, by April 1st of every even numbered year. For 2002, EPA delayed the submittal until October 1, 2002 (EPA, 2001a). EPA is required to approve or disapprove the state-developed 303(d) list within 30 days. For each water quality limited segment Impaired by a pollutant and identified in the 303(d) list, a Total Maximum Daily Load (TMDL) must be developed. TMDLs are not required for waters Impaired by pollution.

North Carolina submitted a combined 305(b) and 303(d) Integrated Report to EPA on October 2, 2002. The Integrated Report includes descriptions of monitoring programs, the use support methodology, and the Impaired waters list. New guidance from EPA places all waterbody assessment units, or segments, into one unique assessment category (EPA, 2001b). Although EPA specifies five unique assessment categories, North Carolina elects to use seven categories in order to maintain continuity with the 2000 North Carolina 303(d) list. Each category is described in detail below:

Category 1: Attaining the water quality standard and no use is threatened. This category consists of those waters where all applicable use support categories are rated "Fully Supporting". Data and information are available to support a determination that the water quality standards are attained and no use is threatened. Future monitoring data will be used to determine if the water quality standard continues to be attained.

Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information are available to determine if the remaining uses are attained or threatened. This category consists of those waters where at least one of the applicable use support categories are rated "Fully Supporting" and the other use support categories are rated "Not Rated". Also included in this category are waters where at least one of the applicable use support categories, except Fish Consumption, are rated "Fully Supporting"; the remaining applicable use support categories, except Fish Consumption, are rated "Not Rated"; and the Fish Consumption category is rated "Partially Supporting-Evaluated". Data and information are available to support a determination that some, but not all, uses are attained. Attainment status of the remaining uses is unknown because there are insufficient or no data or information. Future monitoring data will be used to determine if the uses previously found to be in attainment remain in attainment, and to determine the attainment status of those uses for which data and information were previously insufficient to make a determination.

Category 3: Insufficient or no data and information to determine if any designated use is attained. This category consists of those waters where all applicable use support categories, except Fish Consumption, are rated "Not Rated", and the Fish Consumption category is rated "Partially Supporting-Evaluated". Measured data or information to support an attainment determination for any use are not available. Supplementary data and information, or future monitoring, will be required to assess the attainment status.

Category 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL. This category contains three distinct sub-categories:

Category 4a: TMDL has been completed. This category consists of those waters for which EPA has approved or established a TMDL and water quality standards have not yet been achieved. Monitoring data will be considered when evaluating Category 4a waterbodies for potential delisting.

Category 4b: Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. This category consists of those waters for which TMDLs will not be attempted because other required regulatory controls (e.g., NPDES permit limits, Stormwater Program rules, etc.) are expected to attain water quality standards by the next regularly scheduled listing cycle. Future monitoring will be used to verify that the water quality standard is attained as expected.

Category 4c: Impairment is not caused by a pollutant. This category consists of waters that are 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." 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. Future monitoring will be used to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment.

Category 5: Impaired for one or more designated uses by a pollutant(s) and requires a TMDL. This category consists of those waters that are Impaired by a pollutant and the proper technical conditions exist to develop TMDLs. As defined by the 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." When more than one pollutant is associated with the impairment of a single waterbody in this category, the water will remain in Category 5 until TMDLs for all listed pollutants have been completed and approved by the EPA.

Category 6: Impaired based on biological data. This category consists of waters historically referred to as "Biologically Impaired" waterbodies; these waterbodies have no identified cause(s) of impairment although aquatic life impacts have been documented. Identification of the cause(s) of impairment will precede movement of these waters to Category 5 or Category 4c of the integrated list. EPA has recognized in the past that in specific situations the data are not available to develop TMDLs. Data collection and analysis will be performed in an attempt to determine the cause(s) of impairment.

Category 7: Impaired, but the proper technical conditions do not yet exist to develop a TMDL. As described in the Federal Register, "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, December 28, 1978). These are waters that would otherwise be in Category 5 of the integrated list. As previously noted, EPA has recognized that in some specific situations the data, analyses or models are not available to establish a TMDL. North Carolina seeks EPA technical guidance in developing technically defensible TMDLs for these waters. Open water fecal coliform Impaired shellfishing waters are included in this category.

For this integrated list, Categories 1 and 2 are considered fully supporting any assessed uses. This portion of the integrated list is extensive (thousands of segments); thus, a printed copy is not included in this document. A table of waters on Categories 1 through 3 is available for downloading on the DWQ website (http://h2o.enr.state.nc.us/tmdl/General_303d.htm). Categories 4, 5, 6 and 7 contain those assessment units that have been determined to be Impaired in North Carolina. **Therefore, Categories 4, 5, 6 and 7 constitute the 2002 North Carolina 303(d) List for the State of North Carolina**.

Prioritization of Impaired Waters

North Carolina has developed a priority ranking scheme that reflects the relative value and benefits those waterbodies provide to the state. The priority ranking system is designed to take into account the severity of the impairment, especially threats to human health and endangered species, and the designated uses of the waterbody as required by CWA 303(d)(1)(A). Since other agencies and local governments also use this ranking to direct resources and funding, the priority ranking system has intentionally not included factors to reflect the availability of DWQ resources to address either TMDL development schedules or restoration.

A priority of High, Medium or Low has been assigned to all waterbodies in Categories 4b, 5, 6 and 7 of the integrated list. A high priority is assigned to all waterbodies that are classified as water supplies. A high priority is also automatically assigned to all waterbodies 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.

Scheduling TMDLs

Category 5 waters, those for which a TMDL is needed, 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. Others need to have a technical strategy budgeted, funded and scheduled. Some are ready for EPA submittal.

North Carolina has prioritized TMDL development for waters Impaired due to bacteria. The approach of prioritizing TMDL development based on pollutant has been successfully used in other states. Limited resources are used more effectively with a focus on a particular pollutant. Waters Impaired by other pollutants (i.e., not bacteria) are not excluded from the schedule. However, the majority of waters prioritized for the next few years are associated with bacterial contamination.

The movement of waters from Category 6 (Impaired based on biological data) to either Category 5 or 4c will require a large allocation of resources. North Carolina has used biological data 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 Category 6 is to be expected. It is important to understand that the identification of waters in Category 6 does not mean that they are low priority waters. The assessment of these waters is a high priority for the State of North Carolina. However, it may take significant resources and time to determine the cause of impairment. Assigning waters to Category 6 is a declaration of the need for more data and time to adequately define the problems and whether they are affected by pollution, pollutants or a combination. Scheduling these waters for TMDL development prior to determining the causes of impairment is misleading and counterproductive.

During this listing cycle, significant resources and a grant from the Clean Water Management Trust Fund were utilized to study multiple waters that were considered Impaired based on biological data. One goal of this project was to determine the cause of impairment for these waters. Several of these studies have been completed and causes have been identified. These waters will now move from Category 6 to other locations within the integrated list.

Delisting Waters

In general, waters will move from Categories 4, 5, 6 or 7 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 Impaired waters list will be moved to Categories 1, 2 or 3 under the following circumstances:

- An updated 305(b) use support rating of Supporting, as described in the basinwide management plans.
- Applicable water quality standards are being met (i.e., no longer Impaired for a given pollutant) as described in either basinwide management plans or in technical memoranda.
- 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 or modification of fish eating advice.
- Typographic listing mistakes (i.e., the wrong water was identified).

Appendix V

Tar-Pamlico River Basin Workshop Summaries

Issues Associated with Specific Waters of the Tar-Pamlico River Basin

Water or Area	Subbasin	Issue	Workshop
Fishing Creek	03-03-01	Oxford Discharge.	Louisburg
Tar River	03-03-01	Development along US 1.	Louisburg
Swift Creek	03-03-02	Reclassification to ORW process.	Louisburg, Nashville
Tar River	03-03-02	Low Flows during drought, Trash in river and Old Greenville Landfill.	Nashville
Tar River	03-03-07	Eutrophication and increasing fish kills and development closing shellfish waters.	Greenville, Washington
Town Creek	03-03-05	Runoff from ECU and litter and underground oil spills.	Greenville
Chicod Creek	03-03-03	Cows in creek.	Louisburg
Van Swamp	03-03-06	Unknown pollution sources.	Greenville
Green Mill Run	03-03-03	Negative affects of hydromodification.	Greenville
Broad Creek	03-03-07	Sediment in stream after rain events.	Nashville
Conetoe Creek	03-03-03	Restoration plan needed.	Greenville, Washington
Tranters Creek	03-03-05	Snagging after storms.	Greenville
Franklin County	03-03-01	Development increasing.	Louisburg
Jack Creek	03-03-07	Channelization.	Nashville
Shocco Creek	03-03-04	PBC testing may be needed.	Louisburg

Issues Related to Enforcement, Permitting, Rule Making and Monitoring

Specific Issue	Recommendation	Workshop
Animal operations	Unequal enforcement and double inspections.	Greenville
DOT sites	Not enough oversight of DOT.	Nashville
Buffer Rules	Need more monitoring and enforcement.	Louisburg
Point Sources	Should have to land apply all future flow increases.	Greenville
Land Application Sites	More monitoring of sites.	Greenville
Development	Sediment and erosion control inspections needed on development.	Washington
Waste Haulers	Need to monitor.	Nashville
Forestry	Forestry BMPs manual revision needed.	Washington
Nonpoint Source	More inspectors needed.	Washington
BMPs	Require BMPs to remove nutrients and sediment and remove minimum exclusion.	Greenville
Nitrogen	Develop standards for and limits for areal deposition.	Greenville
Shellfish Closures	Development leading to increase closures.	Washington
Funding	More money for education and enforcement.	Greenville

Issues Related to Funding Sources and Education

Specific Issue	Recommendation	Workshop
Loss of technical assistance	Go to General Assembly.	Durham
Need for BMP research		Washington
Increase funding to remove beavers		Greenville
Education		Greenville
Better use Agricultural Funds		Louisburg
Homeowner education on fertilizer application		Louisburg
Education for local officials		Louisburg, Nashville
Resources to address nonpoint source pollution		Louisburg, Nashville
Education on buffers		Greenville
Farmland protection		Louisburg
More incentives for stream protection		Louisburg, Nashville
Open space preservation		Louisburg, Nashville

Appendix VI

Tar-Pamlico 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 water 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 is available online at 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. Most employees of the Department of Environment and Natural Resources, including the Division of Water Quality, Division of Land Resources and Division of Forest Resources, can be reached by email using the following formula: firstname.lastname@ncmail.net.

Agriculture			

USDA Natural Resources Conservation Service:

Part of the US Dept. 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 Sugg	704-637-2400	530 West Innes Street, Salisbury 28144
Area 3 Conservationist	William J. Harrell	252-751-0976	208 Mallory Street, Suite C, Cashwell Office Park, Goldsboro 27534
County	**Contact Person**	**Phone**	**Address**
Beaufort	Rodney Woolard	252-946-2501	155 C Airport Rd., Agricultural Serv Center, Washington 27889-9684
Dare	Rufus Croom	252-796-3891	128 East Water Street, Suite 202, Plymouth 27962
Edgecombe	A.B. Whitley, III	252-641-7900	201 Saint Andrews Street, PO Box 10, Tarboro 27886
Franklin	Josh Spencer	919-496-3137	101 South Bickett Boulevard, Suite B, Louisburg 27549
Granville	Diana Lewis	919-693-4603	146 Main Street, Room 108, Oxford 27565
Halifax	J. Wayne Short	252-583-3481	County Ag Center, Hwy 301, PO Box 8, Halifax 27839
Hyde	Rodney Woolard	252-946-2501	155 C Airport Rd., Agricultural Serv Center, Washington 27889-9684
Martin	Rupert W. Hasty, Jr.	252-792-4350	104 Kehukee Park Road, Williamston 27892
Nash	Terry L. Best	252-459-4115	1006 Eastern Avenue, Room 107, Nashville 27856
Pamlico	Andrew Metts	252-637-2547	302 Industrial Drive, New Bern 28562-5434
Person	James Huey	336-597-2973	304 South Morgan Street, Room 126, Roxboro 27573
Pitt	J. Tim Etheridge	252-752-2720	403 Government Circle, Suite 4, Greenville 27834
Vance	Diana Lewis	252-438-5727	305 Young Street, Room 1, Henderson 27536
Warren	Dallas Shackleford	252-257-3836	RFD 1, Box 486-D, Warrenton 27589
Washington	Rufus Croom	252-793-4561	128 East Water Street, Suite 202, Plymouth 27962
Wilson	David A. Little	910-798-6032	230 Marketplace Drive, Suite 100, Wilmington 28403

Agriculture (con't)			

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
Beaufort	Dan Windley	252-322-5693	111 West 2nd Street, Washington 27889-4939
Dare	John Receveur		Box 1047, Manteo 27954
Edgecombe	Paul Drake	252-442-7310	201 Saint Andrews Street, PO Box 10, Tarboro 27886
Franklin	Elmo May	919-496-5382	101 South Bickett Boulvard, Suite B, Louisburg 27549
Granville	Warren Daniel	919-693-4907	146 Main Street, Room 108, PO Box 10, Oxford 27565
Halifax	Will Mann	252-537-2206	County Ag Center, Hwy 301, PO Box 8, Halifax 27839
Hyde	David O'Neal	252-926-5721	County Courthouse, PO Box 264, Swanquarter 27885
Martin	Ricky Cannon	252-792-4350	104 Kehukee Park Road, Williamston 27892-9596
Nash	Donald Deans	252-459-9850	Ag Center Drive, Room 107, Nashville 27856-1750
Pamlico	James Hardison	252-745-4303	County Courthouse, PO Box 305, Bayboro 28515
Person	Bruce Whitfield	336-599-0917	304 South Morgan Street, Room 126, Roxboro 27573
Pitt	Charles Davenport	252-752-2720	403 Government Circle, Suite 4, Greenville 27834
Vance	Ben Harris	252-438-5727	305 Young Street, Room 1, Henderson 27536
Warren	Larry West	252-586-3635	133 ½ South Main Street, Warrenton 27589
Washington	Gerald Allen	252-793-4561	128 East Water Street, Suite 202, Plymouth 27962
Wilson	Ricky Hayes	252-237-2711	1806 Goldsboro Street SW, Wilson 27893

Agriculture (con't)			

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	Carroll Pierce	919-715-6110	Archdale Building, 512 North Salisbury Street, Raleigh 27604
Raleigh Region*	Steve Bennett	919-571-4700	3800 Barrett Drive, Suite 101, Raleigh 27609
Washington Region*	George Stewart	252-946-6481	943 Washington Square Mall, Washington 27889

NCDA Regional Agronomists:

The NC Dept. 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	Box 27647, Raleigh 27611
Region 2	Roger Sugg	252-793-4118	Tidewater Research Station, 207 Research Station Rd, Plymouth 27962
Region 3	Bob Edwards	252-353-7079	PO Box 801, Kinston 28502
Region 6	Peter Hight	252-257-1370	5091 South NC 58, Nashville 27856
Region 7	Kevin Johnson	919-736-1799	PO Box 1970, Pikeville 27863
Region 8	Robin Watson	336-570-6850	1709 Fairview Street, Burlington 27215

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
Beaufort	Ann Darkow	252-946-0111	111 West 2nd Street, PO Box 1967, Washington 27889
Dare	Ann Ward	252-473-4290	517 Budleigh Street, Manteo 27954
Edgecombe	James Pearce	252-641-7815	201 Saint Andrews Street, PO Box 129, Tarboro 27886
Franklin	Cedric Jones	919-496-3344	103 South Bickett Boulevard, Louisburg 27549
Granville	Johnsie Cunningham	919-603-1350	PO Box 926, Oxford 27565
Halifax	David Cobb	252-583-5161	359 Ferrell Lane, PO Box 39, Halifax 27839
Hyde	Jean Balance	252-926-4197	35 Second Street, Swan Quarter 27885
Martin	Justus Coltrain, Jr.	252-792-1621	205 East Main Street, PO Box 1148, Williamston 27892
Nash	Charlie Tyson	252-459-9810	1006 Eastern Avenue, Room 102, Nashville 27856
Pamlico	Fred May	252-745-4121	302 Main Street, PO Box 8, Bayboro 28515
Person	Derek Day	336-599-1195	304 South Morgan Street, Room 123, Roxboro 27573
Pitt	Mitchell Smith	252-757-2801	403 Government Circle, Greenville 27834
Vance	Harold Thompson	252-438-8188	305 Young Street, PO Box 1028, Henderson 27536
Warren	Philip McMillan	252-257-3640	PO Box 708, Warrenton 27589
Washington	Richard Rhodes	252-793-2163	128 East Water Street, PO Box 70, Plymouth 27962
Wilson	Walter Earle	252-237-0111	1806 South Goldsboro Street, PO Box 3027, Wilson 27895

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.

Central Office	Shardul Raval	919-733-2162	512 North Salisbury Street, Raleigh 27604
District 4	Water Quality Forester	252-514-4764	3810 Martin Luther King Jr. Boulevard, New Bern 28562-2236
District 5	Water Quality Forester	252-442-1626	737 Smokey Road, Rocky Mount 27804-5869
District 11	Water Quality Forester	919-732-4005	3314 NC Highway 86, South Hillsborough 27278-8711
District 13	District Forester	252-946-3041	9291 Piney Woods Road, Fairfield 27826-0127

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	Mell Nevils, Chief	919-733-4574	512 North Salisbury Street, Raleigh 27626
	Tracy Davis, Mining	919-733-4574	512 North Salisbury Street, Raleigh 27626
Raleigh Region*	John Holley	919-571-4700	3800 Barrett Drive, Raleigh 27609
Washington Region*	Pat McClain	252-946-6481	943 Washington Square Mall, Washington 27889
Local Erosion and Sedimentation Control Ordinances:			
Several local governments in the basin have qualified to administer their own erosion and sedimentation control ordinances.			
City of Greenville	Maria Alge	252-329-4525	1500 Beatty Street, Greenville 27835
City of Henderson	Frank Frazier	252-431-6026	PO Box 1434, Henderson 27536
Pitt County	Dwayne Jones	252-902-3250	1717 West 5th Street, Greenville 27834
City of Rocky Mount	Warren Rackley	252-972-1121	PO Drawer 1180, Rocky Mount 27802-1180
General Water Quality			
DWQ Water Quality Section:			
Coordinate the numerous nonpoint source programs carried out by many agencies; coordinate the Tar-Pamlico 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 x570	512 North Salisbury Street, Raleigh 27604
Urban Stormwater	Bradley Bennett	919-733-5083 x525	512 North Salisbury Street, Raleigh 27604
Modeling	Michelle Woolfolk	919-733-5083 x505	512 North Salisbury Street, Raleigh 27604
Monitoring	Jimmie Overton	919-733-9960 x204	4405 Reedy Creek Road, Raleigh 27609
Wetlands	John Dorney	919-733-9646	4405 Reedy Creek Road, Raleigh 27609
Animal Operations	Dennis Ramsey	919-733-5083 x528	512 North Salisbury Street, Raleigh 27604
Classifications/Standards	Tom Reeder	919-733-5083 x559	512 North Salisbury Street, Raleigh 27604
DWQ Regional Offices:			
Conduct permitting and enforcement field-work 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, Raleigh 27609
Washington Region*	Jim Mulligan	252-946-6481	943 Washington Square Mall, Washington 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	David Cobb	919-528-9886	Falls Lake Office, 1142 I-85 Service Road, Creedmoor 27522
District Office	Wayne Jones	252-443-3536	5044 Sapony Creek Drive, Nashville 27856
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.			
Wilmington District	David Timpy	910-251-4634	PO Box 1890, Wilmington 28402-1890
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, Raleigh 27604
Raleigh Region*	Jay Zimmerman	919-571-4700	3800 Barrett Drive, Raleigh 27609
Washington Region*	Willie Hardison	252-946-6481	943 Washington Square Mall, Washington 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	919-733-4996	401 Oberlin Road, Suite 150 Raleigh 27605
Raleigh Region*	Ben Barnes	919-571-4700	3800 Barrett Drive, Raleigh 27609
Washington Region*	Chuck Boyette	252-946-6481	943 Washington Square Mall, Washington 27889

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	Barbara Hartley-Grimes, PhD	919-715-0141	2728 Capital Boulevard, Raleigh 27604
County	**Primary Contact**	**Phone**	**Address**
Beaufort	Roxanne Frederick	252-946-6048	220 North Market Street, Washington 27889
Edgecombe	James R. Baluss	252-641-7535	2909 North Main Street, Tarboro 27886
Franklin	Sandra Wood	919-496-8100	107 Industrial Drive, Suite C, Louisburg 27549
Granville	W. Rodwell Drake, Jr., MD	919-693-2688	101 Hunt Drive, Oxford 27565
Halifax	Dr. Christopher Szwagiel	252-583-6651	19 Dobbs Street, Halifax 27839
Hyde	Linda Mayo	252-926-4200	1151 Main Street, Swan Quarter 27885
Martin	Keith Patton	252-792-7811	210 West Liberty Street, Williamston 27892
Nash	William Hill, Jr.	252-459-9829	214 South Barnes Street, Nashville 27856
Pamlico	Jenny Lassiter, RN	252-745-5634	PO Box 306, Bayboro 28515
Person	Marc Kolman	336-597-1790	325 South Morgan Street, Roxboro 27573
Pitt	Dr. John Morrow	252-413-1253	201 Government Circle, Greenville 27834
Vance	W. Rodwell Drake, Jr., MD	252-492-2361	115 Charles Rollins Road, Henderson 27536
Warren	Carmine Rocco	252-257-1538	544 West Ridgeway Street, Warrenton 27589
Washington	Keith Patton	252-793-3023	198 NC Hwy 45 North, Plymouth 27926
Wilson	Dr. Louis E. Latour	252-291-0468	1801 Glendale Drive, Wilson 27893

* **DENR Raleigh Region** covers the following counties within the Tar-Pamlico basin: Edgecombe, Franklin, Granville, Halifax, Nash, Person, Vance, Warren and Wilson.

* **DENR Washington Region** covers the following counties within the Tar-Pamlico basin: Beaufort, Hyde, Martin, Pamlico, Pitt and Washington.

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.