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.

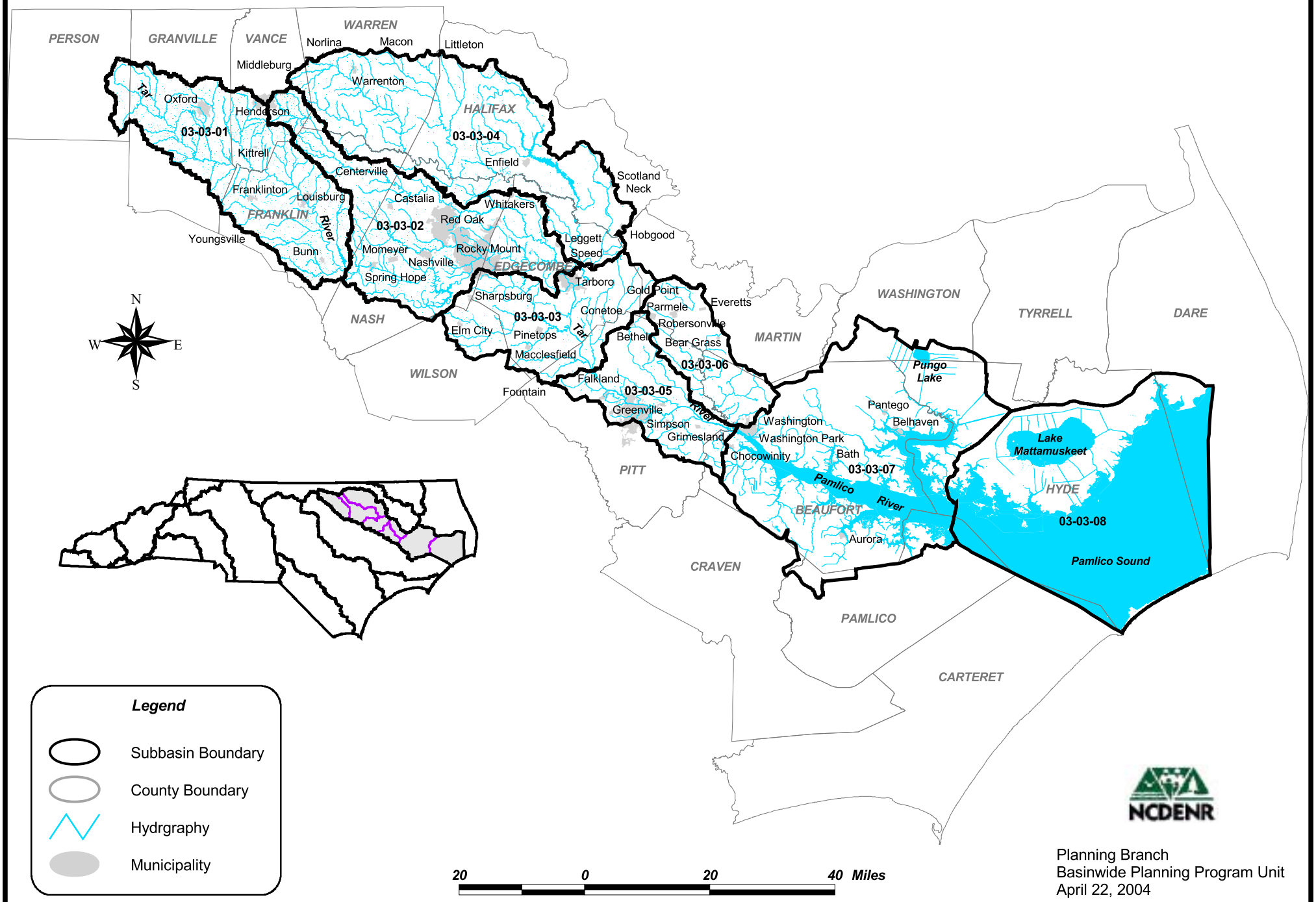
Fifty-five percent of the land in the basin is forest or wetland, and about 25 percent is in cultivated cropland and pasture/managed herbaceous land cover. Only 1 percent of the land falls into the urban/built-up category (NCDEHNR-DLR-CGIA, 1997). There has been a 16 percent (-4,000 acres) decrease in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

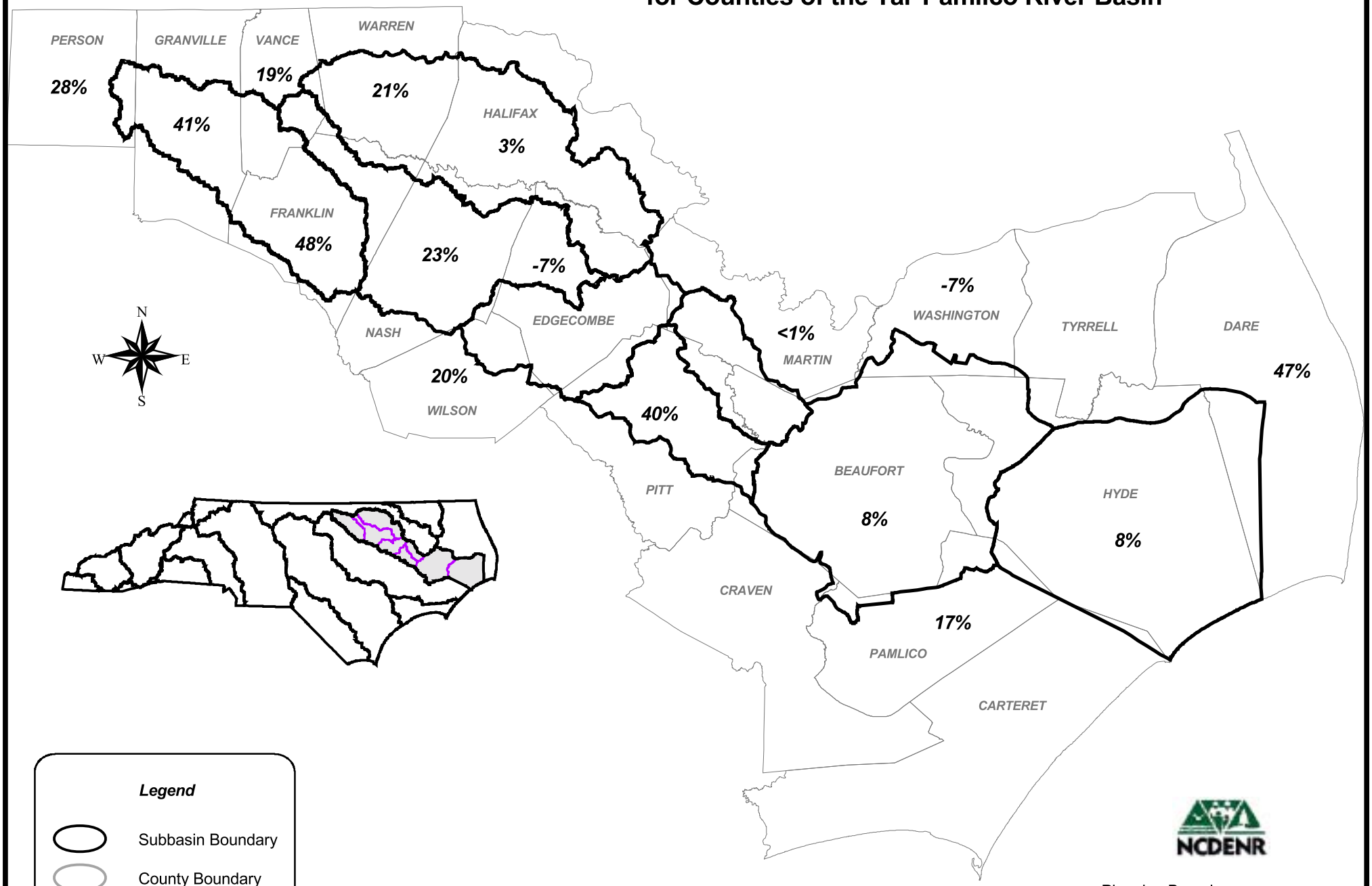
♦ Source: North Carolina Center for Geographic Information and Analysis

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



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

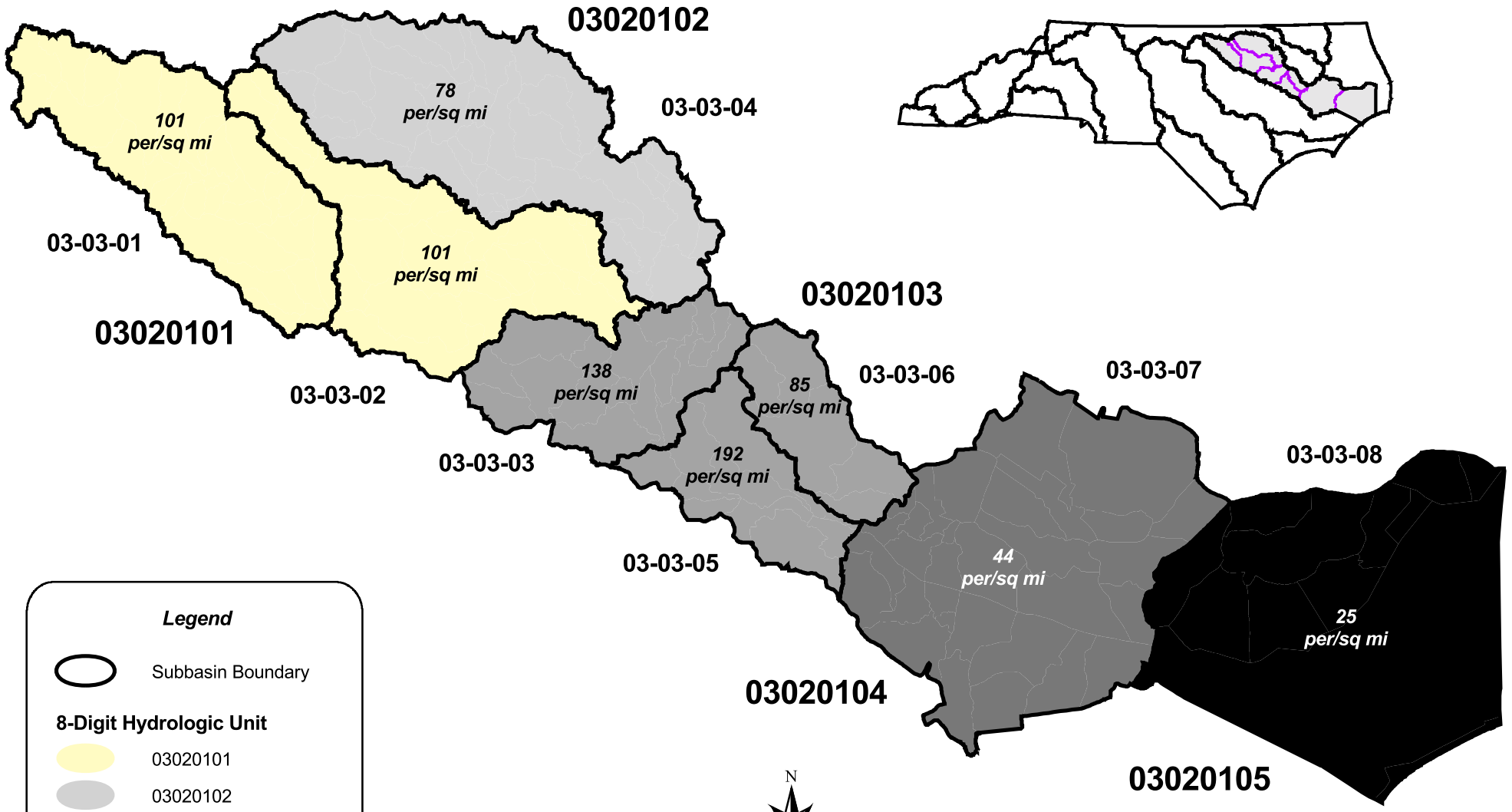
• - The numbers reported reflect municipality population; however, these municipalities are not entirely within the basin. The intent is to demonstrate growth for municipalities located wholly or partially within the basin.

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



Legend

Subbasin Boundary

8-Digit Hydrologic Unit

- 03020101
- 03020102
- 03020103
- 03020104
- 03020105

per/sq mi = persons per square mile

NCDENR

Planning Branch
Basinwide Planning Program Unit
April 22, 2004

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.

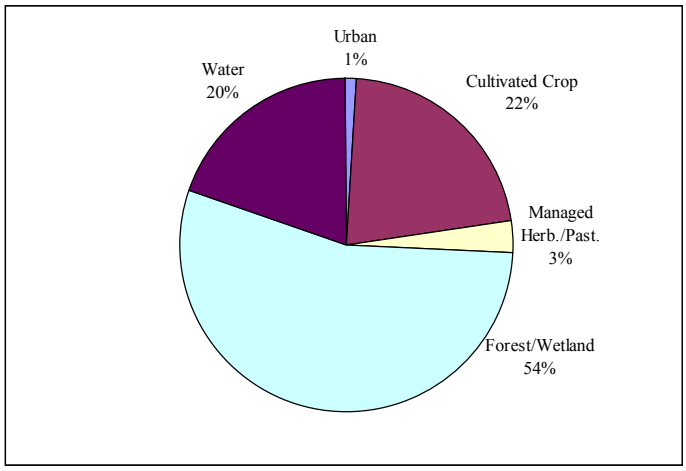


Figure A-6 Percentages within Major CGIA Land Cover Categories in the Tar-Pamlico River Basin

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	*Rural Transportation*: Consists of all highways, roads, railroads and associated rights-of-way outside urban and built-up areas; private roads to farmsteads; logging roads; and other private roads (but not field lanes). *Small Water Areas*: Waterbodies less than 40 acres; streams less than 0.5 miles wide. *Census Water*: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than 0.5 miles in width. *Minor Land*: Lands that do not fall into one of the other categories.

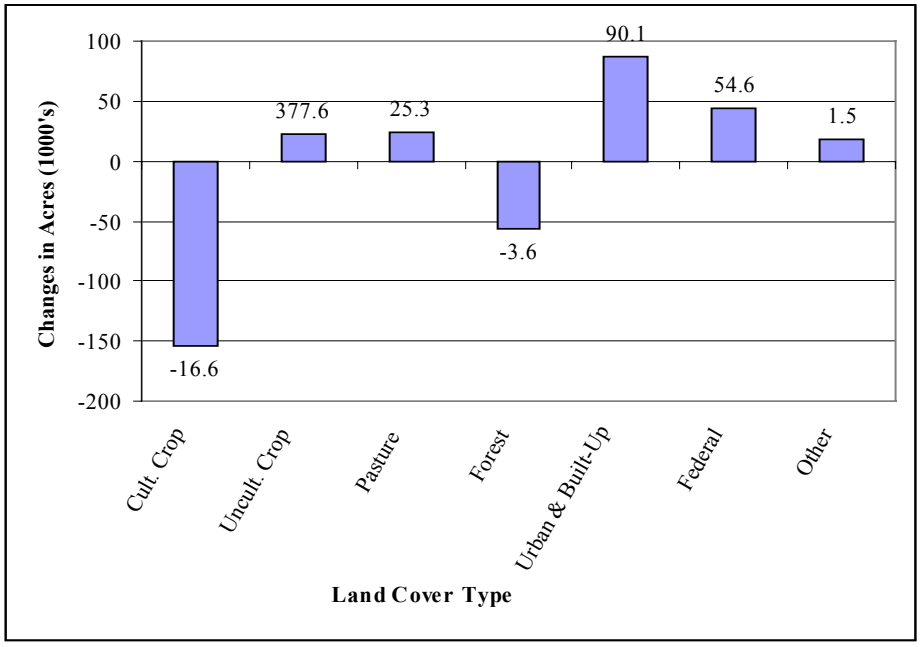


Figure A-7 Land Cover Changes from 1982 to 1997 for the Tar-Pamlico River Basin
(Source: USDA-NRCS, NRI, updated June 2001)

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

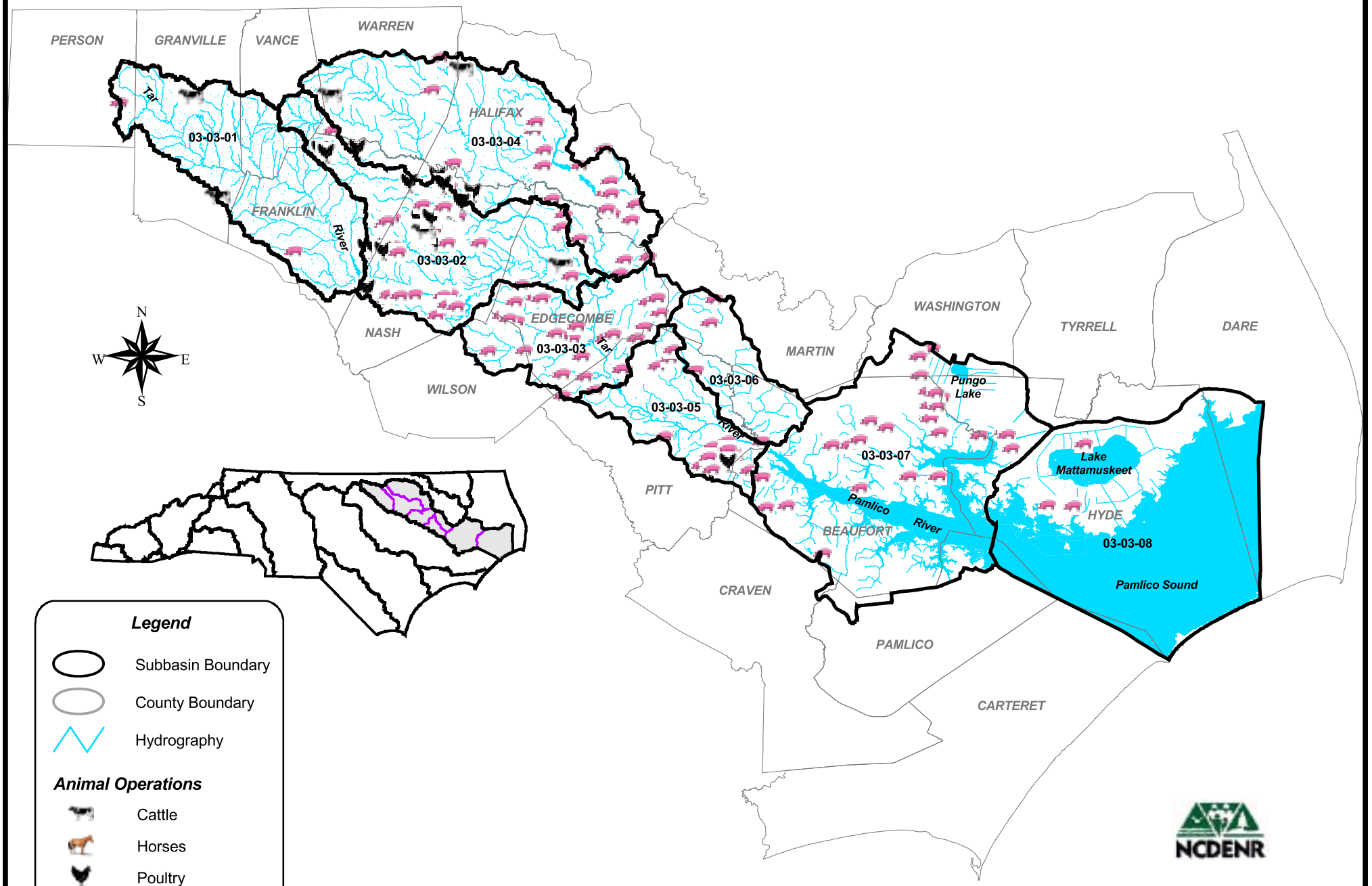


Table A-12 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight as of March 2003. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number 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)

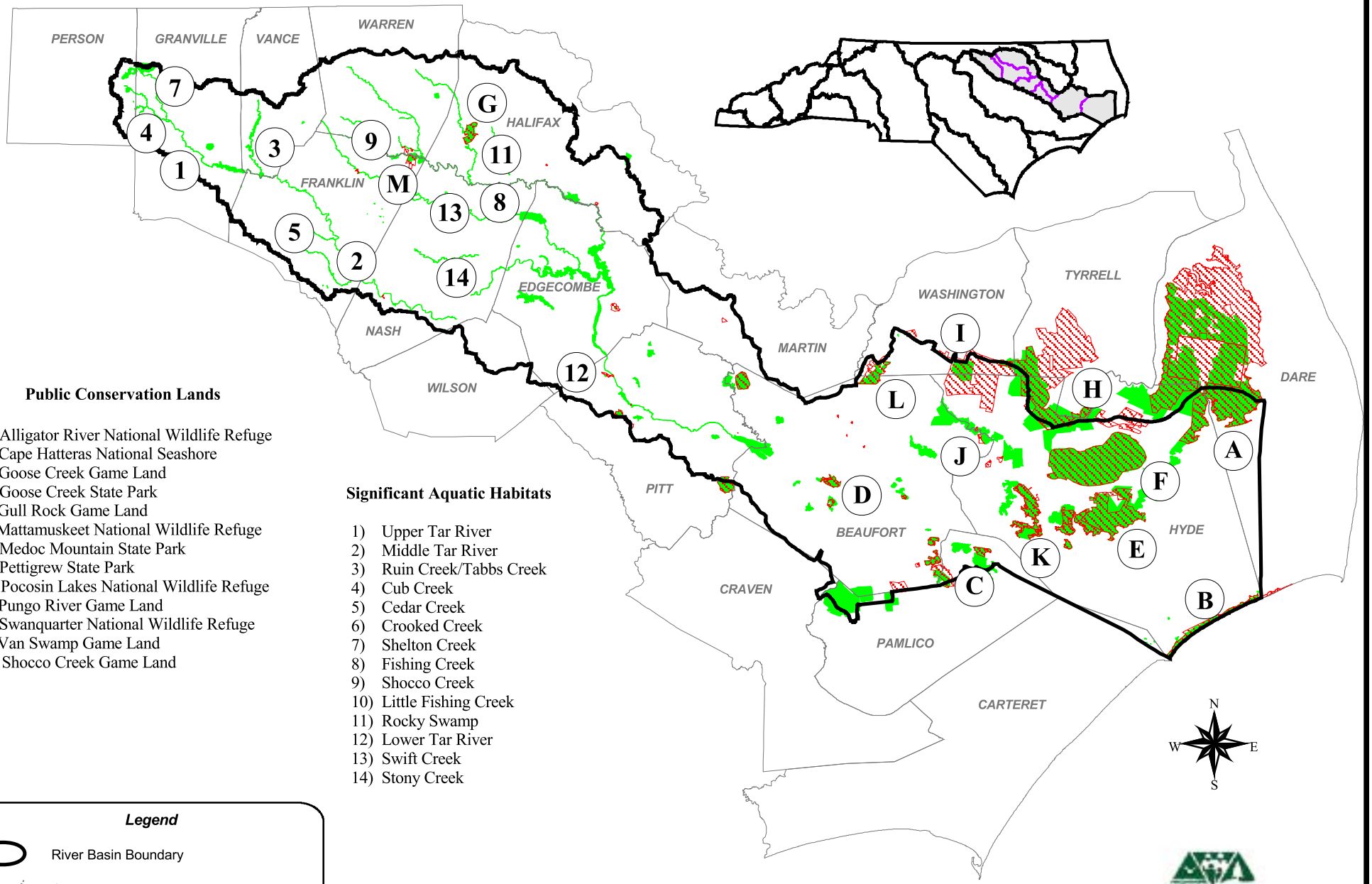
2.8.3 Significant Natural Heritage Areas in the Tar-Pamlico River Basin

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



Public Conservation Lands

A) Alligator River National Wildlife Refuge
B) Cape Hatteras National Seashore
C) Goose Creek Game Land
D) Goose Creek State Park
E) Gull Rock Game Land
F) Mattamuskeet National Wildlife Refuge
G) Medoc Mountain State Park
H) Pettigrew State Park
I) Pocosin Lakes National Wildlife Refuge
J) Pungo River Game Land
K) Swanquarter National Wildlife Refuge
L) Van Swamp Game Land
M) Shocco Creek Game Land

Significant Aquatic Habitats

1) Upper Tar River
2) Middle Tar River
3) Ruin Creek/Tabbs Creek
4) Cub Creek
5) Cedar Creek
6) Crooked Creek
7) Shelton Creek
8) Fishing Creek
9) Shocco Creek
10) Little Fishing Creek
11) Rocky Swamp
12) Lower Tar River
13) Swift Creek
14) Stony Creek

Legend

- River Basin Boundary
- County Boundary
- Significant Natural Heritage Areas
- Public Lands and Private Nature Preserves

20 0 20 40 *Miles*

NCDENR

Planning Branch
Basinwide Planning Program Unit
April 22, 2004

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 (2nd 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.