Section A - Chapter 2
Lumber River Basin Overview

2.1 General Overview

The Lumber River basin lies along the North Carolina/South Carolina border at the southeast corner of the state, extending about 150 miles from the Sandhills region in southern Moore and Montgomery counties to the Atlantic Ocean coastline in Brunswick County (Figure A-3).

Lumber River Basin Statistics

Total Area: 3,336 sq. miles
Freshwater Stream Miles: 2,232.5
Freshwater Lakes Acres: 8,965.9
Estuarine Acres: 4,305.6
Coastline Miles: 25.6
No. of Counties: 9
No. of Municipalities: 51
No. of Subbasins: 10
Population (2000): 304,579*
Pop. Density (2000): 92 persons/sq. mi.*

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

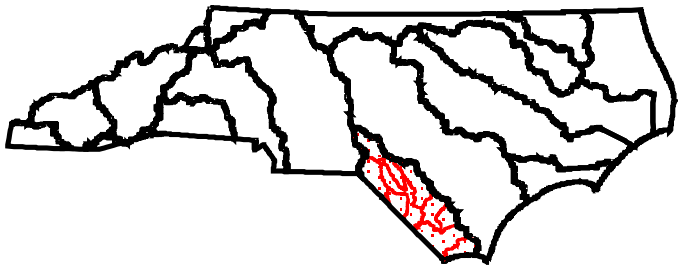
Streams and rivers in the Lumber River basin (except for the Lockwoods Folly and Shallotte Rivers) flow into South Carolina and are tributaries of the Pee Dee River. Ultimately, the Pee Dee River empties at Winyah Bay near Georgetown and Myrtle Beach, South Carolina. Figure A-4 presents the entire Pee Dee River basin including the Yadkin-Pee Dee and Lumber River basins in North Carolina and the Pee Dee River basin in South Carolina.

The Lumber River basin is the home of Lake Waccamaw and Lumber River State Parks. In Moore and Brunswick counties, world-renowned golf resorts call the Lumber River basin home. In addition, the Lumber River mainstem is the only North Carolina blackwater river to earn federal designation as a National Wild and Scenic River. Also, much of the Lumber River mainstem is designated a state Natural and Scenic River, one of just four in North Carolina.

The basin contains all or part of nine counties including: Bladen, Brunswick, Columbus, Hoke, Montgomery, Moore, Richmond, Robeson and Scotland. Population growth for the basin as a whole from 1990 to 2000 is estimated at 18.5 percent.

Sixty percent of the land in the basin is forested, and about 25 percent is cultivated cropland. Tobacco, peanuts, cotton and soybeans are among the most commonly grown crops. Only 7.1 percent of the land falls into the urban/built-up category (USDA-NRCS, NRI, updated June 2001). Despite the large amount of cultivated cropland and the relatively small amount of urban area, the basin has seen a significant decrease (-41,000 acres) in cultivated cropland and (-30,000 acres) in forest and an increase (+67,000 acres) in developed areas over the past 15 years (USDA-NRCS, NRI, updated June 2001).

Figure A-3 General Map of the Lumber River Basin in North Carolina



MONTGOMERY
MOORE
HOKE
CUMBERLAND
RICHMOND
SCOTLAND
ROBESON
BLADEN
COLUMBUS
BRUNSWICK

Candor
Foxfire Village
Norman
Southern Pines
Pinehurst
Aberdeen
Pinebluff
Hoffman
Raeford
Dundarrach
Wagram
Lumber Bridge
Parkton
Red Springs
Saint Pauls
Rennert
East Laurinburg
Gibson
Laurinburg
Maxton
Lumber River
Tar Heel
Pembroke
Dublin
Lumberton
Raynham
McDonald
Rowland
Bladenboro
Fairmont
Proctorville
Orrum
Clarkton
Boardman
Marietta
Cerro Gordo
Whiteville
Chadbourn
Bolton
Fair Bluff
Brunswick
Lake Waccamaw
Tabor City
Bolivia
Boiling Spring Lakes
Shallotte
Varnumtown
Carolina Shores
Ocean Isle Beach
Holden Beach
Oak Island
Sunset Beach

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Legend

- River Basin Boundary
- Subbasin Boundary
- County Boundary
- Hydrography
- Municipality

7 0 7 14 21 Miles

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Basinwide Planning Program Unit
January 12, 2004

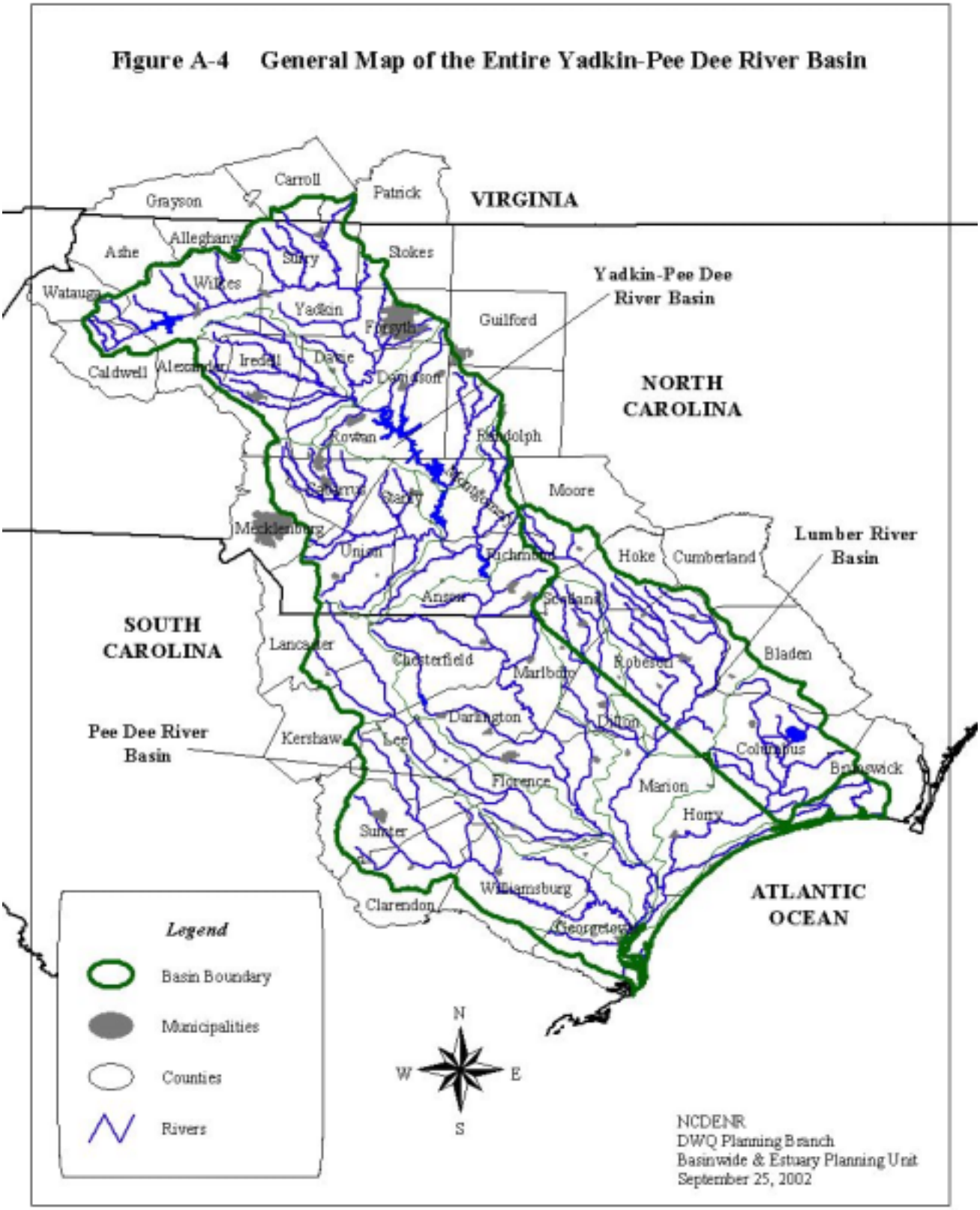


Figure A-4 General Map of the Entire Yadkin-Pee Dee and Lumber River Basins

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 Lumber River basin is divided into 10 subbasins (6-digit DWQ subbasins). 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. Under the federal system, the Lumber River basin is made up of hydrologic areas referred to as hydrologic units (USGS 8-digit hydrologic units). The Lumber River basin is made up of four whole hydrologic units: the Lumber, Little Pee Dee, Waccamaw and Carolina Coastal-Sampit. Hydrologic units are further divided into smaller watershed units (14-digit hydrologic units) that are used for smaller scale planning like that done by NCWRP (page 147). There are 102 14-digit hydrologic units in the Lumber River basin.

2.2.2 Hydrologic Features

There are 2,232.5 freshwater stream miles, 8,965.9 acres of freshwater acres, 4,305.6 estuarine acres, and 25.6 miles of Atlantic coastline in the Lumber River basin. Most of the Lumber River basin contains extensive wetland communities where 88 percent of the freshwater streams are supplementally classified as swamp waters. There are also areas of the Non-Riverine Swamps and Peatlands ecoregion with flat, poorly drained soils of peat and muck. The basin starts in the Sandhills physiographic region with about two-thirds of the basin in the Coastal Plain region.

Streams in the Sandhills ecoregion are typically swift-flowing sandy streams which receive substantial flow from high quality groundwater during low rainfall periods.

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 values. 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.

The Resorts of Pinehurst, Inc. operates Lake Pinehurst dam (subbasin 03-07-50) in Moore County on Horse Creek. Lake Pinehurst dam has a minimum flow release of 2.5 cfs or inflow, whichever is less.

Lake Auman (Seven Lakes West) dam is operated by the Seven Lakes West Property Owners Association, Inc. (subbasin 03-07-50). Lake Auman is located in Moore County on an unnamed tributary of Jackson Creek and has a minimum flow release of 2.0 cfs or inflow, whichever is less.

The Pinewild Country Club of Pinehurst operates Holly Course Lake dam (subbasin 03-07-50) in Moore County on Sandy Run Creek. Holly Course Lake dam has a minimum flow release of 0.4 cfs or inflow, whichever is less.

Division of Water Resources conducted a streamflow study for Southern Pines' proposed increase in withdrawal from 4 MGD to 8 MGD from Drowning Creek and found that the increase would not adversely impact downstream habitat. In addition, the town requested a determination, in anticipation of 50-year sales projections, of how much they could exceed the 8 MGD withdrawal. The study determined that, from a physical habitat perspective, withdrawals between 8 MGD and 14 MGD (21.6 cfs) would not be detrimental if a flow target of 36.2 MGD (56 cfs) could be maintained at the downstream US Geological Survey gage at Highway US 1.

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 MGD.

There are six registered water withdrawals in the Lumber River basin not including those associated with the two public water systems discussed below. All of these are surface water withdrawals. Excluding the public water systems or power generating facilities, there is a cumulative permitted capacity to withdraw 10.5 MGD of water. For more information on water withdrawals, visit http://www.dwr.ehnr.state.nc.us/ or call DWR at (919) 733-4064.

2.2.5 Interbasin Transfers

In addition to water withdrawals (discussed above), water users in North Carolina are also required to register surface water transfers with the Division of Water Resources if the amount is 100,000 MGD or more. In addition, persons wishing to transfer 2 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 (Figure A-7) correspond to these basins within the Lumber River basin. Table A-3 summarizes IBTs involving the Lumber River basin.

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

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

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

Table A-3 Estimated Interbasin Transfers in the Lumber River Basin (1997)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD)
Brunswick County	Ocean Isle Beach	Cape Fear River	Shallotte River	0.386
Brunswick County	Shallotte	Cape Fear River	Shallotte River	0.218

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 Lumber River basin (NCDENR-DWR, January 2001). The information is compiled from Local Water Supply Plans submitted to DWR by two public water systems. In 1995, the USGS estimated that total water use in the Lumber River basin was 69 MGD, with slightly less than half coming from surface water sources.

Total water use in the Lumber River basin is reported to be approximately 26.9 MGD. Public water systems supplied 11 MGD from surface water. For more information or to view local water supply plans, visit http://www.dwr.ehnr.state.nc.us/ or call DWR at (919) 733-4064.

2.3 Population and Growth Trends

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

2.3.1 County Population and Growth Trends

Table A-4 shows the projected population for 2020 and the change in growth between 2000 and 2020 for counties that are wholly or partly contained within the basin. Since river basin boundaries do not coincide with county boundaries, these numbers are not directly applicable to the Lumber River basin. This information is intended to present an estimate of expected population growth in counties that have some land area in the Lumber River basin.

Table A-4 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
Bladen	31	28,663	32,278	38,274	3,615	5,996
Brunswick	55	50,985	73,143	112,885	22,158	39,742
Columbus	89	49,587	54,749	63,283	5,162	8,534
Hoke	43	22,856	33,646	57,891	10,790	24,245
Montgomery	5	23,359	26,822	33,247	3,463	6,425
Moore	21	59,000	74,769	102,828	15,769	28,059
Richmond	19	44,511	46,564	49,825	2,053	3,261
Robeson	100	105,170	123,339	159,552	18,169	36,213
Scotland	99	33,763	35,998	39,932	2,235	3,934
Subtotal		417,894	501,308	657,717	83,414	156,409

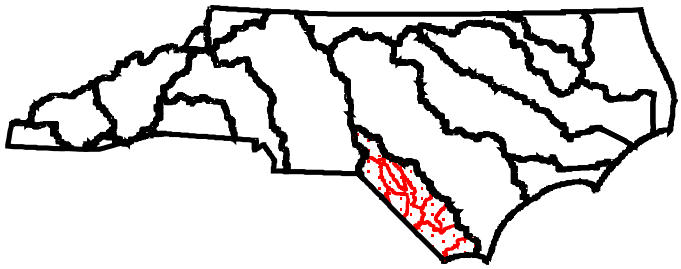
♦ Source: North Carolina Center for Geographic Information and Analysis

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 83,414 people between 1990 and 2000. Figure A-5 presents projected population growth by county (2000-2020) for the Lumber River basin. Hoke, Moore and Robeson counties are growing the fastest in the upper basin, with Brunswick County growing the fastest in the lower basin. The county populations are expected to grow by more than 156,000 by 2020. With the increased population there will be increased drinking water demands and wastewater discharges. There will also be loss of natural areas and increases in impervious surfaces associated with construction of new homes and businesses.

For more information on past, current and projected population estimates, contact the Office of State Budget and Management at (919) 733-7061 or visit the North Carolina State Demographics website at http://demog.state.nc.us/.

Figure A-5 Percent Projected County Population Growth (2000-2020) in the Lumber River Basin



MONTGOMERY

20-30%

MOORE

30-40%

HOKE

70-80%

0-10%

RICHMOND

CUMBERLAND

SCOTLAND

10-20%

ROBESON

20-30%

BLADEN

10-20%

COLUMBUS

10-20%

BRUNSWICK

50-60%

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W

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S

Legend

River Basin Boundary

Subbasin Boundary

10 0 10 20 Miles

NCDENR

Planning Branch
Basinwide Planning Program Unit
January 12, 2004

2.3.2 Municipal Population and Growth Trends

Table A-5 presents population data from Office of State Planning for municipalities with populations greater than 2,000 persons, located wholly or partly within the basin. The highest urban population growth has occurred in the upper basin around Pinehurst and the lower basin around Boiling Spring Lakes. Laurinburg also increased population substantially in the last ten years. In 1999, Long Beach and Yaupon Beach incorporated to become the Town of Oak Island.

Table A-5 Population (1980, 1990, 2000) and Population Change for Municipalities Greater Than 2,000 Located Wholly or Partly in the Lumber River Basin

Municipality	County	Apr-80	Apr-90	Apr-2000	Percent Change (1980-90)	Percent Change (1990-2000)
Aberdeen	Moore	1,945	2,717	3,400	39.7	25.1
Boiling Spring Lakes •	Brunswick	998	1,650	2,972	65.3	80.1
Chadbourn	Columbus	1,975	2,005	2,129	1.5	6.2
Fairmont	Robeson	2,658	2,519	2,604	-5.2	3.4
Laurinburg	Scotland	11,480	11,643	15,874	1.4	36.3
Lumberton	Robeson	18,241	18,733	20,795	2.7	11.0
Maxton	Robeson, Scotland	2,711	2,576	2,551	-5.0	-1.0
Oak Island •	Brunswick	…..	4,550	6,571	…..	44.4
Pembroke	Robeson	2,698	2,241	2,399	-16.9	7.1
Pinehurst •	Moore	1,746	5,091	9,706	191.6	90.7
Raeford •	Hoke	3,630	3,469	3,386	-4.4	-2.4
Red Springs ♦	Robeson	3,607	3,799	3,493	5.3	-8.1
Saint Pauls	Robeson	1,639	1,992	2,137	21.5	7.3
Southern Pines •	Moore	8,620	9,213	10,918	6.9	18.5
Tabor City	Columbus	2,710	2,330	2,509	-14.0	7.7
Whiteville	Columbus	5,565	5,078	5,148	-8.8	1.4

• - 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.

♦ Note: Red Springs is listed only in Robeson County in the 2001 NC League of Municipalities Directory. However, it is listed in Robeson and Hoke counties on the Office of State Planning website for the April 2001 municipality population data even though there are no population figures listed for Hoke County.

2.3.3 Basin Population and Population Density

Most population data are collected from within county or municipal boundaries. It is difficult to evaluate population and population density within watersheds using this information. Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. The overall population of the Lumber River basin is 304,579, with approximately 92 persons/square mile for counties which are partially or entirely in the basin.

2.4 Local Governments and Planning Jurisdictions in the Basin

The Lumber River basin encompasses all or portions of nine counties and 51 municipalities. Table A-6 provides a listing of these municipalities, along with the regional planning jurisdiction (Council of Governments). Eleven municipalities are located in more than one major river basin.

Table A-6 Local Governments and Planning Units within the Lumber River Basin

County	Region	Municipalities
Bladen	N	Bladenboro, Clarkton, Dublin ♦, Tar Heel ♦
Brunswick	O	Boiling Spring Lakes ♦, Bolivia, Calabash, Carolina Shores, Holden Beach, Oak Island ♦, Ocean Isle Beach, Shallotte, Sunset Beach, Varnamtown
Columbus	O	Boardman, Bolton ♦, Brunswick, Cerro Gordo, Chadbourn, Fair Bluff, Lake Waccamaw, Tabor City, Whiteville
Hoke	N	Raeford ♦
Montgomery	G	Candor ♦
Moore	J	Aberdeen, Foxfire Village, Pinebluff, Pinehurst ♦, Southern Pines ♦
Richmond	N	Hoffman ♦, Norman ♦
Robeson	N	Fairmont, Lumber Bridge, Lumberton, Marietta, Maxton *, McDonald, Orrum, Parkton, Pembroke, Proctorville, Raynham, Red Springs, Rennert, Rowland, Saint Pauls
Scotland	N	East Laurinburg, Gibson, Laurinburg, Maxton *, Wagram

* 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
G	Piedmont Triad Council of Governments	Greensboro
J	Triangle J Council of Governments	Durham
N	Lumber River Council of Governments	Lumberton
O	Cape Fear Council of Governments	Wilmington

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 Lumber 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 Lumber 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-7. Figure A-6 provides an illustration of the relative amount of land area that falls into each major cover type for the Lumber River basin. Section B of this plan provides land cover data specific to each subbasin based on this information.

Table A-7 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.

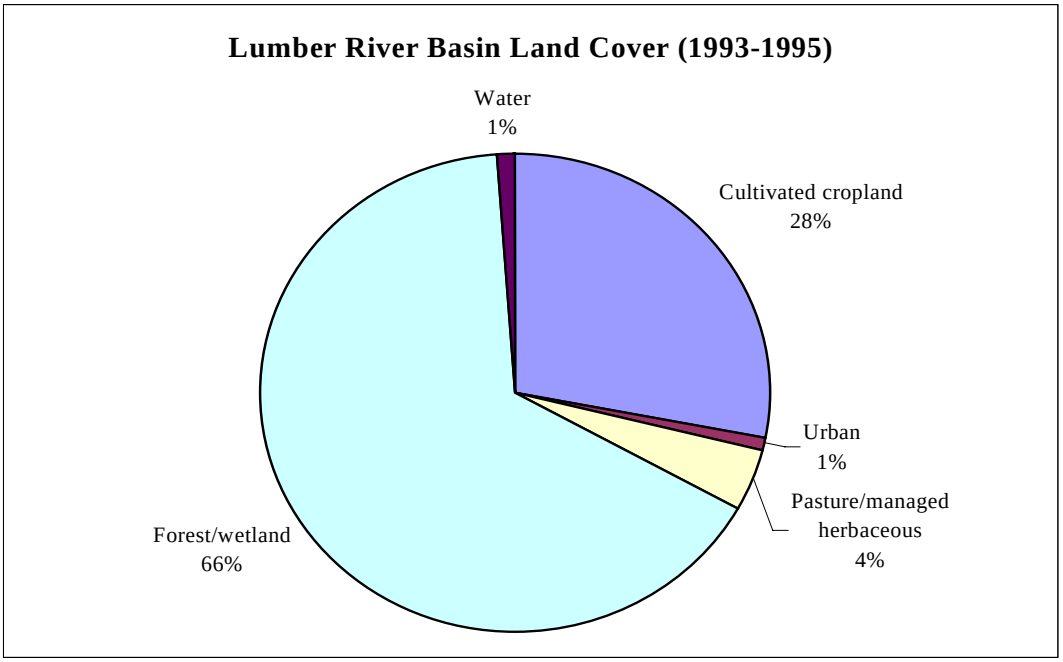


Figure A-6 Percentages within Major CGIA Land Cover Categories in the Lumber River Basin

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, NRI, 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-8 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, and compares the coverages to 1982 land cover. Definitions of the different land cover types are presented in Table A-9. Figure A-7 also shows the relationship between the 8-digit hydrologic units and DWQ subbasin. These data can be used to evaluate changes in land cover over the large area represented by the 8-digit hydrologic units and should not be assumed to represent land cover changes at smaller scales in specific watersheds. In the Lumber River basin, the 8-digit hydrologic units extend into South Carolina, and thus, are partially contained in North Carolina.

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 67,000 acres. Uncultivated cropland decreased by 4,000 acres while pastureland remained about the same. Forest and cultivated cropland cover significantly decreased by 30,000 and 41,000 acres, respectively. Most land cover change is accounted for in the upper Lumber River basin hydrologic unit that includes rapidly growing areas in Hoke, Moore and Robeson counties as well as the lower Lumber River basin hydrologic unit in Brunswick County. Figure A-8 presents changes in land cover between 1982 and 1997.

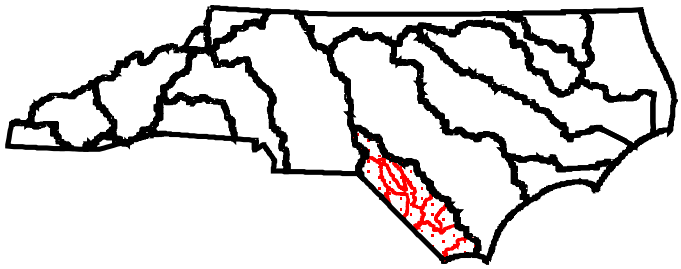
Table A-8 Land Cover in the Lumber River Basin by Major Watersheds – 1982 vs. 1997 (Source: USDA-NRCS, NRI, updated June 2001)

	MAJOR WATERSHED AREAS								1997 TOTALS		1982 TOTALS		% change since 1982
	Lumber		Little Pee Dee		Waccamaw		Carolina Coastal-Sampit						
LAND COVER	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% TOTAL	Acres (1000s)	% TOTAL	
Cult. Crop	309.6	28.7	76.5	30.9	153.3	22.8	10.1	5.9	549.5	25.3	590.7	27.2	-7.0
Uncult. Crop	12.6	1.2	1.6	0.6	0.0	0.0	0.0	0.0	14.2	0.7	18.2	0.8	-22.0
Pasture	22.0	2.0	5.6	2.3	7.4	1.1	5.3	3.1	40.3	1.9	40.6	1.9	-0.7
Forest	599.4	55.6	138.0	55.7	457.5	68.0	105.9	61.7	1300.8	59.9	1330.3	61.2	-2.2
Urban & Built-Up	81.2	7.5	14.5	5.9	26.0	3.9	32.1	18.7	153.8	7.1	86.5	4.0	77.8
Federal	6.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.3	6.5	0.3	0.0
Other	46.9	4.3	11.4	4.6	28.2	4.2	18.3	10.7	104.8	4.8	101.8	4.7	2.9
Totals	1078.2	100.0	247.6	100.0	672.4	100.0	171.7	100.0	2169.9	100.0	2174.6	100.0	
% of Total Basin		49.6		11.4		30.9		7.9					
SUBBASINS	03-07-50 03-07-51 03-07-52 03-07-53 03-07-54		03-07-55		03-07-56 03-07-57 03-07-58		03-07-59						
8-Digit Hydraulic Units	03040203		03040204		03040206		03040207						

* = 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.

Figure A-7 8-Digit Hydrologic Units in the Lumber River Basin



Legend

8-Digit Hydrologic Units

- 03040203
- 03040204
- 03040206
- 03040207

Subbasin Boundary

10 0 10 20 *Miles*

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Basinwide Planning Program Unit
January 12, 2004

Table A-9 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.

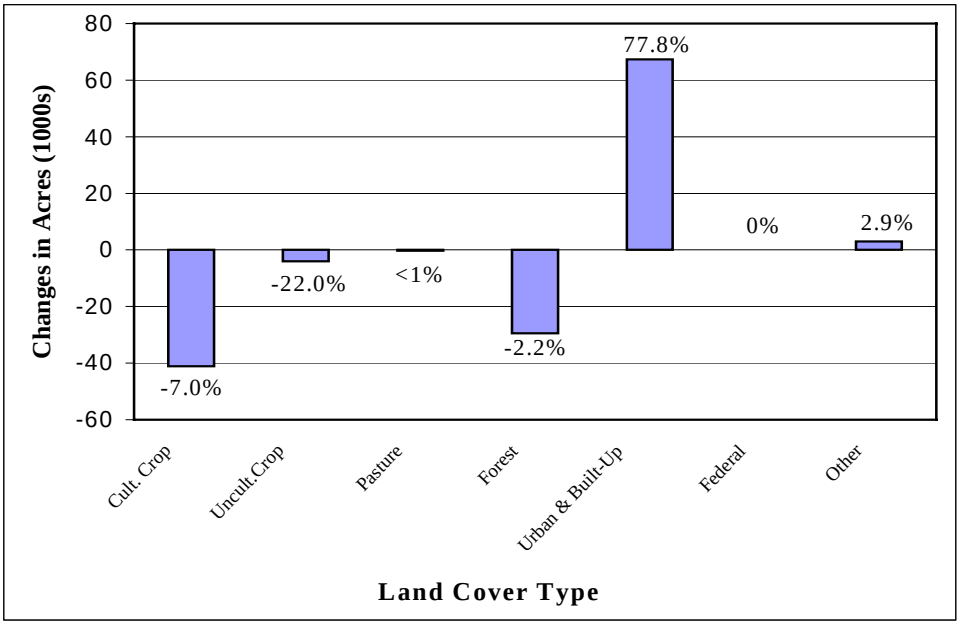


Figure A-8 Land Cover Changes from 1982 to 1997 for the Lumber River Basin
(Source: USDA-NRCS, NRI, updated June 2001)

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 52 permitted wastewater discharges in the Lumber River basin. Table A-10 provides summary information (by type and subbasin) about the discharges. Various types of dischargers listed in the table are described in the inset box. A list of all facilities can be found in Appendix I. Facilities are mapped in each subbasin chapter in Section B. A location key to the facilities is provided at the beginning of Appendix I. Because the GIS data have not been updated as recently as the NPDES database, refer to Appendix I to determine the most current status of individual NPDES permit holders.

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

Table A-10 Summary of NPDES Dischargers and Permitted Flows for the Lumber River Basin (as of 11/27/02)

	Lumber River Subbasin										
Facility Categories	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**TOTAL**
Total Facilities	4	14	3	5	0	11	2	4	6	3	52
Total Permitted Flow (MGD)	6.97	22.88	3.5	1.2	0.0	5.38	0.4	1.64	4.27	0.02	46.26
Major Discharges	1	7	2	0	0	1	0	1	2	0	14
Total Permitted Flow (MGD)	6.7	22.64	3.5	0.0	0.0	4.0	0.0	1.1	4.0	0.0	41.94
Minor Discharges	3	7	1	5	0	10	2	3	4	3	38
Total Permitted Flow (MGD)	0.27	0.24	0.0	1.2	0.0	1.38	0.4	0.54	0.27	0.02	4.32
100% Domestic Waste	0	1	0	0	0	2	0	3	0	1	7
Total Permitted Flow (MGD)	0.0	0.01	0.0	0.0	0.0	0.03	0.0	0.54	0.0	0.01	0.59
Municipal Facilities	1	4	2	3	0	4	1	1	3	0	19
Total Permitted Flow (MGD)	6.7	13.31	3.5	1.2	0.0	5.02	0.4	1.1	4.24	0.0	35.47
Nonmunicipal Facilities	3	10	1	2	0	7	1	3	3	3	33
Total Permitted Flow (MGD)	0.27	9.57	0.0	0.0	0.0	0.36	0.0	0.54	0.03	0.02	10.79

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 122 general stormwater permits and four individual stormwater permits (see Appendix I for a listing). Refer to page 69 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-9 displays general locations of animal operations in the Lumber River basin.

Key Animal Operation Legislation (1995-2000)

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

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

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

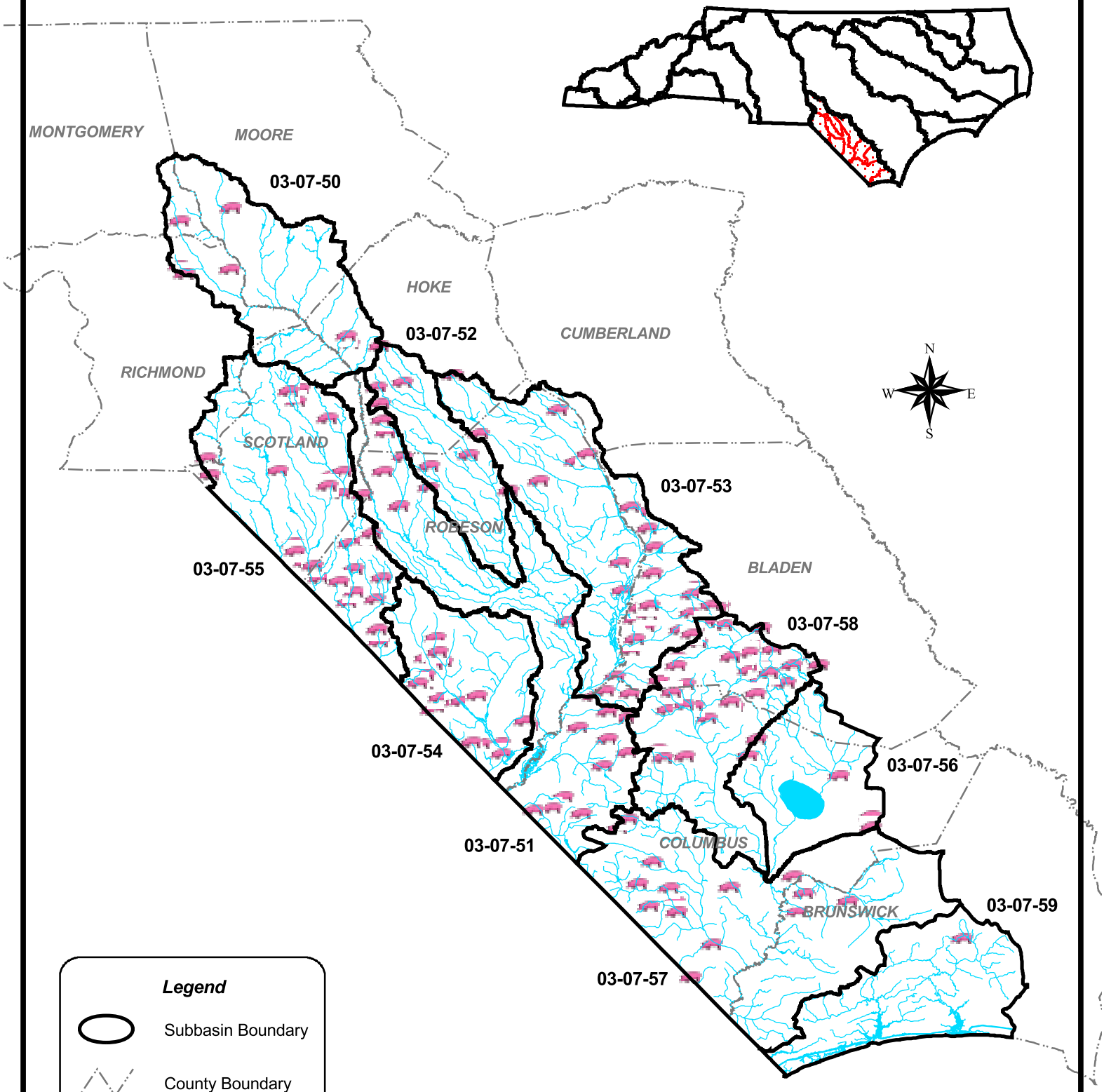
1998 House Bill 1480 extended the moratorium on construction or expansion of swine farms. The bill also requires owners of swine operations to register with DWQ any contractual relationship with an integrator.

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

2000 Attorney General Easley reached a landmark agreement with Smithfield Foods, Inc. to phase out hog lagoons and implement new technologies that will substantially reduce pollutants from hog farms. The agreement commits 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-9 Animal Operations in the Lumber River Basin



NCDENR

Planning Branch
Basinwide Planning Program Unit
January 12, 2004

Table A-11 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight as of January 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. There are no registered cattle or poultry operations in the Lumber River basin.

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

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

Between 1994 and 1998, there were substantial increases in swine and poultry in the basin and a decrease in dairy operations. In several areas, animal density is much greater than human populations. Information on animal capacity by subbasin (Table A-12) was provided by the USDA.

Table A-11 Registered Swine Operations in the Lumber River Basin (as of 01/02/03)

Subbasin	Number of Facilities	Number of Animals	Total Steady State Live Weight
03-07-50	10	55,128	6,881,772
03-07-51	16	95,632	11,483,790
03-07-52	7	53,360	8,157,240
03-07-53	37	264,161	29,416,913
03-07-54	15	88,998	10,915,290
03-07-55	30	203,442	28,916,760
03-07-56	6	46,400	6,261,500
03-07-57	15	60,244	7,948,420
03-07-58	34	236,943	31,976,186
03-07-59	1	3,750	506,250
Totals	171	1,108,058	142,464,121

Table A-12 Estimated Populations of Swine, Dairy and Poultry in the Lumber 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 (%)
03-07-50	13,357	1,453	819	0	0	0	1,760,682	1,683,482	5
03-07-51	189,760	69,136	174	55	15	267	1,391,000	710,600	96
03-07-52	43,475	32,200	35	2	0	2	363,300	182,900	99
03-07-53	203,688	97,169	110	0	4	-100	1,972,650	1,409,350	40
03-07-54	112,060	30,983	262	0	0	0	1,362,000	738,200	85
03-07-55	181,153	121,675	49	0	0	0	3,602,500	2,888,500	25
03-07-56	4,394	6,168	-29	0	0	0	0	0	0
03-07-57	92,833	40,563	129	0	775	-100	0	0	0
03-07-58	238,516	83,636	185	0	120	-100	50,300	50,300	0
03-07-59	10,709	7,542	42	0	0	0	0	0	0
TOTALS	1,089,945	490,525	122	57	914	-94	10,502,432	7,663,332	37
% of State Total	11%	9%		<1%	<1%		5%	4%	

2.8 Permitted Wetland and Stream Losses and Mitigation

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

2.9 Natural Resources

2.9.1 Ecological Significance of the Lumber River Basin

The Lumber River basin encompasses three distinct ecological regions in North Carolina: the Sandhills, the Carolina Bay region and the Southeastern Coastal Plain. This assemblage of ecological regions gives the Lumber River basin a great diversity of natural communities. From the vast pocosins of the Green Swamp to the large Carolina bay that became Lake Waccamaw to the dry sandy hills cloaked with magnificent longleaf pines, the Lumber River basin is a showcase of biological diversity. Of particular note in the Lumber River basin are wetland communities associated with the blackwater river floodplains and pine savannas. Table A-13 presents rare aquatic and wetland-dwelling species found in the Lumber River basin.

Table A-13 Rare Aquatic and Wetland-Dwelling Species in the Lumber River Basin (as of March 2003)

Major Taxon	Scientific Name	Common Name	State Status	Federal Status
Amphibian	*Ambystoma tigrinum*	Eastern tiger salamander	T	
Amphibian	*Rana heckscheri*	River frog	SC	
Amphibian	*Eurycea quadridigitata pop 1*	Dwarf salamander - silver morph	SC	
Amphibian	*Ambystoma mabeei*	Mabee's salamander	SR	
Amphibian	*Pseudacris ornata*	Ornate chorus frog	SR	
Amphibian	*Rana capito*	Carolina gopher frog	T	FSC
Amphibian	*Hyla andersonii*	Pine barrens treefrog	SR	
Crustacean	*Procambarus braswelli*	Waccamaw crayfish	SC	
Fish	*Noturus sp 1*	Broadtail madtom	SC	
Fish	*Menidia extensa*	Waccamaw silverside	T	T
Fish	*Elassoma boehlkei*	Carolina pygmy sunfish	T	FSC
Fish	*Semotilus lumbee*	Sandhills chub	SC	
Fish	*Gobionellus stigmaticus*	Marked goby	SR	
Fish	*Hypsoblennius ionthas*	Freckled blenny	SR	
Fish	*Cyprinella zanema pop 2*	Santee chub - Coastal Plain population	SC	
Fish	*Etheostoma perlongum*	Waccamaw darter	T	
Fish	*Fundulus waccamensis pop 1*	Waccamaw killifish - Lake Waccamaw population	SC	FSC
Fish	*Etheostoma mariae*	Pinewoods darter	SC	FSC
Insect	*Euphyes bimacula*	Two-spotted skipper	SR	
Insect	*Calephelis virginiensis*	Little metalmark	SR	
Insect	*Callophrys hesseli*	Hessel's hairstreak	SR	
Insect	*Amblyscirtes reversa*	Reversed roadside-skipper	SR	
Insect	*Attaneuria ruralis*	A stonefly	SR	
Insect	*Triaenodes marginata*	A caddisfly	SR	
Insect	*Choroterpes basalis*	A mayfly	SR	
Insect	*Ceraclea cancellata*	A caddisfly	SR	
Insect	*Ephemerella argo*	A mayfly	SR	FSC
Mammal	*Trichechus manatus*	West Indian manatee	E	E
Mollusk	*Cincinnatia sp 1*	Waccamaw siltsnail	SC	
Mollusk	*Lampsilis cariosa*	Yellow lampmussel	E	FSC
Mollusk	*Elliptio folliculata*	Pod lance	SC	

Mollusk	*Lampsilis radiata radiata*	Eastern lampmussel	T	
Mollusk	*Leptodea ochracea*	Tidewater mucket	T	
Mollusk	*Amnicola sp 1*	Waccamaw snail	SC	
Mollusk	*Elliptio marsupiobesa*	Cape Fear spike	SC	
Mollusk	*Elliptio waccamawensis*	Waccamaw spike	T	FSC
Mollusk	*Lampsilis fullerkati*	Waccamaw fatmucket	T	FSC
Mollusk	*Viviparus intertextus*	Rotund mysterysnail	SR	
Mollusk	*Triodopsis soelneri*	Cape Fear threetooth	T	FSC
Mollusk	*Toxolasma pullus*	Savannah lilliput	E	FSC
Reptile	*Caretta caretta*	Loggerhead	T	T
Reptile	*Seminatrix pygaea*	Black Swamp snake	SR	
Reptile	*Regina rigida*	Glossy crayfish snake	SR	
Reptile	*Deirochelys reticularia*	Chicken turtle	SR	
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 (rare in North Carolina, but not yet officially listed as threatened or endangered)
SC = Special Concern (have limited numbers in North Carolina and vulnerable populations in need of monitoring)
FSC = Federal Species of Concern (those under consideration for listing under the Federal Endangered Species Act)

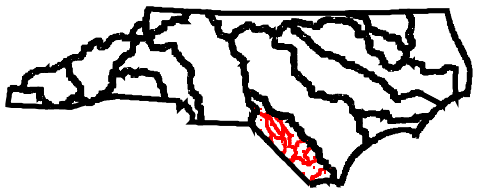
2.9.2 Significant Natural Heritage Areas in the Lumber River Basin

The North Carolina Natural Heritage Program identifies areas that have outstanding conservation value, either because they contain rare or endangered species, or because an area provides an excellent, intact example of an ecological community which naturally occurs in the state. The Lumber River basin contains more than 150 individual significant natural heritage areas (aquatic and terrestrial). It is beyond the scope of this report to discuss even a large fraction of these areas; however, some of the more impressive aquatic areas are mentioned. Refer to Figure A-10 for more information.

Lumber River Watershed

The Lumber River is one of the largest blackwater rivers in the state and it contains notable wetland communities and high quality floodplain forests. These floodplain forests act as buffers, preserving the water quality of the Lumber River. Consequently, the river continues to maintain populations of rare animal species, including fishes such as the pinewoods darter, broadtail madtom and the sandhills chub. In addition, Drowning Creek, Naked Creek, Ashpole Swamp and Bear Swamp contain significant fish, mollusk and insect species.

Figure A-10 Lumber River Basin Managed Lands and Significant Heritage Areas



MONTGOMERY
MOORE
HOKE
CUMBERLAND
RICHMOND
SCOTLAND
ROBESON
BLADEN
COLUMBUS
BRUNSWICK

Public Lands and Private Nature Preserves

A) Bird Island Coastal Reserve
B) Boiling Spring Lakes Preserve
C) Green Swamp Preserve
D) Lake Waccamaw State Park
E) Columbus County Game Land
F) Lumber River State Park
G) Sandhills Game Land
H) Camp Mackall Military Reservation

Significant Natural Heritage Areas

1) Coastal Area
2) Lake Waccamaw and Waccamaw River Floodplain
3) Green Swamp and Juniper Creek
4) Lower Lumber River Floodplain
5) Clay-Based Bays
6) Sandhills Game Land
7) Drowning Creek Floodplain

N
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Legend

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

7 0 7 14 21 *Miles*

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Planning Branch
Basinwide Planning Program Unit
January 12, 2004

Little Pee Dee Watershed

The significant wetland communities of this watershed consist of Sandhill Seeps, Streamhead Pocosins, Coastal Plain Small Stream Swamps, and Streamhead Atlantic White Cedar Forests. Although less extensive than wetlands in other areas, wetland and aquatic communities in the Sandhills harbor rare plants and animals, including rare fish, amphibians and plants. The most significant natural areas in this watershed are uplands, especially the dry longleaf pine communities of the Sandhills Game Land.

Waccamaw River Watershed

Encompassing the Green Swamp, Lake Waccamaw and the Waccamaw River, this watershed is characterized by biological richness. Much of its outstanding diversity is due to the extensive wetlands which include High Pocosins, Pine Savannas, Oxbow Lakes, Sand and Mud Bars, and Wet Pine Flatwoods to name a few. Lake Waccamaw is nationally significant and contains a number of endemic and near-endemic species, rare species, and natural communities. The most significant natural areas in the Waccamaw River watershed form corridors along major waterbodies, connecting Friar Swamp and Lake Waccamaw to the Green Swamp via Juniper Creek and connecting all of these areas to a rich South Carolina estuary via the Waccamaw River. In itself, the connectivity of these high quality natural places is an important ecological feature which lends national significance to these already unique and biologically diverse sites.

L.B. Cahoon et al. conducted research on the unique, natural limestone formation and its effects on productivity in Lake Waccamaw (Cahoon et al., 1993).

Coastal Area Watershed

The Coastal watershed includes the barrier islands and peninsulas off southeastern North Carolina, along with a sizeable portion of inland Brunswick County including the Lockwoods Folly River. The wetland communities of inland Brunswick County are diverse and include many high quality nonriverine communities. High quality marshes and tidal wetlands line the edges of the mainland and barrier islands. The barrier islands are home to a number of rare species such as the federally threatened loggerhead turtle. Boiling Spring Lakes Wetland Complex is a nonriverine wetland assemblage which lies on the border of two watersheds. The natural area is punctuated by long, low ridges of sand, remnants of ancient dunes, interspersed with swales containing shallow peat. Deeper peat fills the large Carolina bays scattered throughout. The site is the largest hydrologically intact wetland complex in Brunswick County and one of the largest in the Coastal Plain.

2.9.3 Conservation Lands

There are a number of state-owned lands within the Lumber River basin. The Division of Parks and Recreation's lands include the Lake Waccamaw State Park, Lumber River State Park and Weymouth Woods State Natural Area (which lies in two watersheds). The Wildlife Resources Commission owns and manages Sandhills Game Land, Bullard and Branch Hunting Preserve, and Columbus County Game Land. The Division of Coastal Management manages the Bird Island Coastal Reserve. The Department of Transportation owns over 1,000 acres of mitigation

sites -- sites which are permanently protected. The Department of Agriculture is protecting the Boiling Spring Lakes Wetland Complex and already owns over 3,000 acres of this ecologically rich landscape.

The contribution of private organizations to conservation in the Lumber River basin has been invaluable. The Nature Conservancy owns and manages a number of nationally significant nature preserves, from small pine savanna and clay-based Carolina bay preserves to the over 16,000-acre Green Swamp Preserve. The Lumber River Conservancy and other local land trusts have also been working to protect the landscape of the Lumber River basin from further fragmentation, benefiting wildlife and improving the quality of life for residents. The Lumber River Conservancy has acquired a total of 1,966 acres on the Lumber River and its tributaries by transferring 566 acres to the Lumber River State Park and 43 acres to the NC Wildlife Resource Commission. In addition, the Lumber River Conservancy continues to hold in fee 1,355.2 acres along the Lumber River and its tributaries and holds a conservation easement of 486 acres along Raft Swamp.

2.9.4 Fisheries

From 2000 through 2003, the NC Wildlife Resources Commission (NCWRC) sampled the resident fish community of the Lumber River mainstem at three sites using standard boat-mounted electrofishing gear. The sampling locations were at Fair Bluff, the State Park at Princess Ann, and behind Ed's Tire store in downtown Lumberton. The Fair Bluff and Princess Ann sites were sampled once each in late summer from 2000 through 2002 (6 total samples). The Ed's Tire site was sampled once, in August 2003. The number of species collected at these sites ranged from 14-20 with a mean of 18 species. Freshwater fish species of recreational importance found in the Lumber River included largemouth bass, bluegill, redear sunfish, redbreast sunfish, pumpkinseed, warmouth, dollar sunfish, spotted sunfish, channel catfish, white catfish, chain pickerel, redfin pickerel, and yellow perch. All of the species mentioned above, except catfish, are classified as inland game fish by the NCWRC. Nongame species commonly encountered included American eel, bowfin, common carp, longnose gar, creek chubsucker, gizzard shad, spotted sucker, golden shiner, ironcolor shiner, coastal shiner, dusky shiner, satinfin shiner, brook silverside, and tessellated darter.

Largemouth bass support popular fisheries year-round throughout the river; however, peak fishing is in late spring and early summer. The Lumber River mainstem provides excellent fishing for redbreast sunfish from Wagram to Boardman as does the Big Swamp, a major tributary to the Lumber River. The Big Swamp is a popular blackwater stream providing good fishing for chain and redfin pickerel, redbreast sunfish, bluegill and largemouth bass. The Big Swamp is managed under the WRC's Black Bass Management Plan (NCWRC, 1993) and all statewide fishing regulations apply.

Anadromous species found within the lower reaches of the Lumber River basin (lower Little Pee Dee River in South Carolina) include striped bass, American shad, hickory shad, blueback herring and alewife (Dan Crochet, SCDNR, pers. comm.). Blueback herring and alewife are generally considered collectively as river herring. Anadromous fish typically spend their adult lives in saltwater environments and migrate inland into the mainstem of the Great Pee Dee River

and the lower end of the Little Pee Dee River and its tributaries to spawn. Abundance of these anadromous species is low in the upper reaches of the Lumber River in North Carolina.

2.9.5 Forestry in the Lumber River Basin

Forest Resources

Nearly two-thirds of the forestland in the Lumber River basin are owned by nonindustrial private landowners, with most of the remaining one-third owned by forest industry. Less than four percent of forestland in the basin is in public ownership. For comparison, statewide figures show that over three-quarters of the forestland are owned by nonindustrial private landowners, while only 13 percent of forestland is owned by forest industry. All data are from the most recent study by the USDA-Forest Service in 1990 (USDA-North Carolina's Forests, 1990, Southeastern Forest Experiment Stn Resource Bulletin SE-142).

For the period of January 1998 through December 2002, nearly 39,000 acres of private land in the Lumber River basin were recorded as having been regenerated in trees, with 70 percent of these acres utilizing cost shared funding through various state or federal programs. Figures for tree regeneration on forest industry land were not available.

From the most recent data available, only nine businesses in the basin are considered as "Primary Processors" of forestry-related raw material, which represents just 3 percent of the total number in North Carolina. A primary processor may include a sawmill, veneer, chip or paper mill. Forest management is an important land use in the basin despite the low number of actual processing plants, as evidenced by the higher proportion of land owned by the forest industry within the basin, when compared to the rest of the state.

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"). However, forestry operations may be exempt from the permit requirements in the SPCA, if the operations meet compliance standards outlined in the *Forest Practices Guidelines Related to Water Quality* (15A NCAC 1I .0101 - .0209, referred to as "FPGs") and General Statutes regarding stream obstruction (G.S. 77-13 and G.S. 77-14). Detailed information is available on the Water Quality Section of the DFR's website at www.dfr.state.nc.us.

The North Carolina Division of Forest Resources (DFR) is delegated the authority, by the Division of Land Resources, to monitor and evaluate forestry operations for compliance with these laws. In addition, the DFR works to resolve identified FPG compliance questions brought to its attention. Violations of the FPG performance standards that cannot be resolved by the DFR are referred to the Division of Land Resources for enforcement action. From 1998 through 2002, the DFR conducted 1,501 FPG inspections of forestry and/or timber harvesting activities in the Lumber River basin; 97 percent of the sites inspected were in compliance.

The lower portion of the Lumber River basin falls within the coverage area for one of the DFR's Water Quality Foresters, based in the Whiteville District office. The DFR has a Water Quality Forester assigned in seven of the DFR's 13 districts across the state. The Water Quality Foresters conduct FPG inspections, develop pre-harvest plans, and provide training opportunities

for landowners, loggers and the public regarding water quality issues related to forestry. Service Foresters and/or County Rangers 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 the DFR's website at www.dfr.state.nc.us.

Forestry Best Management Practices

The implementation of Forestry Best Management Practices (BMPs) is encouraged by the DFR in order to protect the water resources of North Carolina. The *Forestry Best Management Practices Manual* describes recommended techniques that may be used to comply with the state's forestry laws. The BMP Manual is being revised; publication of the new edition is expected during 2004. The new version of the manual will be printed in a pocket-sized version and a full-sized desktop version. The smaller 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. Currently, in the Lumber River basin, the DFR provides bridgemats for short-term loan to loggers for use in all counties located in the basin. The DFR's Bridgemat Loan and Education Program is an educational and protection project which promotes the benefits of using portable bridges for stream crossings, in lieu of using other techniques such as culverts or hard-surface crossings; both of which have a greater potential to result in sedimentation. All bridgemat purchases for the DFR's Program are funded by grant awards from the USEPA's Nonpoint Source Pollution Management Program.