

# Chapter 2 - White Oak River Basin Overview

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## 2.1 General Overview

The White Oak River basin lies entirely within the southern coastal plain (Figure A-4). The name of the basin is a bit of a misnomer in that it includes four separate river systems: the New River and its tributaries in the southwestern section; the White Oak River and its tributaries; the Newport River and its tributaries; and the North River in the eastern section. The basin also includes Bogue and Core Sounds.

### **White Oak River Basin Statistics**

Total Area: 1,264 sq. miles  
Stream Miles: 446  
Estuarine Acres: 130,009  
Atlantic Coastline: 91 miles  
No. of Counties: 4  
No. of Municipalities: 16  
No. of Subbasins: 5  
Population (2000): 150,501\*  
Estimated Pop. (2020): 176,318\*  
% Increase (2000-2020): 17 %  
Pop. Density (1990): 143 persons/sq. mi.

\* Based on % of county land area estimated to be within the basin.

The White Oak River watershed (subbasin 03-05-01), the basin's namesake, is located immediately east of the New River. It is the second largest watershed in the basin. There are 132 stream miles and 12,050 estuarine acres in this subbasin as well as eight miles of Atlantic coastline. The river flows past the western end of Bogue Sound and into the Atlantic Ocean at Bogue Inlet.

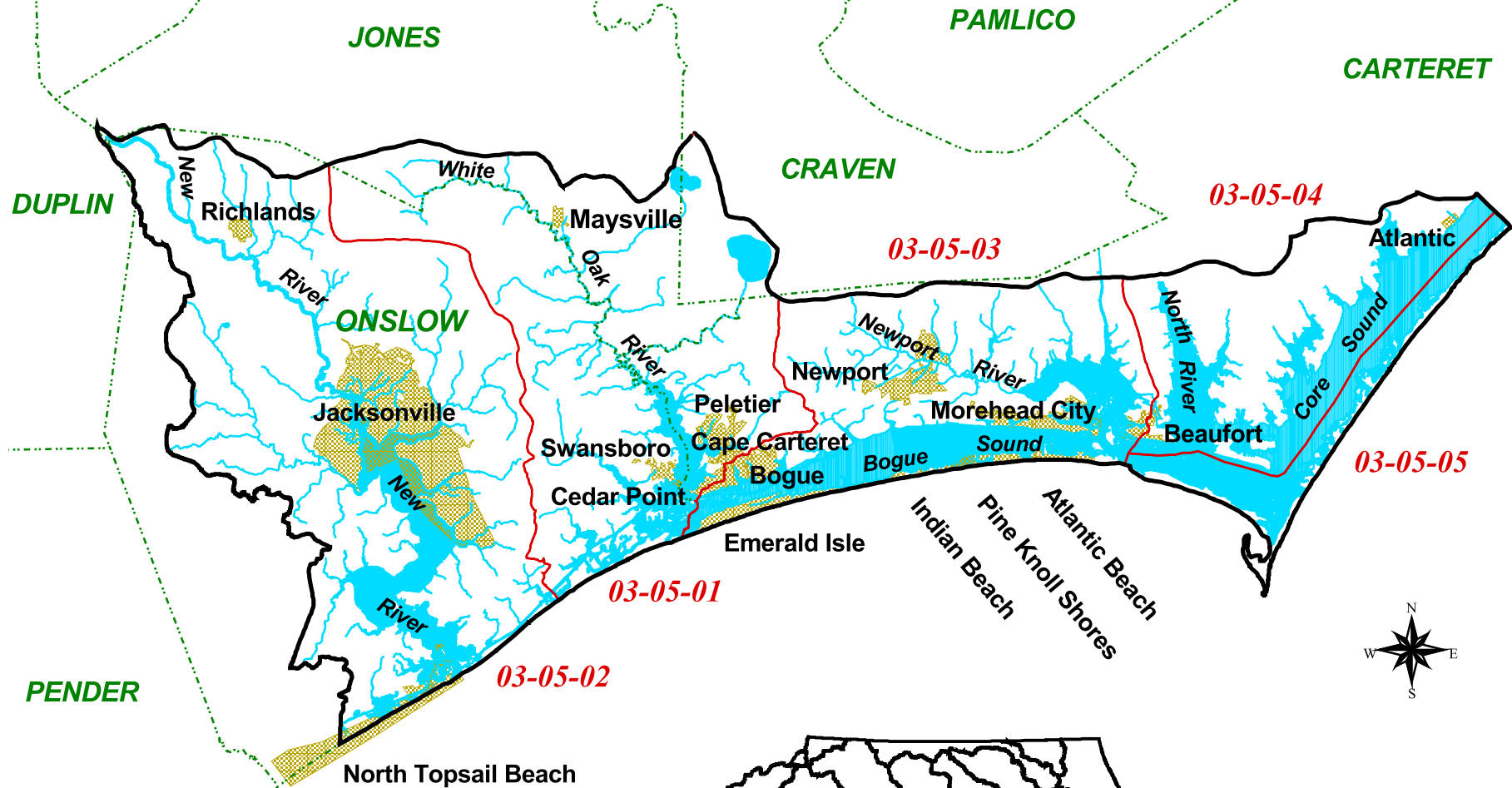
The New River watershed (subbasin 03-05-02) is the westernmost of the four major river systems in the basin. It is also the largest and most populated and includes the City of Jacksonville. The New River is a coastal blackwater river with a watershed entirely

within Onslow County. The watershed above Jacksonville is characterized by gum-cypress swamps with upland areas used primarily for forestry and agriculture. At Jacksonville, the river widens into a broad, slow-moving tidal embayment. It eventually discharges in the Atlantic Ocean through a narrow opening called New River Inlet. The City of Jacksonville and the US Marine Corps, with the operation of Camp Lejeune, comprise the majority of land in the lower watershed (that area below the US 17 bridge). There are 223 stream miles, 22,810 estuarine acres and 15 miles of Atlantic coastline in this subbasin.

The Newport River watershed (subbasin 03-05-03) is located just east of the White Oak River. It flows into the eastern end of Bogue Sound before entering the Atlantic Ocean near Morehead City. The Newport River watershed begins in Craven County and flows through Newport. There are 85 stream miles, 33,211 estuarine acres and 25 miles of Atlantic coastline.

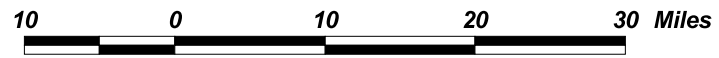
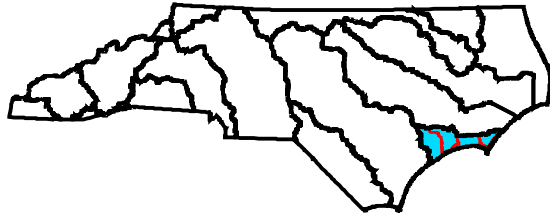
The North River watershed (subbasin 03-05-04) is located on the western side of Core Sound and is mostly rural. The headwaters of the North River originate in Carteret County and flow directly into Back Sound near Harkers Island. Jarrett and Nelson Bays also drain inland areas in this subbasin. There are 4 stream miles and 49,077 estuarine acres in this subbasin.

**Figure A-4 General Map of the White Oak River Basin**



**Legend**

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



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The eastern most subbasin (03-05-05) is sparsely populated, and most of the land area is in the Cape Lookout National Seashore. There are 12,861 estuarine acres and 43 miles of Atlantic coastline in this subbasin.

There are 4 counties and 16 municipalities located in whole or in part in the basin. Based on 1990 data, the population of the basin is 146,240 people. The most populated areas are located in Jacksonville and Camp Lejeune on the New River, and Morehead City and Beaufort on Bogue Sound and the Newport River. The overall population density is 143 persons per square mile versus a statewide average of 139 persons per square mile. There are areas in the basin with very sparse populations (subbasins 03-05-04 and 03-05-05). The population density in the remainder of the basin exceeds the average state population density.

Large portions of the basin are publicly-owned areas, such as the Croatan National Forest on the White Oak River, and the Hoffman State Forest and Camp Lejeune on the New River. Statistics provided by the US Department of Agriculture, Natural Resources Conservation Service indicate that during the last decade there has been a 35,000-acre (65.6%) increase in the amount of developed land, and a 9,000-acre (15.1%) decrease in cultivated cropland, and a 29,000-acre (9.7%) decrease in forestland. Uncultivated croplands and pasturelands have increased by nine acres.

## 2.2 Local Governments and Planning Jurisdictions in the Basin

The White Oak River basin encompasses all or portions of four counties and sixteen municipalities. Table A-3 provides a listing of these municipalities, along with an identification of the regional planning jurisdiction (Council of Governments), and an estimation of what percentage of the county area is within the river basin.

Table A-3 Local Governments and Planning Units within the White Oak River Basin

County	% of County in basin**	Region	Municipalities
Carteret	49%	Region P Neuse River Council of Governments New Bern	Atlantic Beach Beaufort Bogue Cape Carteret Cedar Point Emerald Isle Indian Beach Morehead City Newport Peletier Pine Knolls Shore
Craven	4%	Region P	None
Jones	19%	Region P	Maysville
Onslow	77%	Region P	Jacksonville North Topsail Beach * Richlands Swansboro

**Key:**

\* Located in more than one major river basin.

\*\* Estimated by Center for Geographic Information and Analysis.

Note: Counties are not included as part of a river basin if only a trace amount of the county (<2%) is located in that basin unless there is a municipality.

## 2.3 Surface Water Hydrology

Most federal government agencies, including the US Geological Survey (USGS) and the US Natural Resources Conservation Service (NRCS), use a system of defining watersheds that is different from that used by the Division of Water Quality (DWQ) and many other state agencies in North Carolina. Under the federal system, the White Oak River basin is made up of two hydrologic areas referred to as hydrologic units. One of these units includes the entire White Oak basin, except the New River watershed area, which is assigned to the other unit. Each hydrologic unit is defined by an 8-digit number. DWQ has a two-tiered system in which the state is subdivided into 17 river basins with each basin further subdivided into subbasins. Table A-4 compares the two systems. The White Oak River basin is subdivided by DWQ into five subbasins. Maps of each subbasin are included in Section B of this basinwide plan.

Table A-4 Hydrologic Subdivisions in the White Oak River Basin

Watershed Name and Major Tributaries	USGS 8-digit Hydrologic Units	DWQ Subbasin 6-digit Codes
<i>New River</i>	03030001	03-05-02
<i>Bogue-Core Sounds</i>	03020106	03-05-01
White Oak River	"	03-05-01
Newport River	"	03-05-03
North River	"	03-05-04
Jarrett Bay and Nelson Bay	"	03-05-04
Core Sound and Back Sound	"	03-05-05

## 2.4 Land Cover

Land cover information in this section is from the most current National Resources Inventory (NRI), as developed by the Natural Resources Conservation Service (USDA, 1999). The NRI is a statistically based longitudinal survey that has been designed and implemented to inventory land cover types and acreages. 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 includes reviewing previously recorded data when 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 published for the 1982, 1987 and 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-5 summarizes acreage and percentage of land cover from the 1997 NRI for the basin as a whole and for the major watersheds within the basin, as defined by the USGS 8-digit hydrologic units and compares the coverages to 1982 land cover. Refer to Part 2.3 for a comparison between state and federal hydrologic divisions. Descriptions of land cover types identified by the NRI are found in Table A-6.

Forest and wetlands (both private and federal forests) cover approximately 48.8% of the basin. The "other" category covers approximately 37%. Agriculture (including cultivated and uncultivated cropland and pastureland) covers approximately 6% of the land area. The urban and built-up category comprises roughly 8% and exhibited a dramatic change since 1982. Cultivated cropland and forestland cover both decreased in the basin. Uncultivated cropland and pastureland cover had the most significant changes. These land cover changes are presented in Figure A-5.

Table A-5 Land Cover in the White Oak River Basin by Major Watersheds (June 2001)  
(Source: USDA-NRCS, 1982 and 1997 NRI)

LAND COVER	MAJOR WATERSHED AREAS *								
	New River Watershed		Bogue-Core Sounds Watershed		1997 TOTALS		1982 TOTALS		% change since 1982
	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	
Cult. Crop	12.4	3.5	45.5	5.7	57.9	5.0	67.0	5.8	-13.6
Uncult. Crop	0.0	0.0	5.0	0.6	5.0	0.4	0.0	0.0	500.0
Pasture	4.2	1.2	1.7	0.2	5.9	0.5	1.7	0.1	247.1
Forest	207.4	58.5	144.4	18.1	351.8	30.5	381.3	33.1	-7.7
Urban & Built-Up	38.6	10.9	51.0	6.4	89.6	7.8	54.1	4.7	65.6
Federal	48.0	13.5	163.3	20.5	211.3	18.3	211.2	18.3	0.0
Other	43.9	12.4	386.9	48.5	430.8	37.4	437.0	37.9	-1.4
Totals	354.5	100.0	797.8	100.0	1152.3	100.0	1152.3	100.0	
% of Total Basin		30.8		69.2		100.0			
SUBBASINS	03-05-02		03-05-01	03-05-03					
			03-05-04	03-05-05					
8-Digit Hydraulic Units	03030001		03020106						

\* = Watershed areas 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

Note: Cape Fear River subbasin 03-06-24 is included in the hydrologic unit 03030001 in the White Oak River Basin Plan.

Neuse River subbasin 03-04-14 is included in hydrologic unit 03020106 in the White Oak River Basin Plan.

These hydrologic units are discussed in the White Oak River Basinwide Water Quality Plan.

Table A-6 Description of Land Cover Types (1992 NRI-USDA SCS)

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	<p><u>Rural Transportation</u>: Consists of all highways, roads, railroads and associated rights-of-way outside urban and built-up areas; private roads to farmsteads; logging roads; and other private roads (but not field lanes).</p> <p><u>Small Water Areas</u>: Waterbodies less than 40 acres in size and streams less than one-half mile wide.</p> <p><u>Census Water</u>: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than one-half mile in width.</p> <p><u>Minor Land</u>: Lands not in one of the other categories.</p>

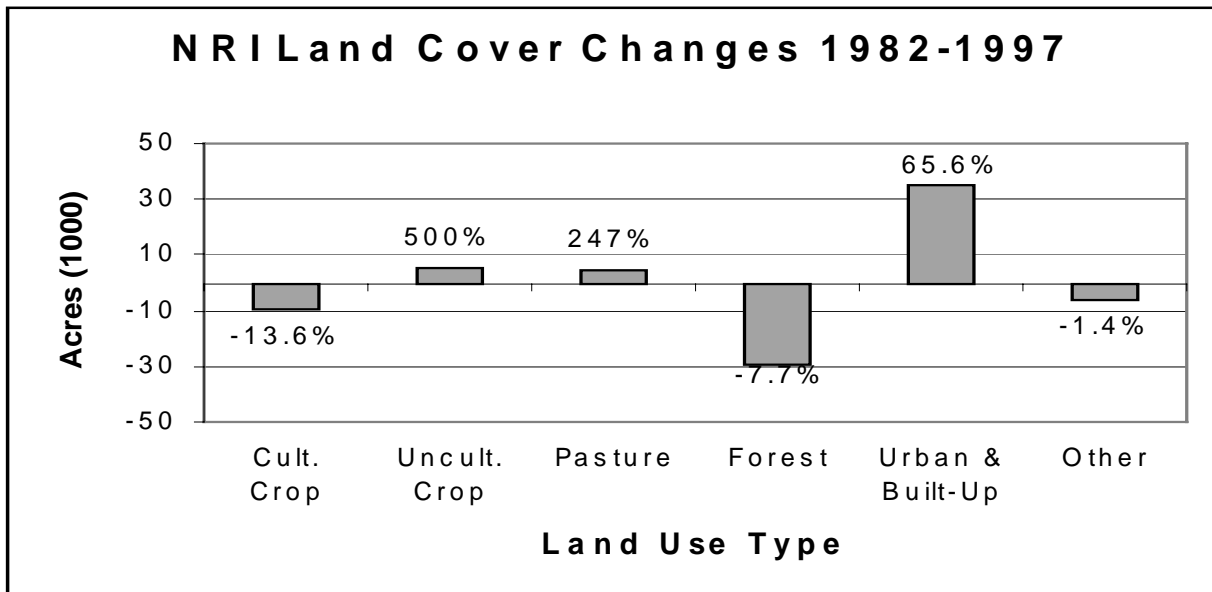


Figure A-5 Land Cover Changes from 1982 to 1997 for the White Oak River Basin (Source: USDA-NRCS 1997 NRI)

The North Carolina Corporate Geographic Database contains land cover information for the White Oak 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. An important distinction between this land cover dataset and that of the NRI is that there is no actual groundtruthing of the satellite-generated data. Figure A-6 provides an illustration of the relative amount of land area that falls into each major cover type for the White Oak River basin. Section B of this plan provides land cover data specific to each subbasin.

Unfortunately, due to differences in the system of categorizing various land cover classes, it is not currently possible to establish trends in land cover changes by comparing this data set to previously attained land cover data. However, it is anticipated that comparisons will be possible with future satellite data since a strong consensus-based effort was made to develop the classification system that was used with the 1996 data.

Table A-7 Description of Land Cover Categories

Land Cover Type	Land Cover Description
Urban	Greater than 50% coverage by synthetic land cover (built-upon area) and municipal areas.
Cultivated	Areas that are covered by crops that are cultivated in a distinguishable pattern (such as rows).
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, conifers, deciduous hardwoods).
Water	Areas of open surface water, areas of exposed rock, and areas of sand or silt adjacent to tidal waters and lakes.

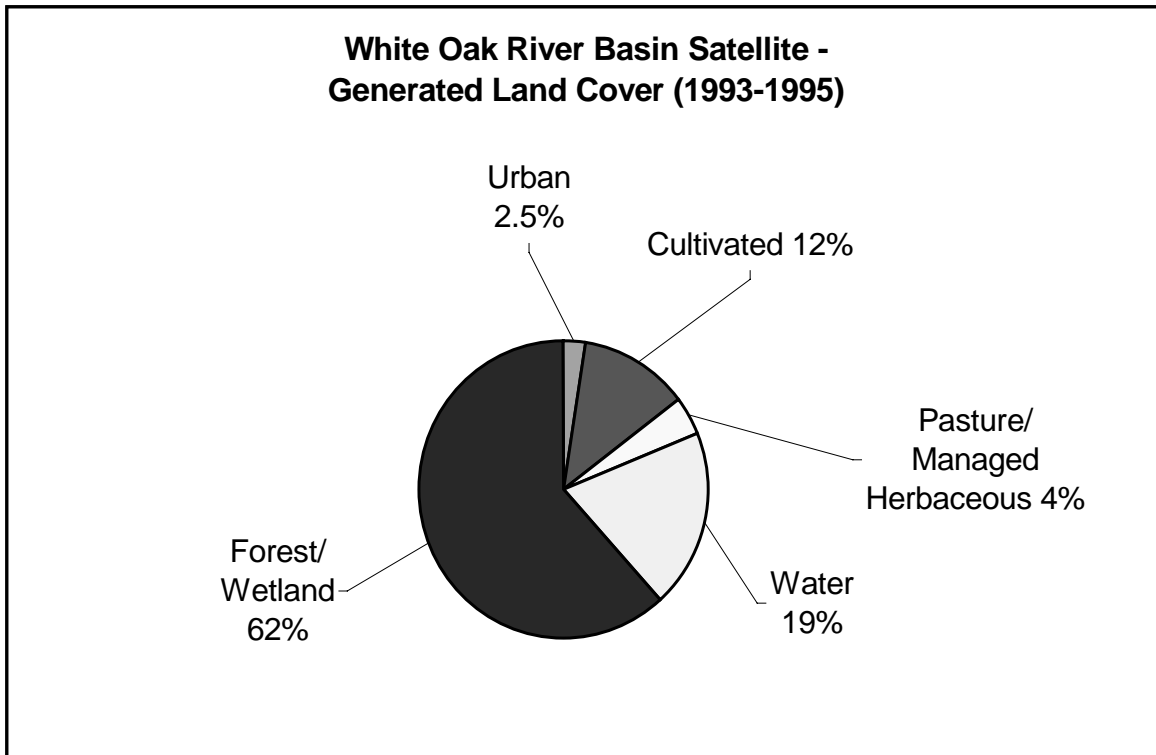


Figure A-6 White Oak River Basin Satellite Generated Land Cover (1993-1995)

## 2.5 Population and Growth Trends

### Population

The White Oak River basin has an estimated population of 149,032 based on the most recent census data (1998 OSP). Table A-8 presents population data for 1970, 1980 and 1990. It also includes population density (persons/square mile) based on *land area* for each subbasin. Overall, the population in the basin has grown by 47% between 1970 and 1990. The cities of Jacksonville and Richlands have both had significant population increases due to the annexation of other areas. In contrast, Atlantic Beach and Cape Carteret have experienced population increases above the state average, and they have not annexed populated areas.

Figure A-7 displays estimated 1998 population densities by county for the White Oak River basin. The overall population density was 146 persons per square mile versus a statewide average of 139 persons per square mile.



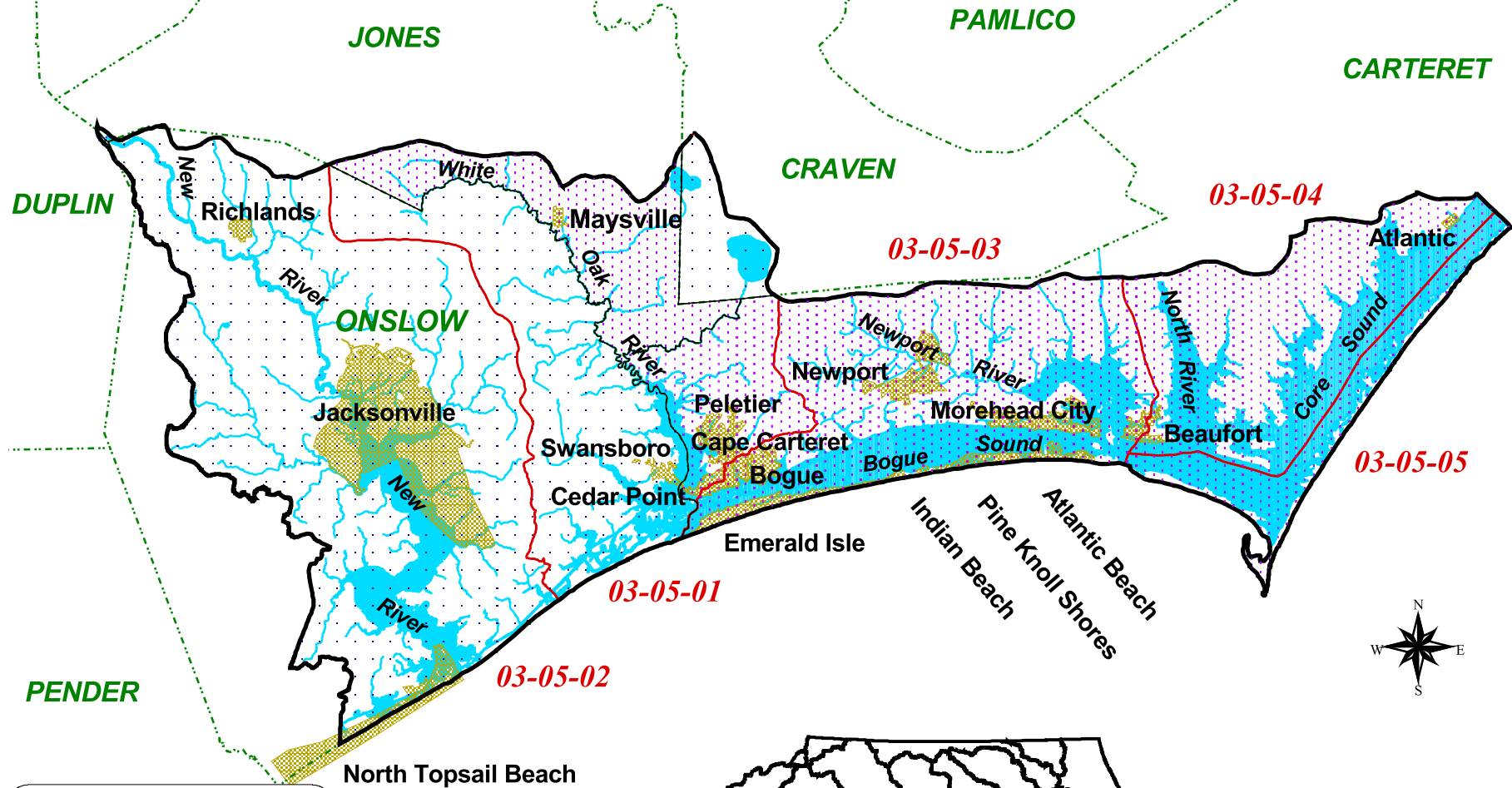
Table A-8 White Oak River Subbasin Populations, Population Density and Land Area Summaries (Source: Office of State Planning 2000)

SUBBASIN	POPULATION (Number of Persons)			POPULATION DENSITY (Persons/Square Mile)			LAND AND WATER AREAS			
	1970	1980	1990	1970	1980	1990	Total Land and Water Area		Water Area	Land Area
							(Acres)	(Sq. Miles)	(Sq. Miles)	(Sq. Miles)
03-05-01	27,748	30,640	39,388	86	95	122	224,923	351	29	322
03-05-02	58,060	63,497	84,359	139	152	201	295,882	462	43	419
03-05-03	6,858	8,917	11,404	41	53	68	146,026	228	60	168
03-05-04	5,120	6,657	8,514	50	65	83	108,875	170	67	103
03-05-05*	1,549	2,014	2,575	194	252	322	33,063	52	44	8
TOTALS	99,335	111,725	146,240	97	110	143	808,769	1,263	243	1,020








\* Subbasin 03-05-05 is mostly National Seashore and very sparsely populated; therefore, density data is not considered to be representative of actual density in this subbasin.

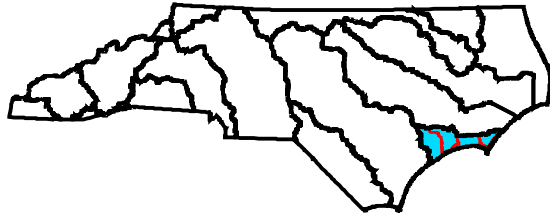
In using these data, it should be noted that some of the population figures are estimates because the census block group boundaries do not generally coincide with subbasin boundaries. The census data are collected within boundaries such as counties and municipalities. By contrast, the subbasin lines are drawn along natural drainage divides separating watersheds. Therefore, where a census block group straddles a subbasin line, the percentage of the population that is located in the subbasin is estimated, assuming that population density is evenly distributed throughout a census block group. This is not always the case; however, the level of error associated with this method is not expected to be significant for the purposes of this document. It is also important to note that the census block groups change every ten years so comparisons between years must be considered approximate. Subbasin 03-05-05 is overestimated, as there are very few residents in this subbasin.

Figure A-7 1998 Population Density for the White Oak River Basin



**Legend**

-  100 - 250 Person Per Square Mile
-  0 - 100 Person Per Square Mile
-  River Basin Boundary
-  Subbasin Boundary
-  County Boundary
-  Hydrography
-  Municipality



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## Growth Trends

The population in the basin increased by almost 35,000 people (26%) between 1980 and 1990. The basin population is projected to increase another 25,000 by 2020. Table A-9 presents population data for municipalities located wholly or partly within the basin. Growth of municipalities can be a combination of population and annexation. Table A-10 shows the projected percent change in growth between 2000 and 2020 for counties within the basin. Since river basin boundaries do not coincide with county boundaries, these numbers are not directly applicable to the White Oak River basin. They are instead presented as an estimate of possible countywide population changes.

Table A-9 Population and Percent Change (1980, 1990, 2000) for Municipalities Located Wholly or Partly in the White Oak River Basin  
(Source: North Carolina Municipal Population, April 2001)

Municipality	County	Apr-80	Apr-90	Apr-2000	Percent Change (1980-90)	Percent Change (1990-2000)
Atlantic Beach	Carteret	941	1,938	1,781	106.0	-8.1
Beaufort	Carteret	3,826	3,808	3,771	-0.5	-1.0
Bogue	Carteret	---	351	590	---	68.1
Cape Carteret	Carteret	944	1,013	1,214	7.3	19.8
Cedar Point	Carteret	479	628	929	31.1	47.9
Emerald Isle	Carteret	865	2,434	3,488	181.4	43.3
Indian Beach	Carteret	54	153	95	183.3	-37.9
Jacksonville	Onslow	18,259	30,398	66,715	66.5	119.5
Maysville	Jones	877	892	1,002	1.7	12.3
Morehead City	Carteret	4,359	6,046	7,691	38.7	27.2
Newport	Carteret	1,883	2,516	3,349	33.6	33.1
North Topsail Beach •	Onslow	301	947	843	214.6	-11.0
Peletier	Carteret	---	304	487	---	60.2
Pine Knoll Shores	Carteret	646	1,360	1,524	110.5	12.1
Richlands	Onslow	825	996	928	20.7	-6.8
Swansboro	Onslow	976	1,165	1,426	19.4	22.4

- - 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.

Table A-10 Past, Projected and Change in Population (1990, 2000, 2020) by County  
 (Source: Office of State Planning, May 2001)

County	1990	2000	Estimated Population 2020	Estimated Population Change 2000-2020
Carteret	25,679	29,098	34,479	5,381
Craven *	3,272	3,657	4,239	582
Jones	1,779	1,972	2,263	291
Onslow	115,375	115,773	135,337	19,564
<b>Subtotal</b>	<b>146,105</b>	<b>150,500</b>	<b>176,318</b>	<b>25,818</b>

\* Less than 5% of the county is in this basin.

Note: These numbers have been adjusted based on the percent of the county (>2%) located in the White Oak River basin (Table A-3).

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

## 2.6 Natural Resources

### 2.6.1 Fish and Shellfish Resources

In the White Oak basin, the Core Sound area produces the most catch with total landings of over 10 million pounds with a value in excess of \$7,700,000 (1994 data from DMF). The other areas of the White Oak River basin are much less productive, probably due to much smaller water areas. The most productive areas after Core Sound are Bogue Sound and the Newport River area with commercial landings in 1994 of 672,419 and 685,223 pounds, respectively.

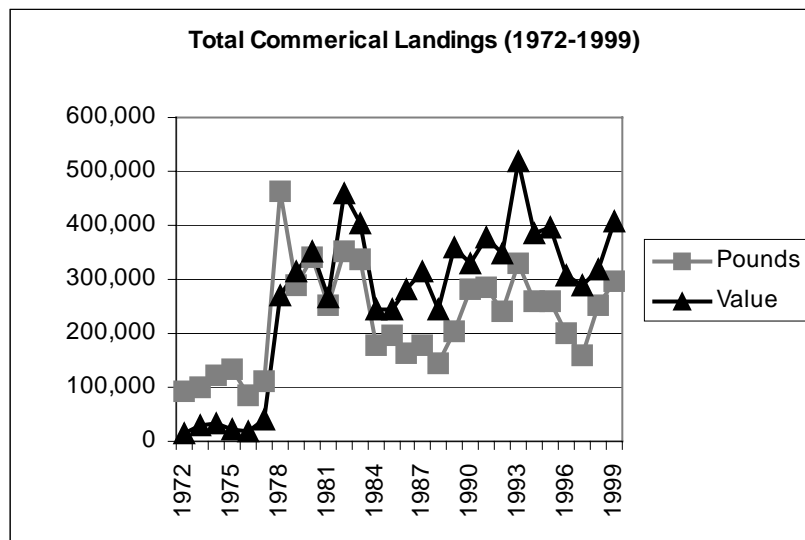


Figure A-8 Overall Trends in Commercial Landing Statistics for the White Oak River Basin by Total Pounds and Total Value  
 (Source: North Carolina Division of Marine Fisheries, 2001)

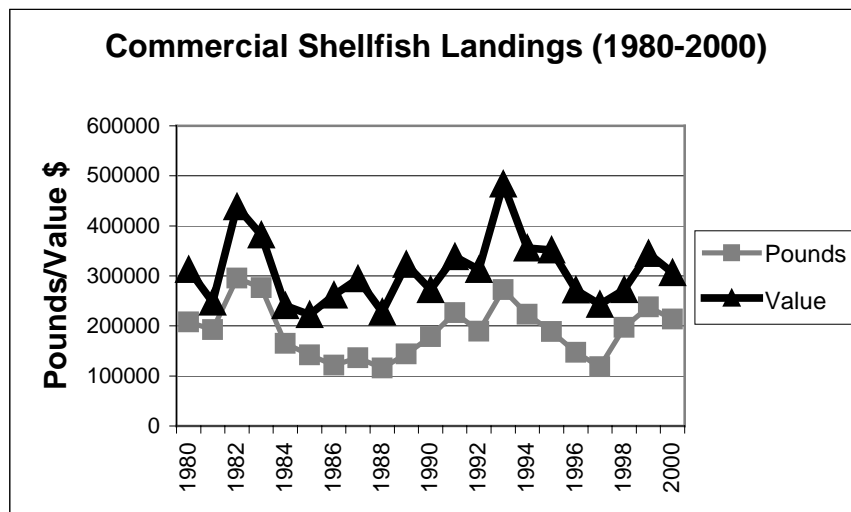


Figure A-9 Commercial Shellfish Landing Statistics for the White Oak River Basin by Total Pounds and Total Value  
(Source: North Carolina Division of Marine Fisheries, 2001)

### 2.6.2 Public Lands in the White Oak River Basin

The White Oak River basin contains many public lands (Figure A-10). In addition to Croatan National Forest, the federal government also owns Camp Lejeune Marine Base and Cape Lookout National Seashore. The state owns a number of smaller but significant properties including: Hammocks Beach and Fort Macon State Parks, Theodore Roosevelt Natural Area, Rachel Carson Estuarine Reserve, and White Oak River Impoundment Game Land.

### 2.6.3 Significant Natural Heritage Areas

The White Oak River basin contains some of the most biologically significant habitats along the entire US Atlantic Coast. Because the White Oak River basin contains so many individual significant natural areas, many more that can be described here; the discussion of natural areas will focus on three of the largest sites in the basin (Figure A-10).

Camp Lejeune Marine Corps Base contains some of the highest quality longleaf pine and pocosin habitat in the state, as well as high quality examples of the Pine Savanna, Wet Pine Flatwoods and Small Depression Ponds. Often termed "limesinks" because of the way they are formed, the Small Depression Pond community occurs where depressions in the uplands intersect the watertable. The seasonally exposed margin of this wetland supports a high diversity of herbs, including many rare plants.

In addition to the numerous limesinks, Camp Lejeune also contains large wetlands called "Domed Pocosins", so named because they are higher than the surrounding lands. The low relief and a gradual accumulation of organic matter from previous generations of plants promoted the development of this deep peat layer. (The word "pocosin" is traceable to an Algonquin Indian word translatable as "swamp-on-a-hill".) Pocosins are easy to drain, and for this reason, the best examples are preserved in public areas like Croatan National Forest and Camp Lejeune.

Pocosins are found nowhere else in the world except North and South Carolina and a few areas in southern Virginia. North Carolina has 70 percent of the remaining pocosins, and some of the highest quality areas lie within Camp Lejeune. The deep, peaty soils absorb rainwater and release it slowly into adjacent estuaries, preserving the proper mix of saltwater and freshwater that is critical for many fish and shellfish.

Bogue Inlet includes considerable area of the lower White Oak River and serves as an important link between the Croatan National Forest and Camp Lejeune. This nationally significant site contains some of the highest quality environments remaining along the coastal edge of North Carolina, with excellent examples of maritime forest and dune communities, and extensive areas of unditched marshes and tidal creeks.

The White Oak River Marsh is a significant natural heritage area that contains exemplary freshwater tidal marsh and swamp communities, including one of the best examples of the rare Tidal Red Cedar Forest natural community. This tidal forest type is known only from the area around the New River and White Oak River.

#### 2.6.4 Rare Aquatic and Wetland-Dwelling Animal Species

The following information on rare aquatic and wetland-dwelling species (Table A-11) was obtained from the NC Natural Heritage Program, Division of Parks and Recreation (January 2001).

Table A-11 Rare and Aquatic Animals in the White Oak River Basin

Major Taxon	Common Name	Scientific Name	State Status	Federal Status
reptile	American Alligator	<i>Alligator mississippiensis</i>	T	T (S/A)
reptile	Loggerhead Turtle	<i>Caretta caretta</i>	T	T
reptile	Leatherback Turtle	<i>Dermochelys coriacea</i>	E	E
fish	Shortnose Sturgeon	<i>Acipenser brevirostrum</i>	E	E
reptile	Carolina Diamondback Terrapin	<i>Malaclemys terrapin centrata</i>	SC	
mammal	Manatee	<i>Trichecus manatus</i>	E	E

Rare Species Listing Criteria	
E =	Endangered (those species in danger of becoming extinct)
T =	Threatened (considered likely to become endangered within the foreseeable future)
SC =	Special Concern (have limited numbers and vulnerable populations in need of monitoring)
SR =	Significantly Rare (those whose numbers are small and whose populations need monitoring)

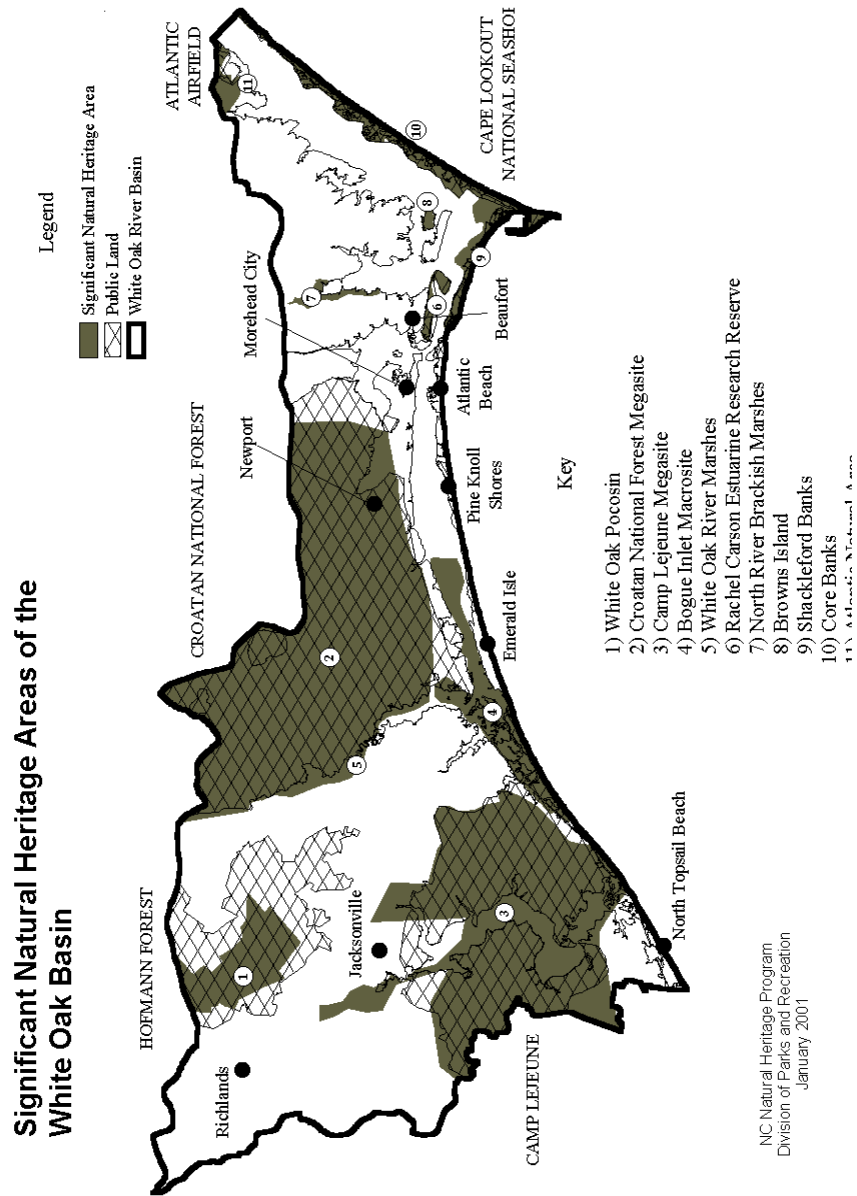


Figure A-10 Significant Natural Heritage Areas and Public Lands of the White Oak River Basin

## 2.7 Permitted Wastewater and Stormwater Discharge Facilities

***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 which 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.

### 2.7.1 Wastewater Discharges in the White Oak River Basin

There are 50 permitted wastewater discharges in the White Oak River basin. Table A-12 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.

Figure A-11 shows the location of major and minor permitted wastewater discharges within the basin. The number of sites on the map depicting major discharges differs from the number of major facilities listed in Table A-12. Since some major facilities have more than one outfall point, each outfall received a symbol on the map. For more information and recommendations regarding NPDES permit holders, refer to page 62.

***Types of Wastewater Discharges:***

**Major Facilities:** Municipal Wastewater Treatment Plants with flows  $\geq 1$  MGD (million gallons per day); and some industrial facilities (depending on flow and potential impacts on public health and water quality).

**Minor Facilities:** Any facilities not meeting the definition of Major.

**100% Domestic Waste:** Facilities that only treat domestic-type waste (water from bathrooms, sinks, washers).

**Municipal Facilities:** Facilities that serve a municipality. Can treat waste from homes and industries.

**Industrial Facilities:** Facilities with wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation.

**Other Facilities:** This category includes a variety of facilities such as schools, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.



Table A-12 Summary of NPDES Dischargers and Permitted Flows for the White Oak River Basin

Facility Categories	Subbasin					
	01	02	03	04	05	TOTAL
<b>Total Facilities</b>	9	30	6	5	0	50
Total Permitted Flow (MGD)	0.535	18.448	2.213	4.543	0	25.729
<b>Major Discharges</b>	0	1	1	2	0	4
Total Permitted Flow (MGD)	0	16	1.7	4.5	0	22.2
<b>Minor Discharges</b>	9	29	5	3	0	46
Total Permitted Flow (MGD)	0.535	2.448	0.513	0.034	0	3.529
<b>100% Domestic Waste</b>	5	24	2	2	0	33
Total Permitted Flow (MGD)	0.535	17.904	2.2	1.52	0	22.154
<b>Municipal Facilities</b>	2	1	2	1	0	6
Total Permitted Flow (MGD)	0.48	0.25	2.2	1.5	0	4.45
<b>Nonmunicipal Facilities</b>	7	29	4	4	0	44
Total Permitted Flow (MGD)	0.055	18.198	0.013	3.034	0	21.30

## 2.7.2 Stormwater Discharges in the White Oak River Basin

Amendments were made to the Clean Water Act in 1990 and most recently in 1999 pertaining to permit requirements for stormwater discharges associated with industrial activities and municipal separate storm sewer systems (MS4s). DWQ administers these regulations in North Carolina through the state’s NPDES stormwater program. The goal of the DWQ stormwater discharge permitting regulations is to prevent pollution via stormwater runoff by controlling the source(s) of pollutants.

The municipal permitting requirements are designed to lead into the formation of comprehensive stormwater management programs for municipal areas. No municipalities in the White Oak River basin were required to obtain a NPDES permit for stormwater sewer systems under the Phase I

**EPA Stormwater Rules**

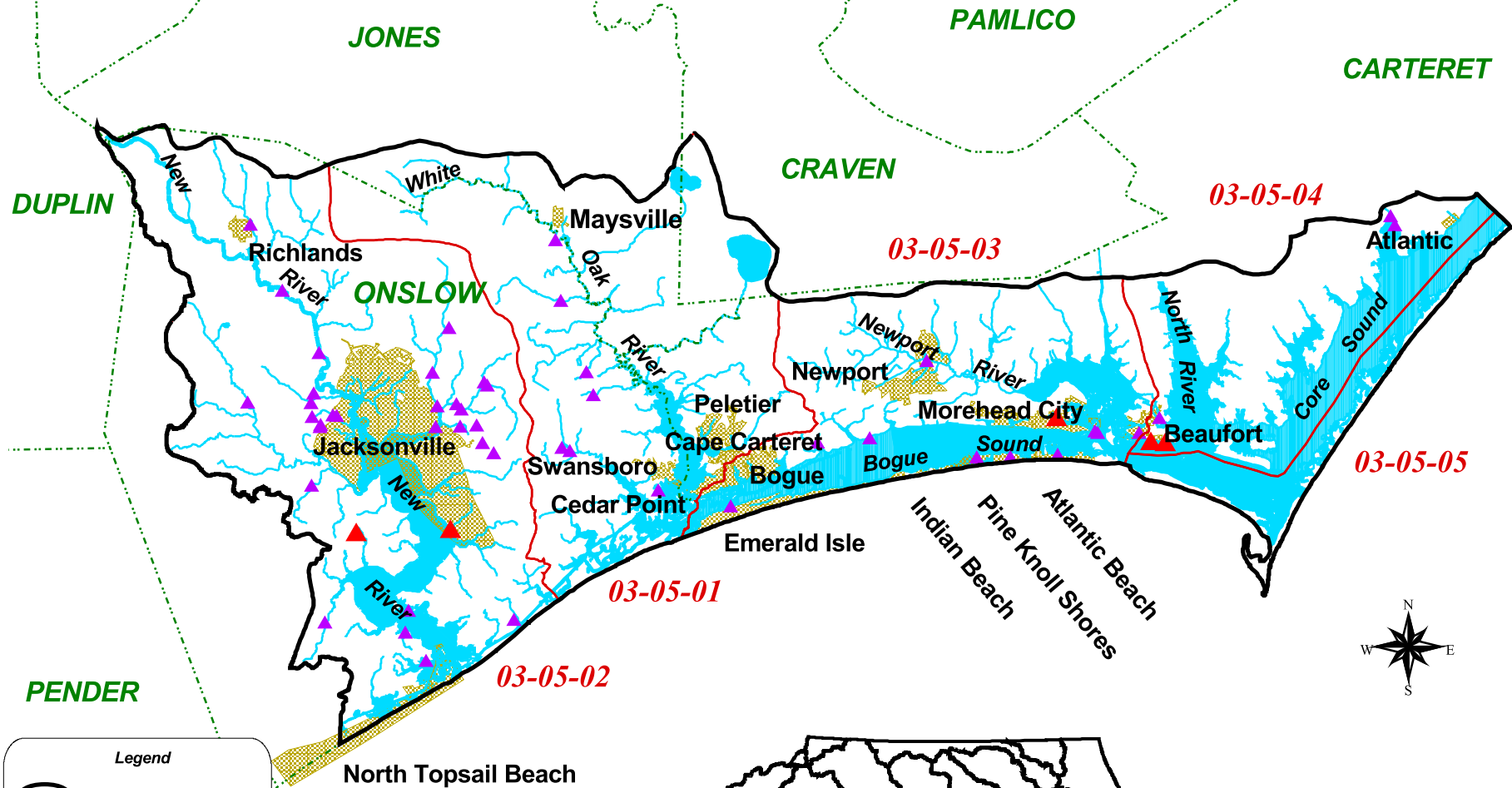
**Phase I – December 1990**

- Requires a NPDES permit for municipal storm sewer systems (MS4s) serving populations of 100,000 or more.
- Requires a NPDES stormwater permit for ten categories of industry.
- Requires a NPDES stormwater permit for construction sites that are 5 acres or more.

**Phase II – December 1999**

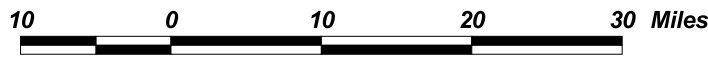
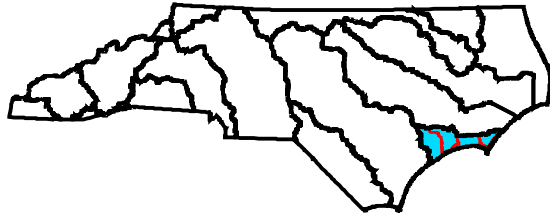
- Requires a NPDES permit for some municipal storm sewer systems serving populations under 100,000, located in urbanized areas.
- Provides a "no stormwater exposure" exemption to industrial facilities covered under Phase I.
- Requires a NPDES stormwater permit for construction sites that are 1-5 acres.

Figure A-11 NPDES Discharges in the White Oak River Basin



**Legend**

- River Basin Boundary
- Subbasin Boundary
- NPDES Discharges**
  - Major
  - Minor
- County Boundary
- Hydrography
- Municipality



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 October 22, 2001

rules (population >100,000). Additionally, no municipalities in the basin are automatically required (US Census designated Urban Areas) to obtain a NPDES stormwater permit under the Phase II rules. However, Jacksonville will be considered for inclusion under the Phase II rules because of a population greater than 10,000 and/or a population density greater than 1000 persons per square mile. DWQ is currently developing criteria that will be used to determine whether these and other municipalities should be required to obtain a NPDES permit.

Industrial activities which require permitting are defined in categories ranging from sawmills and landfills to manufacturing plants and hazardous waste treatment, storage or disposal facilities. 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 59 general stormwater permits and one individual permit active within the White Oak River basin. Individual permit holders are presented in Appendix I.

The primary concern with runoff from industrial facilities is the contamination of stormwater from contact with exposed materials. Poor housekeeping can lead to significant contributions of sediment and other water quality pollutants. To address these issues, each NPDES stormwater permitted facility must develop a Stormwater Pollution Prevention Plan (SPPP) that addresses the facility's potential impacts on water quality. Facilities identified as having significant potential to impact water quality may also be required to conduct analytical monitoring to characterize pollutants in stormwater discharges.

The state stormwater management rules (15A NCAC 2H .1000) regulate development activities in 20 coastal counties and on lands statewide that drain to Outstanding Resource Waters (ORW) and/or High Quality Waters (HQW). Under this program, development is permitted as either low density or high density. Low density limits the impervious, or built upon, area and allows natural infiltration and attenuation of stormwater runoff. High density requires installation and maintenance of structural best management practices to control and treat stormwater runoff from the site. For more information on stormwater issues, refer to page 58.

## **2.8 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. Within the past five years, there have been several additional pieces of legislation enacted that affect animal operations in North Carolina (see text box).

*Key Animal Operation Legislation (1995-1999)*

- 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. DENR 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 DENR to develop an inventory of inactive lagoons, and 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.

Table A-13 summarizes, by subbasin, total animal capacities and change in capacities from 1994 to 1998. There has been a noted decline in dairy operations but a large increase in swine capacity, especially in subbasin 03-05-02.

Table A-14 summarizes, by subbasin, the number of registered livestock operations, total animals, total acres in operation and total steady state live weight as of January 2000. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in each subbasin. Figure A-12 shows the general location of the registered operations in the basin.

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.

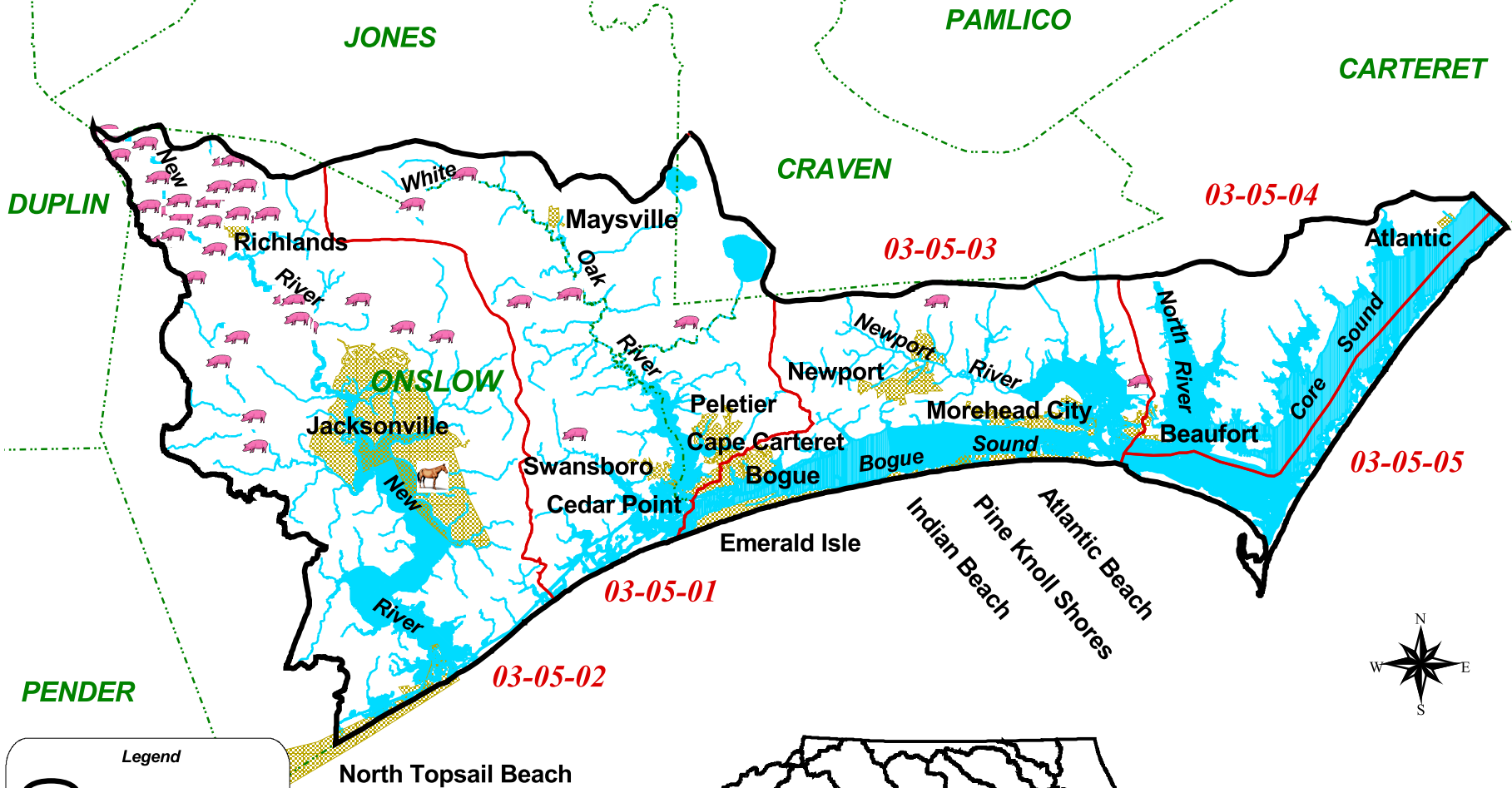
Table A-13 Estimated Populations of Swine, Dairy and Poultry in the White Oak River Basin  
(Source: USDA, Division of Veterinary Health)

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 (%)
03-05-01	28,036	14,666	91	0	230	-100	64,000	64,000	0
03-05-02	132,513	82,944	60	0	0	0	867,681	758,000	14
03-05-03	3,503	2,432	44	0	0	0	48,000	48,000	0
03-05-04	0	0	0	0	0	0	0	0	0
03-05-05	0	0	0	0	0	0	0	0	0
<b>TOTALS</b>	<b>164,052</b>	<b>100,042</b>	<b>64</b>	<b>0</b>	<b>230</b>	<b>-100</b>	<b>979,681</b>	<b>870,000</b>	<b>13</b>
% of State Total	2%	2%		0%	<1%		<1%	<1%	

Table A-14 Registered Animal Operations in the White Oak River Basin (as of 1/20/2000)

Subbasin	Swine		
	No. of Facilities	No. of Animals	Total Steady State Live Weight
03-05-01	6	20,852	2,263,920
03-05-02	38	150,427	17,956,695
03-05-03	2	3,375	542,655
03-05-04	--	--	--
03-05-05	--	--	--
<b>TOTALS</b>	<b>46</b>	<b>174,654</b>	<b>20,763,270</b>

Figure A-12 Animal Operations in the White Oak River Basin



**Legend**

- River Basin Boundary
- Subbasin Boundary
- Animal Operations**
  - Horses
  - Swine
- Hydrography
- County Boundary
- Municipality

