

Section A - Chapter 2

Catawba River Basin Overview

2.1 General Overview

The Catawba River basin, along with the Broad River basin, forms the headwaters of the Santee-Cooper River system, which flows through South Carolina to the Atlantic Ocean (Figure A-3). The Catawba River begins on the eastern slopes of the Blue Ridge Mountains in Avery, Burke, Caldwell and McDowell counties and flows southeast to the North Carolina-South Carolina border near Charlotte (Figure A-4).

Catawba River Basin Statistics

Total Area: 3,285 sq. miles
Freshwater Stream Miles: 3,048
Freshwater Lakes Acres: 50,764
No. of Counties: 11
No. of Municipalities: 61
No. of Subbasins: 9
Population (2000): 1,170,512 *
Pop. Density (2000): 356 persons/sq. mi.*

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

Many of these streams have Good to Excellent water quality and are classified as trout waters. The basin contains the Linville River, one of only four rivers in the state designated as a Natural and Scenic River. The Linville River flows through the Pisgah National Forest Wilderness area and into Lake James. In 2002, Wilson Creek gained designation as a National Wild and Scenic River.

As the basin enters the piedmont from the mountains, land use shifts from forest to agricultural and urban uses. Nonpoint runoff from

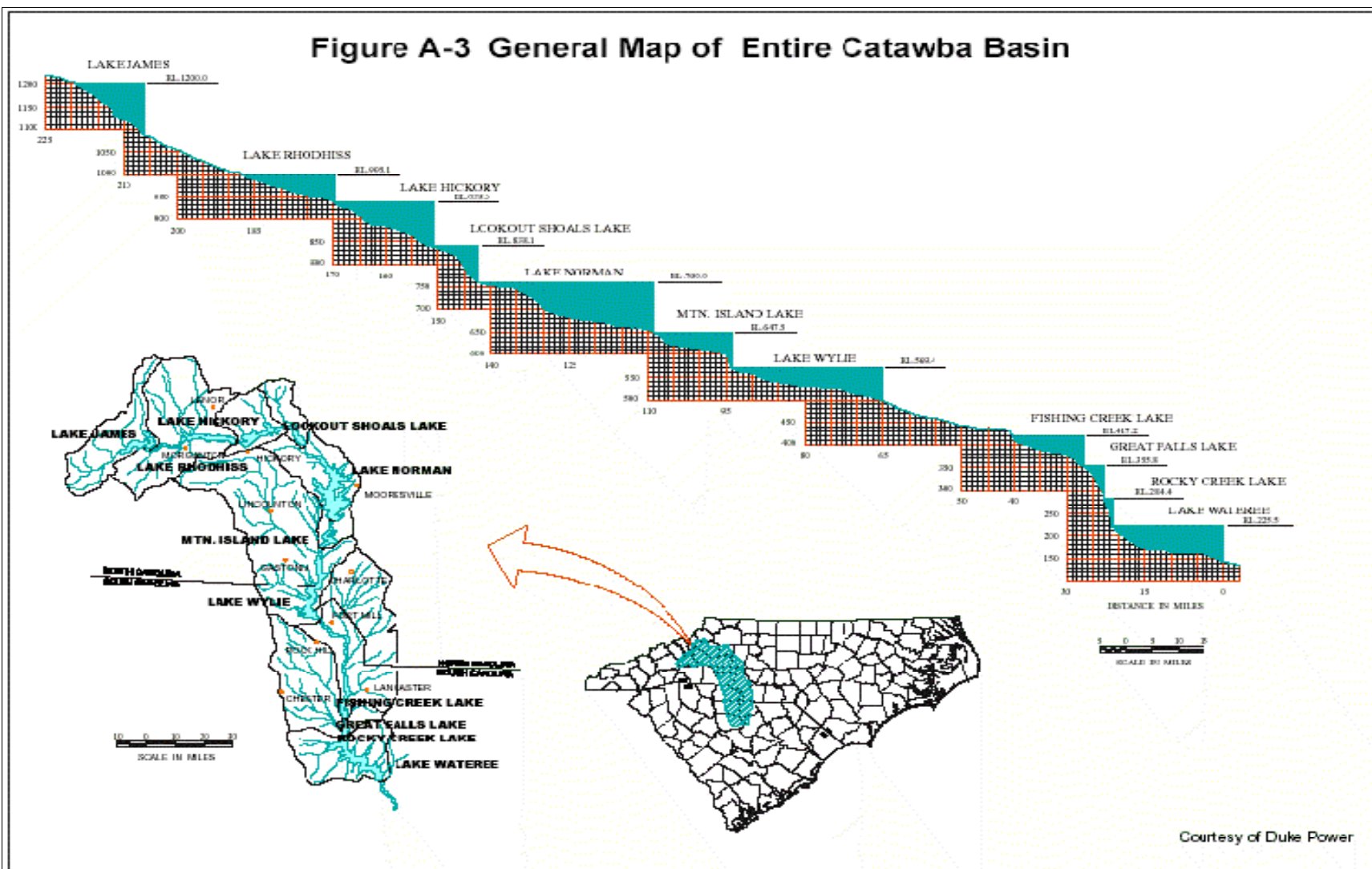
agricultural operations and urban areas has caused nutrient enrichment and habitat degradation in the streams, rivers and lakes of the area. Though urban areas are not numerous in the upper portions of the basin, the lower Catawba region contains many cities, including the growing Charlotte-Mecklenburg metropolitan area. In this region, urban growth has affected the water quality of the lakes, streams and rivers.

The mainstem of the Catawba River in North Carolina is regulated by a series of seven hydroelectric dams. The reservoirs formed by these dams are commonly referred to as the Catawba River Chain Lakes. All are owned by Duke Power and were created to generate electricity. The lakes begin with Lake James, located at the foot of the Blue Ridge Mountains, followed by Lake Rhodhiss, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake and Lake Wylie.

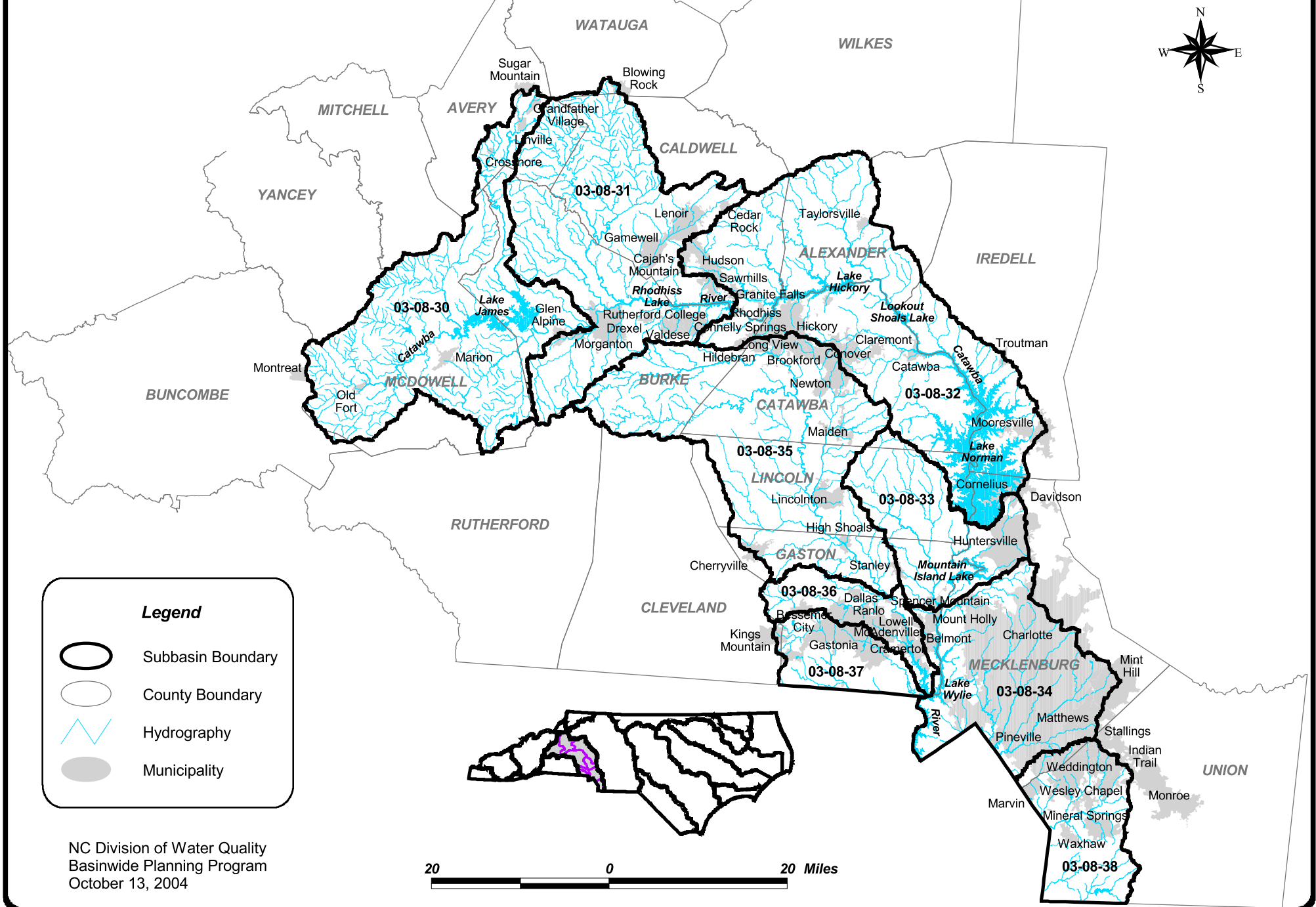
Population growth for the basin as a whole from 1990 to 2000 is estimated at 18.5 percent, and estimated population density is 356 persons/square mile. The statewide population density is 163 persons/square mile, demonstrating the population concentration within the Catawba River basin.

Over the 15-year period from 1982 to 1997, urban and built-up land cover increased by 183,000 acres or about 52 percent. Uncultivated cropland increased by 7,000 acres while pastureland decreased by 13,000 acres. Forest and cultivated cropland cover significantly decreased by 104,000 and 75,000 acres, respectively (USDA-NRCS, NRI, updated June 2001).

Figure A-3 General Map of Entire Catawba Basin



**Figure A-4 General Map of the
Catawba River Basin in North Carolina**



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 Catawba River basin is divided into nine subbasins (6-digit DWQ subbasins) (Figure A-4). 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 Catawba River basin is made up of hydrologic areas referred to as hydrologic units (USGS 8-digit hydrologic units). The Catawba River basin is made up of three hydrologic units: the Upper Catawba, South Fork Catawba and Lower Catawba. Hydrologic units are further divided into smaller watershed units (14-digit hydrologic units) that are used for smaller scale planning like that done by the Ecosystem Enhancement Program (Section C, Chapter 1, Part 1.3.2). There are 94 14-digit hydrologic units in the Catawba River basin. Table A-3 compares the three systems.

Table A-3 Hydrologic Subdivisions in the Catawba River Basin

Major Waterbody Name	USGS 8-Digit Hydrologic Units	DWQ 6-Digit Subbasin Codes
Upper Catawba	03050101	03-08-30, 03-08-31, 03-08-32, 03-08-33, 03-08-34, 03-08-37
South Fork Catawba	03050102	03-08-35, 03-08-36
Lower Catawba	03050103	03-08-34, 03-08-38

2.2.2 Hydrologic Features

The Catawba River begins in mountainous western North Carolina near Grandfather Mountain and flows easterly and southerly through the piedmont into South Carolina, where it joins Big Wateree Creek to form the Wateree River. The hydrologic landscape is dominated by the presence of Duke Power's Catawba-Wateree Hydroelectric Project. The Catawba-Wateree Project is comprised of 13 hydropower plants and 11 reservoirs, including the James (Bridgewater), Rhodhiss, Hickory (Oxford), Lookout Shoals, Norman (Cowan's Ford), Mountain Island, Wylie, Fishing Creek, Great Falls, Rocky Creek, and Wateree reservoirs. Seven of these reservoirs, from Lake James to Lake Wylie, are at least partially located within the boundaries of North Carolina.

In addition to the mainstem lakes and river, the Catawba River basin includes the federally recognized Wild and Scenic Linville River and the South Fork Catawba River. The Linville River rushes through the high mountain wilderness areas of Burke County and into Lake James.

The South Fork Catawba River flows through the agricultural and industrial corridor along US Highway 321 and joins the mainstem Catawba River at Lake Wylie.

There are 3,048 stream miles and 50,764 freshwater acres (lakes) in the North Carolina portion of the Catawba River basin.

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 (Table A-4).

2.2.4 Water Withdrawals and Water Supply

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

There are 235 registered water withdrawals in the Catawba River basin. The US Geological Survey's (USGS) 1995 summary estimated total water use in the basin at 279 MGD. Eighty-six percent was withdrawn from surface water sources. Overall, public water systems supplied 152 MGD of surface water and 4 MGD of groundwater for both residential and nonresidential uses. The remaining residential water demand was met by 17 MGD of self-supplied groundwater. In addition, there was 87 MGD of self-supplied surface water withdrawn for nonresidential water uses not including electric power generation (NCDENR-DWR, January 2001). For more information on water withdrawals, visit the website at <http://www.ncwater.org/> or call DWR at (919) 733-4064.

Table A-4 Minimum Streamflow Projects in the Catawba River Basin

Site	Waterbody	Drainage Area (sq. mi.)	Minimum Release (cfs)
<i>Hydropower Dams</i>			
Catawba-Wateree Project (FERC#2232) ^a	Catawba River		
Lake James (Bridgewater Dam)	Catawba River	380	25 (66 ^b)
Lake Rhodhiss	Catawba River	1,088	40 (225 ^b)
Lake Hickory (Oxford Dam)	Catawba River	1,310	40 (261)
Lookout Shoals Lake	Catawba River	1,449	60 (278 ^b)
Lake Norman (Cowan's Ford Dam)	Catawba River	1,770	80 (311 ^b)
Mountain Island Lake	Catawba River	1,860	80 (314 ^b)
Long Shoals (FERC#7742)	South Fork Catawba River	470	92
High Shoals (FERC#4827)	South Fork Catawba River	510	None ^c
Hardins (FERC#6492)	South Fork Catawba River	512	43.5
Spencer Mountain (FERC#2607)	South Fork Catawba River	622	76
McAdenville (FERC#4186)	South Fork Catawba River	632	None ^c
Brushy Mountain (Millersville) (Non-Jurisdictional)	Lower Little River	80.7	2
<i>Non-Hydropower Dams</i>			
Lake Tahoma ^d	Buck Creek	23.1	None ^e
Henry River ^f	Henry Fork	81	24.5
Loch Dornie	Linville River	3.5	1.9
Land Harbor Lake	Linville River	19	6.6
West Fork Linville River	Linville Ridge	0.3	0.1
Anchor's Landing	Silver Creek	3.77	3.9
Ben Webber Lake	UT Long Creek	2.3	0.2
<i>Miscellaneous Dams</i>			
Blue Ridge Country Club	Laurel Branch	1.05	0.39
Duke Power Lincoln Combustion Turbine Station	Killian Creek	36	2.28

^a The license issued for the Catawba-Wateree Project by the Federal Energy Regulatory Commission (FERC) will expire on 8/31/08. The flow requirements from each dam will be examined during the relicensing process.

^b Minimum average daily flow that may be requested for a specified period of time by the state to maintain water quality standards. Flow requirements may be provided by power generation, spillage and/or leakage.

^c Even though there is no minimum flow, the project must still operate in a run-of-river mode; i.e., instantaneous inflow equals instantaneous outflow. A noncompliant project can alter noticeably the streamflow.

^d The dam is a former hydropower facility (FERC#4021). The dam owners have surrendered the license to operate, and the dam will have a minimum flow requirement determined in accordance with the NC Dam Safety Law.

^e Even though there is no minimum flow yet, the dam provides a run-of-river flow; i.e., instantaneous inflow equals instantaneous outflow.

^f The site is a former, non-jurisdictional hydropower facility.

2.2.5 Interbasin Transfers

"Interbasin Transfer" is the term used to describe the withdrawal, diversion or pumping of surface water from one river basin and the use or discharge of all or any part of the water in a basin different from the basin of origin. Water users in North Carolina are required to register surface water interbasin transfers with the Division of Water Resources if the amount is 100,000 gallons per day 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 Catawba River basin. Table A-5 summarizes IBTs involving the Catawba River basin.

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

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

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

Table A-5 Estimated Interbasin Transfers in the Catawba River Basin (1997)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD) ¹
Charlotte-Mecklenburg	Charlotte-Mecklenburg	Catawba	Rocky	5.1
Charlotte-Mecklenburg	Union County	Catawba	Rocky	0.22
Burlington Industries	Burlington Industries	Catawba	Rocky	3.84
Gastonia	Gastonia	Catawba	South Fork Catawba	5.25
Gastonia	Cramerton	Catawba	South Fork Catawba	0.33
Gastonia	Lowell	Catawba	South Fork Catawba	0.45
Gastonia	McAdenville	Catawba	South Fork Catawba	0.42
Mooreville	Mooreville	Catawba	Rocky	2.6
Valdese	Burke County	Catawba	South Fork Catawba	0.08
Hickory	Hickory	Catawba	South Fork Catawba	5.1
Hickory	Newton	Catawba	South Fork Catawba	Emergency
Hickory	Conover	Catawba	South Fork Catawba	0.05
Hickory	Brookford	Catawba	South Fork Catawba	0.06
Belmont	Belmont	Catawba	South Fork Catawba	Unknown
Belmont	Cramerton	Catawba	South Fork Catawba	Emergency
Long View	Long View	Catawba	South Fork Catawba	1.3
Mount Holly	Stanley	Catawba	South Fork Catawba	Unknown
Lincoln County	Lincolnton	Catawba	South Fork Catawba	0.01
Lenoir	Caldwell County SE	Catawba	Yadkin	Unknown
Lenoir	Caldwell County N	Catawba	Yadkin	Unknown
Mooreville	Mooreville	Catawba	South Yadkin	0.28
Kings Mountain	Kings Mountain	Broad	Catawba	1.47
Blowing Rock	Blowing Rock	New	Catawba	Unknown
Anson County	Union County	Yadkin	Catawba	1.44
Alexander County	Taylorsville	South Yadkin	Catawba	0.41
Alexander County	Alexander County	South Yadkin	Catawba	Unknown
Alexander County	West Iredell	South Yadkin	Catawba	0.15
Statesville	Troutman	South Yadkin	Catawba	0.07
Monroe	Union County	Rocky	Catawba	Unknown
Newton	Newton	South Fork Catawba	Catawba	Unknown
Newton	Catawba	South Fork Catawba	Catawba	0.09
Dallas	Gastonia	South Fork Catawba	Catawba	Emergency
Bessemer City	Gastonia	South Fork Catawba	Catawba	Emergency
Bessemer City	Bessemer City	South Fork Catawba	Catawba	1.51
Ranlo	Gastonia	South Fork Catawba	Catawba	Emergency
Stanley	Stanley	South Fork Catawba	Catawba	Unknown
Lincolnton	Lincoln County	South Fork Catawba	Catawba	Unknown
Cherryville	Cherryville	South Fork Catawba	Broad	Unknown
Kings Mountain	Bessemer City	Broad	South Fork Catawba	Emergency

¹ All transfer amounts are based on average daily water use reported in 1997 Local Water Supply Plans, and the 1999 Water Withdrawal and Transfer Registration Database. "Unknown" refers to undocumented consumptive use. "Emergency" refers to connections that are designated as for emergency use.

2.3 Population and Growth Trends

In the following sections are three different ways of presenting population data for the Catawba River basin. The Office of State Budget and Management projects population growth by county using 2000 Census data as a starting point. This information is important in determining areas that expect significant population changes in the future. Data presented by municipality summarizes information on past growth of large urban areas in the basin. While the municipal data are not projected into the future, it is possible to locate areas where past growth may have impacted water quality. These two measures are based on political boundaries and not on watersheds areas. Population data were also presented by subbasin to gain insight into population densities within the basin. While the three different sets of information cannot be directly compared because the areas and time periods are different, general conclusions are apparent by looking at the information. Counties with the highest expected growth are associated with the largest municipal areas and the most densely populated subbasins in the Catawba River basin.

2.3.1 County Population and Growth Trends

Table A-6 shows the projected population for 2020 and the change in growth between 1990 and 2020 for counties that are wholly or partly contained within the basin. Since river basin boundaries do not coincide with county boundaries, these numbers are not directly applicable to the Catawba River basin. This information is intended to present an estimate of expected population growth in counties that have some land area in the Catawba River basin.

Table A-6 Past and Projected Population (1990, 2000, 2020) and Population Change by County

County	Percent of County in Basin ♦	1990	2000	Projected % Growth 1990-2000	Projected Population 2020	Projected % Growth 2000-2020
Alexander	68	27,544	33,603	18.0	45,168	25.6
Avery	35	14,867	17,167	13.4	19,976	14.1
Burke	100	75,740	89,148	15.0	113,367	21.4
Caldwell	75	70,709	77,415	8.7	86,577	10.6
Catawba	100	118,412	141,685	16.4	186,058	23.8
Gaston	97	174,769	190,365	8.2	215,587	11.7
Iredell	22	93,205	122,660	24.0	182,758	32.9
Lincoln	93	50,319	63,780	21.1	90,778	29.7
McDowell	86	35,681	42,151	15.3	53,170	20.7
Mecklenburg	74	511,211	695,454	26.5	1,089,258	36.2
Union	25	84,210	123,677	31.9	210,738	41.3
Subtotals		1,256,667	1,597,105	21.3	2,293,435	30.4

♦ 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 wholly or partly contained within the basin increased by 340,438 people between 1990 and 2000. Figure A-5 presents projected population growth by county (2000-2020) for the Catawba River basin. Mecklenburg and Union counties are growing the fastest in the lower basin, with Iredell, Alexander and Catawba counties growing the fastest in the upper basin. The county populations are expected to grow by more than 696,000 by 2020. Along 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, businesses and transportation infrastructure. These side effects of population growth often have a negative impact on water quality if not carefully managed. A detailed discussion of these impacts can be found in Section A, Chapter 4, Parts 4.11-4.13.

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/>.

2.3.2 Population, Growth Trends, and Population Density

Table A-7 presents population data from the Office of State Planning for municipalities with populations greater than 2,000 persons, located wholly or partly within the basin. The highest percentage of urban population growth has occurred in the lower basin around Cornelius, Huntersville and Indian Trail. Mooresville, Waxhaw and Wesley Chapel have also increased in population substantially over the last ten years.

Most population data are collected from within county or municipal boundaries. It is difficult to evaluate population and population density within watersheds using this information. Both county and municipal boundaries may extend beyond basin boundaries.

Information on population density at a watershed scale is useful in determining what streams are likely to have the most impacts as a result of population growth. This information is also useful in identifying stream segments that have good opportunities for preservation or restoration. This information is presented to estimate population and population density by each subbasin and for the entire basin. Assuming county populations are distributed evenly throughout each county, subbasins that are within counties with large urban areas may overestimate the actual population in that portion of the basin. The overall population of the Catawba River basin is 1,170,512, with approximately 356 persons/square mile for counties that are partially or entirely in the basin. Population density estimated by subbasin is presented in Figure A-6.

**Figure A-5 Percent Projected County Population Growth (2000-2020)
for Counties of the Catawba River Basin**

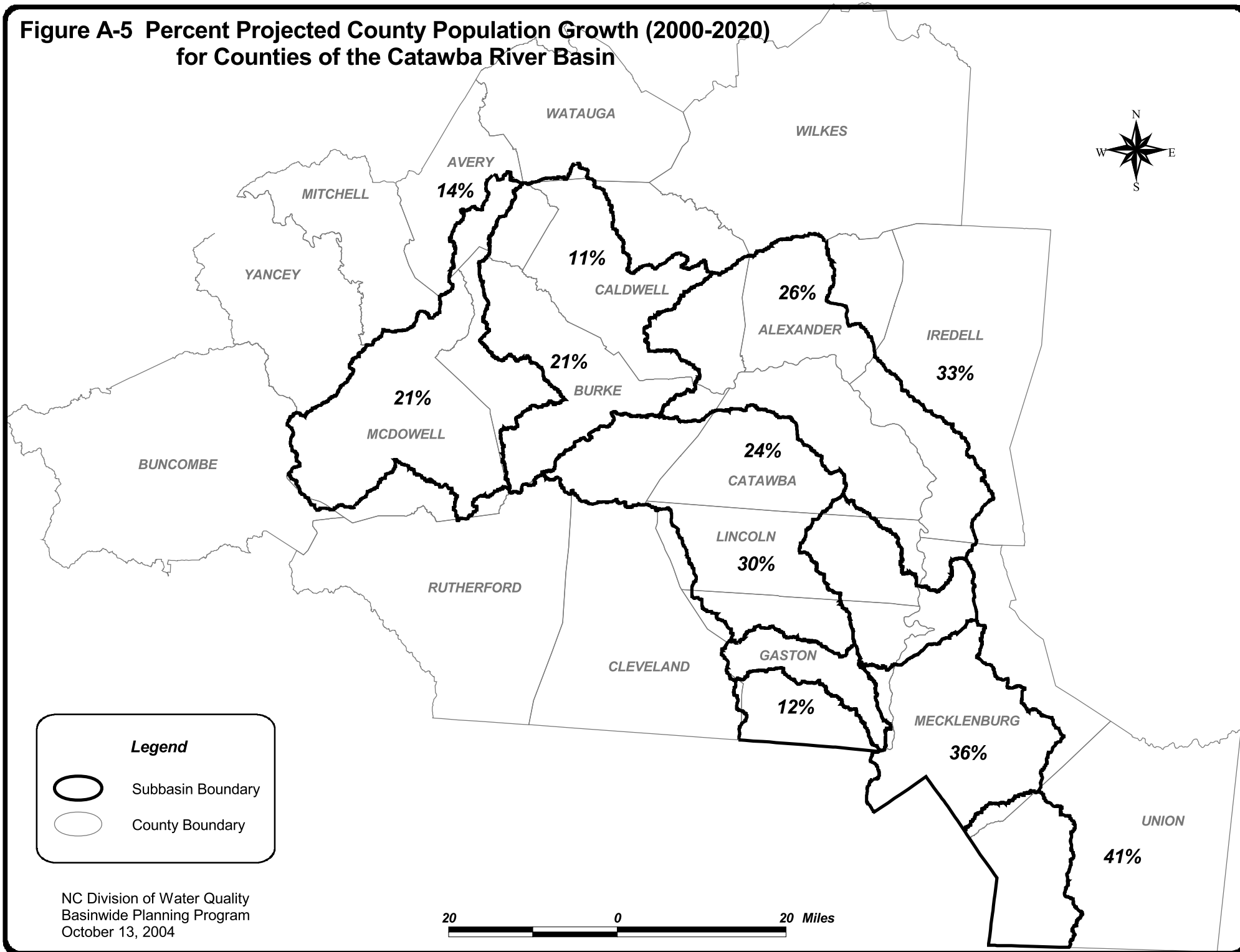
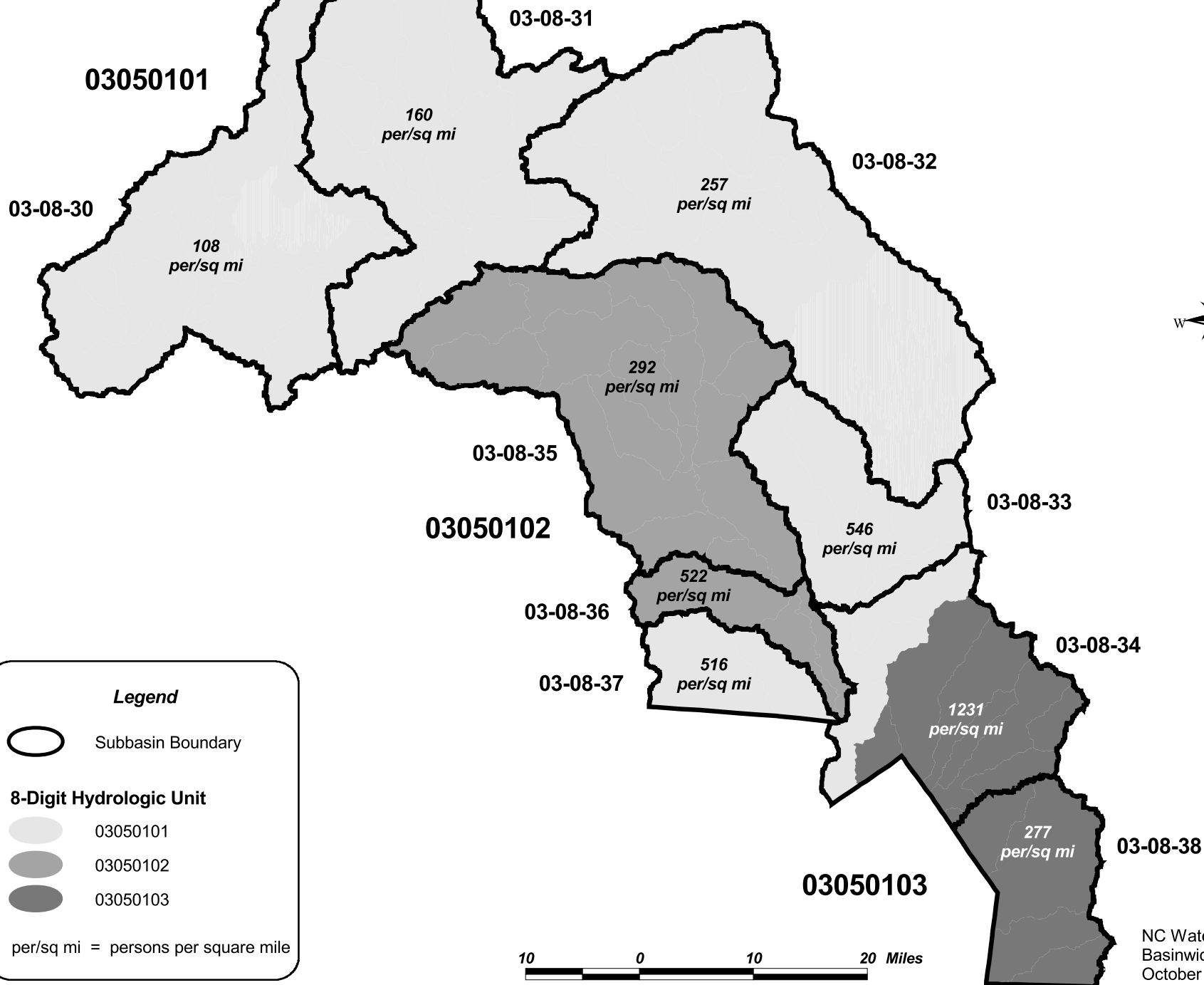


Table A-7 Population (1980, 1990, 2000) and Population Change for Municipalities Greater Than 2,000 Located Wholly or Partly in the Catawba River Basin

Municipality	County	Apr-80	Apr-90	Apr-2000	Percent Change (1980-90)	Percent Change (1990-2000)
Belmont	Gaston	4,607	8,434	8,705	83.1	3.2
Bessemer City	Gaston	4,787	4,698	5,119	-1.9	9.0
Cajah Mountain	Caldwell	1,884	2,429	2,683	28.9	10.5
Charlotte •	Mecklenburg	315,474	395,934	540,828	25.5	36.6
Cherryville •	Gaston	4,844	4,756	5,361	-1.8	12.7
Conover	Catawba	4,245	5,465	6,604	28.7	20.8
Cornelius •	Mecklenburg	1,460	2,581	11,969	76.8	363.7
Cramerton	Gaston	1,869	2,371	2,976	26.9	25.5
Dallas	Gaston	3,340	3,012	3,402	-9.8	12.9
Davidson •	Iredell, Mecklenburg	3,241	4,046	7,139	24.8	76.4
Gamewell	Caldwell	2,910	3,357	3,644	15.4	8.5
Gastonia	Gaston	47,218	54,725	66,277	15.9	21.1
Granite Falls	Caldwell	2,580	3,253	4,612	26.1	41.8
Hickory	Burke, Caldwell, Catawba	20,757	28,474	37,222	37.2	30.7
Hudson	Caldwell	2,888	2,819	3,078	-2.4	9.2
Huntersville •	Mecklenburg	1,294	3,023	24,960	133.6	725.7
Indian Trail •	Union	811	1,942	11,905	139.5	513.0
Kings Mountain •	Cleveland, Gaston	9,080	8,763	9,693	-3.5	10.6
Lenoir	Caldwell	13,748	14,192	16,793	3.2	18.3
Lincolnton	Lincoln	4,879	6,955	9,965	42.5	43.3
Long View	Burke, Catawba	3,587	3,353	4,722	-6.5	40.8
Lowell	Gaston	2,917	2,710	2,662	-7.1	-1.8
Maiden	Catawba, Lincoln	2,574	2,470	3,282	-4.0	32.9
Marion	McDowell	3,684	4,765	4,943	29.3	3.7
Matthews •	Mecklenburg	1,648	13,651	22,127	728.3	62.1
Mint Hill •	Mecklenburg	7,915	11,615	14,922	46.7	28.5
Mooreville •	Iredell	8,575	9,317	18,823	8.7	102.0
Morganton	Burke	13,763	15,085	17,310	9.6	14.7
Mount Holly	Gaston	4,530	7,710	9,618	70.2	24.7
Newton	Catawba	7,624	9,077	12,560	19.1	38.4
Pineville	Mecklenburg	1,525	2,970	3,449	94.8	16.1
Ranlo	Gaston	1,774	1,650	2,198	-7.0	33.2
Sawmills	Caldwell	3,706	4,088	4,921	10.3	20.4
Stallings •	Union	1,826	2,152	3,189	17.9	48.2
Stanley	Gaston	2,341	2,897	3,053	23.8	5.4
Valdese	Burke	3,364	3,914	4,485	16.3	14.6
Waxhaw	Union	1,208	1,294	2,625	7.1	102.9
Weddington ♦	Union	848	3,803	6,696	348.5	76.1
Wesley Chapel	Union	-----	1,018	2,549	-----	150.4

- 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: Weddington is listed in Mecklenburg and Union counties in the 2001 NC League of Municipalities Directory. It is also listed in Mecklenburg and Union counties on the Office of State Planning website for the April 2001 municipality population data even though there are no population figures listed for Mecklenburg County. However, on the 2000 GIS data layer, Weddington is only listed in Union County.

**Figure A-6 8-Digit Hydrologic Units in the Catawba River Basin
and Population Density by Subbasin**



2.4 Local Governments and Planning Jurisdictions in the Basin

The Catawba River basin encompasses all or portions of 11 counties and 61 municipalities. Table A-8 provides a listing of these municipalities, along with the regional planning jurisdiction (Council of Governments). Fifteen municipalities are located in more than one major river basin.

Table A-8 Local Governments and Planning Units within the Catawba River Basin

County	Region	Municipalities
Alexander	E	Taylorsville ♦
Avery	D	Crossnore, Grandfather Village, Sugar Mountain ♦
Burke	E	Connelly Springs, Drexel, Glen Alpine, Hickory *, Hildebran, Long View *, Morganton, Rhodhiss *, Rutherford College, Valdese
Caldwell	E	Blowing Rock * ♦, Cahah Mountain, Cedar Rock, Gamewell, Granite Falls, Hickory *, Hudson, Lenoir, Rhodhiss *, Sawmills
Catawba	E	Brookford, Catawba, Claremont, Conover, Hickory *, Long View *, Maiden *, Newton
Cleveland	C	Kings Mountain * ♦
Gaston	F	Belmont, Bessemer City, Cherryville ♦, Cramerton, Dallas, Gastonia, High Shoals *, Kings Mountain * ♦, Lowell, McAdenville, Mount Holly, Ranlo, Spencer Mountain, Stanley
Iredell	F	Davidson * ♦, Mooresville ♦, Troutman ♦
Lincoln	F	High Shoals *, Lincolnton, Maiden *
McDowell	C	Marion, Old Fort
Mecklenburg	F	Charlotte ♦, Cornelius ♦, Davidson * ♦, Huntersville ♦, Matthews ♦, Mint Hill ♦, Pineville
Union	F	Indian Trail ♦, Marvin, Mineral Springs, Stallings ♦, Waxhaw, Weddington, Wesley Chapel
Watauga	D	Blowing Rock * ♦

* Located in more than one county.

♦ Located in more than one major river basin.

Note: Counties adjacent to and sharing a border with a river basin are not included as part of that basin if only a trace amount of the county (<2 percent) is located in that basin, unless a municipality is located in that county. (Note: Cleveland County is included only because of the municipality, Kings Mountain; and Watauga County is included only because of the municipality, Blowing Rock.)

Note: Gastonia has a minute portion located in the Broad River basin; however, it will only be included in the Catawba River basin at this time. Monroe has a minute portion located in the Catawba River basin; however, it will only be included in the Yadkin-Pee Dee River basin at this time.

Region	Name	Location
C	Isothermal Planning and Development Commission	Rutherfordton
D	Region D Council of Governments	Boone
E	Western Piedmont Council of Governments	Hickory
F	Centralina Council of Governments	Charlotte

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 Catawba 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 National Resources Inventory (NRI 1982-1997) 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 Catawba 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-9. Figure A-7 provides an illustration of the relative amount of land area that falls into each major cover type for the Catawba River basin. Section B of this plan provides land cover data specific to each subbasin based on this information.

Table A-9 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.

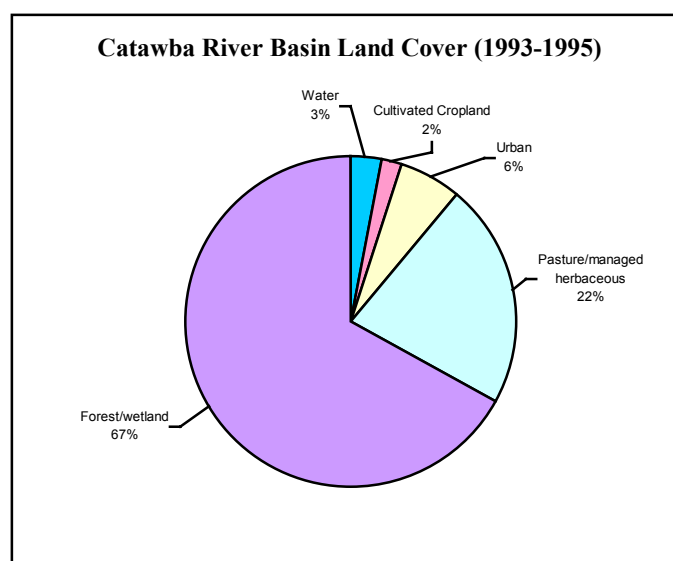


Figure A-7 Percentages within Major CGIA Land Cover Categories in the Catawba River Basin

2.5.2 NRI Land Cover Trends

Land cover information in this section is from the most current NRI, as developed by the Natural Resources Conservation Service (USDA-NRCS, NRI, updated June 2001). The 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-10 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-11. Figure A-6 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 Catawba 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 183,000 acres or about 52 percent. Uncultivated cropland increased by 7,000 acres while pastureland decreased by 13,000 acres. Forest and cultivated cropland cover significantly decreased by 104,000 and 75,000 acres, respectively. Most land cover change is occurring in the upper Catawba River basin hydrologic unit that includes the rapidly growing areas in Catawba and Iredell counties, and in the lower Catawba River basin hydrologic unit in Mecklenburg and Union counties. Figure A-8 presents changes in land cover between 1982 and 1997.

Table A-10 Land Cover in the Catawba River Basin by Major Watersheds – 1982 vs. 1997
(Source: USDA-NRCS, NRI, updated June 2001)

LAND COVER	MAJOR WATERSHED AREAS						1997 TOTALS		1982 TOTALS		% change since 1982
	Upper Catawba		South Fork Catawba		Lower Catawba						
	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	
Cult. Crop	53.5	3.7	39.9	10.2	20.8	8.0	114.2	5.4	188.8	8.9	-39.5
Uncult. Crop	49.4	3.4	12.9	3.3	3.2	1.2	65.5	3.1	58.2	2.8	12.5
Pasture	72.2	4.9	60.4	15.5	17.2	6.7	149.8	7.1	162.8	7.7	-8.0
Forest	674.1	46.2	170.1	43.5	81.2	31.4	925.4	43.9	1029.6	48.7	-10.1
Urban & Built-Up	316.4	21.7	89.7	22.9	128.8	49.8	534.9	25.4	352.0	16.7	52.0
Federal	190.5	13.1	0.0	0.0	0.0	0.0	190.5	9.0	188.7	8.9	1.0
Other	102.7	7.0	17.9	4.6	7.4	2.9	128.0	6.1	133.6	6.3	-4.2
Totals	1458.8	100.0	390.9	100.0	258.6	100.0	2108.3	100.0	2113.7	100.0	
% of Total Basin		69.2		18.5		12.3		100.0			
SUBBASINS	03-08-30 03-08-31 03-08-32 03-08-33 03-08-34 03-08-37	03-08-35 03-08-36		03-08-34 03-08-38							
8-Digit Hydraulic Units	03050101		03050102		03050103						

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

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

Table A-11 Description of Land Cover Types
(Source: USDA-NRCS, NRI, updated June 2001)

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

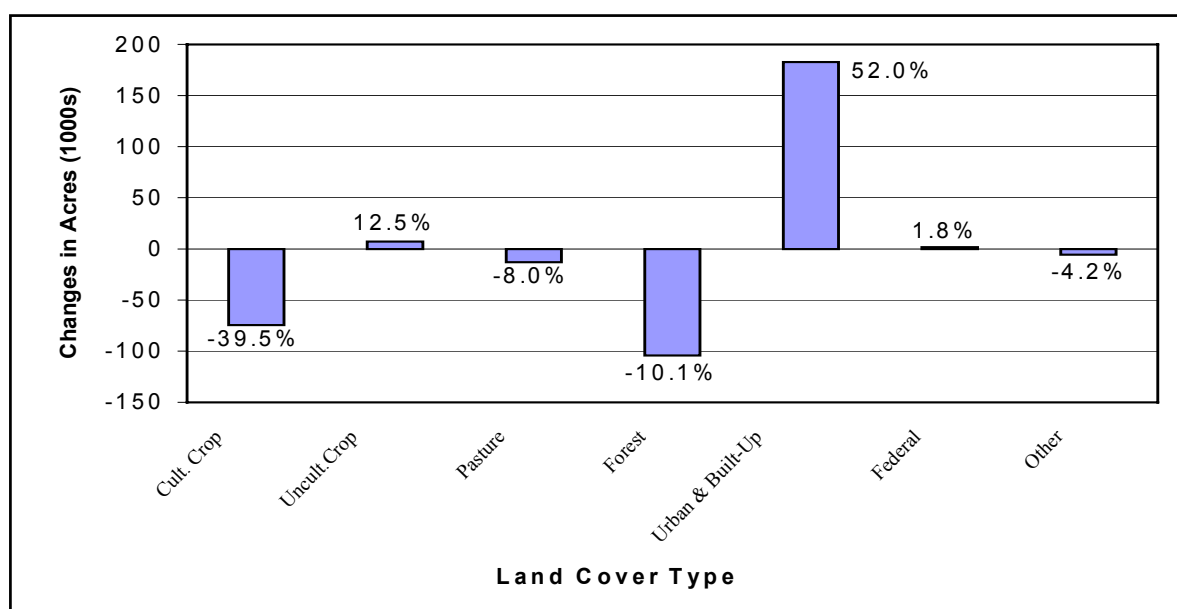


Figure A-8 Land Cover Changes from 1982 to 1997 for the Catawba River Basin
(Source: USDA-NRCS, NRI, updated June 2001)

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 204 permitted wastewater discharges in the Catawba 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. 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 Catawba River basin is from major municipal wastewater treatment plants. Nonmunicipal discharges also contribute substantial wastewater flow into the

Catawba 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-12 Summary of NPDES Dischargers and Permitted Flows for the Catawba River Basin (as of 06/16/03)

	Catawba River Subbasin									
Facility Categories	03-08-30	03-08-31	03-08-32	03-08-33	03-08-34	03-08-35	03-08-36	03-08-37	03-08-38	TOTAL
Total Facilities	29	14	52	10	44	24	14	15	2	204
Total Permitted Flow (MGD)	8.62	24.69	14.51	10.99	119.67	27.33	24.08	7.26	2.51	239.66
Major Discharges	4	4	7	3	6	6	4	2	1	37
Total Permitted Flow (MGD)	7.4	24.58	10.53	10.0	117.9	26.5	21.4	6.62	2.5	227.43
Minor Discharges	25	10	45	7	38	18	10	13	1	167
Total Permitted Flow (MGD)	1.22	0.11	3.98	0.99	1.77	0.83	2.68	0.65	0.01	12.24
100% Domestic Waste	19	7	28	3	11	7	2	4	1	82
Total Permitted Flow (MGD)	0.87	0.10	0.79	0.05	0.73	0.16	0.09	0.07	0.01	2.87
Municipal Facilities	4	3	11	3	5	8	6	1	1	42
Total Permitted Flow (MGD)	4.52	24.58	12.65	10.75	104.03	26.03	21.38	6.0	2.5	212.44
Nonmunicipal Facilities	25	11	41	7	39	16	8	14	1	162
Total Permitted Flow (MGD)	4.10	0.11	1.85	0.24	15.64	1.29	2.70	1.26	0.01	27.20

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 565 general stormwater permits and 38 individual stormwater permits (see Appendix I for a listing). Refer to Section A, Chapter 4, Part 4.12 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 Catawba River basin.

Key Animal Operation Legislation (1995-2003)

- 1995** Senate Bill 974 requires owners of swine facilities with 250 or more animals to hire a certified operator. Operators are required to attend a six-hour training course and pass an examination for certification. Senate Bill 1080 established buffer requirements for swine houses, lagoons and land application areas for farms sited after October 1, 1995.
- 1996** Senate Bill 1217 required all facilities (above threshold populations) to obtain coverage under a general permit, beginning in January 1997, for all new and expanding facilities. DWQ was directed to conduct annual inspections of all animal waste management facilities. Poultry facilities with 30,000+ birds and a liquid waste management system were required to hire a certified operator by January 1997, and facilities with dry litter animal waste management systems were required to develop an animal waste management plan by January 1998. The plan must address three specific items: 1) periodic testing of soils where waste is applied; 2) development of waste utilization plans; and 3) completion and maintenance of records on-site for three years. Additionally, anyone wishing to construct a new, or expand an existing, swine farm must notify all adjoining property owners.
- 1997** House Bill 515 placed a moratorium on new or existing swine farm operations and allows counties to adopt zoning ordinances for swine farms with a design capacity of 600,000 pounds (SSLW) or more. In addition, owners of potential new and expanding operations are required to notify the county (manager or chair of commission) and local health department, as well as adjoining landowners. NCDENR was required to develop and adopt economically feasible odor control standards by March 1, 1999.
- 1998** House Bill 1480 extended the moratorium on construction or expansion of swine farms. The bill also requires owners of swine operations to register with DWQ any contractual relationship with an integrator.
- 1999** House Bill 1160 extended (again) the moratorium on new construction or expansion of swine farms, required NCDENR to develop an inventory of inactive lagoons. The Bill requires owners/operators of an animal waste treatment system to notify the public in the event of a discharge to surface waters of the state of 1,000 gallons or more of untreated wastewater.
- 2000** Attorney General Easley reached a landmark agreement with Smithfield Foods, Inc. to phase out hog lagoons and implement new technologies that will substantially reduce pollutants from hog farms. The agreement commits Smithfield to phase out all anaerobic lagoon systems on 276 company-owned farms. Legislation will be required to phase out the remaining systems statewide within a 5-year period (State of Environment Report 2000).
- 2001** House Bill 1216 extended (again) the moratorium on new construction or expansion of swine farms.

**Figure A-9 Animal Operations in the
Catawba River Basin**

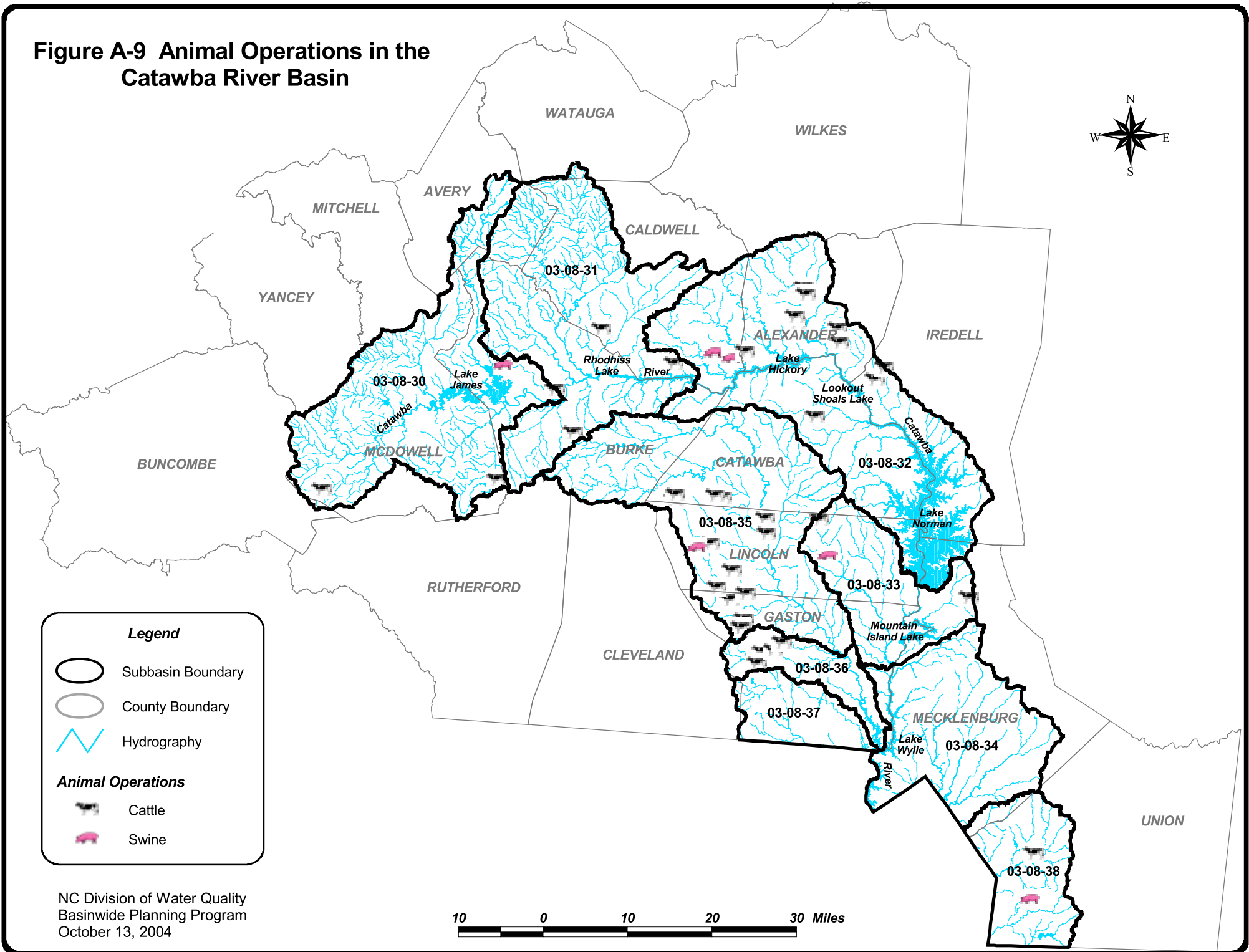


Table A-13 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight as of July 2003. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in each subbasin. There are no registered poultry operations in the Catawba River basin.

Table A-13 Registered Animal Operations in the Catawba River Basin (as of 07/03/03)

Subbasin	Cattle			Swine		
	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight
03-08-30	2	360	504,000	0		
03-08-31	0			0		
03-08-32	8	3,288	4,603,200	1	2,600	368,420
03-08-33	1	175	245,000	0		
03-08-34	0			0		
03-08-35	8	3,121	4,369,400	0		
03-08-36	2	794	1,111,600	0		
03-08-37	0			0		
03-08-38	1	700	980,000	0		
Totals	22	8,438	11,813,200	1	2,600	368,420

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

Between 1994 and 1998, there was a 20 percent increase in poultry capacity in the basin. There was a 22 percent decrease in dairy operations and a minimal increase in swine capacity. Information on animal capacity by subbasin (Table A-14) was provided by the USDA.

Table A-14 Estimated Populations of Swine, Dairy and Poultry in the Catawba 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 (%)
03-08-30	292	391	-25	295	737	-60	550,507	431,907	27
03-08-31	3,921	3,477	13	743	747	-1	1,836,300	1,730,400	6
03-08-32	3,628	4,578	-21	4,203	5,485	-23	3,942,879	3,175,448	24
03-08-33	2,717	1,802	51	1,448	1,448	0	62,084	11,822	425
03-08-34	428	274	56	45	45	0	538	538	0
03-08-35	1,355	1,814	-25	4,896	6,757	-28	2,133,378	1,767,550	21
03-08-36	107	101	6	1,793	2,138	-16	100,352	352	28,409
03-08-37	236	236	0	223	223	0	276	250	10
03-08-38	1,838	1,280	44	192	237	-19	2,179,920	1,869,620	17
TOTALS	14,522	13,953	4	13,838	17,817	-22	10,806,234	8,987,887	20
% of State Total	<1%	<1%		14%	13%		5%	5%	

2.8 Natural Resources

2.8.1 Catawba River Chain Lakes

One of the most prominent hydrologic features of the Catawba River basin is the series of hydropower impoundments along the river's length that are widely referred to as the Catawba River Chain Lakes (Figure A-4). The discharge from the upstream reservoir, as well as inputs from the surrounding watershed and discharges to the lakes, influences the water quality of each impoundment. The most upstream impoundment, Lake James, has the best water quality of all of the lakes in the Catawba River chain.

The next three impoundments are Lake Rhodhiss, Lake Hickory and Lookout Shoals Lake. Enriched conditions found at these reservoirs are caused by nutrient loading from agricultural runoff, urban stormwater and municipal dischargers. Although nutrient concentrations in these reservoirs are sufficient to support substantial algal populations, short water retention times and limited light availability historically kept algae from reaching higher levels (NCDEHNR-DEM, 1992). During the last basin cycle, retention times increased due to drought, and the potential for intense algal growth was realized in Lake Rhodhiss and Lake Hickory. Refer to Section A, Chapter 4, Part 4.7 for more information on these lakes.

Lake Norman is located on the Catawba River below Lookout Shoals Lake and has historically exhibited good water quality. Water released from Lake Norman forms Mountain Island Lake, which is moderately productive. The final impoundment on the Catawba River in North Carolina is Lake Wylie. Lake Wylie is experiencing localized sedimentation and nutrient enrichment problems in the Crowders Creek and Catawba Creek arms of the lake.

All seven of the Catawba River Chain Lakes (Catawba-Wateree Project) are owned by Duke Power Company and were created to generate electricity. All of the chain lakes were completed between 1904 and 1928 with the exception of Lake Norman, which was completed in 1963. In addition to power generation, the lakes are popular recreational areas, and some are used for water supply purposes and for waterfront home development (Table A-15).

Part I of the Federal Power Act (FPA) requires Duke Power's Catawba-Wateree Project to have a license in order to operate. Relicensing is the process for obtaining a new license for a hydropower project after the existing license expires. Duke Power's current license for the project was issued in 1958 and will expire in 2008. Please refer to Section A, Chapter 4, Part 4.7.1 for a discussion on the relicensing process.

More detailed information on each of the lakes can be found in Section B.

Table A-15 Statistics on Major Lakes in the Catawba River Basin

Lake	Surface Area (Acres)	Mean Depth (Feet)	Shore Length (Miles)	Mean Retention Time (Days)	Trophic Level	Watershed Area (Sq. Mi.)	Major Uses *
Catawba River Chain Lakes (Upstream to downstream order)							
Lake James	6,510	46	145	208	Oligotrophic	380	Hydro, Rec
Rhodhiss Lake	3,515	20	90	21	Mesotrophic	1,090	Hydro, Rec
Lake Hickory	4,100	33	105	33	Oligotrophic	1,310	Hydro, Rec, WS
Lookout Shoals	1,270	30	39	7	Oligotrophic	1,449	Hydro, Rec
Lake Norman	32,510	33	520	239	Oligotrophic	1,790	Hydro, Rec, WS
Mt. Island Lake	3,234	16	61	12	Oligotrophic	1,859	Hydro, Rec, WS
Lake Wylie	12,450	23	327	39	Eutrophic	3,020	Hydro, Rec
Other Major Lakes (Not on Catawba River)							
Lake Tahoma	161				Oligotrophic		Rec (was Hydro)
Little River Dam	162				Eutrophic	25	Rec (was Hydro)
Maiden Lake	14				Eutrophic	20	WS
Bessemer City	15				Mesotrophic	0.4	WS
Newton City Lake	17				Oligotrophic		WS

* Hydro = Hydropower; Rec = Recreation; WS = Water Supply

The five other lakes in the Catawba River basin included in Table A-15 are not on the Catawba River. The Little River Dam, located on a tributary to Lake Hickory, is no longer used for hydropower purposes and has become a local fishing spot. Lake Tahoma, located on a tributary to the Catawba River upstream from Lake James, is now a recreational lake owned by Lake Tahoma, Incorporated. The last three lakes are small water supply reservoirs serving the municipalities of Maiden, Bessemer City and Newton.

2.8.2 Ecological Significance of the Catawba River Basin

Significant natural plant and animal communities in the basin are somewhat influenced by the geology of the area. The Catawba River basin supports several nationally significant aquatic habitat communities, notable for their rare mollusk, fish and insect populations (see Table A-16).

The most biologically important aquatic habitats in the basin are in Waxhaw Creek, Wilson Creek and Upper Creek. The Linville River, which also contains several rare species, is valued as a recreational river and has been designated a State Natural and Scenic River. Ecologically significant wetlands in the basin are mostly small, isolated bogs, such as the nationally significant Pineola Bog in Avery County and several bogs in McDowell County. These bogs are often home to a variety of rare plants and animals. Large, high quality floodplain wetland communities have not been identified in the basin.

Table A-16 Rare Aquatic and Wetland-Dwelling Species in the Catawba River Basin (as of August 2003)

Major Taxon	Scientific Name	Common Name	State Status	Federal Status
Crustacean	<i>Caecidotea carolinensis</i>	Bennett's Mill Cave water slater	SR	FSC
Crustacean	<i>Dactylocythere isabelae</i>	Catawba crayfish ostracod	SR	FSC
Fish	<i>Carpiodes velifer</i>	Highfin carpsucker	SC	
Fish	<i>Micropterus coosae</i>	Redeye bass	SR	
Fish	<i>Etheostoma collis pop 1</i>	Carolina darter - Central Piedmont population	SC	FSC
Fish	<i>Cyprinella zanema pop 1</i>	Santee chub - Piedmont population	SR	
Insect	<i>Ceraclea sloossonae</i>	A caddisfly	SR	
Insect	<i>Bolotoperla rossi</i>	A stonefly	SR	
Insect	<i>Acerpenna macdunnoughi</i>	A mayfly	SR	
Insect	<i>Ephemerella berneri</i>	A mayfly	SR	
Insect	<i>Barbaetis benfieldi</i>	Benfield's bearded small minnow mayfly	SR	
Insect	<i>Homoeoneuria cahabensis</i>	Cahaba sand-filtering mayfly	SR	
Insect	<i>Heterocloeon petersi</i>	A mayfly	SR	
Insect	<i>Rhyacophila mainensis</i>	A caddisfly	SR	
Insect	<i>Matrioptila jeanae</i>	A caddisfly	SR	
Insect	<i>Triaenodes marginata</i>	A triaenode caddisfly	SR	
Insect	<i>Micrasema burksi</i>	A caddisfly	SR	
Insect	<i>Micrasema sprulesi</i>	A caddisfly	SR	
Insect	<i>Macdunnoa brunnea</i>	A mayfly	SR	
Insect	<i>Macromia margarita</i>	Mountain River cruiser	SR	FSC
Insect	<i>Palaeagapetus celsus</i>	A caddisfly	SR	
Insect	<i>Ophiogomphus howei</i>	Pygmy snaketail	SR	FSC
Insect	<i>Ophiogomphus edmunds</i>	Edmund's snaketail	SR	FSC
Mollusk	<i>Alasmidonta robusta</i>	Carolina elktoe	EX	
Mollusk	<i>Leptoxis dilatata</i>	Seep mudalia	T	
Mollusk	<i>Alasmidonta varicosa</i>	Brook floater	E	FSC
Mollusk	<i>Lasmigona decorata</i>	Carolina heelsplitter	E	E
Mollusk	<i>Villosa constricta</i>	Notched rainbow	SC	
Mollusk	<i>Villosa delumbis</i>	Eastern creekshell	SR	
Mollusk	<i>Villosa vaughaniana</i>	Carolina creekshell	E	FSC

Rare Wetland-Dwelling Animals in the Catawba River Basin				
Amphibian	<i>Hemidactylium scutatum</i>	Four-toed salamander	SC	
Bird	<i>Vireo gilvus</i>	Warbling vireo	SR	
Bird	<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T (PD)
Insect	<i>Autochton cellus</i>	Golden banded-skipper	SR	
Mammal	<i>Sorex palustris punctulatus</i>	Southern water shrew	SC	FSC
Reptile	<i>Glyptemys muhlenbergii</i>	Bog turtle	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)
EX =	Extirpated
PD =	Proposed Delisted
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)
T(S/A) =	Threatened due to Similarity of Appearance

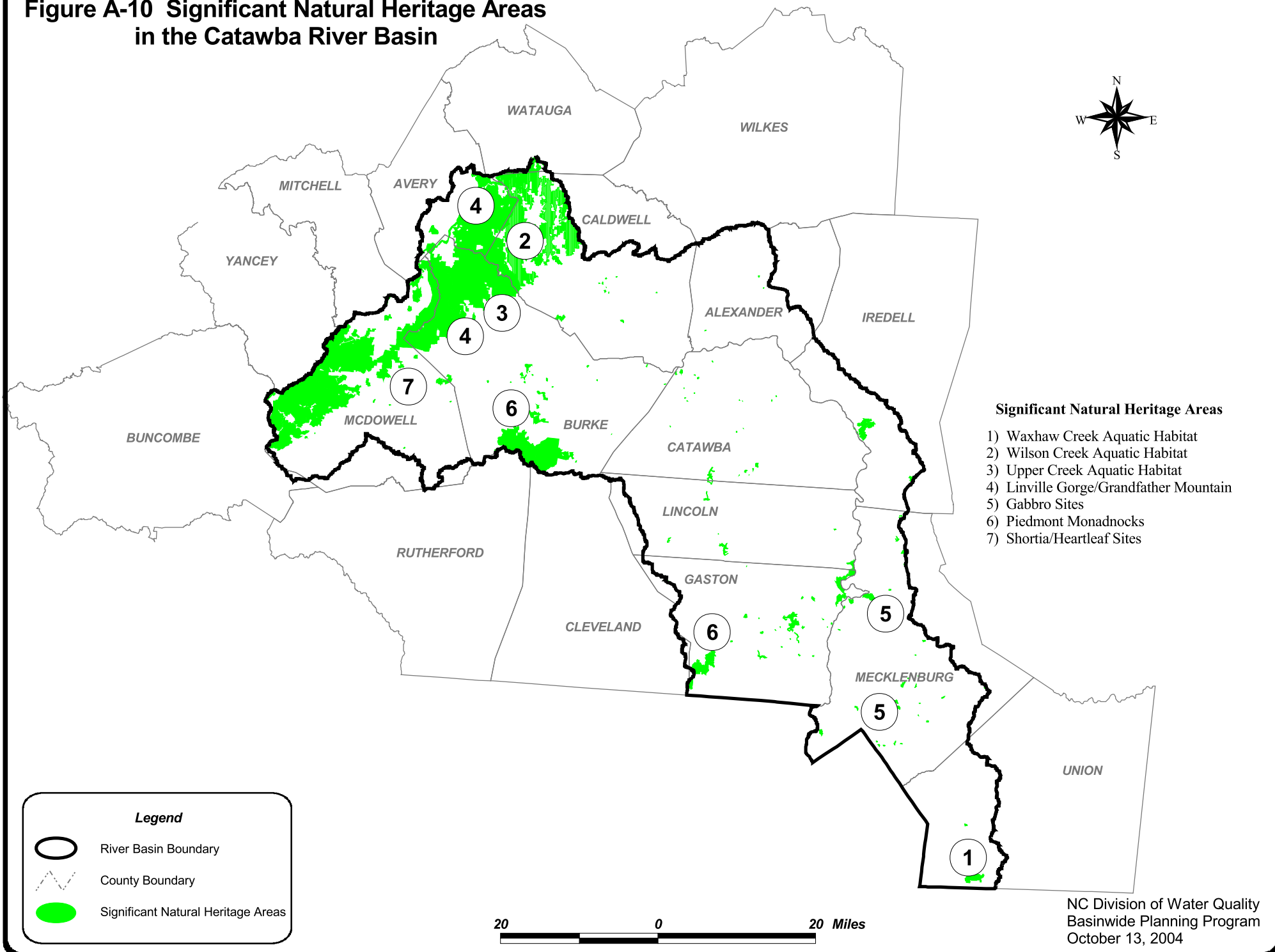
2.8.3 Significant Natural Heritage Areas in the Catawba River Basin

Figure A-10 is a map of the Significant Natural Heritage Areas of the Catawba River basin. The North Carolina Natural Heritage Program (NHP) of the Division of Parks and Recreation compiles a list of Significant Natural Heritage Areas as required by the Nature Preserves Act. The list is based on the program's inventory of natural diversity in the state. Natural areas are evaluated on the basis of the occurrences of rare plant and animal species, rare or high quality natural communities, and geologic features. The global and statewide rarity of these elements and the quality of their occurrence at a site relative to other occurrences determine a site's significance. The sites included on this list are the best representatives of the natural diversity of the state, and therefore, have priority for protection. Inclusion on the list does not imply that any protection or public access exists.

Sites that directly contribute to the maintenance of water quality in the Catawba River basin are highlighted on the map and in the following text. More complete information on Significant Natural Heritage Areas may be obtained from the Natural Heritage Program.

1. **Waxhaw Creek Aquatic Habitat.** A section of Waxhaw Creek in Union County, from the vicinity of NC 200 downstream to the first tributary below SR 1117, is considered an important aquatic habitat for a rare species of freshwater mussel known as Carolina heelsplitter. Waxhaw Creek is one of only two streams in North Carolina and approximately five streams nationwide that have living populations of this federally endangered species.
2. **Wilson Creek Aquatic Habitat.** Wilson Creek is a large creek that flows southeast from the area of Grandfather Mountain to Johns River in northwestern Caldwell County. Wilson Creek is one of only two known sites that support a population of a rare dragonfly, Edmund's snaketail. Edmund's snaketail is a globally rare species, which was feared to be extinct until it was rediscovered a few years ago.

**Figure A-10 Significant Natural Heritage Areas
in the Catawba River Basin**



3. **Upper Creek Aquatic Habitat.** Upper Creek is a fairly large stream that flows southward toward Catawba River in northern Burke County. The upper boundary of Upper Creek Aquatic Habitat is at Timbered Branch, and the downstream boundary is at Warrior Fork, just north of Morganton. Upper Creek is a nationally significant aquatic habitat recognized for being the best of only two known locations with a population of a rare dragonfly, Edmund's snaketail. Upper Creek also supports another rare dragonfly, the pygmy snaketail. Two rare freshwater mussel species, brook floater, a state threatened species; and eastern creekshell, a significantly rare species, are also found in Upper Creek.
4. **Linville Gorge/Grandfather Mountain.** Linville Gorge, a 10,000-acre high quality natural area significant for its 2,000-foot steep valley walls topped by quartzite cliffs, is one of the few primeval gorges in the Appalachians. It contains several rare plant species, as well as a few rare animal species and high quality examples of rare natural communities. Linville Gorge is within the Pisgah National Forest and has been established as a National Wilderness Area and a Registered Natural Heritage Area.

Grandfather Mountain is the highest mountain (5,964 feet) in the Blue Ridge Ranges region of the Blue Ridge Mountains. Grandfather Mountain has an astonishing diversity of both endemic and disjunct species, with nearly 60 rare plant and animal species known. Nearly 1,000 acres of Grandfather Mountain in Watauga and Avery counties are permanently dedicated as a State Nature Preserve.

5. **Gabbro sites.** Mecklenburg and Union counties contain areas of unique geology that support high quality wetland communities such as Upland Depression Swamp Forests. Several of the upland depressions have recently been protected, but most of the gabbro sites are highly threatened by development in the Charlotte area.
6. **Piedmont Monadnocks.** A cluster of monadnocks occurs on the southern edge of the Catawba River basin in Gaston, Catawba and Burke counties. Three of the most prominent monadnock clusters (remnant bodies of rock that are more resistant to erosion than the surrounding rocks) are Crowders and Kings Mountains, South Mountains and Bakers Mountain. In addition to their geologic significance, these monadnocks are significant natural areas for their biodiversity.

The South Mountains are a rugged landscape of narrow ridges, ravine-like valleys and steep slopes. The South Mountains support communities typical of the Blue Ridge but are extremely rare in the Piedmont. Over 11,000 acres of South Mountains are protected as a state park, and the recent acquisition of the adjacent Rollins Tract by the NC Wildlife Resources Commission adds another 17,000 acres to the protected area. Crowders Mountain and Kings Pinnacle are protected as the 3,000-acre Crowders Mountain State Park. Approximately 300 acres of Bakers Mountain are owned by Catawba County and are under consideration for protection as a park.

7. **Shortia/Heartleaf sites.** Northern oconee bells and dwarf-flowered heartleaf are two very rare plants that live in areas of moist, sandy, acidic soils found on slopes of several streams in Catawba, Burke, and McDowell counties. These species have been extirpated over most of their former ranges by the damming of streams and rivers. Other populations have been

endangered through land development or excessive logging of the steep ravines in which the plants grow.

2.8.4 Forestry in the Catawba River Basin

In Caldwell County, the Division of Forest Resources (DFR) manages approximately 300 acres at the Tuttle Educational State Forest, which help protect the headwaters of Husband Creek and Celia Creek. The forest, established in 1978, is managed as an outdoor classroom for school groups and the general public, as well as for sustainable forestry. Visitation averages 35,000 per year, including nearly 6,000 school children that are provided classes that focus on water quality protection and soil conservation practices. More information is available on the North Carolina Division of Forest Resources' website at <http://www.dfr.state.nc.us/>.

The 1,700-acre Mountain Island Educational State Forest is currently being established on the western shores of Mountain Island Lake along the Lincoln/Gaston county line. This forest helps protect a significant portion of the watershed around Mountain Island Lake, which is used as the primary drinking water supply for the greater Charlotte/Mecklenburg region. This forest focuses on the benefits and importance of using proper Best Management Practices ("BMPs") and shows how active sustainable forest management is compatible with water quality protection. While the forest is not yet open to the public, a virtual tour is available on their website at http://www.dfr.state.nc.us/esf/miesf/miesf_home.htm.

There is an estimated 171,000 acres of the Pisgah National Forest within the Catawba River basin, which amounts to one-third of the entire holdings of the Pisgah National Forest. More information about the National Forests and the USDA-Forest Service can be found on the website at <http://www.fs.fed.us/>.

Forest Resources

Nearly 75 percent of forestland in the Catawba River basin is owned by nonindustrial private landowners. Less than 5 percent of the forestland is owned by forest products companies, with the remaining 20 percent under public ownership. Most of the forestland in public ownership consists of the Pisgah National Forest (USDA-Forest Service, *North Carolina's Forests*, 1990, *Southeastern Forest Experiment Station Resource Bulletin SE-142*).

From the most recent data available, 25 different businesses in the basin are considered "Primary Processors" of forestry-related raw material, which represents less than 10 percent of the total number of primary processors (285) located in North Carolina. Some examples of a primary processor include a sawmill, veneer mill, chip mill, paper mill or pallet mill. The state, with general appropriations combined with tax revenue from forest product Primary Processors, provides cost share assistance to private landowners for approved forestation practices through the "Forest Development Program". Other state and federal cost share programs also are available to promote forestation work and forestland management. More information on these cost share programs is available at local DFR county offices and the DFR website at <http://www.dfr.state.nc.us/>. At least 11,500 acres of land were reported as having been established or regenerated in trees across the Catawba River basin during September 1997 through August 2002.

During this same time period, DFR provided private forest landowners in the Catawba River basin 1,655 individual forest management plans, encompassing 71,480 acres. In addition, 28 tracts of private forestland are certified Stewardship Forests, totaling over 3,700 acres. DFR's Urban and Community Forestry Program recognizes four municipalities in the Catawba River basin, including Charlotte and Gastonia, as a "Tree City USA".

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 exempted 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 11 .0101 - .0209, referred to as "FPGs") and General Statutes regarding stream obstruction (G.S. 77-13 and G.S. 77-14).

Additionally, the Environmental Management Commission enacted a temporary riparian buffer rule in 2001 (15A NCAC 2B .0243) that applies to the lakes and mainstem of the Catawba River. This riparian buffer rule goes into full effect in August 2004 and creates certain restrictions regarding timber removal and forestry activities in the buffer zone. Refer to Section A, Chapter 4, Part 4.11.3 for further discussion.

The North Carolina Division of Forest Resources (DFR) is delegated the authority to monitor and evaluate forestry operations for compliance with these aforementioned laws and/or rules. In addition, the DFR works to resolve identified FPG and basin buffer rule compliance questions brought to its attention through citizen complaints. Violations of the FPG performance standards that cannot be resolved by the DFR are referred to the Division of Land Resources for enforcement action; violations of Catawba River temporary buffer rules are referred to DWQ for enforcement. More information is available on the Water Quality Section of the DFR's website at <http://www.dfr.state.nc.us/>.

During the period September 1997 through August 2002, DFR conducted 1,186 FPG inspections of forestry-related activities in the Catawba River basin; 92 percent of the sites inspected were in compliance.

There are three Water Quality Foresters that cover the Catawba River basin. The DFR currently has a Water Quality Forester located in seven of the DFR's 13 Districts across the state. Service Foresters and county personnel along with their other forest management and fire control responsibilities handle water quality issues in the remaining districts. 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.

Forestry Best Management Practices

Implementing Forestry Best Management Practices ("BMPs") is encouraged by DFR in order to efficiently and effectively 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 and help protect water quality. This document is available for viewing on the Water Quality Section of the DFR's website.

Among the BMPs promoted for timber harvesting is the use of bridge mats for establishing temporary stream crossings. Bridge mats are available for temporary use across the entire Catawba River basin. The DFR's Bridge Mat 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 bridge mat purchases for the DFR's program are funded by grant awards from the USEPA's Nonpoint Source Pollution Management Program under Section 319(h) of the Clean Water Act {1987}. More information is available on the Water Quality Section of the DFR's website at <http://www.dfr.state.nc.us/>.

The NCDFR frequently hosts workshops and 'in-woods' field tours for loggers, landowners and other forestry professionals to provide refresher training on proper BMP implementation and the importance of protecting water quality during forestry activities.