

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-4). The basin is the eighth largest river basin in the state and is located in the south central portion of western North Carolina (Figure A-5).

Catawba River Basin Statistics

Total Area: 3,285 sq. miles
Stream Miles: 3,005
No. of Counties: 12
No. of Subbasins: 9
Population (1990): 1,033,347*
Estimated Pop. (2015): 1,200,778*
% Increase (1990-2015): 39%
Pop. Density (1990): 321 persons/sq. mi.

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

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. 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 flows through the Pisgah National Forest Wilderness area and into Lake James.

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 sedimentation 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 metropolitan area surrounding Charlotte. In this region, urban growth has affected the water quality of the lakes, streams and rivers.

The mainstem of the Catawba River is regulated by a series of seven hydroelectric dams. The reservoirs formed by these dams are commonly referred to as the Catawba chain lakes. All are owned by Duke Energy 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.

There are 3,005 miles of named and classified streams in the Catawba River basin in North Carolina and over 60,000 acres of impoundments. The basin is subdivided into nine subbasins represented in Figure A-5 by six digit subbasin codes (03-08-30 through 03-08-38).

The population of the basin, based on 1990 census data, was estimated at 1,033,347. The overall population density of the basin is 321 persons per square mile versus a statewide average of 127 persons per square mile. The percent population growth over the past ten years (1980 to 1990) was 16.5% versus a statewide percentage increase of 12.7%.

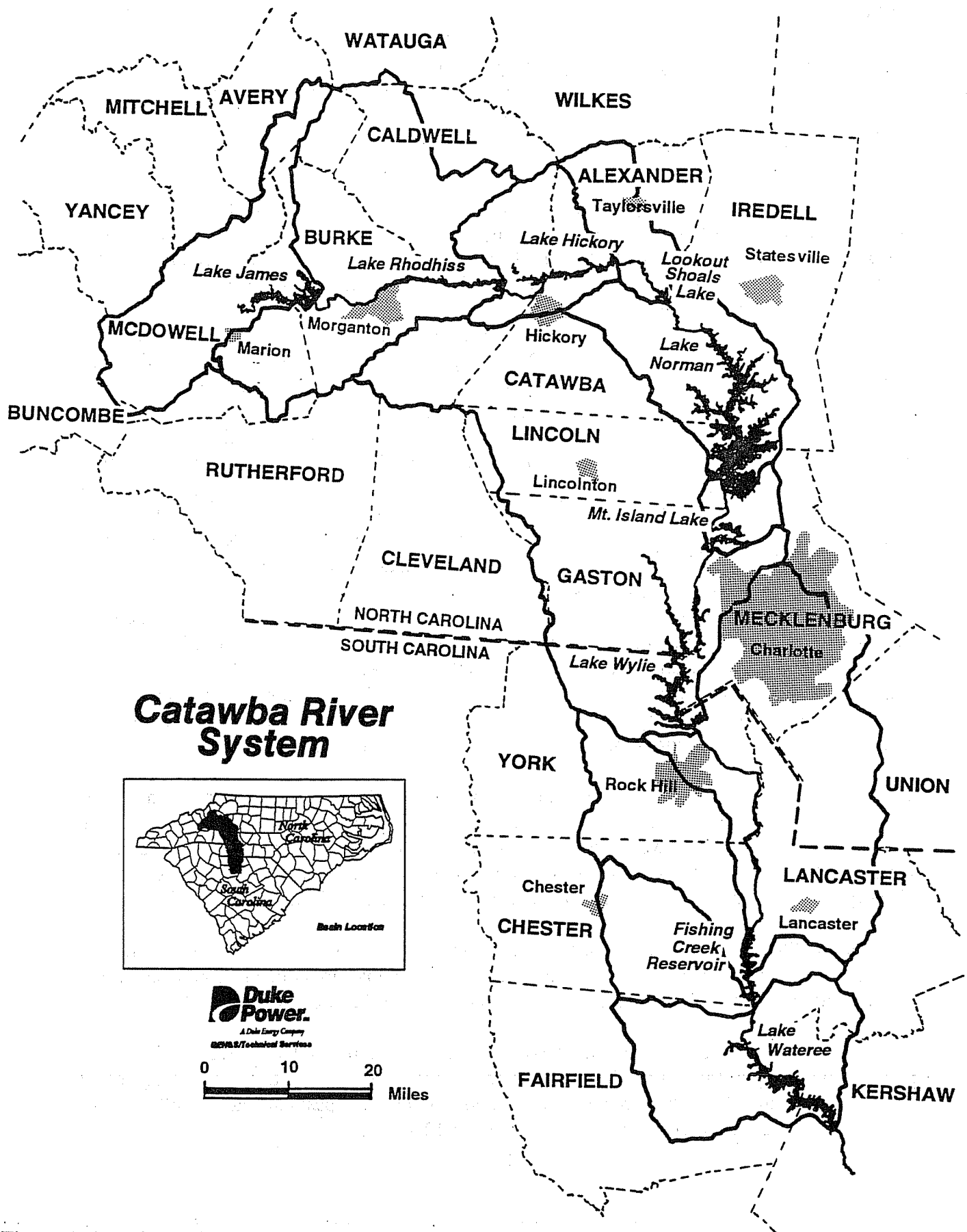


Figure A-4 General Map of the Entire Catawba River Basin

General Map of the Catawba River Basin

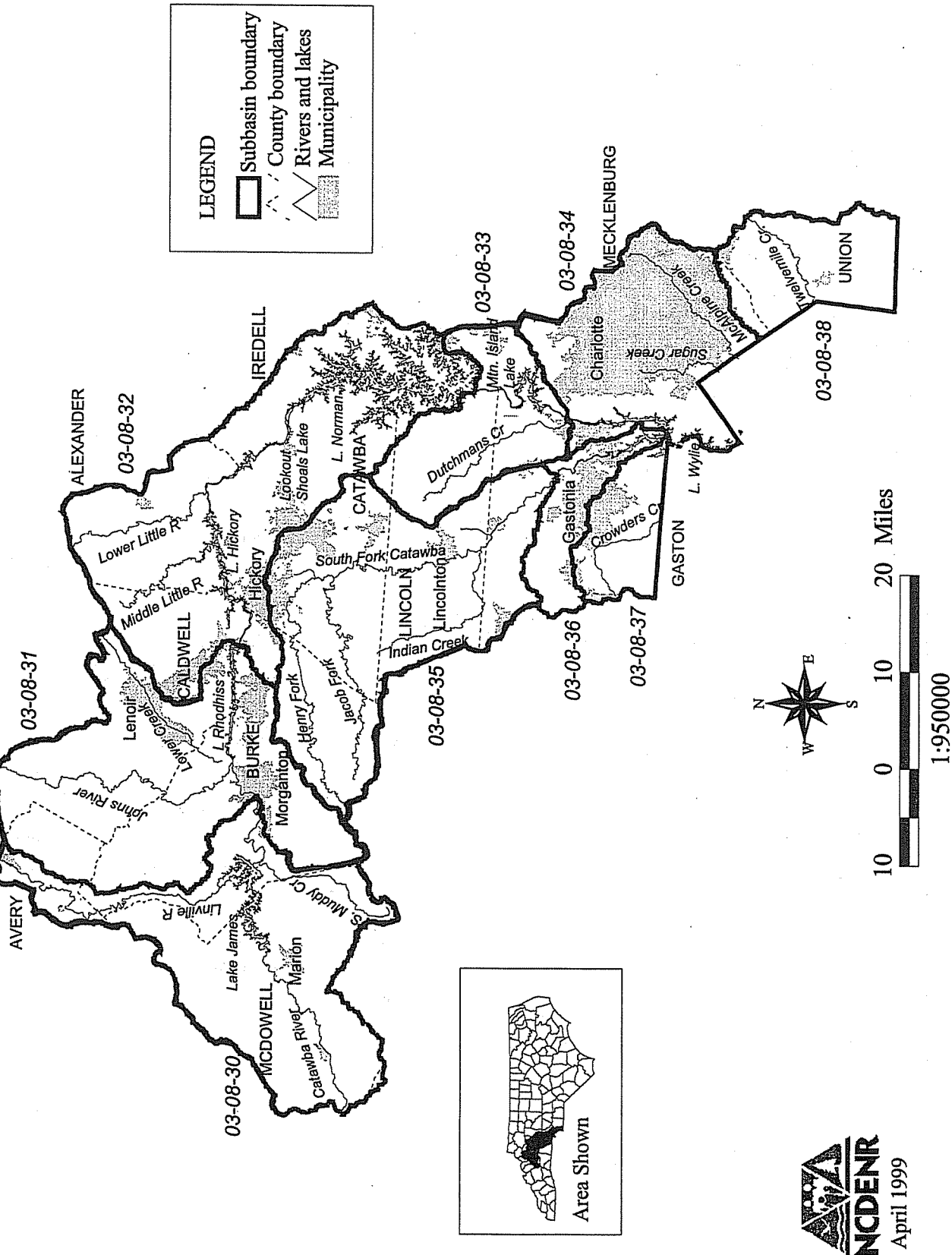


Figure A-5 General Map of the Catawba River Basin in North Carolina

2.2 Local Governments and Planning Jurisdictions in the Basin

The Catawba River basin encompasses all or portions of twelve counties and fifty-eight 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 Catawba River Basin

County	% of County in basin**	Region	Municipalities
Alexander	68	Western Piedmont Council of Governments	Taylorsville
Avery	35	Region D Council of Governments	Crossnore, Grandfather Village
Burke	100	Western Piedmont Council of Governments	Connelly Springs, Drexel, Glen Alpine, Hickory ***, Hildebran, Long View ***, Morganton, Rhodhiss ***, Rutherford College, Valdese
Caldwell	75	Western Piedmont Council of Governments	Blowing Rock ***, Cajah's Mountain, Gamewell, Granite Falls, Hickory ***, Hudson, Lenoir, Rhodhiss ***, Sawmills, Cedar Rock
Catawba	100	Western Piedmont Council of Governments	Brookford, Catawba, Claremont, Conover, Hickory ***, Long View ***, Maiden ***, Newton
Gaston	97	Centralina Council of Governments	Belmont, Bessemer City *, Cherryville, Cramerton, Dallas, Dellview, Gastonia *, High Shoals ***, Kings Mountain ***, Lowell, McAdenville, Mount Holly, Ranlo, Spencer Mountain, Stanley
Iredell	22	Centralina Council of Governments	Davidson ***, Mooresville, Troutman
Lincoln	93	Centralina Council of Governments	High Shoals ***, Lincolnton, Maiden ***
McDowell	86	Isothermal Planning and Development Commission	Marion Old Fort
Mecklenburg	74	Centralina Council of Governments	Charlotte *, Cornelius, Davidson ***, Huntersville, Matthews, Mint Hill, Pineville
Union	25	Centralina Council of Governments	Indian Trail, Marvin, Stallings, Waxhaw, Weddington
Watauga	1	Region D Council of Governments	Blowing Rock ***

Key:

* Located in more than one major river basin.

** Estimated by Center for Geographic Information and Analysis.

*** Located in more than one county.

2.3 Surface Water Hydrology

Most federal government agencies, including the US Geological Survey 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 Catawba River basin is made up of three hydrologic areas referred to as hydrologic units. Each hydrologic unit is defined by an 8-digit number. By contrast, DWQ has a two-tiered system in which the state is subdivided into 17 river basins with each basin further subdivided into subbasins. The Catawba River basin is subdivided by DWQ into nine subbasins. Table A-4 compares the two systems. Maps of each subbasin are included in Section B of this basinwide plan.

Table A-4 Hydrologic Subdivisions in the Catawba River Basin

Watershed Name and Major Tributaries	USGS 8-digit Hydrologic Units	DWQ Subbasin 6-digit Codes (Fig A-2)
<i>Upper Catawba</i> Catawba River headwaters, Linville River, North Muddy Creek	03050101	03-08-30
<i>Upper Catawba</i> Warrior Fork, Johns River, Silver Creek, Lower Creek	03050101	03-08-31
<i>Upper Catawba</i> Little Rivers, Gunpowder Creek, Muddy Fork	03050101	03-08-32
<i>Upper Catawba</i> Dutchmans Creek	03050101	03-08-33
<i>Upper Catawba and Lower Catawba</i> Irwin Creek, McAlpine Creek, Sugar Creek	03050101 03050103	03-08-34
<i>South Fork Catawba</i> Henry Fork, Jacob Fork, Clark Creek	03050102	03-08-35
<i>South Fork Catawba</i> Long Creek	03050102	03-08-36
<i>Upper Catawba</i> Crowders Creek	03050101	03-08-37
<i>Lower Catawba</i> Twelvemile Creek, Sixmile Creek, Waxhaw Branch	03050103	03-08-38

2.4 Land Cover

Land cover information in this section is from the National Resources Inventory (NRI) of 1992 and 1982, as developed by the Natural Resources Conservation Service (USDA, 1994). The NRI is a multi-resource national inventory based on soils and other resource data collected at scientifically selected random sample sites. It is considered accurate to the 8-digit hydrologic unit scale established by the US Geological Survey.

Table A-5 summarizes acreage and percentage of land cover from the 1992 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.

Forestlands (both private and federal forests) cover approximately 45% of the basin. Agriculture (including cultivated and uncultivated cropland and pastureland) covers approximately 16% of the land area. The urban and built-up category comprises roughly 23% and exhibited the most dramatic change since 1982 (35% increase). Agriculture related land cover decreased by a total of 31% in the basin. It is likely that some of this land was converted to urban and built-up areas. These land cover changes are presented in Figure A-6.

Table A-5 Estimated Land Use Acreage for the Catawba River Basin - 1982 vs. 1992
(Source: Natural Resources Inventory, 1992)

LAND COVER	MAJOR WATERSHED AREAS *						1992 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	50.9	3.6	38.1	8.5	31.6	13.9	120.6	5.8	193.6	9.3	-37.7
Uncult. Crop	48.3	3.4	12.8	2.8	2.3	1.0	63.4	3.0	56.5	2.7	12.2
Pasture	82.7	5.9	56.6	12.6	13.7	6.0	153	7.4	160.5	7.7	-4.7
Federal	126.2	9.0	48.7	10.8	0	0.0	174.9	8.4	173.3	8.3	0.9
Forest	693.9	49.4	177.4	39.4	59.6	26.3	930.9	44.7	986.4	47.4	-5.6
Urban & built-up	281.3	20.0	78.7	17.5	114.1	50.3	474.1	22.8	351.0	16.9	35.1
Other	120.6	8.6	38	8.4	5.7	2.5	164.3	7.9	159.9	7.7	2.8
Totals	1403.9	100.0	450.3	100.0	227	100.0	2081.2	100.0	2081.2	100.0	
% of Total Basin		67.5		21.6		10.9		100.0			
Subbasin Numbers	030830 030832 030834	030831 030833 030837	030835	030836	030834	030838					
8-Digit Hydraulic Units	03050101		03050102		03050103						
* = Watershed areas as defined by the 8-Digit Hydraulic Units do not necessarily coincide with subbasin titles used by DWQ.											

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

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, aquaculture in crop rotation, 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>

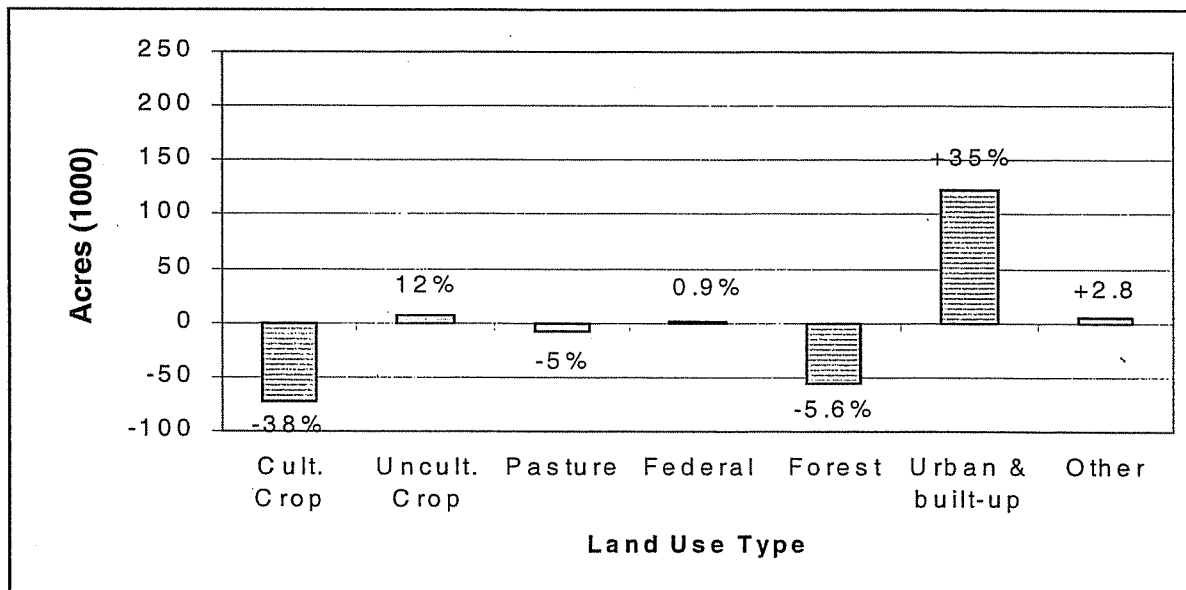


Figure A-6 Land Cover Changes from 1982 to 1992 for the Catawba River Basin
(Source: USDA-NRCS 1992 NRI)

The most recent land cover information for the Catawba River basin is based on satellite imagery collected from the North Carolina Corporate Geographic Database. The state's Center for Geographic Information and Analysis (CGIA) developed statewide land cover information based on this 1993-1995 satellite imagery. This land cover data is divided into 24 categories. 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-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.

Unfortunately, due to differences in the system of categorizing various land cover classes, it is not 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.

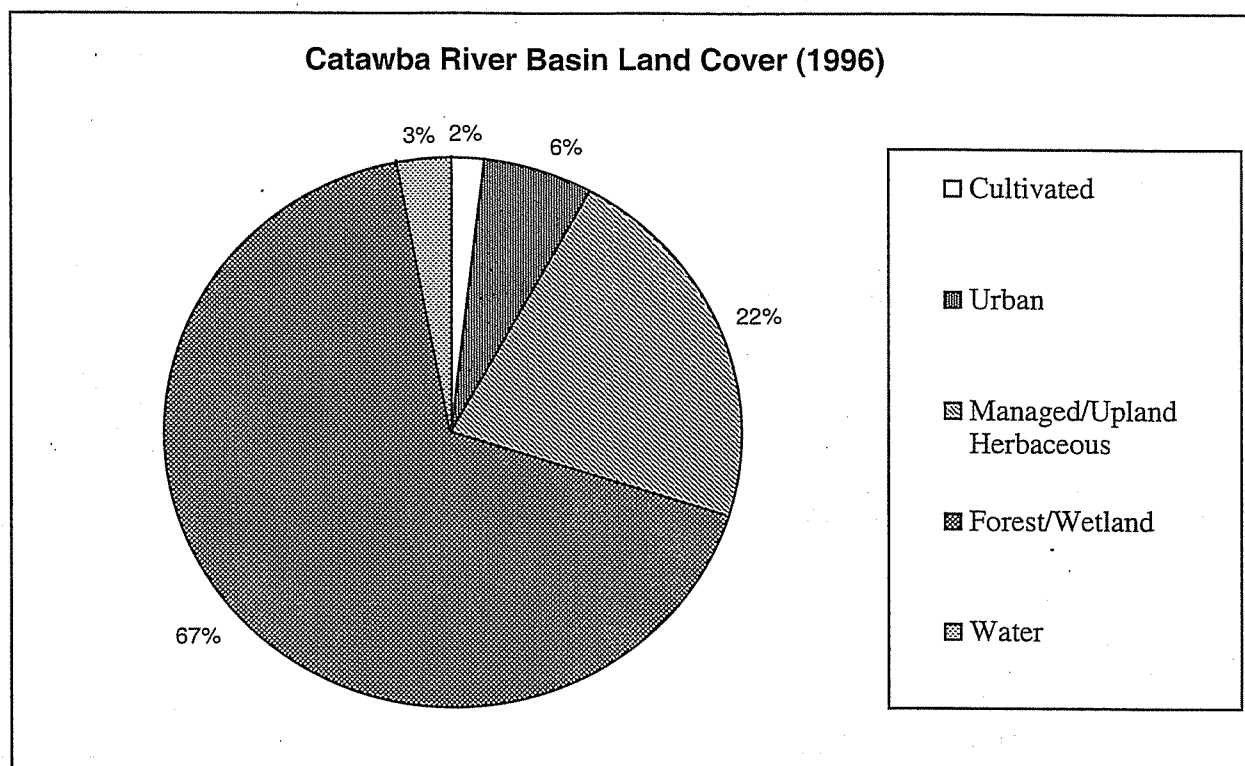


Figure A-7 Percentages within Major Land Cover Categories in the Catawba River Basin

2.5 Population and Growth Trends

Population

Based on 1990 census data, approximately 1,033,347 people live in the basin. Table A-8 presents census data for 1970, 1980 and 1990, the percent population change and population density (persons per square mile) within each subbasin. It also includes land and water area by subbasin. The subbasins containing Mecklenburg County and Gaston County have the greatest population and density.

Figure A-8 shows 1990 population densities by census block group for the Catawba River basin. The overall population density was 312 persons per square mile versus a statewide average of 123 persons per square mile. Subbasin population densities, as of 1990, are highest in the lower portion of the basin.

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. This is done by simply estimating the percentage of the census block

group area located in the subbasin, and then taking that same percentage of the total census block group population and assigning it the subbasin. This method assumes that population density is evenly distributed throughout a census block group, which 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.

Table A-8 Catawba River Subbasin Population (1970, 1980 and 1990), Percent Population Change and Land Area Summaries

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)
03-08-30	36,369	42,671	42,702	70	82	82	336,659	526	10	516
03-08-31	77,096	88,648	92,541	133	153	160	372,006	581	3	578
03-08-32	101,842	126,998	151,979	157	196	234	451,872	706	59	647
03-08-33	30,127	39,067	47,301	139	180	218	141,101	220	4	216
03-08-34	281,144	348,562	435,725	885	1,098	1,372	207,501	324	7	317
03-08-35	87,074	101,427	110,523	155	181	197	357,843	559	1	558
03-08-36	52,676	59,851	61,697	520	591	609	66,438	104	3	101
03-08-37	62,379	59,586	64,977	594	567	618	67,872	106	1	105
03-08-38	10,714	20,121	25,902	60	112	145	114,669	179	1	178
TOTALS	739,421	886,931	1,033,347	230	276	321	2,115,961	3,305	89	3,216

Growth Trends

Figure A-9 presents population growth by subbasin for the entire Catawba River basin. The percent population growth over the last ten-year census period (1980-1990) was 16.5 percent, as compared to the statewide average of 12.7 percent.

Table A-9 presents population data for municipalities, with populations greater than 2,000 persons, located wholly or partly within the basin. Table A-10 shows the projected percent change in growth between 1990 and 2015 for counties within the basin (Office of State Planning, 1996). Since river basin boundaries do not coincide with county boundaries, these numbers are not directly applicable to the Catawba River basin. They are instead presented as an estimate of possible countywide population changes. With the exception of Avery, Caldwell, Cleveland and Gaston counties, all counties within the basin are expected to experience significant growth by 2015.

1990 Population Density by Census Block Group

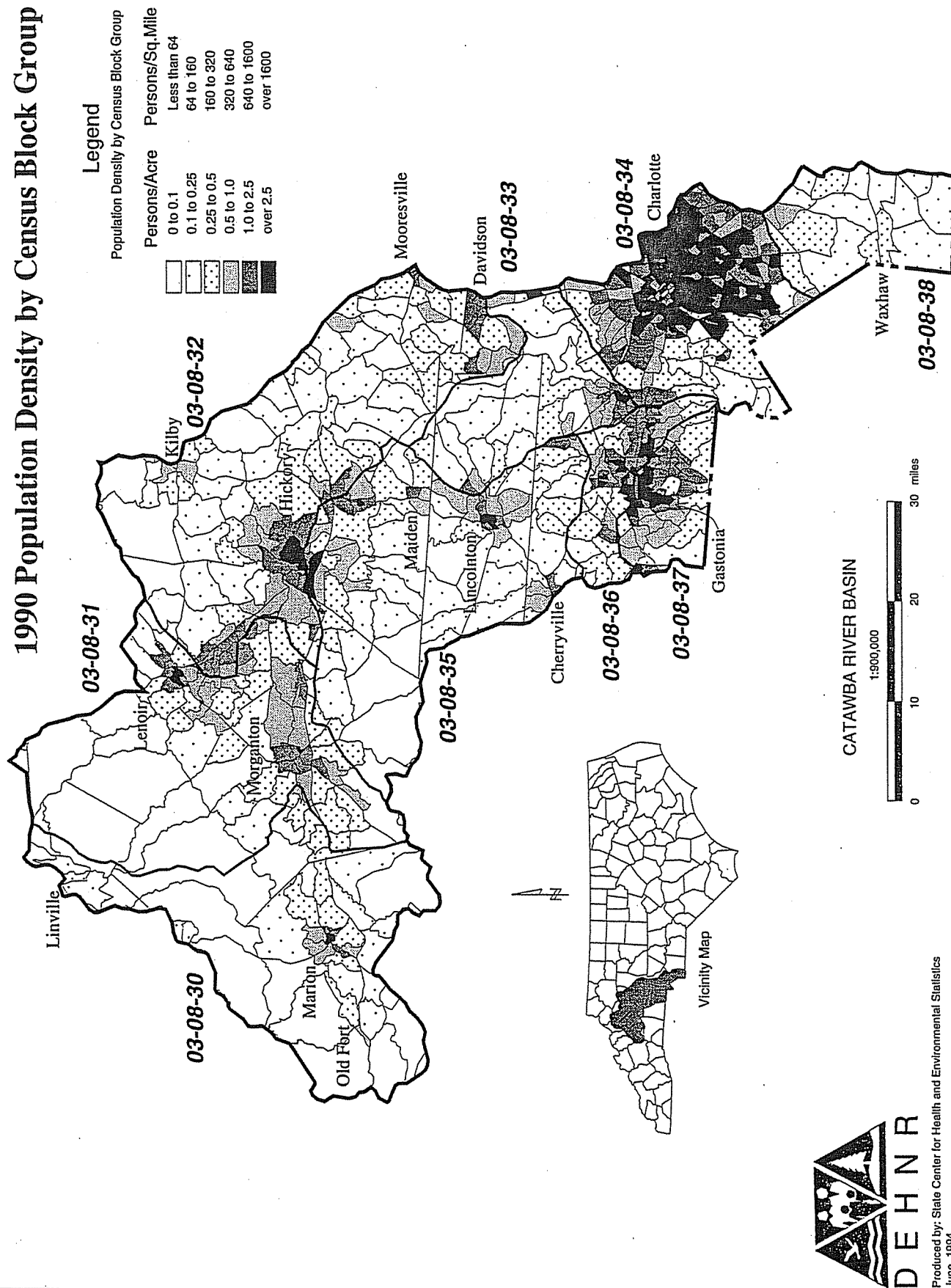
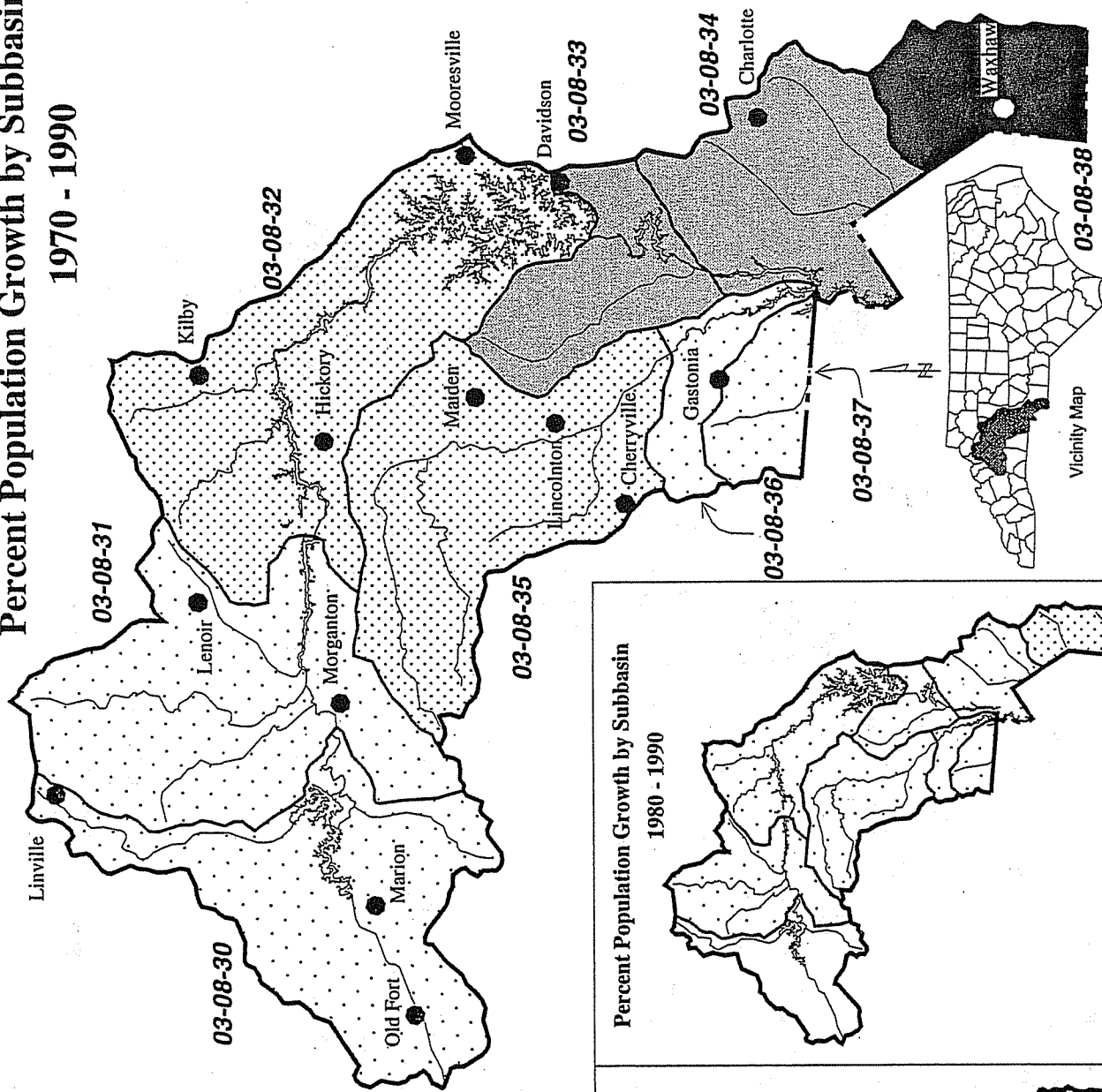
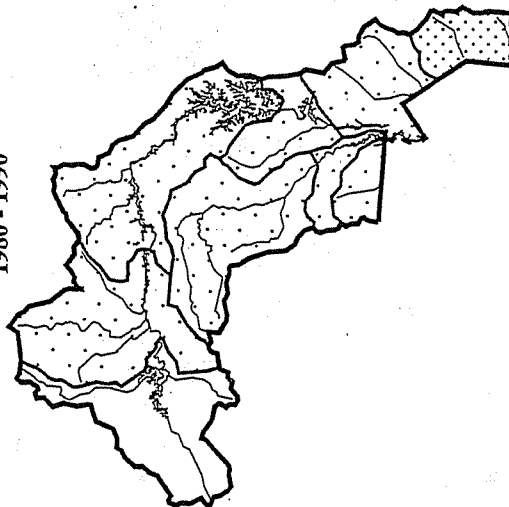


Figure A-8 1990 Population Density by Census Block Group

Percent Population Growth by Subbasin 1970 - 1990



Percent Population Growth by Subbasin 1980 - 1990



Percent Population Growth by Subbasin 1970 - 1980

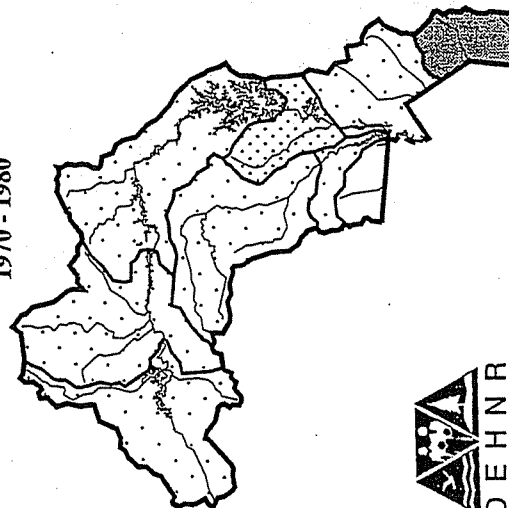


Figure A-9 Population Growth by Subbasin (1970 to 1990)

Table A-9 Population and Percent Change (1980, 1990, 1996) for Municipalities Greater Than 2,000 Located Wholly or Partly in the Catawba River Basin
(Source: North Carolina Municipal Population 1996 and 1997)

Municipality	County	Apr-80	Apr-90	Jul-96	Percent Change (1980-90)	Percent Change (1990-96)
Belmont	Gaston	4,607	8,434	8,072	83.1	-4.3
Bessemer City	Gaston	4,787	4,698	4,957	-1.9	5.5
Cajah's Mountain	Caldwell	1,884	2,429	2,717	28.9	11.9
Charlotte •	Mecklenburg	315,474	395,934	469,741	25.5	18.6
Cherryville	Gaston	4,844	4,756	5,474	-1.8	15.1
Conover	Catawba	4,245	5,465	6,408	28.7	17.3
Cornelius •	Mecklenburg	1,460	2,581	8,198	76.8	217.6
Cramerton	Gaston	1,869	2,371	2,477	26.9	4.5
Dallas	Gaston	3,340	3,012	2,959	-9.8	-1.8
Davidson •	Mecklenburg	3,241	4,046	5,127	24.8	26.7
Gamewell	Caldwell	2,910	3,357	3,601	15.4	7.3
Gastonia	Gaston	47,218	54,725	61,898	15.9	13.1
Granite Falls	Caldwell	2,580	3,253	3,634	26.1	11.7
Hickory	Catawba	20,684	28,395	32,632	37.3	14.9
Hudson	Caldwell	2,888	2,819	3,158	-2.4	12.0
Huntersville •	Mecklenburg	1,294	3,023	11,777	133.6	289.6
Indian Trail	Union	811	1,942	6,399	139.5	229.5
Kings Mountain •	Cleveland	8,430	8,007	8,230	-5.0	2.8
Lenoir	Caldwell	13,748	14,192	15,797	3.2	11.3
Lincolnton	Lincoln	4,879	6,955	10,203	42.5	46.7
Long View •	Catawba	3,277	2,995	3,902	-8.6	30.3
Lowell	Gaston	2,917	2,710	2,595	-7.1	-4.2
Maiden	Catawba	2,574	2,470	3,033	-4.0	22.8
Marion	McDowell	3,684	4,765	4,972	29.3	4.3
Matthews •	Mecklenburg	1,648	13,651	18,144	728.3	32.9
Mint Hill •	Mecklenburg	7,915	11,615	15,821	46.7	36.2
Mooreville •	Iredell	8,575	9,317	13,500	8.7	44.9
Morganton	Burke	13,763	15,085	16,129	9.6	6.9
Mount Holly	Gaston	4,530	7,710	8,159	70.2	5.8
Newton	Catawba	7,624	9,077	11,731	19.1	29.2
Pineville	Mecklenburg	1,525	2,970	3,312	94.8	11.5
Ranlo	Gaston	1,774	1,650	2,113	-7.0	28.1
Sawmills	Caldwell	3,706	4,088	4,933	10.3	20.7
Stallings	Union	1,826	2,152	2,489	17.9	15.7
Stanley	Gaston	2,341	2,897	3,203	23.8	10.6
Taylorsville	Alexander	1,103	1,566	2,275	42.0	45.3
Valdese	Burke	3,364	3,914	4,167	16.3	6.5
Weddington	Union	848	3,803	5,403	348.5	42.1

• - 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 and Projected Population and Percent Change (1990 to 2015) by County
(Source: Office of State Planning 1996)

County	1990	2015	% Change
Alexander	27,544	36,992	34.3
Avery	14,867	15,335	3.1
Burke	75,740	93,827	23.9
Caldwell	70,709	78,975	11.7
Catawba	118,412	150,077	26.7
Gaston	175,093	187,398	7.0
Iredell	92,935	134,324	44.5
Lincoln	50,319	72,971	45.0
McDowell	35,681	39,374	10.4
Mecklenburg	511,481	818,704	60.1
Union	84,210	143,360	70.2
Watauga *	36,952	46,532	25.9
Subtotal	1,295,933	1,819,884	40.4

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

2.6 Natural Resources

2.6.1 Major 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 chain lakes (Figure A-10). The water quality of each impoundment is influenced by the discharge from the upstream reservoir, as well as inputs from the surrounding watershed and discharges to the lakes. The most upstream impoundment, Lake James, has the best water quality of all of the lakes in the Catawba chain.

The next three impoundments are Rhodhiss Lake, Lake Hickory and Lookout Shoals Lake. Enriched conditions found at some of these reservoirs may be 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 generally keep algae from reaching higher levels (NC Department of Environment, Health and Natural Resources, 1992).

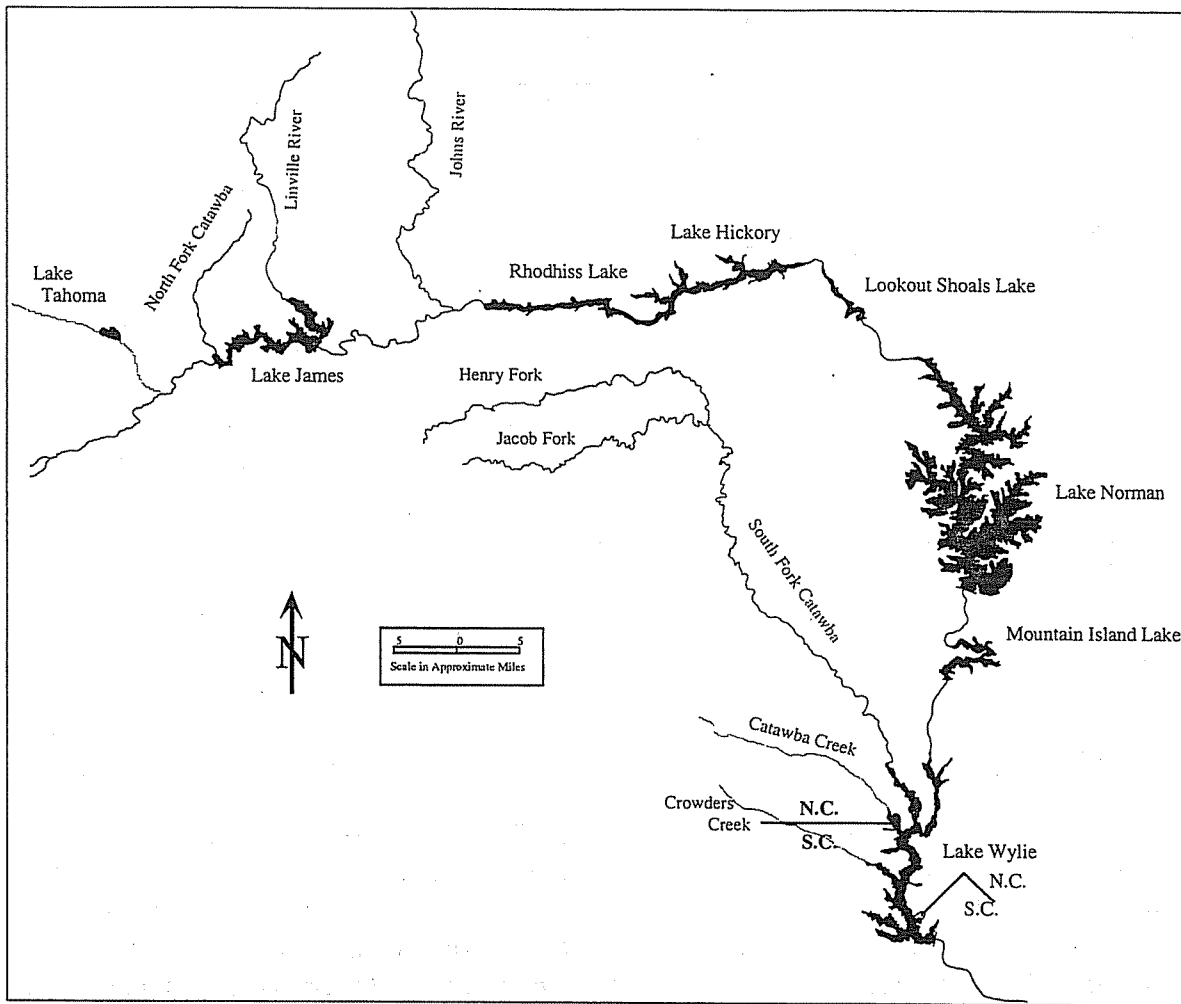


Figure A-10 Catawba River Chain Lakes

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 chain lakes 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 1967. 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-11).

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

Table A-11 Statistics on Major Lakes in the Catawba River Basin

<u>Lake</u>	<u>Surface Area (Acres)</u>	<u>Mean Depth (Feet)</u>	<u>Shore Length (Miles)</u>	<u>Retention Time (Days)</u>	<u>Trophic Level</u>	<u>Watershed Area (Sq. Mi.)</u>	<u>Major Uses</u>
Catawba 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	Eutrotrophic	3,020	Hydro, Rec
Other Major Lakes (Not on Catawba River)							
Lake Tahoma	161				Oligotrophic		Rec (was Hydro)
Little River Dam	162				Eutrotrophic	25	Rec (was Hydro)
Maiden Lake	14				Eutrotrophic	20	WS
Bessemer City	15				Mesotrophic	0.4	WS
Newton City Lake	17				Oligotrophic		WS

The five other lakes in the Catawba basin included in Table A-11 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.

2.6.2 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. In Mecklenburg County, for instance, areas of gabbro (a coarse grained mafic rock) are responsible for shaping very flat topography, which in turn supports rare community types, such as Xeric Hardpan Forests and Upland Depression Swamp Forests. Other important upland geologic features of the Catawba River basin that influence biodiversity are the low mountain areas of South Mountains and Kings/Crowders Mountain and the slopes and cliffs of Linville Gorge, Linville Caverns and Wilson Creek (NC Division of Parks and Recreation, 1998).

The Catawba River basin supports several nationally significant aquatic habitat communities, notable for their rare mollusk, fish and insect populations (see Part 2.6.5). 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.

Compared with other river basins of the state, there has not been significant detailed investigation into the biodiversity of the Catawba River basin. Of the eleven counties represented in the basin, only Mecklenburg and Iredell counties have been systematically inventoried, and Gaston is in progress. Detailed biological inventories of the remaining counties in the Catawba River basin would greatly increase knowledge of significant natural areas remaining in the region.

2.6.3 Public Lands in the Catawba River Basin

There are four state parks within the Catawba River basin: Crowders Mountain State Park, South Mountains State Park, Lake James State Park and Duke Power State Park. Over 17,700 acres of natural area are protected by these parks. Additional acreage is protected in the Broughton Hospital Watershed and the NC School for the Deaf Watershed by the NC Department of Agriculture and the NC Department of Human Resources, respectively. A large area of land in the western end of the Catawba River basin is in the Pisgah National Forest. In addition, there are several ongoing projects to protect streamside buffers and important aquatic and wetland habitats that have been funded by the NC Clean Water Management Trust Fund, including a river/riparian planning project for South Fork Creek watershed being conducted by the Catawba Lands Conservancy.

2.6.4 Significant Natural Heritage Areas

Figure A-11 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 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.

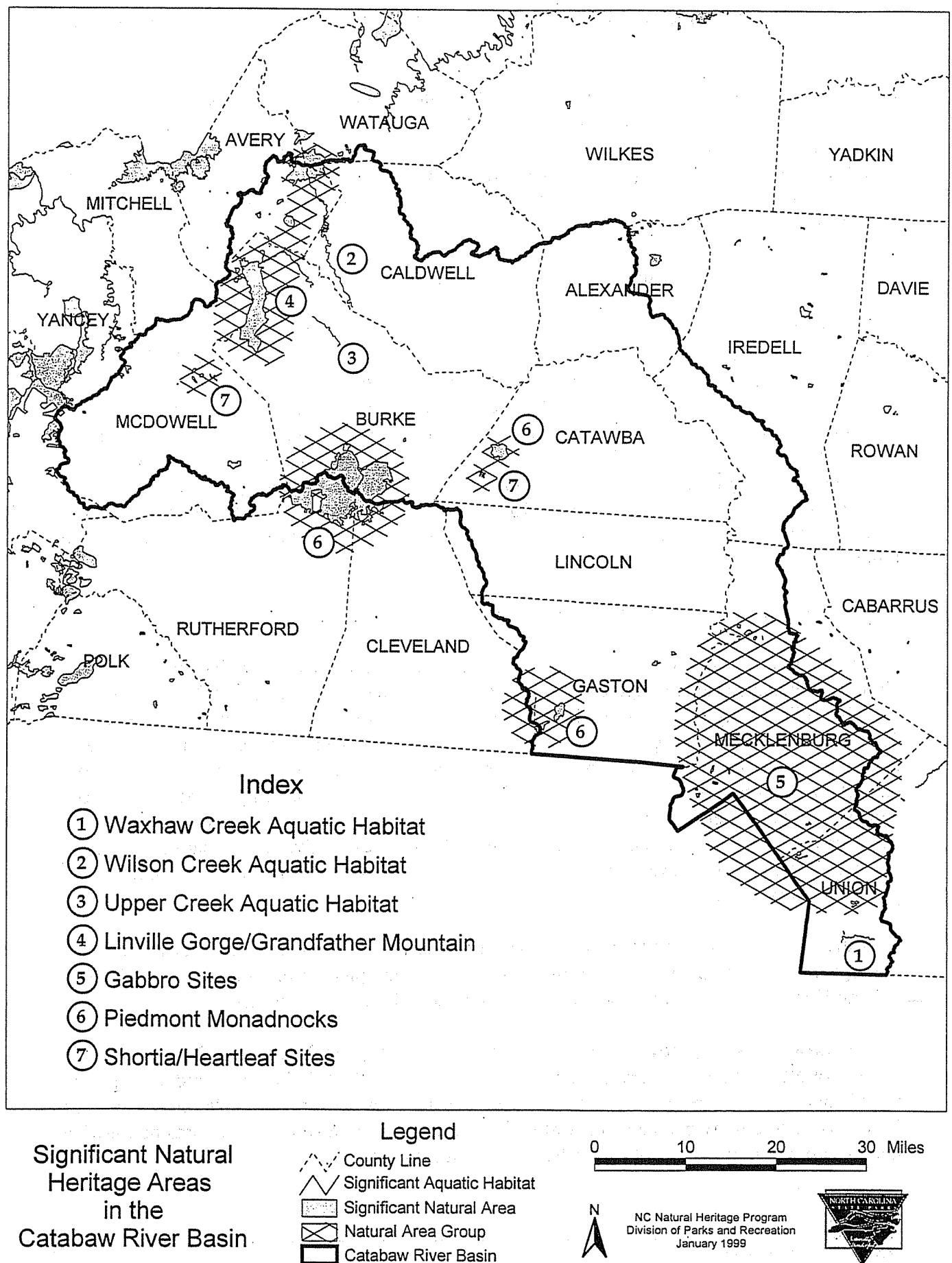


Figure A-11 Significant Natural Heritage Areas of the Catabaw River Basin

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.

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 2000-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 3000-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 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.

2.6.5 Rare Aquatic and Wetland-Dwelling Animal Species

The following information on rare aquatic and wetland-dwelling species (Table A-12) was obtained from the NC Natural Heritage Program, Division of Parks and Recreation (April 1998).

Table A-12 Rare and Aquatic Animals in the Catawba River Basin

Major Taxon	Common Name	Scientific Name	State Status	Federal Status
fish	Highfin carpsucker	<i>Carpionodes velifer</i>	SC	
fish	Santee chub - piedmont population	<i>Cyprinella zanema pop 1</i>	SR	
fish	Carolina darter	<i>Etheostoma collis</i>	SC	
fish	Redeye bass	<i>Micropterus coosae</i>	SR	
mollusk	Brook floater	<i>Alasmidonta varicosa</i>	T	FSC
mollusk	Carolina heelsplitter	<i>Lasmigona decorata</i>	E	E
mollusk	Seep mudalia	<i>Leptoxis dilatata</i>	T	
mollusk	Notched rainbow	<i>Villosa constricta</i>	SR	
mollusk	Eastern creekshell	<i>Villosa delumbis</i>	SR	
mollusk	Carolina creekshell	<i>Villosa vaughaniana</i>	SC	
crustacean	Bennett's mill cave water slater	<i>Caecidotea carolinensis</i>	SR	FSC
crustacean	French broad crayfish	<i>Cambarus reburus</i>	SR	FSC
crustacean	Catawba crayfish ostracod	<i>Dactylocythere isabelae</i>	SR	FSC
dragonfly	Edmund's snaketail	<i>Ophiogomphus edmunds</i>	SR	FSC
dragonfly	Pygmy snaketail	<i>Ophiogomphus howei</i>	SR	FSC
Rare Wetland-Dwelling Animals in the Catawba River Basin				
amphibian	Bog turtle	<i>Clemmys muhlenbergii</i>	T	T(S/A)
mammal	Star-nosed mole - coastal plain population	<i>Condylura cristata pop 1</i>	SC	
mammal	Southern water shrew	<i>Sorex palustris punctulatus</i>	SC	FSC

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)
FSC = Federal Species of Concern (formerly considered Category 2 candidates for listing)
SR = Significantly Rare (those whose numbers are small and whose populations need monitoring)

2.7 Permitted Wastewater and Stormwater Discharge Facilities

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

The primary pollutants associated with point source discharges are:

- * oxygen-consuming wastes,
- * nutrients,
- * color, and
- * toxic substances including chlorine, ammonia and metals.

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 Catawba River Basin

Types of Wastewater Discharges:

Major Facilities: Municipal Wastewater Treatment Plants with flows ≥ 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.

There are 234 permitted wastewater discharges in the Catawba River basin. Table A-13 provides summary information (numbers of facilities and permitted flows) regarding the discharges by type and subbasin. The various types of dischargers characterized in the table are described in the inset box. A summary of all dischargers can be found in Appendix I.

Figure A-12 shows the location of major and minor permitted wastewater discharges within the basin. The number of triangles on the map depicting major discharges do not correspond exactly to the number of major facilities listed in Table A-13, since some major facilities have more than one outfall point. Each outfall point received its own triangle.

Table A-13 Summary of NPDES Dischargers and Permitted Flows for the Catawba River Basin

	Subbasin									
Facility Categories	30	31	32	33	34	35	36	37	38	TOTAL
Total Facilities	30	15	55	14	50	28	18	21	3	234
Total Permitted Flow (MGD)	10.24	19.69	15.28	8.00	103.20	22.12	18.90	18.46	0.26	216.15
Major Discharges	3	4	6	4	6	6	5	4	0	38
Total Permitted Flow (MGD)	6.2	19.58	10.53	7.0	101.9	21.0	15.9	17.11	0	199.22
Minor Discharges	27	11	49	10	44	22	13	17	3	196
Total Permitted Flow (MGD)	4.04	0.11	4.75	1.00	1.30	1.12	3.00	1.35	0.26	16.93
100% Domestic Waste	21	8	38	5	15	14	8	6	3	118
Total Permitted Flow (MGD)	1.08	0.10	4.91	0.80	48.54	5.88	4.22	0.07	0.26	65.86
Municipal Facilities	4	4	12	3	4	12	7	3	0	49
Total Permitted Flow (MGD)	4.12	19.58	12.72	7.75	88.0	20.83	12.13	16.5	0	181.63
Nonmunicipal Facilities	26	11	43	11	46	16	11	18	3	185
Total Permitted Flow (MGD)	6.12	0.11	2.56	0.25	15.20	1.28	6.77	1.96	0.26	34.51
Industrial Facilities	3	2	4	1	3	2	0	1	0	16
Total Permitted Flow (MGD)	0.03	0.01	0.04	0.01	0.01	0.013	0	0.14	0	0.253

2.7.2 Stormwater Discharges in the Catawba River Basin

The goal of the DWQ stormwater discharge permitting regulations is to prevent stormwater runoff pollution by controlling the source(s) of pollutants. Phase I amendments to the Clean Water Act pertaining to permit requirements for stormwater discharges associated with industrial activities and municipal storm sewer systems (with population greater than 100,000) became effective in December 1990.

The municipal permitting requirements are designed to lead to the formation of site-specific stormwater management programs for a municipal area. Municipalities covered by these regulations are called Municipal Separate Storm Sewer Systems (MS4s). Only the City of Charlotte was required to have an NPDES stormwater permit under Phase I.

Industrial activities that require permitting are defined in eleven categories in the federal regulations ranging from sawmills and landfills to phosphate manufacturing plants and hazardous waste treatment, storage or disposal facilities. Permits are granted in the form of general

stormwater permits (which covers a wide variety of activities) or individual stormwater permits. Excluding construction general permits, there are 652 general stormwater permits and 38 individual stormwater permits issued within the 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. In addition, 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 or activities identified as having significant potential to impact water quality are also required to perform analytical monitoring to characterize the pollutants in their stormwater discharges under individual NPDES stormwater permits.

On October 29, 1999, Phase II of the NPDES stormwater program became law. Phase II lowers the construction activity threshold to one or more acres of land disturbance and allows a permitting exemption for industrial facilities that do not have significant materials or activities exposed to stormwater. Phase II will include smaller local governments into the NPDES stormwater program. Phase II MS4 permit applications must be submitted to DWQ by March 1, 2003.

2.8 Agriculture

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 April 1998. 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-13 shows the general location of the registered operations in the basin.

Steady State Live Weight (SSLW) is a measure in pounds, after a conversion factor is applied to the number of animals on a farm. The conversion factors vary depending on the type of animals and the operation. The SSLW is the best way to compare farm sizes.

Information on animal capacity by subbasin (Table A-15) was provided by the NC Department of Agriculture.

Key Livestock Operation Legislation

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.

1996 - Senate Bill 1217 required any operator of a dry litter animal waste management system involving 30,000 or more birds to develop an animal waste management plan by January 1998. The plan must consist of 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.

LEGEND

Animal Operations
 ☒ Cattle
 ▲ Swine
 ▢ Subbasin boundary
 --- County Boundary
 / Rivers and Lakes
 ▨ Municipality



Figure A-13 Registered Animal Operations in the Catawba River Basin

Table A-14 Registered Animal Operations in the Catawba River Basin (as of 4/98)

Subbasin	Cattle Total Animals	Cattle Total Steady State Live Weight	Total Cattle Operations	Swine Total Animals	Swine Total Steady State Live Weight	Total Swine Operations	Total Animals	Total Steady State Live Weight
03-08-30	300	420,000	2	1,350	191,295	1	1,650	611,295
03-08-31	0	0	0	2,800	1,212,400	1	2,800	1,212,400
03-08-32	2,170	3,038,000	10	4,000	564,120	3	6,170	3,602,120
03-08-33	210	294,000	2	2,500	354,250	1	2,710	648,250
03-08-34	0	0	0	0	0	0	0	0
03-08-35	2,680	3,752,000	12	500	70,850	1	3,180	3,822,850
03-08-36	1,055	1,477,000	4	0	0	0	1,055	1,477,000
03-08-37	0	0	0	0	0	0	0	0
03-08-38	630	882,000	2	450	60,750	1	1,080	942,750
TOTALS	7,045	9,863,000	32	11,600	2,453,665	8	18,645	12,316,665

Table A-15 Estimated Populations of Swine (1998, 1994 and 1990), Dairy (1998 and 1994) and Poultry (1998 and 1994) in the Catawba River Basin
(Source: NCDA Veterinary Division)

Subbasin	1998 Swine	1994 Swine	1990 Swine	Swine Change	1998 Dairy	1994 Dairy	Dairy Change	1998 Poultry	1994 Poultry	Poultry Change
	Total Capacity	Total Capacity	Total Capacity	94-98 (%)	Total Capacity	Total Capacity	94-98 (%)	Total Capacity	Total Capacity	94-98 (%)
03-08-30	292	391	2,938	-25	295	737	-60	550,507	431,907	27
03-08-31	3,921	3,477	3,712	13	743	747	-1	1,836,300	1,730,400	6
03-08-32	3,628	4,578	3,176	-21	4,203	5,485	-23	3,942,879	3,175,448	24
03-08-33	2,717	1,802	2,639	51	1,448	1,448	0	62,084	11,822	425
03-08-34	428	274	485	56	45	45	0	538	538	0
03-08-35	1,355	1,814	4,615	-25	4,896	6,757	-28	2,133,378	1,767,550	21
03-08-36	107	101	229	6	1,793	2,138	-16	100,352	352	28,409
03-08-37	236	236	306	0	223	223	0	276	250	10
03-08-38	1,838	1,280	2,153	44	192	237	-19	2,179,920	1,869,620	17
TOTALS	14,522	13,953	20,253	4	13,838	17,817	-22	10,806,234	8,987,887	20
% of State Total	0.1%	0.3%	0.8%		14%	13%		5%	5%	

2.9 Water Use and Minimum Streamflow

2.9.1 Local Water Supply Planning

The North Carolina General Assembly mandated a local and state water supply planning process under North Carolina General Statute 143-355(l) and (m) to assure that communities have an adequate supply of water for future needs. Under this statute all units of local government that provide or plan to provide public water supply service are required to prepare a Local Water Supply Plan (LWSP) and to update that plan at least every five years. The information presented in a LWSP is an assessment of a water system's present and future water needs and its ability to

meet those needs. The current LWSPs are based on 1992 data. Plans are being updated this year (1999) based on 1997 water supply and water use information.

Forty-four systems that use water from the Catawba River basin provided an average of 153 million gallons per day (MGD) to 747,348 persons in 1992. Projections of future needs show that these systems expect their service populations to increase by 55% to 1,238,702 persons by the year 2020. Average daily water use for these systems is expected to double to 317 MGD by the year 2020. This information represents systems submitting a LWSP and does not reflect the needs of the many public water systems in this basin that are not required to prepare a local plan because they are not operated by a unit of local government. The information is self-reported and has not been field verified. However, plans have been reviewed by staff engineers for consistency and reasonableness. More information is available for these and other systems across the state that submitted a Local Water Supply Plan from the Division of Water Resources website at: www.dwr.ehnr.state.nc.us/home.htm.

2.9.2 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, in conjunction with the Wildlife Resources Commission, recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The permits are issued by the Division of Land Resources. DWR has been involved in many minimum streamflow studies in this basin (Table A-16).

2.9.3 Interbasin Transfers

Water users in North Carolina are required to register their water withdrawals and transfers with the Division of Water Resources (DWR) if the amount is 100,000 gallons per day or more, according to G.S. 143-215.22H. In addition, transfers of two million gallons per day or more require certification from the Environmental Management Commission, according to 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*, that was filed in the Office of the Secretary of State on April 16, 1991. Within the Catawba basin, two subbasins are delineated: the Catawba River and the South Fork Catawba River (Figure A-14).

Table A-17 lists transfers involving the Catawba basin. The transfer amounts shown are 1992 average daily amounts in million gallons per day (MGD) based on 1992 Local Water Supply Plans (see Part 2.9.1) and registered withdrawal/transfer information. Many of the transfers listed cannot be quantified due to undocumented consumptive losses (examples: septic, lawn irrigation). Note: Under a provision of Senate Bill 1299 (ratified by the General Assembly on September 23, 1998), all local water systems are now required to report existing and anticipated interbasin transfers as part of the Local Water Supply Planning process. This information will be available for future updates of this management plan and will allow an assessment of cumulative impacts.

Currently, there are no interbasin transfer certificate holders in the Catawba basin. Current transfers by Burlington Industries, Charlotte-Mecklenburg Utilities (CMU), Gastonia, Hickory and Mooresville - all estimated to be greater than 2.0 MGD - are grandfathered under provisions of the interbasin transfer law. CMUD has recently applied for a certificate to transfer additional water from the Catawba subbasin to the Rocky River subbasin. CMUD is preparing environmental documentation to support its application.

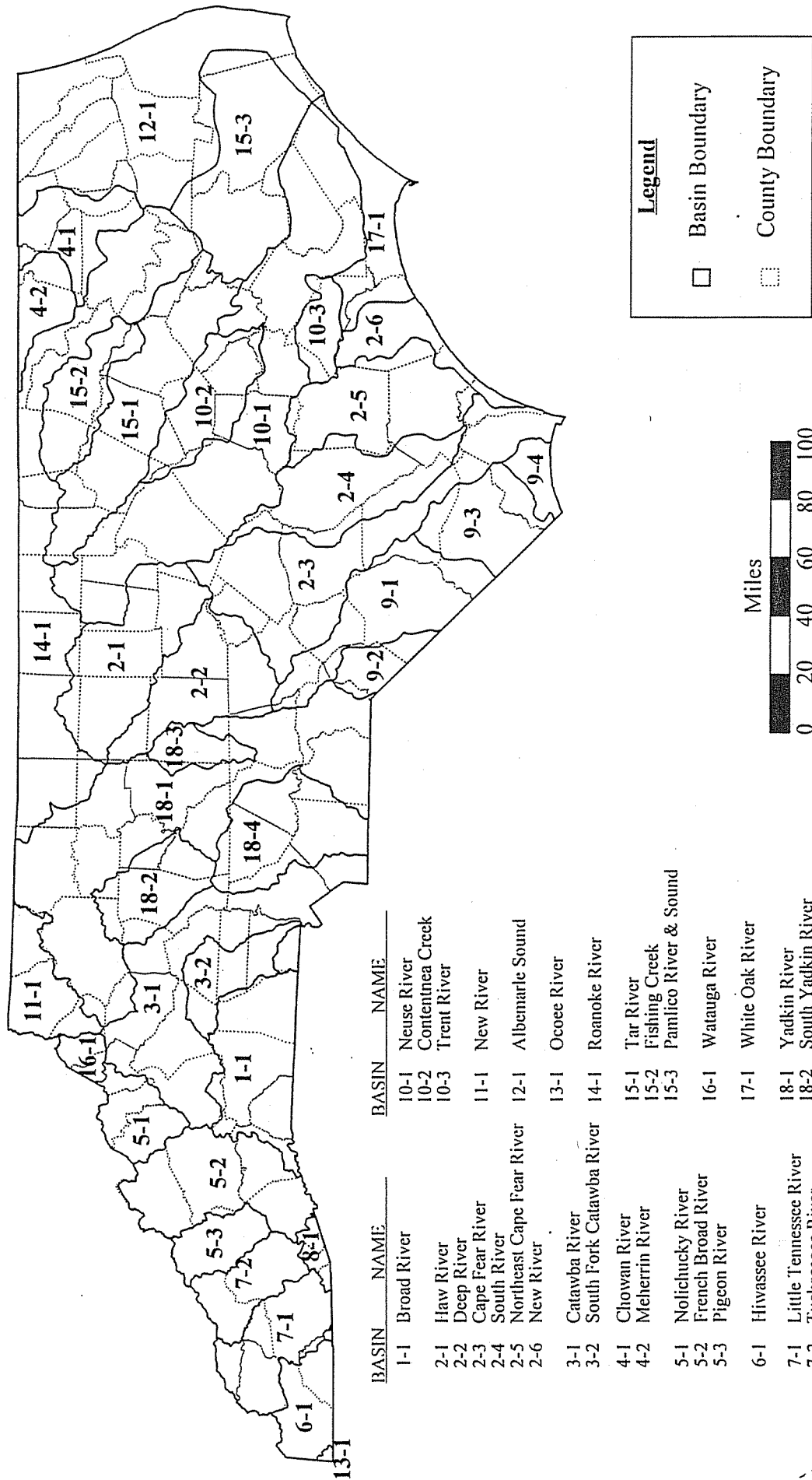
Table A-16 Minimum Streamflow Projects in the Catawba River Basin

Site	Waterbody	Drainage Area (sq. mi.)	Min. Release (cu.ft/sec)
Hydropower Dams			
+Catawba-Wateree Project (FERC#2232)	Catawba River: Lakes James, Rhodhiss, Hickory, Lookout, Norman, Mountain Island, Wylie		
McAdenville (FERC#4186)	South Fork Catawba River	632	None*
Spencer Mountain (FERC#2607)	South Fork Catawba River	622	76
Hardins (FERC#6492)	South Fork Catawba River	512	43.5
High Shoals (FERC#4827)	South Fork Catawba River	510	None*
Long Shoals (FERC#7742)	South Fork Catawba River	470	92
Brushy Mountain (Millersville) (Non-Jurisdictional)	Lower Little River	80.7	2
Lake Tahoma (FERC#4021)	Buck Creek	23.1	None*
Henry River (closed) (unlicensed)	Henry Fork	81	24.5
Non-Hydropower Dams			
Loch Dornie	Linville River	3.5	7Q10 (1.9)
Land Harbor Lake	Linville River	19	6.6
Miscellaneous			
Blue Ridge Country Club irrigation intake	Laurel Branch	1.05	7Q10(.39)
Duke Power Lincoln Combustion Turbine Station	Killian Creek	36	7Q10 (2.28)
Bessemer City Intake Weir	Long Creek	26	?

Notes:

+ The license issued for the Catawba-Wateree project by the Federal Energy Regulatory Commission will expire on August 31, 2008. Studies to determine the need for a minimum flow to protect aquatic habitat below each dam will probably begin during the span of the 1999 Catawba Basinwide Management Plan.

* 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.



Division of Water Resources
919-733-4064

Figure A-14 NC Division of Water Resources Interbasin Map of Major River Basins and Subbasins

Table A-17 Interbasin Transfers in the Catawba River Basin

Source System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD) ¹
Charlotte-Mecklenburg	Charlotte-Mecklenburg	Catawba	Rocky	4.8
Charlotte-Mecklenburg	Union Co.	Catawba	Rocky	0.22
Burlington Industries	Burlington Industries	Catawba	Rocky	3.75
Gastonia	Gastonia	Catawba	S. Fork Catawba	8.3
Gastonia	Cramerton	Catawba	S. Fork Catawba	0.33
Gastonia	Lowell	Catawba	S. Fork Catawba	0.48
Gastonia	McAdenville	Catawba	S. Fork Catawba	0.46
Mooresville	Mooresville	Catawba	Rocky	2.70
Valdese	Burke Co.	Catawba	S. Fork Catawba	0.66
Hickory	Hickory	Catawba	S. Fork Catawba	3.62
Hickory	Newton	Catawba	S. Fork Catawba	Emergency
Hickory	Conover	Catawba	S. Fork Catawba	1.16
Hickory	Long View	Catawba	S. Fork Catawba	0.19
Hickory	Brookford	Catawba	S. Fork Catawba	0.19
Belmont	Belmont	Catawba	S. Fork Catawba	Unknown
Belmont	Cramerton	Catawba	S. Fork Catawba	Emergency
Long View	Long View	Catawba	S. Fork Catawba	1.25
Mount Holly	Stanley	Catawba	S. Fork Catawba	Unknown
Lincoln Co.	Lincolnton	Catawba	S. Fork Catawba	0.446
Lenoir	Caldwell Co. SE	Catawba	Yadkin	0.38
Lenoir	Caldwell Co. N	Catawba	Yadkin	0.01
Mooresville	Mooresville	Catawba	S. Yadkin	Unknown
Kings Mountain	Kings Mountain	Broad	Catawba	Unknown
Anson Co.	Union Co.	Yadkin	Catawba	0.61
Alexander Co.	Taylorsville	S. Yadkin	Catawba	0.41
Alexander Co.	Alexander Co.	S. Yadkin	Catawba	Unknown
Alexander Co.	Alexander Co. Hwy. 16 S	S. Yadkin	Catawba	Unknown
Alexander Co.	West Iredell	S. Yadkin	Catawba	0.05
Statesville	Troutman	S. Yadkin	Catawba	0.09
Monroe	Union Co.	Rocky	Catawba	Unknown
Morganton	Drexel	S. Fork Catawba	Catawba	1.3
Newton	Newton	S. Fork Catawba	Catawba	Unknown
Newton	Catawba	S. Fork Catawba	Catawba	0.09
Dallas	Gastonia	S. Fork Catawba	Catawba	Emergency
Bessemer City	Gastonia	S. Fork Catawba	Catawba	Emergency
Bessemer City	Bessemer City	S. Fork Catawba	Catawba	1.07
Ranlo	Gastonia	S. Fork Catawba	Catawba	Emergency
Stanley	Stanley	S. Fork Catawba	Catawba	Unknown
Lincolnton	Lincoln Co.	S. Fork Catawba	Catawba	0.11
Cherryville	Cherryville	S. Fork Catawba	Broad	Unknown
Kings Mountain	Bessemer City	Broad	S. Fork Catawba	0.683

¹ Transfer amounts for Charlotte-Mecklenburg Utilities are 1993 average values based on its interbasin transfer application. Transfer amounts for Gastonia are 1997 average values based on recently submitted interbasin transfer documentation. All other transfer amounts are based on average daily water use reported in 1992 Local Water Supply Plans and the 1993 Water Withdrawal and Transfer Registration Database. "Unknown" refers to undocumented consumptive use. "Emergency" refers to emergency connections.