

Chapter 2 - French Broad River Basin Overview

2.1 General Overview

The French Broad River basin drains to the Gulf of Mexico via the Tennessee, Ohio and Mississippi Rivers (Figure A- 4). The boundaries of the French Broad River basin within NC contain portions or all of Transylvania, Buncombe, Henderson, Madison, Haywood, Yancey, Mitchell and Avery counties (Figure A- 5).

French Broad Basin Statistics

Total Area: 2,830 sq. miles
Stream Miles: 4,136
No. of Counties: 8
No. of Municipalities: 25
No. of Subbasins: 7
Population (1990): 357,932*
Estimated Pop. (2016): 418,252*
% Increase (1990-2016): 19%
Pop. Density (1990): 128 persons/sq. mi.

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

The basin includes Mount Mitchell, the highest point in the United States east of the Mississippi River (elevation 6,684 feet). Much of the basin is within Pisgah National Forest or Pisgah Game Lands. The northwest corner of Haywood County is in the Great Smoky Mountains National Park. About one-half of the land in the basin is forested. Steep slopes limit the land area suitable for development and crop production. Therefore, most agricultural and developed lands are concentrated within the river valleys.

The basin is composed of three major drainages: French Broad River, Pigeon River and Nolichucky River. These rivers individually flow northwest into Tennessee. There are seven man-made lakes in the basin monitored by DWQ: Lake Julian, Burnett Reservoir, Beetree Reservoir, Busbee Reservoir, Lake Junaluska, Allen Creek Reservoir and Walters (Waterville) Lake.

The population of the basin, based on 1990 census data, was estimated at 357,932. The overall population density of the basin is 128 persons per square mile versus a statewide average of 139 persons per square mile. The percent population growth over the past ten years (1980 to 1990) was 8.5 % versus a statewide increase of 12.7%.

Water quality is generally good throughout the basin, although there are several areas of concern. Trout waters are abundant and many waters are classified as High Quality or Outstanding Resource Waters.

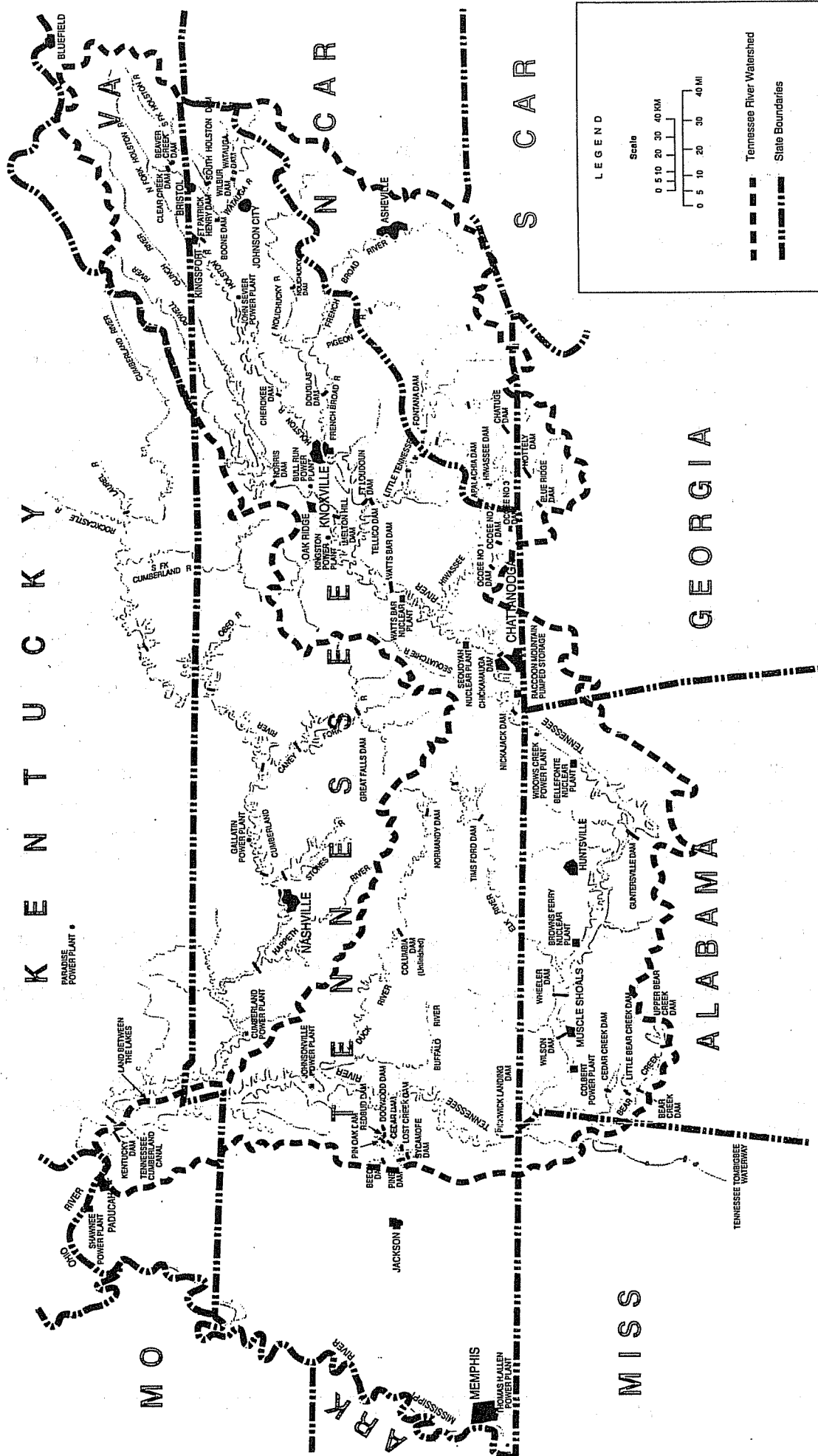
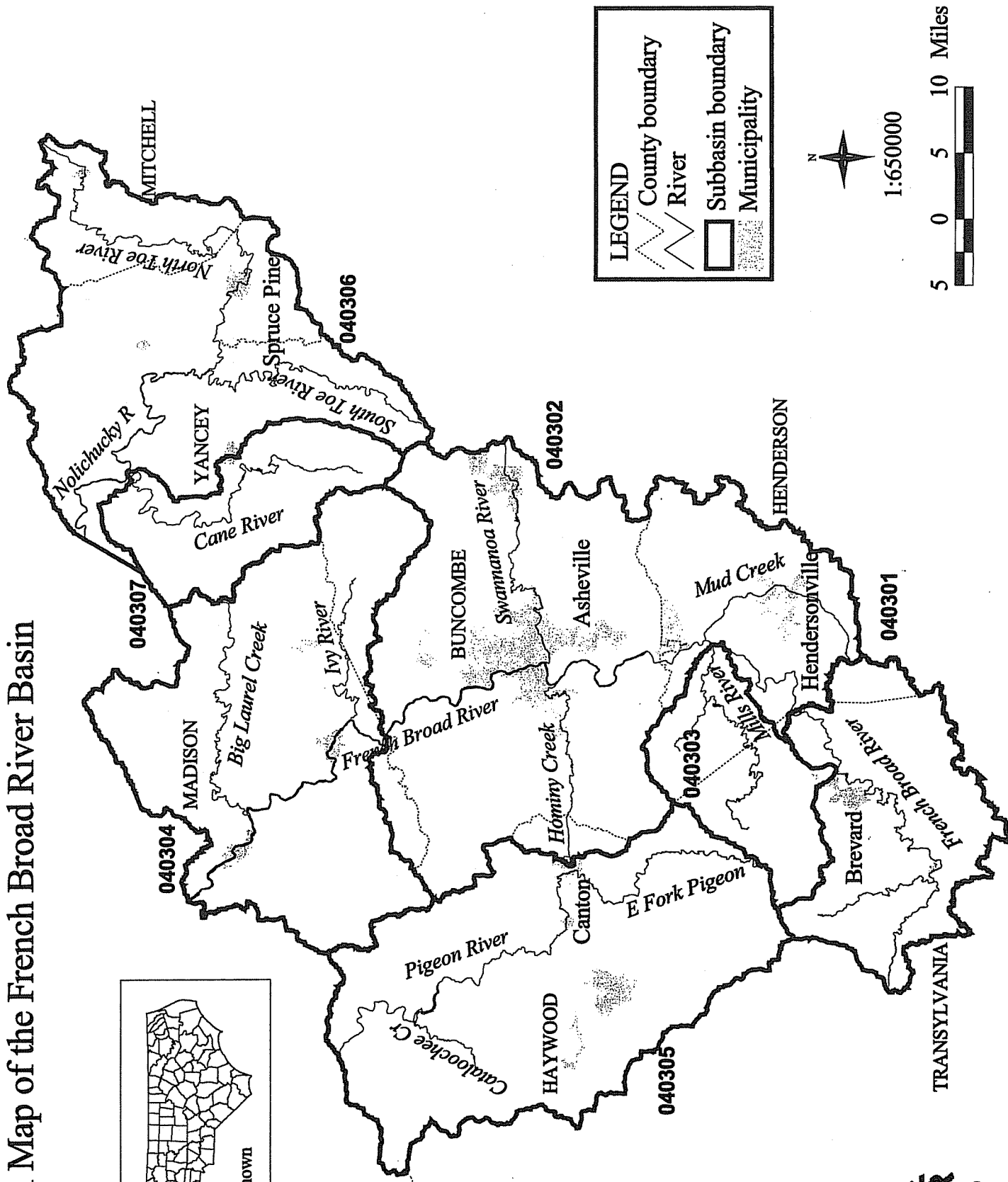
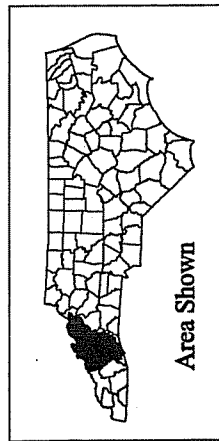


Figure A-4 General Map of the Entire French Broad River Basin

General Map of the French Broad River Basin



October 1999

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

2.2 Local Governments and Planning Jurisdictions in the Basin

The basin encompasses all or part of eight counties and twenty-five 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 French Broad River Basin

County	% of County in Basin *	Council of Government Region	Municipalities
Avery	38%	D	Newland Sugar Mountain
Buncombe	93%	B	Asheville Biltmore Forest Black Mountain Montreat Weaverville Woodfin
Haywood	100%	A	Canton Clyde Hazelwood Maggie Valley Waynesville
Henderson	71%	B	Flat Rock Fletcher Hendersonville Laurel Park
Madison	100%	B	Hot Springs Mars Hill Marshall
Mitchell	100%	D	Bakersville Spruce Pine
Transylvania	82%	B	Brevard Rosman
Yancey	100%	D	Burnsville

* Source: North Carolina Center for Geographic Information and Analysis

Region	Name	Location
A	Southwestern NC Planning and Economic Development Commission	Bryson City
B	Land-of-Sky Regional Council	Asheville
D	Region D Council of Governments	Boone

2.3 Surface Water Hydrology

2.3.1 Major Hydrologic Divisions

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 French Broad River basin is made up of three hydrologic areas referred to as hydrologic units. An 8-digit number defines each hydrologic unit. By contrast, DWQ has a two-tiered system in which the state is divided into 17 river basins with each basin further subdivided into subbasins. The French Broad River basin is subdivided by DWQ into seven 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 French Broad River Basin

Watershed Name and Major Tributaries	USGS 8-digit Hydrologic Units	DWQ 6-digit Subbasin Codes
<i>French Broad River and Major Tributaries</i>	06010105	
Upper mainstem and headwater streams	"	
North, West and East Fork of French Broad		04-03-01
Little River		04-03-01
Middle mainstem and tribs	"	
Mud Creek, Cane Creek, Swannanoa River,		04-03-02
Hominy Creek, Sandymush Creek		04-03-02
Mills and Davidson River	"	04-03-03
Lower mainstem and tribs	"	
Big Ivy Creek (River), Big Laurel Creek and		04-03-04
Spring Creek		04-03-04
<i>Pigeon River and Major Tributaries</i>	06010106	
East and West Forks Pigeon River	"	04-03-05
Jonathan, Richland, Cataloochee and Big Creeks	"	04-03-05
<i>Nolichucky River and Tributaries</i>	06010108	
Nolichucky mainstem	"	
North and South Toe Rivers		04-03-06
Big Rock Creek		04-03-06
Cane River	"	04-03-07

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 2.3.1 for a comparison between state and federal hydrologic divisions. Descriptions of land cover types identified by the NRI are found in Table A-6.

Table A-5 Land Cover in the French Broad River Basin by Major Watersheds
(8-Digit USGS Hydrologic Units)

LAND COVER	MAJOR WATERSHED AREAS *						1992 TOTALS		1982 TOTAL		% change since 1982
	French Broad		Pigeon		Nolichucky						
	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	
Cult. Crop	45.6	4.4	0.0	0.0	0.0	0.0	45.6	2.5	55.0	3.0	-17.1
Uncult. Crop	12.1	1.2	3.8	1.1	4.5	1.1	20.4	1.1	40.4	2.2	-49.5
Pasture	163.0	15.6	38.6	11.4	36.2	8.5	237.8	13.1	253.0	14.0	-6.0
Forest	500.9	47.8	125.1	37.0	270.2	63.7	896.2	49.5	924.1	51.1	-3.0
Urban & Built-up	129.2	12.3	27.5	8.1	25.0	5.9	181.7	10.0	127.8	7.1	42.2
Other	196.3	18.7	143.4	42.4	88.1	20.8	427.8	23.6	409.2	22.6	4.5
Totals	1047.1	100.0	338.4	100.0	424.0	100.0	1809.5	100.0	1809.5	100.0	
% of Total Basin		57.9		18.7		23.4		100.0			
SUBBASINS	04-03-01 04-03-03	04-03-02 04-03-04	04-03-05		04-03-06 04-03-07						
8- Digit Hydraulic Units	06010105		06010106		06010108						

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

Source: USDA, Soil Conservation Service - 1982 and 1992 NRI

Land cover in the basin is dominated by forestland, which covers approximately 50 percent of the land area. Agriculture (including cultivated and uncultivated cropland and pastureland) covers approximately 17 percent. The urban and built-up category covers 10 percent of the land area. The remaining 24 percent of land cover is in the other category. Comparisons of land cover types between 1982 and 1992 show a significant decrease in the agriculture-related categories (72%) and a substantial increase in the urban and built-up category (42%).

The most recent land cover information for the French Broad 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. Figure A-7 provides an illustration of the relative amount of land area that falls into each major cover type for the French Broad River basin. Section B of this plan provides land cover data specific to each subbasin.

Table A-6 Description of Land Cover Type from the 1992 National Resources Inventory

Land Cover Type	Land Cover 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	Forage plants for livestock grazing, including 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 Land	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	<i>Rural Transportation:</i> 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). <i>Small Water Areas:</i> Waterbodies less than 40 acres in size and streams less than one-half mile wide. <i>Census Water:</i> Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than one-half mile in width. <i>Minor Land:</i> Lands not in one of the other categories.

Source: USDA, Soil Conservation Service -1992 NRI

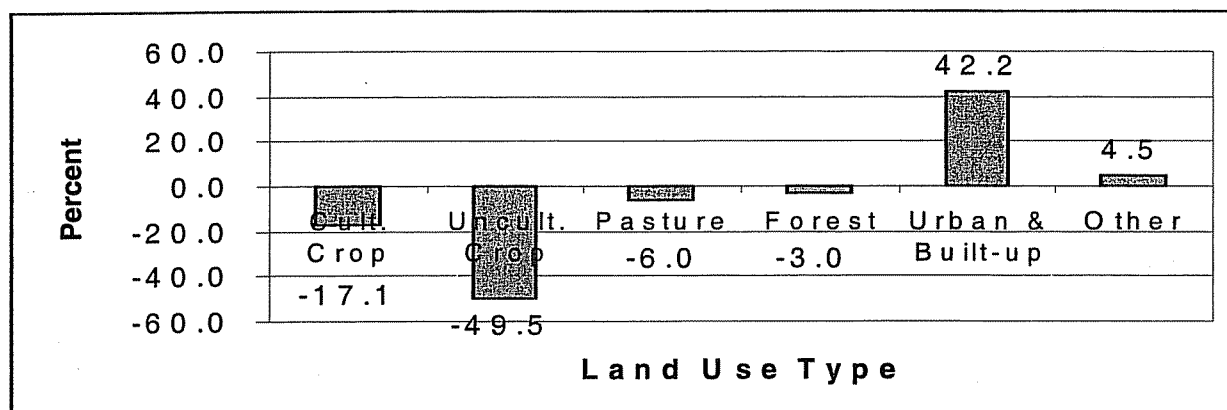


Figure A-6 Land Cover Changes from 1982 to 1992 for the French Broad River Basin
(Source: USDA-NRCS 1992 NRI)

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.

Source: Center for Geographic Information and Analysis

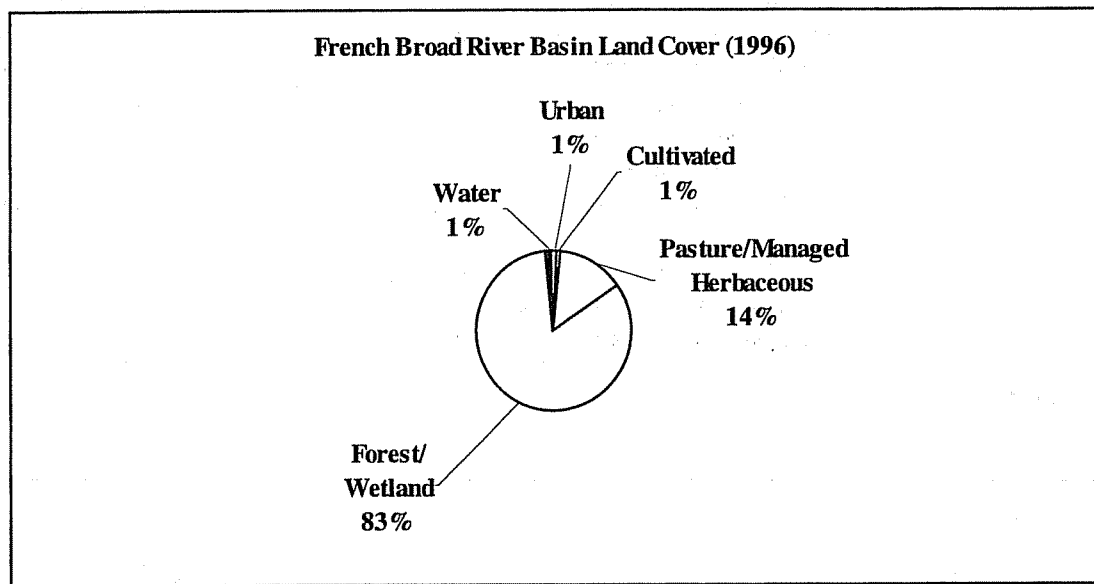


Figure A-7 Percentages within Major Land Cover Categories in the French Broad River Basin

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.

2.5 Population and Growth Trends

Population

Based on 1990 census data, approximately 357,932 people live in the French Broad River 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.

Figure A-8 shows 1990 population densities by census block group for the French Broad River basin. The overall population density was 128 persons per square mile versus a statewide average of 139 persons per square mile. Subbasin population densities, as of 1990, are highest in the subbasin containing the City of Asheville. Other areas of the basin have relatively low population density.

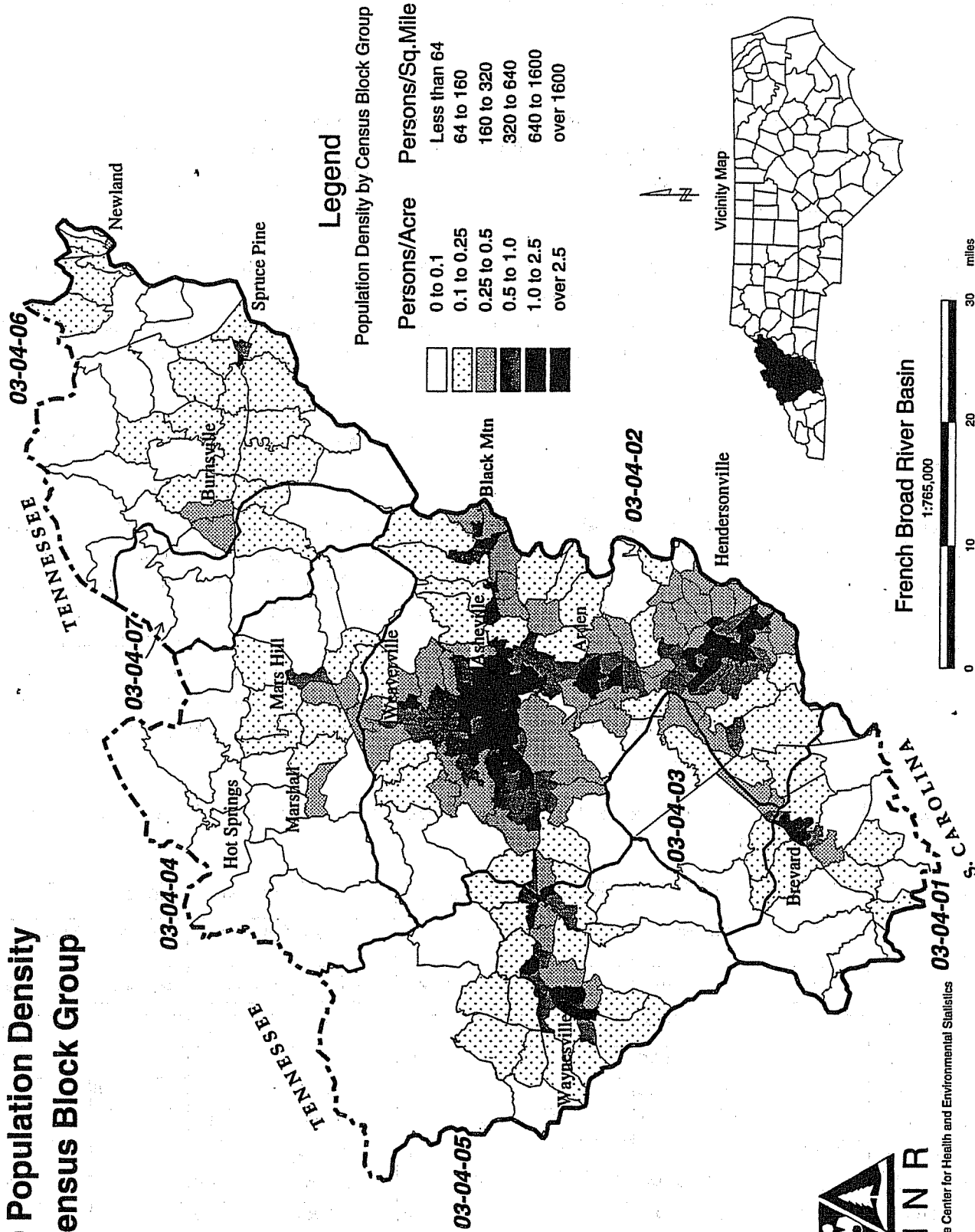
In using these data, it should be noted that some of the population figures are estimates because the census block group boundaries do not generally coincide with subbasin boundaries. The census data are collected within boundaries such as counties and municipalities. By contrast, the subbasin lines 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 French Broad River Subbasin Population (1970, 1980 and 1990) 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)
04-03-01	14,269	16,111	17,853	67	75	83	137,498	215	1	214
04-03-02	182,108	209,252	232,903	227	261	291	515,494	806	5	801
04-03-03	4,576	7,279	7,530	32	52	53	90,317	141	0	141
04-03-04	19,092	20,205	20,660	39	41	42	317,139	496	2	494
04-03-05	38,670	42,322	43,746	73	80	82	340,710	532	1	531
04-03-06	25,862	29,858	29,806	56	64	64	298,054	466	1	465
04-03-07	4,637	4,878	5,434	30	32	36	98,265	153	0	153
TOTALS	289,214	329,905	357,932	103	118	128	1,797,477	2,809	10	2,799

Source: State Center for Health Statistics using US Census Data

1990 Population Density by Census Block Group



Produced by: State Center for Health and Environmental Statistics
January, 1994

Figure A-8 1990 Population Density by Census Block Group

Growth Trends

Figure A-9 presents population growth by subbasin for the entire French Broad River basin. The percent population growth over the last ten-year census period (1980-1990) was 8.5 percent, as compared to the statewide average of 12.7 percent.

Table A-9 presents population data for municipalities located at least in part within the basin and having populations greater than 1,000 persons. The Town of Hendersonville is one of the fastest growing municipalities in the basin. The small Town of Black Mountain has also been growing very quickly.

Table A-9 Population and Percent Change (1980, 1990, 1996) for Municipalities Greater than 1,000 Located Wholly or Partly in the French Broad River Basin

Municipality	County	Apr-80	Apr-90	Jul-97	Percent Change (1980-90)	Percent Change (1990-97)
Asheville	Buncombe	54,022	61,855	68,133	14.5	10.1
Biltmore Forest	Buncombe	1,499	1,324	1,347	-11.7	1.7
Black Mountain	Buncombe	4,083	5,533	7,409	35.5	33.9
Brevard	Transylvania	5,323	5,388	6,079	1.2	12.8
Burnsville	Yancey	1,452	1,482	1,570	2.1	5.9
Canton	Haywood	4,631	3,790	3,718	-18.2	-1.9
Clyde	Haywood	1,008	1,041	1,138	3.3	9.3
Fletcher	Henderson	2,233	2,787	3,288	24.8	18.0
Hendersonville	Henderson	6,862	7,284	9,624	6.1	32.1
Laurel Park	Henderson	764	1,322	2,035	73.0	53.9
Mars Hill	Madison	2,126	1,611	1,573	-24.2	-2.4
Spruce Pine	Mitchell	2,282	2,010	1,909	-11.9	-5.0
Waynesville	Haywood	8,576	8,438	9,687	-1.6	14.8
Weaverville	Buncombe	1,495	2,107	2,425	40.9	15.1
Woodfin	Buncombe	3,260	2,736	3,349	-16.1	22.4

Source: Office of State Planning North Carolina Municipal Population 1995 and 1997

Table A-10 shows the projected percent change in growth between 1990 and 2016 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 French Broad River basin. They are instead presented as an estimate of possible countywide population changes. With the exception of Mitchell County, all counties are expected to experience population increases. Buncombe and Henderson counties are expected to experience the greatest growth.

Percent Population Growth by Subbasin 1970 - 1990



Produced by: State Center for Health and Environmental Statistics
June, 1994

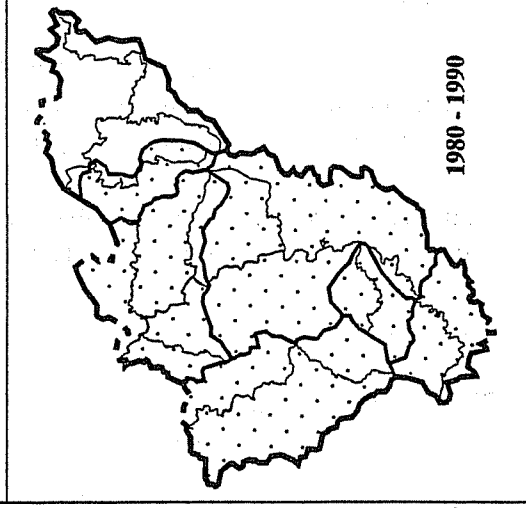
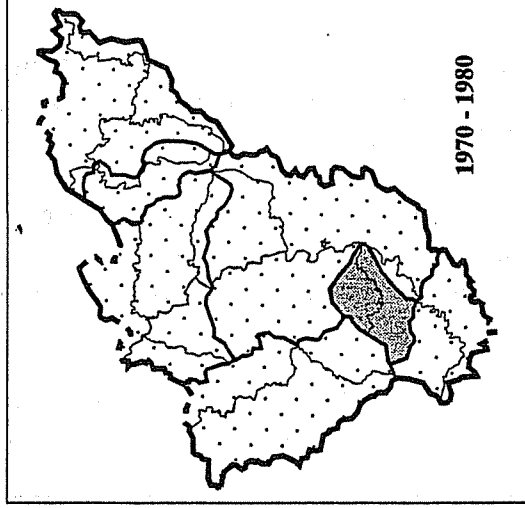
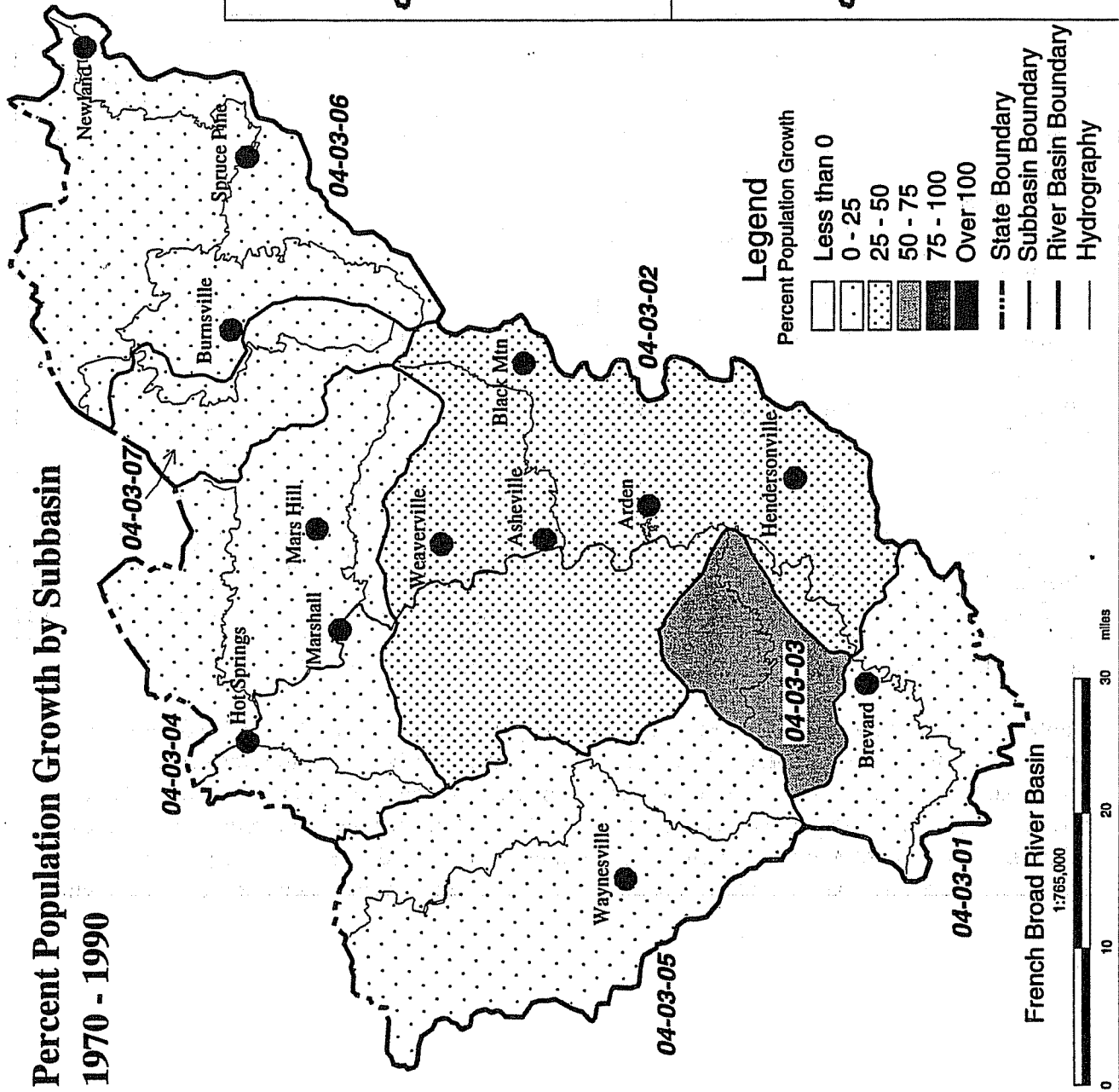


Figure A-9 Population Growth by Subbasin (1970 to 1990)

Table A-10 Past and Projected Population and Percent Changes (1990 to 2016) by County *

County	Population in 1990	Estimated Population in 1996	Estimated % Growth 1990 - 1996	Estimated Population in 2016	Estimated % Growth 1996 - 2016
Avery	14,867	15,205	2.3	15,295	0.6%
Buncombe	174,778	191,798	9.7	227,434	18.6%
Haywood	46,942	50,443	7.5	53,792	6.6%
Henderson	69,326	77,549	11.9	95,604	23.3%
Madison	16,953	18,020	6.3	19,288	7.0%
Mitchell	14,433	14,864	3.0	14,797	-0.5%
Transylvania	25,520	27,447	7.6	30,317	10.5%
Yancey	15,419	16,278	5.6	17,269	6.1%
Totals	378,238	411,604	8.8	473,796	15.1

Source: Office of State Planning 1996

* For counties with >5 percent of land area within basin

2.6 Natural Resources

2.6.1 Rare Aquatic Species and Significant Natural Areas

The French Broad River basin is comprised of the Pigeon, French Broad and Nolichucky watersheds. Two rare aquatic species found in all three watersheds of the French Broad River basin are the Hellbender (a large, uncommon aquatic salamander) and the Appalachian Elktoe (a federally endangered freshwater mussel). Hellbenders are found elsewhere in North Carolina in the mountain counties, while the Appalachian Elktoe is only found elsewhere in the state in the Little Tennessee River basin. An uncommon aquatic lichen is found in the French Broad and Pigeon River watersheds, as well as scattered throughout the mountains.

French Broad River Watershed

The most ecologically significant aquatic area in the French Broad River watershed is the lower section of the French Broad River from the Town of Marshall in Madison County to the Tennessee state line. As part of the Tennessee Valley River system, the French Broad River provides habitat for numerous fish species found in no other river systems in North Carolina. While many of these fish appear to have been extirpated from the French Broad River, several other kinds of these fish, including Freshwater Drum, Banded Sculpin, Mooneye and perhaps the Paddlefish, still survive in this stretch of the river.

Other aquatic species that make their appearance in North Carolina only in the French Broad River watershed are the Mudpuppy (an aquatic salamander) and the Eastern Spiny Softshell (an aquatic turtle more common to the west). Other rare species include the French Broad Crayfish, a North Carolina endemic found only in the French Broad and Horsepasture Rivers; and the Tennessee Heelsplitter mussel, a federal species of concern found in North Carolina only in the French Broad River watershed and a few rivers of the Hiwassee River basin.

Spring Creek is another important aquatic habitat found in the French Broad River watershed. Spring Creek flows into the French Broad River at Hot Springs. Approximately ten rare fish species have been found in this creek, though several now appear to be extirpated. Three (the Ohio Lamprey, the American Brook Lamprey and the Dusky Darter) are found nowhere else in North Carolina. Also notable are the Spotfin Chub (found in North Carolina only in the French Broad River watershed and the Little Tennessee River basin) and the Loggerhead Musk turtle (found in North Carolina only in the French Broad River watershed and the Hiwassee basin).

Nolichucky River Watershed

The Nolichucky and its three main tributaries, the North Toe, South Toe and the Cane Rivers, are home to a number of rare aquatic animals. The Wavy-rayed Lampmussel (a freshwater mussel) is found in the Nolichucky and Little Tennessee River watersheds only. The Cane River contains several rare animals: most notably, almost the entire state population of Sharphead Darter, Striped Shiner, Stonecat and Olive Darter.

The South Toe River supports the only extant North Carolina population of the Blotchside Darter. Several nearby bogs and marshes in the Celo area contain rare plants. The lower stretches of the North Toe and Nolichucky Rivers provide habitat for several noteworthy fish, including the Olive Darter, Logperch and Tangerine Darter, and the Appalachian Elktoe, a freshwater mussel.

Also noteworthy in the Nolichucky River watershed are the largely protected and intact forested slopes of the Black Mountains and the Roan Mountain Massif, both of which harbor a number of rare plants and animals and help ensure the water quality of the region.

Pigeon River Watershed

While the Pigeon River watershed harbors several rare aquatic species, including the Hellbender, Appalachian Elktoe, Sauger and Tangerine Darter, it does not match the diversity found in the other two watersheds of the French Broad River basin. Most notable features are the large, intact forested areas of the Great Smoky Mountains National Park and the Shining Rock Wilderness area.

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

The primary pollutants associated with point source discharges are:

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

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.

2.7.1 Wastewater Discharges in the French Broad River Basin

There are 166 permitted wastewater discharges in the French Broad River basin. Only 16 of these dischargers are major dischargers. Table A-11 provides summary information by subbasin (numbers of facilities and permitted flows) regarding the discharges. 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.

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 and can treat waste from homes and industries.

Nonmunicipal: Facilities with wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation. This category includes a variety of facilities such as schools, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

Figure A-10 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-11, since some major facilities have more than one outfall point. Each outfall point received its own triangle.

2.7.2 Stormwater Discharges in the French Broad River Basin

Amendments were made to the Clean Water Act in 1990 pertaining to permit

requirements for stormwater discharges associated with industrial activities and municipal storm sewer systems serving populations of 100,000 or more (called Phase I). In November 1999, a second phase of the NPDES stormwater program went into effect. Phase II requires smaller municipalities in urbanized areas to develop stormwater programs. DWQ administers these regulations in North Carolina through the state stormwater program. The goal of the DWQ stormwater discharge permitting regulations is to prevent pollution via stormwater runoff by controlling the source(s) of pollutants.

The municipal permitting requirements are designed to lead to the formation of comprehensive stormwater management programs for municipal areas. There were no municipalities in the French Broad River basin large enough to require a stormwater discharge permit under Phase I. For a current list of local governments that will be required to obtain an NPDES stormwater permit under Phase II, refer to Section A, Chapter 4, Part 4.3.3.

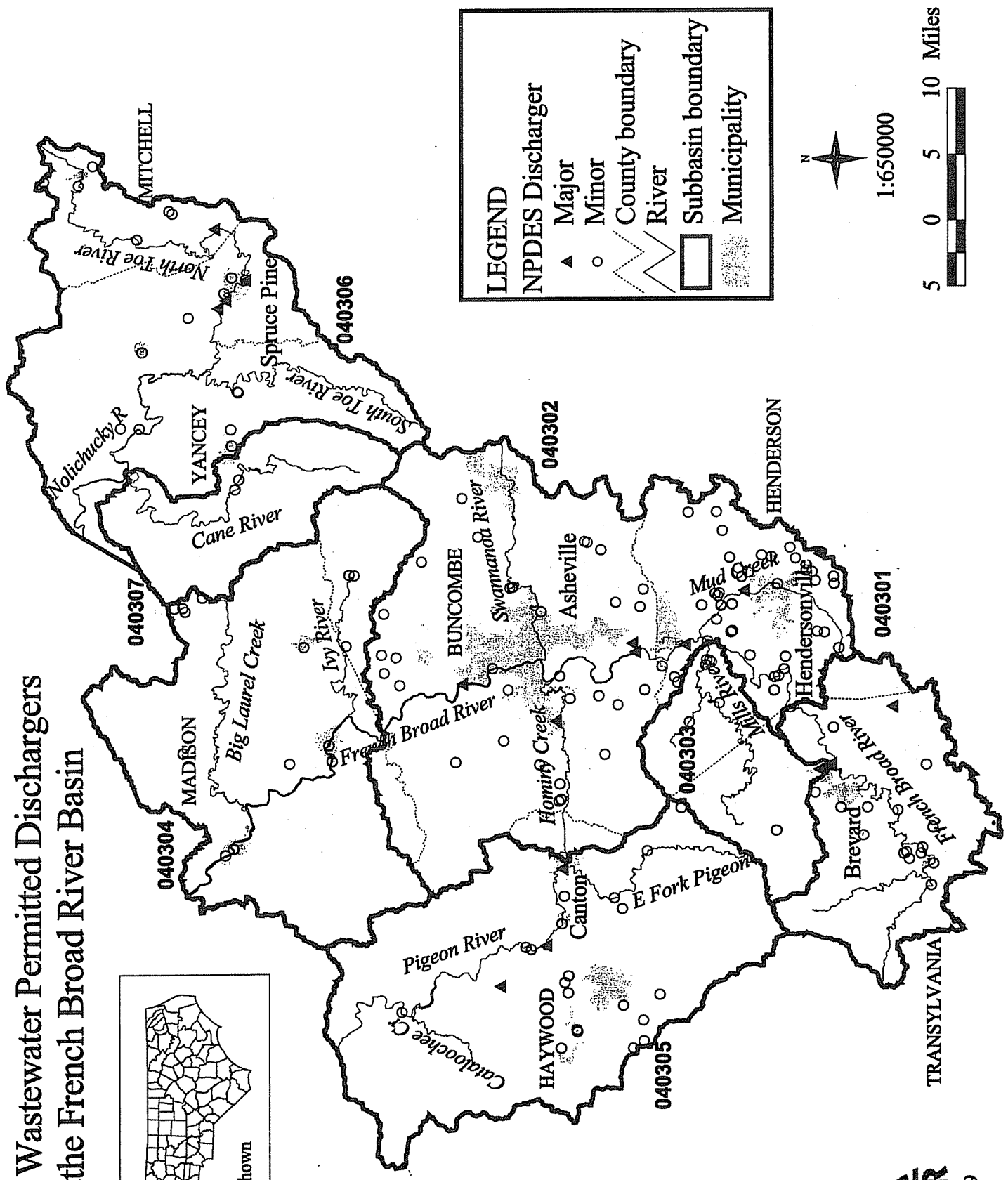
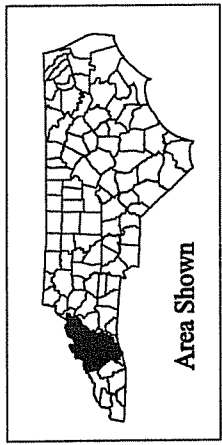
Table A-11 Summary of NPDES Dischargers and Permitted Flows for the French Broad River Basin

Facility Categories	Subbasin							
	01	02	03	04	05	06	07	TOTAL
Total Facilities	15	83	8	11	21	23	2	166
Total Permitted Flow (MGD)	33.529	55.8627	0.228	0.9779	37.3576	13.158	0.8177	141.9309
Major Discharges	3	6	0	0	3	4	0	16
Total Permitted Flow (MGD)	33.0	53.75	0.0	0.0	36.9	10.99	0.0	134.64
Minor Discharges	12	77	8	11	18	19	2	150
Total Permitted Flow (MGD)	0.529	2.1127	0.0228	0.9779	0.4576	2.168	0.8177	7.0857
100% Domestic Waste	10	63	7	8	20	10	1	120
Total Permitted Flow (MGD)	2.984	1.4317	0.048	0.5754	1.4576	0.188	0.0177	6.7024
Municipal Facilities	2	2	0	3	3	3	1	14
Total Permitted Flow (MGD)	2.59	43.2	0.0	0.905	7.21	0.995	0.8	55.7
Nonmunicipal Facilities	13	81	8	8	18	20	1	152
Total Permitted Flow (MGD)	30.939	12.6627	0.0228	0.0729	30.1476	12.163	0.0177	86.0257

Table A-12 Summary of Individual NPDES Stormwater Permits in the French Broad River Basin

Permit #	Facility Name	Receiving Stream	Subbasin	County
NCS000179	BASF Corporation	Hominy Creek & UT	04-03-02	Buncombe
NCS000209	Branford Wire Manufacturing	Mud Creek	04-03-02	Henderson
NCS000234	Arden Services, Inc.	Powell Creek	04-03-02	Buncombe
NCS000105	Blue Ridge Paper Products	Pigeon River, Bowen Branch & Beaverdam	04-03-05	Haywood
NCS000340	Vigoro Industries, Inc. - Haywood	Waynesville storm sewer system into Richland Creek	04-03-05	Haywood
NCS000093	Outboard Marine Corporation	English Creek	04-03-06	Mitchell
NCS000202	United States Gypsum	Toe River	04-03-06	Mitchell

NPDES Wastewater Permitted Dischargers in the French Broad River Basin



1:650000



October 1999

Figure A-10 Location of NPDES Permitted Dischargers in the French Broad River Basin

Industrial activities which require permitting are defined in categories ranging from sawmills and landfills to manufacturing plants and hazardous waste treatment, storage or disposal facilities. Stormwater permits are granted in the form of general permits (which cover a wide variety of more common activities) or individual permits. Excluding construction general permits, there are 154 general stormwater permits and 7 individual stormwater permits issued within the river basin. Individual permit holders are presented in Table A-12.

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

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

EPA Stormwater Rules

Phase I – December 1990

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

Phase II – November 1999

- Requires a NPDES permit for municipal storm sewer systems serving populations under 100,000 that are located in urbanized areas.
- Provides incentives to industrial facilities covered under Phase I for protecting operations from stormwater exposure.
- Requires a NPDES stormwater permit for construction sites that are 1-5 acres.

2.8 Animal Operations

In 1992, the Environmental Management Commission adopted a rule modification establishing procedures for managing and reusing animal wastes from intensive livestock operations. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following size: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system. Within the past five years there have been several additional pieces of legislation enacted that affect animal operations in North Carolina.

Table A-13 summarizes, by subbasin, the number of registered livestock operations, total animals, total acres in operation, and total steady state live weight as of September 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.

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

The NC Department of Agriculture provided information on animal capacity by subbasin (Table A-14). Total swine capacity represents only 1 percent of the state total. The two subbasins that had large numbers of swine significantly decreased their numbers between 1994 and 1998. Basinwide, the numbers of swine have decreased by about 61 percent. Only about 3 percent of the state's total capacity for dairy animals are within the basin. The numbers of dairy animals have also significantly decreased (41%). The basin contains less than 1 percent of the state total capacity for poultry.

Table A-13 Registered Animal Operations in the French Broad River Basin (as of 9/98)

Subbasin	Swine			Cattle		
	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight
04-03-01	0	0	0	0	0	0
04-03-02	1	2,000	283,400	10	3,630	5,082,000
04-03-03	0	0	0	2	425	595,000
04-03-04	0	0	0	0	0	0
04-03-05	0	0	0	8	1,180	1,586,000
04-03-06	0	0	0	0	0	0
04-03-07	0	0	0	0	0	0
Totals	1	2,000	283,400	20	5,235	7,263,000

Table A-14 Estimated Populations of Swine (1998, 1994 and 1990), Dairy (1998 and 1994) and Poultry (1998 and 1994) in the French Broad River Basin

Subbasin	Total Swine Capacity			Swine Change	Total Dairy Capacity			Dairy Change	Poultry Capacity		Poultry Change
	1998	1994	1990	94-98 (%)	1998	1994	94-98 (%)		1998	1994	94-98 (%)
04-03-01	260	219	275	19	0	0	0		700	700	0
04-03-02	690	1,180	1,468	-42	1,216	2,965	-59		600	600	0
04-03-03	14	6	0	133	285	269	6		0	0	0
04-03-04	95	105	204	-10	332	332	0		0	0	0
04-03-05	255	1,905	1,292	-87	1,337	1,696	-21		0	0	0
04-03-06	10	4	13	150	0	3	-100		0	0	0
04-03-07	0	0	0	0	110	303	-64		0	0	0
TOTALS	1,324	3,419	3,252	-61	3,280	5,568	-41		1,300	1,300	0
% of State Total	<1%	<1%	<1%		3%	4%			<1%	<1%	

Source : NC Department of Agriculture, Veterinary Division

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.

Twenty-three systems that use water from the French Broad River basin provided an average of 39 million gallons per day (MGD) to 204,396 persons in 1992 (Table A-15). Projections of future needs show that these systems expect their service populations to increase by 74 percent to 356,567 persons by the year 2020. Average daily water use for these systems is expected to increase to 56 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: <http://www.dwr.ehnr.state.nc.us/home.htm>.

Table A-15 Population and Water Use Information Contained in Local Water Supply Plans in the French Broad River Basin

County	System	Population			Average Daily Water Use (MGD)		
		1992	2000	2020	1992	use2000	use2020
Avery	Newland	645	850	950	0.113	0.143	0.157
Buncombe	Asheville	99000	127100	190900	21.5	25.0	31.0
Buncombe	Biltmore Forest	1321	1401	1601	0.205	0.217	0.248
Buncombe	Black Mountain	5750	6226	7599	0.57	0.594	0.663
Buncombe	Montreat	637	700	800	0.14	0.15	0.17
Buncombe	Weaverville	3300	3907	5911	0.429	0.508	0.768
Buncombe	Woodfin	7000	7523	8138	0.998	1.058	1.136
Haywood	Canton	7000	7140	7500	1.435	1.668	1.9
Haywood	Clyde	1350	1497	1938	0.158	0.175	0.226
Haywood	Junaluska SD	3550	3900	4700	0.275	0.299	0.363
Haywood	Maggie Valley SD	5510	6456	9593	0.915	1.072	1.595
Haywood	Waynesville	10150	10760	12440	3.21	3.56	3.7
Henderson	Hendersonville	40000	46866	76795	5.567	5.628	9.273
Henderson	Laurel Park	1100	1572	1818	0.11	0.16	0.18
Madison	Mars Hill	2950	3460	5140	0.253	0.341	0.677
Madison	Marshall	809	802	776	0.119	0.119	0.12
McDowell	Little Switzerland CWA	270	300	360	0.011	0.012	0.014
Mitchell	Bakersville	340	340	340	0.088	0.088	0.088
Mitchell	Spruce Pine	3304	3260	3002	0.993	1.02	1.085
Polk	Saluda	565	678	758	0.11	0.139	0.152
Transylvania	Brevard	7600	10086	13075	0.99	1.31	1.69
Transylvania	Rosman	445	500	520	0.044	0.055	0.066
Yancey	Burnsville	1800	1874	1913	0.321	0.394	0.41
Total		204,396	247,198	356,567	38.554	43.71	55.681

Source: NC Division of Water Resources Local Water Supply Plans

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 of Water Resources (DWR), 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. DWR has been involved in several minimum streamflow projects in this basin (Table A-16 and Table A-17).

Table A-16 Minimum Instream Flow Projects for Hydroelectric Dams in the French Broad River Basin

HYDROELECTRIC DAMS					
Hydropower Dam	Location	Ownership	Bypass Reach	Drainage Area (sq. mi.)	Min. Release (cu.ft/sec)
<i>French Broad River Hydroelectric Dams: Craggy, Capitola and Redmon</i>					
Craggy	downstream of Beaverdam Creek confluence	Metropolitan Sewer District	3200 feet	966	460 July through January 860 remainder of year
Capitola	upstream of Marshall, NC	French Broad Electric Membership Corporation	1000 feet	1332	None*
Redmon	downstream of Marshall, NC	Carolina Power and Light Company	None	1343	None*
<i>Other Dams</i>					
Ivy River	2.2 miles upstream of the mouth	Madison Hydropower Partners	None		16
Little River		Cascade Power Company	1016 feet	40	10
Walters Dam	Pigeon River confluence with Big Creek on the NC-TN border	Carolina Power and Light Company	12 miles	455	**
Richland Creek	impounds Lake Junaluska	Lake Junaluska Assembly	None	63.6	None*

Source: NC Division of Water Resources

Notes:

* 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.

** A minimum flow of 100 cfs is required one mile below the powerhouse at Brown's Bridge in Tennessee. Scheduled recreational releases are also required.

No minimum release will be required in the bypassed natural channel until water quality and biological criteria are met. In lieu of a minimum flow, the utility will contribute funds to the Pigeon River Fund. In exchange for contributions to the Fund, DENR will not seek a minimum release from the dam for 10 years. When water quality and biological criteria are met, the minimum release into the bypassed channel will be 30 cfs during May and June and 20 cfs during the remainder of the year.

Table A-17 Minimum Instream Flow Studies for Water Supply Impoundments in the French Broad River Basin

WATER SUPPLY IMPOUNDMENTS/WITHDRAWALS		
Dam	Study Cooperators	Purpose of Study
Davidson River - Cedar Rock Creek	NC Wildlife Resources Commission and US Forest Service	The Commission's Pisgah Fish Hatchery relies on these streams to fill raceways. The study will assist in determining a flow management strategy during low flow periods.
Jonathan Creek	NC Wildlife Resources Commission and Town of Maggie Valley	Study is for a proposed water treatment plant expansion from 1.5 to 3.0 MGD. All parties agreed on an 8 cfs minimum flow below the intake and the installation of a monitoring gage.
Ivy River	NC Wildlife Resources Commission and Town of Weaverville	A proposed withdrawal of 1.5 MGD was determined not to have a significant impact on downstream flows.
Mills River	NC Wildlife Resources Commission, Asheville-Buncombe County Water Authority and Henderson County	Discussions on a proposed water withdrawal on Mills River. The project includes a 5 MGD capacity WTP, 10 MGD (15.5 cfs) capacity intake, 50 million gallon raw water storage facility, and 2-10 MGD raw water pump stations. Further expansion of the facility will draw from the French Broad River. The resource agencies determined that, since the withdrawal is within 150 feet of confluence with the French Broad River, no instream flow study would be required.
Mills River	NC Wildlife Resources Commission and City of Hendersonville	The city is allowed to withdraw 12 MGD (18.5 cfs) without restriction, but withdrawals up to a maximum of 24 MGD (37 cfs) will require a minimum flow of 30 cfs.
North Fork Mills River - Bradley Creek	NC Wildlife Resources Commission, US Forest Service and City of Hendersonville	All parties agreed upon an 8 cfs release below each of the water supply impoundments with gages to monitor the releases.
Reems Creek - Sugarcamp Fork	NC Wildlife Resources Commission and Woodfin Sanitary Water and Sewer District	Discussions regarding a minimum flow release from the Woodfin Reservoir. The reservoir is located on Sugarcamp Fork very near the confluence with Reems Creek. The Division supports a tiered release from the reservoir with a maximum release no greater than 0.8 cfs and the development of a reservoir management plan.

Source: NC Division of Water Resources

2.9.3 Interbasin Transfers

The Division of Water Resources (DWR) is responsible for the registration and certification of interbasin transfers. The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolina* and filed in the Office of the Secretary of State on April 16, 1991.

Table A-18 lists interbasin transfers in the French Broad River basin. The transfer amounts shown are 1992 average daily amounts in million gallons per day (MGD) based on 1992 Local Water Supply Plans and registered withdrawal/transfer information. All three of the transfers shown involve the City of Hendersonville, which has service areas in both the French Broad and Broad River basins. The first transfer involves a small unquantified consumptive loss (examples: septic systems, lawn irrigation). The second transfer would only occur during emergency water purchases from the City of Asheville. The third transfer is a bulk sale to the Town of Saluda. Currently, there are no interbasin transfer certificate holders in the French Broad River basin.

Under a provision of Senate Bill 1299 (ratified by the General Assembly on September 23, 1988), 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.

Table A-18 Interbasin Transfers in the French Broad River Basin

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Net Transfer ¹ (MGD)
Hendersonville	Hendersonville	French Broad	Broad	Unknown (out)
Asheville	Hendersonville	French Broad	Broad	Emergency (Out)
Hendersonville	Saluda	French Broad	Broad	0.10 (out)

Source: NC Division of Water Resources

¹ Transfer amounts are based on average daily water use reported in 1992 Local Water Supply Plans. "Unknown" refers to undocumented consumptive losses. "Emergency" refers to an existing emergency connection between two public water systems.

Water Withdrawal Registrations

Prior to 1999, North Carolina General Statute 143-215.22H required all persons who withdraw or transfer one million gallons or more of surface or groundwater on any day, to register with the Division of Water Resources (DWR). Beginning in 1999, withdrawals and transfers greater than 100,000 gallons per day are to be registered with DWR. Table A-19 lists the parties that have registered withdrawals in the French Broad River basin as of January 1, 1999.

Table A-19 Water Withdrawal Registration in the French Broad River Basin

County	Facility #	Capacity (MGD)	Facility
Avery	06-002	2.63	Unimin
Buncombe	11-003	14.00	BASF Corporation
Buncombe	11-004	1.50	BASF Corporation
Buncombe	11-009	0.00	Vulcan Materials Company
Buncombe	11-007	1.73	Vulcan Materials Company
Buncombe	11-008	0.00	Vulcan Materials Company
Buncombe	11-005	316.00	Carolina Power & Light Company
Buncombe	11-006	7.20	Carolina Power & Light Company
Buncombe	11-011	1166.40	Metro Sewerage District of Buncombe County
Buncombe	11-010	0.00	Metro Sewerage District of Buncombe County
Haywood	44-005	1.00	Blue Ridge Paper Products
Haywood	44-006	60.00	Blue Ridge Paper Products
Haywood	44-003	1.00	Carolina Power & Light Company
Haywood	44-004	1256.00	Carolina Power & Light Company
Haywood	44-010	3.60	Little East Fork Trout Farm
Henderson	45-001	4.00	Cranston Print Works Company
Henderson	45-003	1.00	Vulcan Materials Company
Henderson	45-004	5.00	NCSU Mountain Horticulture Crop Res. Station
Madison	57-001	139.30	French Broad EMC
Madison	57-002	1.15	Spring Creek Trout Farm
Madison	57-003	0.69	Little Creek Trout Farm
Madison	57-004	1.40	Franklin Trout Farm
Madison	57-005	1.20	Fox Trout Farm
Madison	57-006	1.20	Fox Trout Farm
Mitchell	61-004	4.00	The Feldspar Corporation
Mitchell	61-003	4.20	Unimin
Mitchell	61-005	1.15	Roan Mountain Trout Farm
Transylvania	88-004	35.00	P.H. Glatfelter Company Ecusta Division
Transylvania	88-003	22.00	P.H. Glatfelter Company Ecusta Division
Transylvania	88-011	4.03	E.I. Dupont Denemours & Company
Transylvania	88-002	80.70	Cascade Power Company
Transylvania	88-005	10.80	NC Wildlife Resources Commission
Transylvania	88-007	1.50	Gourmet Mountain Trout of Western NC, Inc.
Transylvania	88-008	1.00	Sewah Trout Farm
Transylvania	88-009	0.86	High Valley Trout Farm
Transylvania	88-009	8.65	Headwater Trout Farm
Transylvania	88-010	7.00	Trigo Trout Farm
Transylvania	88-012	1.50	Cawtrell Creek Trout Farm
Transylvania	88-013	7.00	Cashiers Valley Trout Farm
Total Capacity		3175.39	MGD

Source: NC Division of Water Resources

