Chapter 2 -
Basin Overview

2.1 General Overview

The Watauga River basin is located within the Blue Ridge Province of the Appalachian Mountains of western North Carolina (Figure A-4). The Watauga River basin is nestled between the French Broad River basin to the south and the New River basin to the north. The watershed drains north to northwest from North Carolina to Tennessee.

Watauga River Basin Statistics

Total Area: 205 mi^2
Stream Miles: 270
No. of Counties: 2
No. of Municipalities: 6
No. of Subbasins: 1
Population (2000): 23,676 *
Est. Population (2020): 28,399 *
% Increase (2000-2020): 20 %
Pop. Density (1990): 78 persons/sq. mi.

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

The North Carolina portion of the Watauga River basin is composed of the headwaters and tributaries of the Elk River and the Watauga River. The Elk River, the prinicipal tributary of the Watauga River, and the Watauga River flow into Watauga Lake in Tennessee. The Watauga River and the Elk River are tributaries of the Holston River, which flows into the Tennessee River near Knoxville. Waters from the Watauga River eventually flow into the Mississippi River and the Gulf of Mexico (Figure A-5).

The Watauga River basin is the second smallest basin in the state and encompasses 205 square miles in portions of Avery and Watauga counties. The basin contains approximately 270 miles of freshwater streams and rivers. Overall water quality in this basin is excellent as most of the streams drain undisturbed, forested mountain areas.

There are six municipalities located wholly or partially in the basin. Based on 2000 census data, the population is estimated to be 23,676. Population among the municipalities ranges from 129 in Seven Devils to 13,472 in Boone. The overall population density of the basin in 1990 was 78 persons per square mile compared to a statewide average of 139 persons per square mile. While the resident population may be low, the basin experiences significant seasonal population fluctuations from recreation and tourism.

Within the Watauga River basin, there are 18 miles of streams classified as Outstanding Resource Waters (ORW), all within the Boone Fork Creek watershed. There are also 32 stream miles classified as High Quality Waters (HQW). These include the entire mainstem of the Watauga River as well as a portion of the Beech Creek watershed. In addition, 55 percent of the streams within the basin are classified as trout streams.

The land comprising the Watauga River basin is mountainous and rural. Sixty-three percent of the land in the basin is forested and about 22 percent is pastureland. Steep slopes limit the land that is suitable for development and crop production. Therefore, most of the development and agricultural activities, with the exception of Christmas tree farms, are concentrated in the valleys. Roads are also commonly located along streams and rivers in the basin.

Figure A-4 General Map of the Watauga River Basin

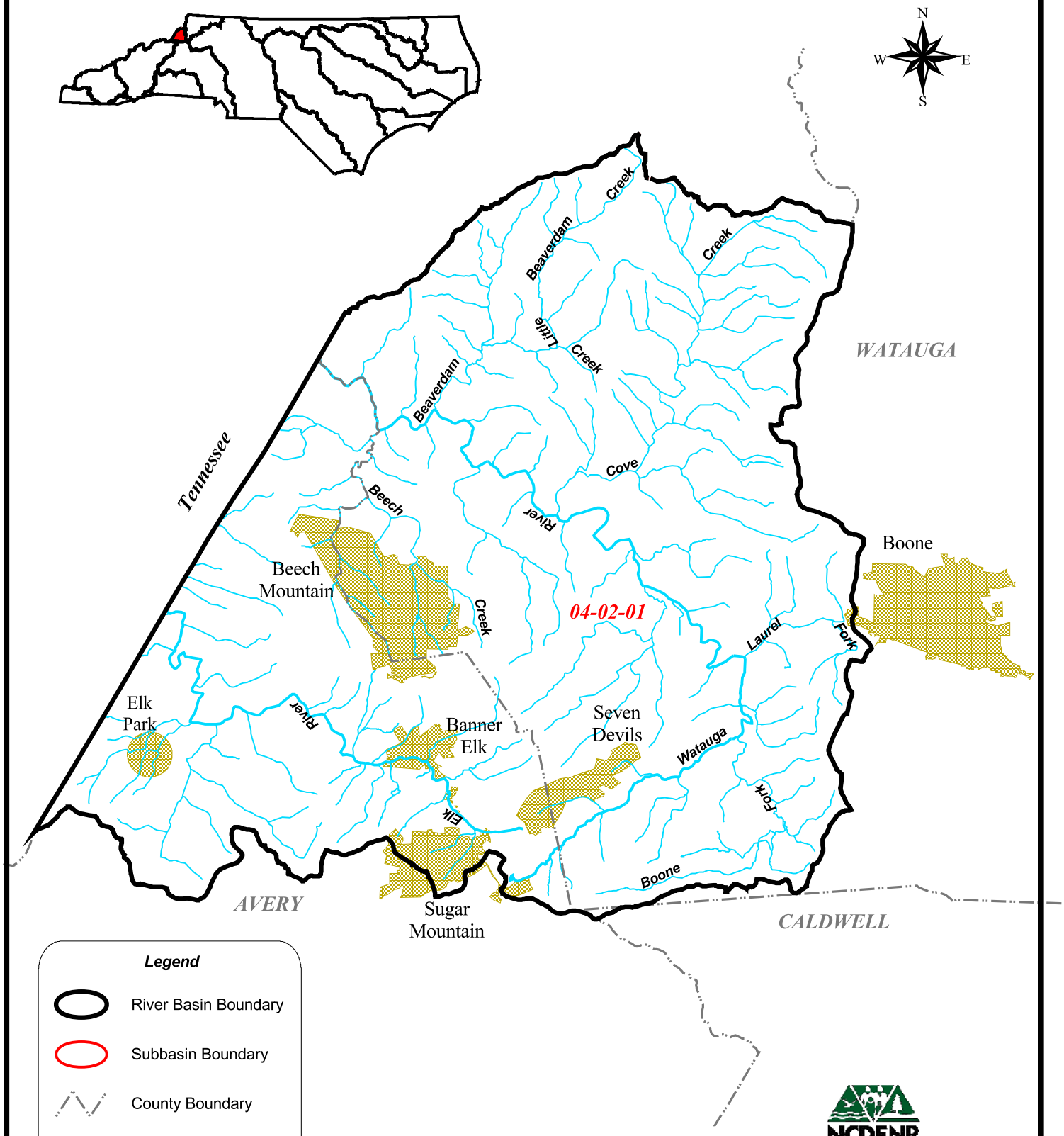
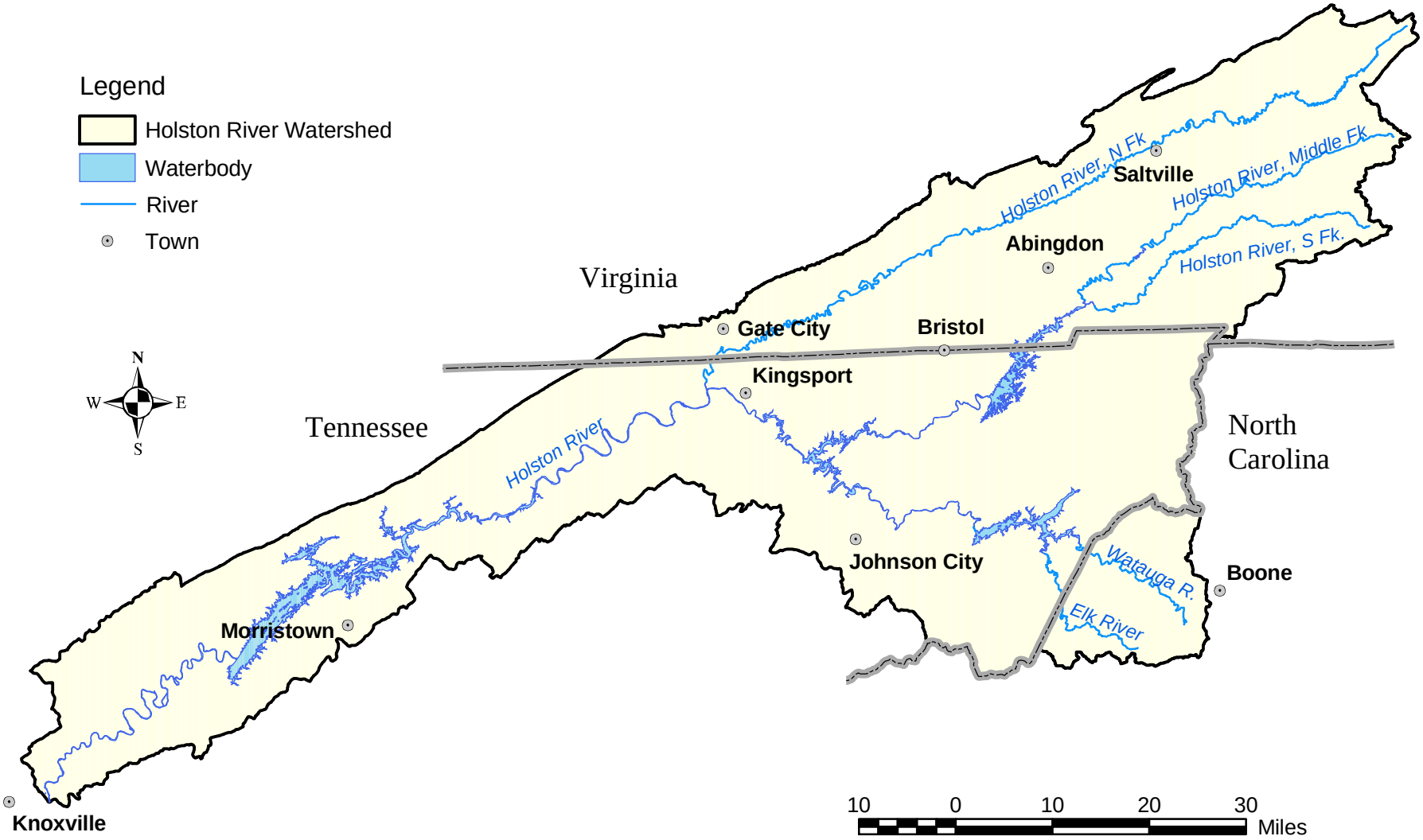


Figure A-5 General Map of the Holston River Watershed



Map Produced by GI&E, TVA, Norris TN

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2.2 Local Governments and Planning Jurisdictions in the Basin

The Watauga River basin encompasses all or part of the following two counties and six municipalities (Table A-3). Two municipalities are located in more than one major river basin: Boone and Sugar Mountain.

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

County	Council of Government Region	Municipalities
Avery	Region D Council of Governments Boone, NC	Banner Elk Beech Mountain * Elk Park Seven Devils * Sugar Mountain (♦)
Watauga	Region D Council of Governments Boone, NC	Beech Mountain * Boone (♦) Seven Devils *

* Located in more than one county

(♦) Located in more than one river basin

Note: Counties adjacent to and sharing a border with a river basin are not included as part of that basin if only a trace amount of the county (<2%) is located in that basin, unless a municipality is located in that county.

2.3 Surface Water Hydrology

Most federal government agencies, including the US Geological Survey (USGS) and the 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 Watauga River basin is made up of one hydrologic area referred to as a hydrologic unit. The USGS 8-digit hydrologic unit is 06010103. DWQ has a two-tiered system in which the state is divided into 17 major river basins with each basin further subdivided into subbasins. The Watauga River basin is subdivided by DWQ into one subbasin (shown on Figure A-4). The DWQ 6-digit subbasin code for the Watauga River basin is 04-02-01. A map of the subbasin is included in Section B of this plan.

Hydrologic Features

In this basin, 270 miles of freshwater streams drain 205 square miles of mountainous terrain in portions of Avery and Watauga counties. The average drainage area per stream mile is 0.68 square miles. In comparison, the neighboring New River basin has an average drainage area of 0.94 square miles per stream mile, while the largest river basin in the state, the Cape Fear River, drains 1.5 square miles per stream mile. In the Watauga River basin, there are many streams draining small areas of land (high drainage density due to very steep terrain). But in the Cape Fear River basin, there are fewer streams draining much larger portions of land. Areas with high drainage density are associated with high flood peaks, high sediment production, relatively low

suitability for traditional agriculture, and high development costs for the construction of buildings and the installation of roads and bridges.

One operational hydroelectric facility, Ward Mill Dam, exists in the basin on the Watauga River. The project is a "run of river" facility and operates so that instantaneous inflow equals outflow most of the time. This kind of operation typically results in minimal impoundment of the river.

Buckeye Creek in the Beech Mountain watershed contains one impoundment dam that forms Beech Mountain Reservoir. This reservoir currently serves as the drinking water source for Beech Mountain.

2.4 Land Cover

Land cover information in this section is from the most current National Resources Inventory (NRI), as developed by the Natural Resources Conservation Service (USDA, updated June 2001). The NRI is a statistically based longitudinal survey that has been designed and implemented to access conditions and trends of soil, water and related resources on the Nation's nonfederal rural lands. The NRI provides results that are nationally and temporally consistent for four points in time – 1982, 1987, 1992 and 1997.

In general, NRI protocols and definitions remain fixed for each inventory year. However, part of the inventory process is that the previously recorded data are carefully reviewed as determinations are made for the new inventory year. For those cases where a protocol or definition needs to be modified, all historical data must be edited and reviewed on a point-by-point basis to make sure that data for all years are consistent and properly calibrated. The following excerpt from the *Summary Report: 1997 National Resources Inventory* provides guidance for use and interpretation of current NRI data:

> *"The 1997 NRI database has been designed for use in detecting significant changes in resource conditions relative to the years 1982, 1987, 1992 and 1997. All comparisons for two points in time should be made using the new 1997 NRI database. Comparisons made using data published for the 1982, 1987 and 1992 NRI may provide erroneous results, because of changes in statistical estimation protocols, and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected."*

Table A-4 summarizes acreage and percentage of land cover from the 1997 NRI for the North Carolina portion of the basin as defined by the USGS 8-digit hydrologic units. Data from 1982 are also provided for a comparison of the land use changes over a 15-year period. Land cover in the basin, as presented in Table A-4, is dominated by forest and federal land, which covers approximately 62.8 percent of the land area. Agriculture (including cultivated and uncultivated cropland and pastureland) covers approximately 22 percent. Less than 10 percent of the land area is urban and built-up areas. However, between 1982 and 1997, urban and built-up areas increased by 219 percent (8,200 acres). A description of land cover types, including the "Other" category, to which 5.9 percent of land in the basin is assigned, can be found in Table A-5.

Table A-4 Land Cover in the Watauga River Basin by Major Watersheds – 1982 vs. 1997 (Source: USDA-NRCS, NRI, updated June 2001)

	MAJOR WATERSHED AREAS *						
	Watauga Watershed		1997 TOTALS		1982 TOTALS		% change since 1982
LAND COVER	Acres (1000s)	%	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	
Cult. Crop	0.0	0.0	0.0	0.0	2.0	1.6	-100.0
Uncult. Crop	2.4	1.9	2.4	1.9	3.6	2.8	-33.3
Pasture	25.9	20.2	25.9	20.2	26.0	20.3	-0.4
Forest	67.8	53.0	67.8	53.0	75.8	59.2	-10.6
Urban & Built-Up	11.8	9.2	11.8	9.2	3.7	2.9	218.9
Federal	12.5	9.8	12.5	9.8	12.5	9.8	0.0
Other	7.6	5.9	7.6	5.9	4.4	3.4	72.7
Totals	128.0	100.0	128.0	100.0	128.0	100.0	
% of Total Basin		100.0		100.0			
SUBBASINS	04-02-01						
8-Digit Hydraulic Units	06010103						

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

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

Comparisons of land cover between 1982 and 1997 (Figure A-6) show a decrease in forestlands (-8,000 acres). The data also show a 218.9 percent or 8,100-acre increase in lands classified in the urban/built-up category. Land in the "Other" category, which includes rural highways, logging roads and private roads outside of developed areas, also increased over the 15-year period (+3,200 acres).

Table A-5 Description of Land Cover Types (Source: USDA-NRCS, NRI, updated June 2001)

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

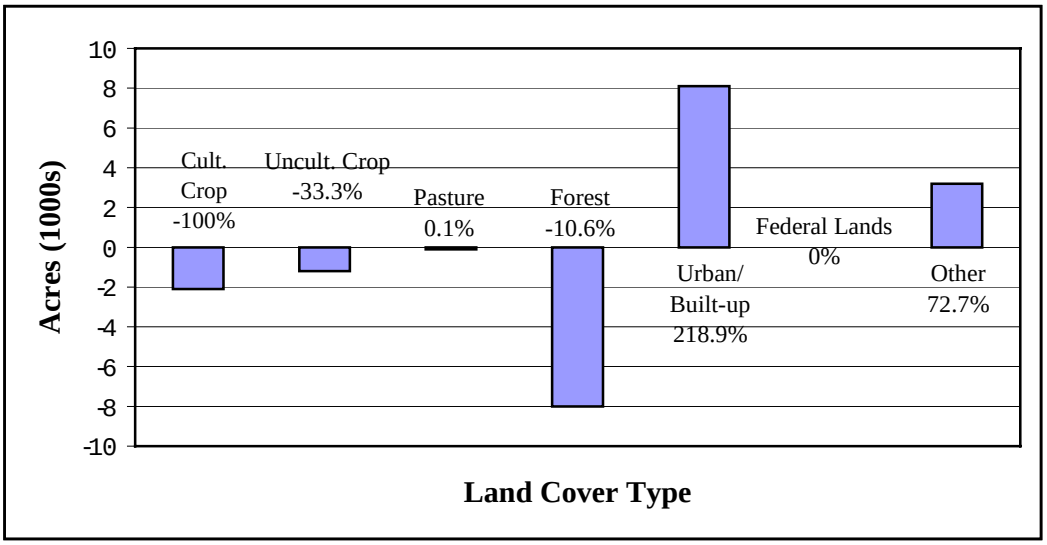


Figure A-6 Land Cover Changes from 1982 to 1997 for the Watauga River Basin (Source: USDA-NRCS, NRI, updated June 2001)

The North Carolina Corporate Geographic Database contains land cover information for the Watauga River basin based on satellite imagery. 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-6. 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.

Table A-6 Description of Major CGIA 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.

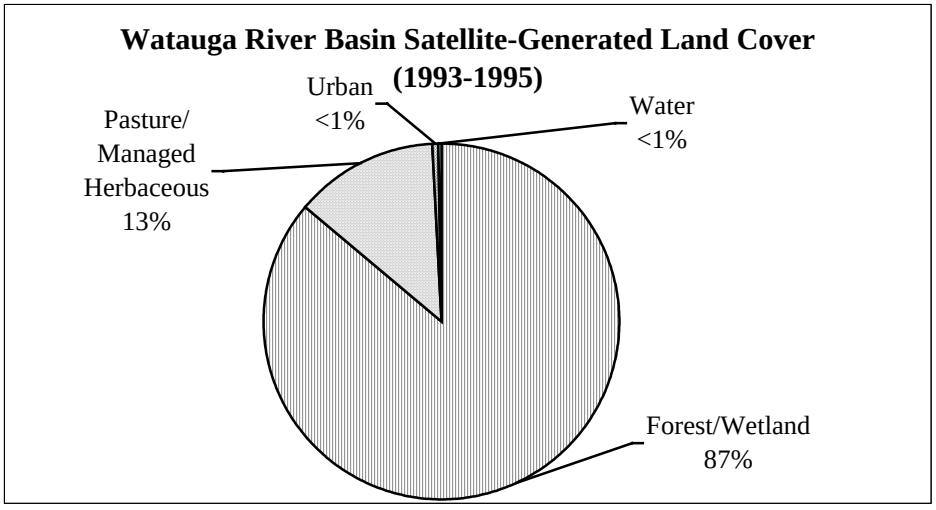


Figure A-7 Percentages within Major CGIA Land Cover Categories in the Watauga River Basin

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

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

2.5 Population and Growth Trends

Population

The Watauga River basin in North Carolina had an estimated population of 16,083 based on 1990 census data. Table A-7 presents census data for 1970, 1980 and 1990. It also includes population densities (persons/square mile) based on the *land area* (excludes open water) for the basin. Most of the basin's population is located in and around the Boone area, but the other municipalities are also experiencing steady growth.

Table A-7 Watauga River Basin Population (1970, 1980 and 1990), Percent Population Change and Land Area Summary

	POPULATION [1] (Number of Persons)			POPULATION DENSITY [2] (Persons/Square Mile)			LAND AND WATER AREAS [3]			
							Total Land and Water Area		Water Area	Land Area
SUBBASIN	1970	1980	1990	1970	1980	1990	(Acres)	(Sq. Miles)	(Sq. Miles)	(Sq. Miles)
04-02-01	11,880	15,164	16,083	58	74	78	131,200	205	0	205
TOTALS	11,880	15,164	16,083	58	74	78	131,200	205	0	205

[1] Population estimated based on US Census data and percentage of census block that falls within the subbasin.
[2] Population density based on land area only. Large wetlands (swamps) not included in area used to calculate density.
[3] Information generated by the NC Center for Geographic Information Analysis.

In using these data, it should be noted that 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, an estimate is made on the percentage of the population in the subbasin. This was done by simply taking the percentage of the census block area located in the subbasin and then taking that same percentage of the total census block group population and assigning it to the subbasin. Use of this method necessitates assuming that population density is evenly distributed through the 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. This analysis to determine river basin population has not yet been conducted for the recently released 2000 census data.

Growth Trends

While population in the Watauga River basin is low, there has been significant population growth. The percent population growth in the basin over the twenty-year period from 1970 to

1990 was 35.4 percent, almost triple the state average, although growth over the ten-year period from 1980 to 1990 was 6.1 percent.

Table A-8 presents population data for municipalities that are located wholly or partially within the basin. The table includes more recent data (2000) which indicates that Sugar Mountain is currently the fastest growing municipality in the basin with an increase in population of 71 percent from 1990 to 2000. Population in Banner Elk decreased over the same ten-year period by -13 percent. Population growth in the majority of municipalities in the basin slowed considerably after 1990. For those municipalities showing a decrease in population, it is probable that the population is not leaving the basin but moving outside municipal boundaries. This information was obtained from the Office of State Planning (April and May 2001).

Table A-8 Population and Percent Change (1980, 1990, 2000) for Municipalities Located Wholly or Partly in the Watauga River Basin

Municipality	County	Apr-80	Apr-90	Apr-2000	% Change (1980-90)	% Change (1990-2000)
Banner Elk	Avery	1,087	933	811	-14.2	-13.1
Beech Mountain	Avery, Watauga	190	239	310	25.8	29.7
Boone •	Watauga	10,191	12,949	13,472	27.1	4.0
Elk Park	Avery	535	486	459	-9.2	-5.6
Seven Devils	Avery, Watauga	54	117	129	116.7	10.3
Sugar Mountain •	Avery	188	132	226	-29.8	71.2

• - 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-9 shows the projected population and percent change in growth between 2000 and 2020 for counties that are wholly or partially contained within the basin and an estimation, provided by the NC Center for Geographic Information and Analysis, of the percentages of each county's area that lies within the basin. Since river basin boundaries do not usually coincide with county boundaries, these numbers are not directly applicable to the Watauga River basin. Even though 45 percent of Watauga County is contained within the basin, only 26 percent of Avery County is encompassed.

Table A-9 Past, Projected and Change in Population (1990, 2000, 2020) by County

County	% of County in Basin	1990	2000	Estimated Population 2020	Estimated Pop Change 1990-2000	Estimated Pop Change 2000-2020
Avery	26	14,867	17,167	19,976	2,300	2,809
Watauga	45	36,952	42,695	51,567	5,743	8,872
Total		**51,819**	**59,862**	**71,543**	**8,043**	**11,681**

* Source: North Carolina Center for Geographic Information and Analysis

Note: The numbers reported reflect county population; however, the county may not be entirely contained within the basin. The intent is to demonstrate growth for counties located wholly or partially within the basin.

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

2.6 Natural Resources

2.6.1 Ecological Significance of the Watauga River Basin

A number of features make the Watauga River basin an important component of the natural diversity of North Carolina -- unusual wetlands, the topography and range of elevations within the basin, and the rock type which underlies the eastern edge of the basin. Although small in area, the Watauga River basin contains a number of significant natural areas, including portions of two of the most significant sites in the Southern Appalachians -- Grandfather Mountain and Roan Mountain Massif. These areas are recognized well beyond North Carolina, due to numerous rare plants and animals, as well as outstanding and rare natural communities.

The Watauga River basin also contains several high quality Southern Appalachian Mountain bogs. Mountain bogs are saturated with water most of the year and may have thick layers of sphagnum moss underlain by peat and are acidic. Although these bogs are often small and do not make up a significant portion of the landscape, they support many rare plants and animals, including bog turtles (*Clemmys muhlenbergii*). About 90 percent of mountain bogs have been destroyed in North Carolina. The exact number of remaining bogs is difficult to determine, but is most likely fewer than 150 in the entire southeast. Historically ditched and drained for farms and pastures, bogs are now imperiled by development activities. More than half of the existing bogs are in private ownership and are under serious conversion pressure by private developers.

2.6.2 Significant Natural Heritage Areas, Public Lands and Rare Aquatic Species

Figure A-8 shows the significant natural heritage areas and public lands in the Watauga River basin. The National Park Service (Blue Ridge Parkway) and US Forest Service (Pisgah National Forest) manage less than 10% of the land in the Watauga basin. The majority of the basin is in private ownership, including a number of significant natural heritage areas.

Southern Appalachian Mountain Bogs

In North Carolina, mountain bogs are generally small, isolated and rare wetlands largely concentrated in two areas: a band between Henderson and Clay counties in the southern mountains; and in Avery, Watuaga, Ashe and Alleghany counties in the northern mountains (Early, 1989). Many are too small to be included on soil survey maps (Moorhead and Rossell, 1998). NC holds less than 500 acres of mountain bogs, and the entire Appalachian Highlands (includes Appalachian Plateau, Ridge and Valley, and Blue Ridge provinces of AL, GA, NC, VA and WV) contains less than 6,175 acres (Moorhead and Rossell, 1998). In the Watauga River basin, Beech Creek Bog is an outstanding example of this wetland community type. Also, the Julian Price Park contains three examples of Southern Appalachian Mountain bogs along the Blue Ridge Parkway.

North Carolina's mountain bogs host 77 species of rare, threatened or endangered plants such as the bunched arrowhead (*Sagittaria fasciculata*), swamp pink (*Helonias bullata*) and Gray's lily (*Lilium grayi*) (Murdock, 1994). In addition to harboring important plant species, the state's mountain bogs also host five species of rare, threatened or endangered animals (Murdock, 1994), most notably the bog turtle (*Clemmys muhlenbergii*). Of the estimated 500 acres of mountain bogs in NC, less than half support bog turtles (Herman, 1994).

Little research has investigated the hydrology of these bogs, but they may be found in four principle landscape positions: headwater regions of mountain streams, slopes intercepting the water table and subject to constant groundwater seepage, stream valleys no longer subject to flooding, and isolated systems over resistant rock strata (Walbridge, 1991; Weakley and Schafale, 1994). Although these wetlands are groundwater fed, (technically "fens" in classifications based on water source), they are locally known as bogs and have been called that in most publications within the state. The groundwater tends to be acidic and nutrient poor because of the acidic substrates it comes through. It is less rich than is typical of most northern fens, and the vegetation is therefore more "bog-like".

Historically ditched and drained for farms, ponds and pastures, mountain bogs today are also imperiled by development activities. Active management of some mountain bogs has focused on protecting or enhancing habitat for bog turtles or rare plants (Moorhead and Rossell, 1998). Since many bogs are privately owned and not actively managed or protected (Weakley and Moorhead, 1991), educating landowners on the value and significance of mountain bogs is an important first step in their protection.

Significant Upland Sites

A portion of Grandfather Mountain, one of the highest mountains in the Blue Ridge escarpment at 5,964 feet, lies within the Watauga basin. Popular for its rugged bluffs and scenic vistas, Grandfather Mountain contains one of the largest clusters of rare plants, animals and natural communities in the Southern Appalachians and is one of the most significant natural areas in eastern North America. Only a small portion of Roan Mountain lies in the southwest corner of the basin, but this area contains a number of rare species of plants, animal and natural communities, including Southern Appalachian Mountain bogs.

Rare Aquatic Species

In the Watauga River basin, there are eight species that are listed by North Carolina as either Endangered, Special Concern or Significantly Rare (Table A-10).

Table A-10 Rare Aquatic Animals in the Watauga River Habitat (as of November 2000)

Major Taxon	Common Name	Scientific Name	State Status	Federal Status
fish	Banded sculpin	*Cottus carolinae*	T	
salamander	Hellbender	*Cryptobranchus alleganiensis*	SC	SC
aq Insect	mayfly	*Drunella longicornis*	SR	
aq Insect	mayfly	*Litobrancha recurvata*	SR	
aq Insect	stonefly	*Bolotoperla rossi*	SR	
aq Insect	stonefly	*Shipsa rotunda*	SR	
aq Insect	caddisfly	*Palaeagapetus celsus*	SR	
mollusk	Green floater	*Lasmigona subviridis*	E	SC

Rare Species Listing Criteria

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

The **hellbender** is a long-lived salamander which inhabits large streams with cool, clean, fast-flowing water. Because they are sensitive to stream pollution, siltation and damming, hellbenders can serve as indicators of stream water quality. Urban development and associated habitat degradation have reduced many populations of the hellbender in North Carolina. Forested riparian buffers can reduce pollution and siltation of streams and improve hellbender habitat.

The **green floater** is an endangered mussel which lives in smaller, slow-flowing streams. Once common in the Neuse and Cape Fear River basins, green floater populations have declined due to water quality degradation, habitat destruction and loss of fish hosts. Clean water will help protect the green floater mussel populations in the Watauga River basin.

The entire range of the **banded sculpin** is limited to far western Virginia and North Carolina. These fish are typical of clean, clear streams with well-oxygenated, cool water. Sculpins prefer streams with a rock or gravel bottom and an abundance of rocks in which to look for their food, which consists of aquatic insects, small fishes and occasionally some vegetation.

The **stonefly**, *Shipsa rotunda*, is the only species in the genus. Found primarily further north in North America, this aquatic insect feeds by breaking down or shredding organic matter such as leaves in the stream.

The **mayfly**, *Drunella longicornis*, makes its living by clinging to rocks and other stable objects in the stream current and feeding on the algae growing on the surfaces of these objects.

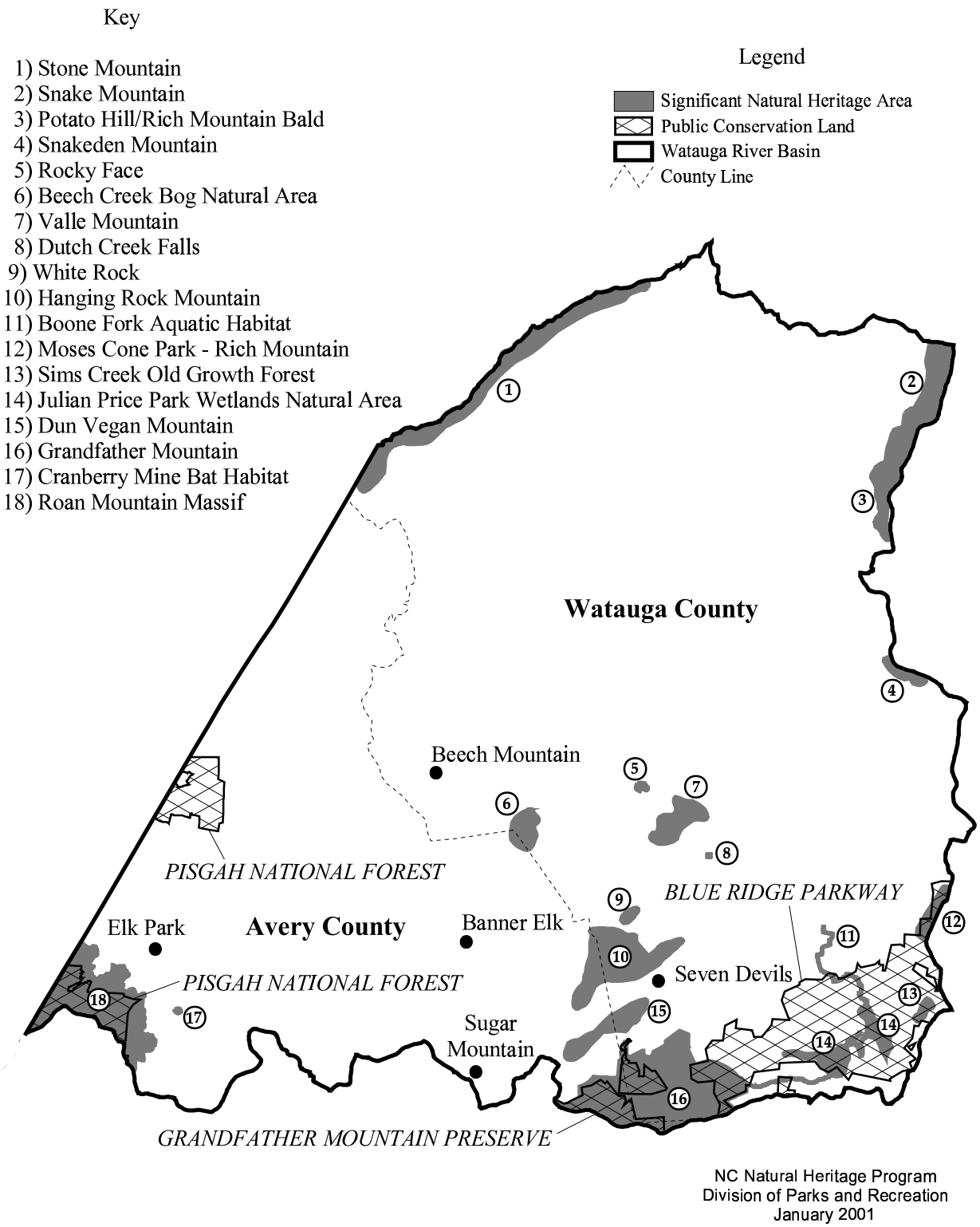


Figure A-8 Public Lands and Significant Natural Heritage Areas in the Watauga River Basin

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 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.

The primary pollutants associated with point source discharges are:

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

2.7.1 Wastewater Discharges in the Watauga River Basin

There are 28 permitted discharges in the Watauga River basin. Table A-11 provides summary information (numbers of facilities and permitted flows) regarding the discharges. More detailed information regarding the dischargers characterized in the table is provided in Appendix I.

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

	Subbasin 04-02-01
Facility Categories	**TOTAL**
Total Facilities	28
Total Permitted Flow (MGD)	2.3
Major Discharges	0
Minor Discharges	28
Total Permitted Flow (MGD)	2.3
100% Domestic Waste	25
Total Permitted Flow (MGD)	2.3
Municipal Facilities	4
Total Permitted Flow (MGD)	1.2
Nonmunicipal Facilities	24
Total Permitted Flow (MGD)	1.1

The majority of the NPDES dischargers in the Watauga River basin are from wastewater treatment plants serving communities and schools (package plants). All of the facilities in the basin discharge less than one million gallons of flow per day. Facilities, large or small, where recent data show problems with a discharge are listed and discussed in each subbasin chapter in Section B. Figure A-9 shows the location of all permitted wastewater discharges within the 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 as Major.

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

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

Industrial Facilities: Non-public facilities that provide treatment for domestic, industrial or commercial wastewater. This category includes wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation, and other facilities such as schools, subdivisions, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

2.7.2 Stormwater Discharges in the Watauga River Basin

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

EPA Stormwater Rules

Phase I – December 1990

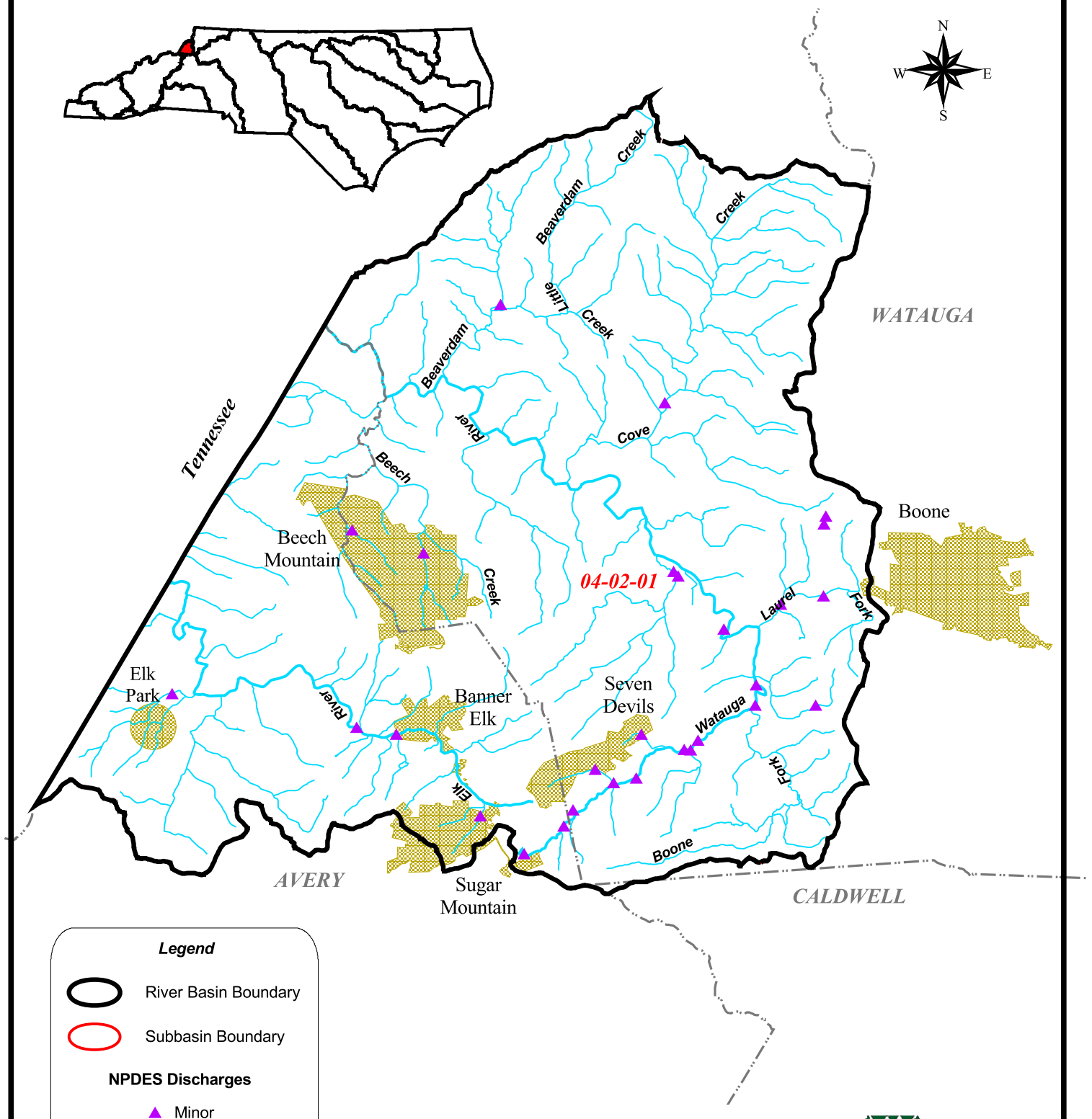
- Requires a NPDES permit for municipal separate storm sewer systems (MS4s) serving populations of 100,000 or more.
- Requires a NPDES stormwater permit for ten categories of industry.
- Requires a NPDES stormwater permit for construction sites that are 5 acres or more.

Phase II – December 1999

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

The municipal permitting requirements are designed to lead into the formation of comprehensive stormwater management programs for municipal areas. No municipalities in the Watauga River basin were required to obtain a NPDES permit for stormwater sewer systems under the Phase I rules (population >100,000). Additionally, no municipalities in the basin are automatically required (US Census designated Urban Areas) to obtain a NPDES stormwater permit under the Phase II rules. However, Boone will be considered for inclusion under the Phase II rules because of a population greater than 10,000 and/or a population density greater than 1,000 persons per square mile. DWQ is currently developing criteria that will be used to determine whether this and other municipalities should be required to obtain a NPDES permit.

Figurea A-9 NPDES Discharges in the Watauga 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 stormwater general permits, there are 8 general stormwater permits and no individual permits active within the Watauga River basin. Individual permit holders are presented in Appendix I.

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

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

2.8 Animal Operations

In 1992, the Environmental Management Commission adopted a rule modification (15A NCAC 2H.0217) establishing procedures for managing and reusing animal wastes from intensive livestock operations. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following size: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system. Within the past five years there have been several additional pieces of legislation enacted that affect animal operations in North Carolina.

There is only one registered animal operation in the Watauga River basin, containing a total of 300 cattle (240,000 pounds SSLW) (Table A-12). This number reflects only operations required by law to be registered, and therefore, does not represent the total number of animals in the basin.

Table A-12 Registered Animal Operations in the Watauga River Basin (as of 3/1/2001)

Subbasin 04-02-01	Cattle			Poultry			Swine		
	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight	No. of Facilities	No. of Animals	Total Steady State Live Weight
TOTALS	1	300	240,000	0	0	0	0	0	0

Steady State Live Weight (SSLW) is the result, in pounds, after a conversion factor has been applied to the number (head count) of swine, cattle or poultry on a farm. The conversion factors, which come from the US Department of Agriculture-Natural Resources Conservation Service (USDA-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 the size of the animal, SSLW is the best way to compare the sizes of the farms.

Information on animal capacity (Table A-13) was provided by the NC Department of Agriculture and Consumer Service. A negligible percentage of the state's total capacity for swine, dairy and poultry is found in the Watauga River basin. Overall, swine and dairy production in the Watauga River basin decreased this decade while poultry production remained constant.

Table A-13 Estimated Populations of Swine, Dairy and Poultry in the Watauga River Basin (1998 and 1994)

Subbasin 04-02-01	Total Swine Capacity		Swine Change	Total Dairy Capacity		Dairy Change	Poultry Capacity		Poultry Change
	1998	1994	94-98 (%)	1998	1994	94-98 (%)	1998	1994	94-98 (%)
TOTALS	35	88	-60	80	182	-56	962	962	0
% of State Total	<1%	<1%		<1%	<1%		<1%	<1%	

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 in 1989 to assure that communities have an adequate supply of potable 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.

Total water use in the Watauga River basin is estimated at 4.2 million gallons per day (MGD), with about two-thirds of the demand supplied from surface water sources. Five public water systems in the basin, Banner Elk, Elk Park, Seven Devils, Beech Mountain and Mill Ridge Property Owners Association, provide 0.6 MGD to 4,124 people in the basin. Beech Mountain is the only system of these five that uses surface water. Water demand from these public systems is estimated to increase by 27 percent by 2020. Two of the four systems reported that available supply is not adequate to meet estimated demand through 2020 (NCDENR-DWR, 2001).

Not everyone gets water from public water supply systems. Many households and some commercial and industrial operations supply their own water from both surface and groundwater sources in the basin. The US Geological Survey estimates that self-supplied users, excluding power generating facilities, account for 55 percent of the total water used in the Watauga River

basin. Water used for irrigation comprises the majority of self-supplied water use in the basin (Figure A-10).

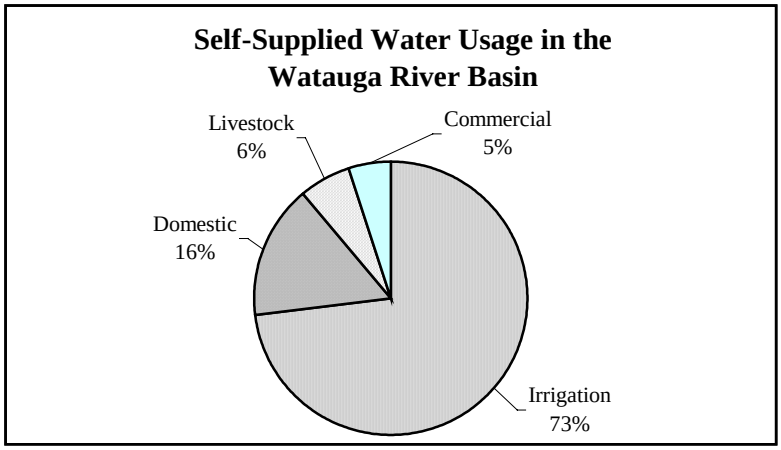


Figure A-10 Estimated Self-Supplied Water Usage in the Watauga River Basin (NCDENR-DWR, January 2001)

The State Water Supply Plan is a compilation of over 500 LWSPs developed by local government water systems in North Carolina. More detailed information is available in the plan about water supply and water usage in the Watauga River basin. This plan is available online at the Division of Water Resources website at http://www.dwr.ehnr.state.nc.us or by calling (919) 733-4064.

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. Division of Water Resources, in conjunction with the Wildlife Resources Commission, recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The permits are issued by the Division of Land Resources. Table A-14 presents projects DWR has been involved with in the Watauga River basin.

Table A-14 Minimum Streamflow Projects in the Watauga River Basin

Name	Location	Waterbody	Drainage Area (sq. mi.)	Min. Release Jan.-Sept. (cu.ft/sec)	Min. Release Oct.-Dec. (cu.ft/sec)
Hydroelectric Dams: Watauga River, Watauga County					
Ward Mill Dam		Watauga River	92.6	None*	None*
Impoundment Dams: Buckeye Creek, Avery County					
Beech Mountain Reservoir	Beech Mountain	Buckeye Creek	3.4	1.5	2.8**

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

** A higher minimum flow is required from October to December, the spawning period for brook trout.

2.9.3 Water Withdrawals

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

As of August 2000, there are 10 registered water withdrawals in the basin. Four of these (40 percent) are surface water withdrawals. Excluding public water supply systems or power generating facilities, there is a cumulative capacity to withdraw approximately 6 million gallons per day (Table A-15), primarily from groundwater.

Table A-15 Registered Water Withdrawals (as of 08/01/2000) in the Watauga River Basin

Facility	Source of Withdrawal	Average Withdrawal (MGD)	Maximum Withdrawal (MGD)
Blowing Rock Country Club	# 9 Lake	0.17	0.25
Beech Mountain Resort, Inc.	Pond on Beech Mountain	1	4
Sugar Mountain Resort, Inc.	Stream and Pond at Sugar Mountain	0.14	0.3
Ski Hawksnest, Inc.	Valley Creek Ponds	0.45	0.6
Carolina Water Service – Hounds Ear	Groundwater	0.73	0.137
Elk River Utilities, Inc. – Elk River	Groundwater	0.0585	Not Reported
Carolina Water Service – Sugar Mountain	Groundwater	0.197	0.312
Carolina Water Service – Ski Country	Groundwater	0.012	0.033
Carolina Water Service – Crystal Mountain	Groundwater	0.004	0.048
Carolina Water Service – Misty Mountain	Groundwater	0.028	0.17

2.9.4 Interbasin Transfers

In addition to water withdrawals (discussed above), water users in North Carolina are also required to register surface water transfers with the Division of Water Resources if the amount is 100,000 gallons per day or more. In addition, persons wishing to transfer two million gallons per day (MGD) or more, or increase an existing transfer by 25 percent or more, must first obtain a certificate from the Environmental Management Commission (G.S. 143-215.22I). The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolin*a, on file in the Office of the Secretary of State. These boundaries differ slightly from the 17 major river basins delineated by DWQ.

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

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

A provision of the interbasin transfer law requires that an environmental assessment or environmental impact statement be prepared in accordance with the State Environmental Policy Act as support documentation for a transfer petition.

Currently, the only potential transfer involving the Watauga River basin is the Town of Boone. Based on information from 1997 Local Water Supply Plans, the town withdraws water from the New River basin and serves some customers in the Watauga River basin. The transfer amount due to consumptive losses (irrigation, septic, etc.) is unknown, but most likely very small.

2.10 Physical Impacts to Wetlands and Streams

DWQ has issued approvals for wetland filling activities since the mid-1980s; however, in 1989, the Environmental Management Commission directed DWQ to begin reviewing wetland fill and stream alteration activities using a review sequence of (1) avoidance, (2) minimization and (3) mitigation of wetland impacts. Rules finalized in 1996, required that wetland values, such as whether or not the wetland is providing significant uses or whether the filling activity would remove or degrade those uses, be considered. The rules also specify wetland and stream mitigation ratios and type and location of projects to make the mitigation process more predictable and manageable for the regulated community. DWQ's emphasis continues to be on water quality and the essential role that wetlands play in maintaining water quality. The issuance of a 401 Water Quality Certification by DWQ is required before the US Army Corps of Engineers can issue a Section 404 Permit authorizing the fill or alteration of wetlands and/or streams in North Carolina.

Despite efforts to protect and restore wetland and stream functions on the part of DWQ and many other agencies and organizations in North Carolina, there is still an annual net loss of wetlands and streams statewide. DWQ and Division of Land Resources (DLR) regulate construction activities near streams and wetlands. These regulatory programs ensure that construction projects cause minimal damage to these resources and that unavoidable impacts are addressed through mitigation projects. Restoration projects are also funded through the Wetland Restoration Program (WRP), Section 319 Program, Clean Water Management Trust Fund and Division of Water Resources Grant Program that can help offset stream and wetland impacts.

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

Over the five-year period from 1995-1999, DWQ issued permits for approximately 1.22 acres of wetland fill activities and alteration activities that affected at least 977 linear feet of stream in the Watauga River basin. A significant percentage of stream impacts statewide are associated with highway construction projects.

In June 1998, a federal court declared that the US Army Corps of Engineers' Tulloch Rule, which prohibited the ditching and draining of wetlands, was illegal. As a result, during FY 1999-2000, approximately 9,220 acres of wetlands on about 80 sites (mostly in southeastern NC) were ditched and drained. This activity stopped in March 1999 when DWQ began to enforce its wetland standards. DWQ, EPA and DLR have spent an extensive amount of time visiting each of these sites to check for compliance with environmental rules. Most of these wetlands were slated to be restored by December 2000.