

Executive Summary

Basinwide water quality planning is a watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the North Carolina Division of Water Quality (DWQ) for each of the seventeen major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by DWQ, their implementation and the protection of water quality entail the coordinated efforts of many agencies, local governments and stakeholders throughout the state.

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to Impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters while allowing for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with regional and local agencies to develop appropriate management strategies. This includes providing agencies information related to financial and funding opportunities.
- Assure equitable distribution of waste assimilative capacity.
- Evaluate the cumulative effects of pollution.
- Improve public awareness and involvement.
- Regulate point and nonpoint sources of pollution where other approaches are unsuccessful.

This document is the third five-year update of the *Watauga River Basinwide Water Quality Plan*. The first basin plan for the Watauga River basin was completed in 1997 and the second in 2002. The format of the plan was revised in response to comments received during the first and second planning cycles. DWQ replaced much of the general information in the first two plans with more detailed information specific to the Watauga River basin. For this plan, a greater emphasis was placed on identifying water quality concerns on the watershed level in order to facilitate protection and restoration efforts.

Basin Overview

The Watauga River basin is situated in the far northwest corner of the state between the French Broad River basin to the south and the New River basin to the north. The entire watershed drains northwest into Tennessee where it flows into the Watauga River Reservoir (Figure *iii*). The Watauga River itself is a major tributary to the Holston River, which eventually flows to the Tennessee River. The basin is the second smallest in the state, containing nearly 280 stream miles and encompassing only 205 square miles.

The North Carolina portion of the Watauga River basin is located entirely in the Blue Ridge Province of the Appalachian Mountains. Major tributaries to the Watauga River include Boone Fork, Cove Creek, Buckeye Creek, and the Elk River. Two counties (Avery and Watauga) are

entirely or partially contained within the basin. DWQ subdivides all river basins into subbasins. The Watauga River basin contains one subbasin (Figure *iv*).

Information presented in this basinwide water quality plan is based on data collected from September 1999 to August 2004. Specific watershed characteristics and water quality concerns are included in Chapter 1.

DWQ identifies the stressors to water quality as specifically as possible depending on the amount of information available in a particular watershed. Most often, the source of the stressor is based on the predominant land use in a watershed. In the Watauga River basin, habitat degradation, nutrient enrichment and temperature were all identified as possible stressors. Impervious surfaces, construction activities, pasture, agriculture, and stormwater outfalls were identified as potential sources. Water quality decline can often be attributed to a combination of many stressors that can lead to habitat and water quality degradation. In some way, every person, industry, landowner, and municipality in the basin impacts water quality. Therefore, every resident of the basin must play a role in management strategies designed to protect and restore the streams, lakes and rivers of the basin.

Use Support Summary

Use support assessments based on surface water classifications form the foundation of this basinwide plan. Surface waters are classified according to their best-intended use. Determining how well a waterbody supports its use (use support rating) is an important method of interpreting water quality data and assessing water quality.

Biological, chemical and physical monitoring data collected between September 1999 and August 2004 were used to assign use support ratings in the Watauga River basin. A total of 5.9 miles (6.6 percent) of monitored streams are Impaired in the Watauga River basin. The impairments are associated with habitat degradation and nonpoint source runoff related to agricultural and residential land use. Table *i* presents a summary of the Impaired waters and the associated stressors. Current status and recommendations for restoration of water quality for the Impaired water is discussed in Chapter 1. Current use support ratings for assessed streams are also presented on the subbasin map in Chapter 1 (Figure 3).

Use support methodology has changed significantly since the 2002 revision of the *Watauga River Basinwide Water Quality Plan*. In the previous plan, surface waters were rated fully supporting (FS), partially supporting (PS), not supporting (NS) and not rated (NR). FS was used to identify waters that were meeting their designated use. Impaired waters were rated PS and NS, depending on the degree of degradation. NR was used to identify waters with no data or those that had inconclusive data.

The 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance* issued by the Environmental Protection Agency (EPA) requests that states no longer subdivide the Impaired category. In agreement with this guidance, North Carolina no longer subdivides the Impaired category and rates waters as Supporting (S), Impaired (I), Not Rated (NR), or No Data (ND). These ratings refer to whether the classified uses of the water (such as water supply, aquatic life, primary/secondary recreation) are being met. Detailed information on use support methodology is provided in Appendix IX.

Table i Summary of Impaired Waters in the Watauga River Basin

Stream/ River Name	Assessment Unit Number (AU#)	Subbasin	Class	Miles	Category	Water Quality Stressor/Source
Beaverdam Creek	8-19	04-02-01	C Tr	5.9	Aquatic Life	Habitat degradation from Land Use Practices (i.e., agriculture, residential)

Use Support Category	Total Impaired Freshwater Miles	Percent of Impaired Monitored Streams
Aquatic Life	5.9 mi	6.6
Recreation	0.0	0.0
Fish Consumption	0.0	0.0
Water Supply	0.0	0.0

DWQ use support methods were developed to assess ecosystem health and human health risk through the development of use support ratings for five categories: aquatic life, fish consumption, recreation, shellfish harvesting, and water supply. These categories are tied to the uses associated with the primary classifications applied to North Carolina rivers, streams and lakes. A full description of the classifications is available in the DWQ document titled *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina* (www.ncwaterquality.org/csu/).

Water Quality Standards and Classifications

Throughout the Watauga River basin, water quality is generally good and even excellent. Chapter 2 discusses water quality standards and classifications and includes maps showing the designated Water Supply (WS) watersheds, High Quality Waters (HQW) and Outstanding Resource Waters (ORW).

In the Watauga River basin, several municipalities and smaller outlying communities are being pressured to expand. This often involves construction and/or development in areas of pristine waters. Many of the streams the Watauga River basin have the supplemental classification of HWQ or ORW. Management strategies are associated with these supplemental classifications and are intended to prevent degradation of water quality below present levels from point and nonpoint sources of pollution. A brief summary of these strategies and the administrative code under which the strategies are found are included in Chapter 1.

Water Quality Stressors

Water quality stressors are identified when impacts have been noted to biological (benthic and fish) communities or water quality standards have been violated. Whenever possible, water quality stressors are identified for Impaired waters as well as waters with notable impacts (Figure *i* and *ii*).

Figure i Stressors Identified in the Watauga River Basin

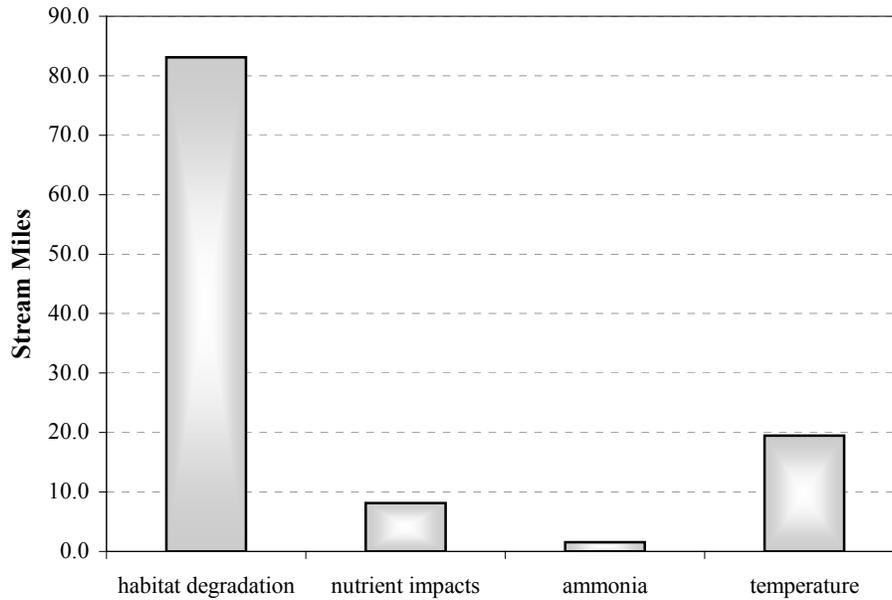
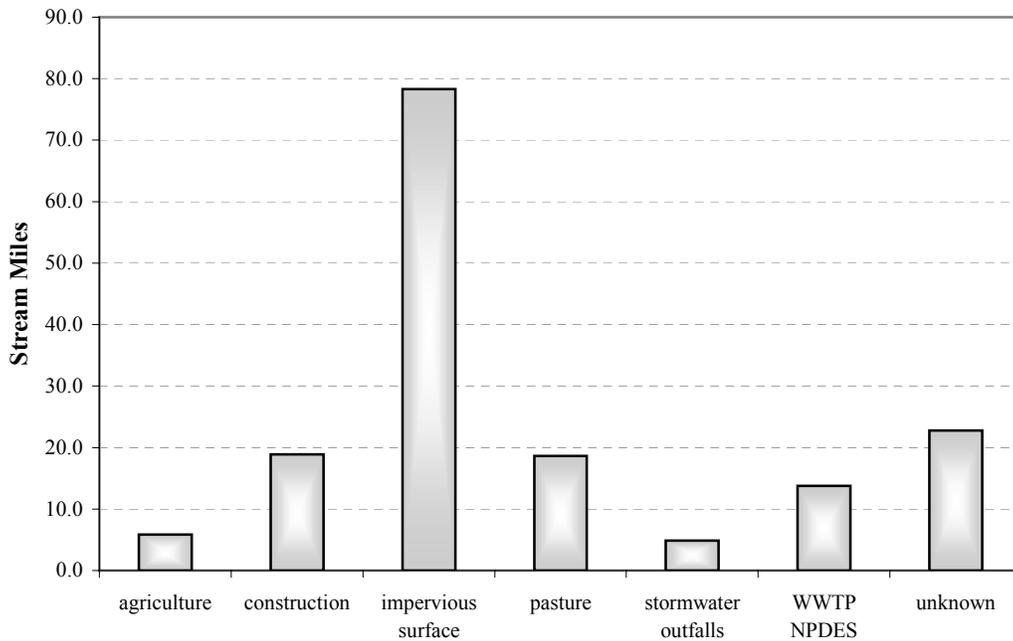


Figure ii Sources of Identified Stressors in the Watauga River Basin



One of the most noted water quality stressors is instream habitat degradation. Instream habitat degradation is identified where there is a notable reduction in habitat diversity or a negative change in habitat. Sedimentation, streambank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour are all associated

with habitat degradation. These stressors are typically a result of increased flow of stormwater runoff due to land use changes or to sediment runoff from land-disturbing activities. Streams with noted habitat degradation are discussed in Chapter 1.

Other chemical and biological factors can also impact water quality. These include excess algal growth, low dissolved oxygen, nitrogen and phosphorus levels, pH, and fecal coliform bacteria. Chapter 3 provides definitions and recommendations for reducing impacts associated with physical, chemical and biological factors.

Population Growth and Changes in Land Use

The Watauga River basin encompasses all or portions of two counties and six municipalities. In 2000, the overall population in the basin (based on the percent of the county land area in the basin) was 23,675. The most populated areas are located in and around the towns of Boone and Banner Elk.

Watauga River Basin Statistics (North Carolina Portion)

Total Area: 205 sq. miles
Freshwater Stream Miles: 278.3 mi
No. of Counties: 2
No. of Municipalities: 6
No. of Subbasins: 1
Population (2000): 23,675*
Pop. Density (2000): 115 persons/sq. mile*

Water Quality Statistics

Aquatic Life

Percent Monitored Streams: 32.3%
Percent Supporting: 88.2%
Percent Impaired: 6.6%
Percent Not Rated: 5.2%

Recreation

Percent Monitored Streams: 7.0%
Percent Supporting: 100%

* Estimated based on % of county land area that is partially or entirely within the basin, not the entire county population.

Between 1990 and 2000, both counties in the basin experienced an increase in population. Avery County saw an increase of about 2,500 persons (13.4 percent) while Watauga County had an increase of nearly 6,000 persons (13.4 percent). County populations are expected to grow by another 7,000 people (10.1 percent) by 2020. This would result in a total population of over 66,000 people in the two counties in the Watauga River basin. Population growth trends and the accompanying impacts to water quality are discussed in Chapters 3 and 4.

Expanding populations are typically characterized by a loss of natural areas and an increase in impervious surface. Based on the current land cover information provided by the National Resources Inventory (USDA-NRCS, 2001), between 1982 and 1997 there was a 100 percent decrease (2,000 acres) in cultivated cropland in the Watauga River basin. Uncultivated cropland and pastureland also decreased by nearly 1,300 acres (33.3 percent and 0.4 percent, respectively). Urban and built-up areas increased by nearly 8,100 acres, or 218.9 percent. Much of this land cover change is accounted for in the areas around Beech Mountain

and Sugar Mountain, where population increased by 29.7 percent and 71.2 percent, respectively, from 1990 to 2000. Land cover tables and statistics are included in Appendix III. Population statistics are included in Appendix I.

Growing populations not only require more water, but they also lead to the discharge and runoff of greater quantities of waste and pollutants into the state's streams and groundwater. The impacts on rivers, lakes and streams can be significant and permanent if stormwater runoff is not

controlled. Just as water demand and use increases, some of the potential water supply is also lost (Orr and Stuart, 2000).

Impacts from Steep Slope Disturbance

Dramatic elevation changes and steep slopes define mountain topography. Building sites perched along mountainsides provide access to unparalleled vistas and are a major incentive for development. However, construction on steep slopes presents a variety of risks to the environment and human safety.

Poorly controlled erosion and sediment from steep slope disturbance negatively impact water quality, hydrology, aquatic habitat and threaten human safety and welfare. Soil types, geology, weather patterns, natural slope, surrounding uses, historic uses and other factors all contribute to unstable slopes. Improper grading practices disrupt natural stormwater runoff patterns and result in poor drainage, high runoff velocities and increased peak flows during storm events. There is an inherent element of instability in all slopes and those who choose to undertake grading and/or construction activities should be responsible for adequate site assessment, planning, designing and construction of reasonably safe and stable artificial slopes.

Local communities also have a role in reducing impacts from steep slope development. These impacts can also be addressed through the implementation of city and/or county land use and sediment and erosion control plans. Land use plans are a non-regulatory approach to protect water quality, natural resources and sensitive areas. In the planning process, a community gathers data and public input to guide future development by establishing long-range goals for the local community over a ten- to twenty-year period. They can also help control the rate of development, growth patterns and conserve open space throughout the community. Land use plans examine the relationship between land uses and other areas of interest including quality-of-life, transportation, recreation, infrastructure and natural resource protection (Jolley, 2003).

Impacts from Stormwater Runoff

Stormwater runoff is rainfall or snowmelt that runs off the ground or impervious surfaces (i.e., buildings, roads, parking lots, etc.) instead of absorbing into the soil. In some cases, stormwater runoff drains directly into streams, rivers, lakes and oceans. In other cases, particularly urbanized areas, stormwater drains into streets and manmade drainage systems consisting of inlets and underground pipes, commonly referred to as a storm sewer system. Stormwater runoff is a primary carrier of nonpoint source pollution in both urbanized and rural areas. The impact of stormwater runoff is particularly severe in developing areas where recently graded lands are highly susceptible to erosion. Water quality impacts are also evident in urbanized areas where stormwater runoff is increased by impervious surfaces and is rapidly channeled through ditches or curb and gutter systems into nearby streams. For more information on stormwater as it relates to growth and development, refer to Chapter 4.

There are several different stormwater programs administered by DWQ. Two of these programs affect communities in the Watauga River basin. The goal of DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs accomplish this goal by controlling the source(s) of pollution. Chapter 5 contains more information federal and state stormwater programs.

Septic Systems and Straight Pipes

In the Watauga River basin, wastewater from many households is not treated at a wastewater treatment plant (WWTP). Instead, it is treated on-site through the use of permitted septic systems. However, wastewater from some homes illegally discharges directly into streams through what is known as a “straight pipe”. In some cases, wastewater can also enter streams through failing septic systems. In highly susceptible areas, wastewater from failing septic systems or straight pipes can contaminate a drinking water supply or recreational water with nutrients, disease pathogens and endocrine disturbing chemicals.

In order to protect human health and maintain water quality, the NC Wastewater Discharge Elimination (WaDE) Program is actively helping to identify and remove straight pipes (and failing septic systems) in western North Carolina. The program uses door-to-door surveys to locate straight pipes and failing septic systems and offers deferred loans or grants to assist homeowners in eliminating straight pipes and repairing septic systems. More information on WaDE and the DWQ wastewater programs can be found in Chapter 5.

Agriculture and Water Quality

Excess nutrient loading, pesticide and/or herbicide contamination, bacterial contamination, and sedimentation are often associated with agricultural activities, and all can impact water quality. Chapter 6 provides information related to agricultural activities in the Watauga River basin and also identifies funding opportunities for best management practices (BMP). During this five-year assessment period, the North Carolina Agricultural Cost Share Program (NCACSP) funded BMPs totaling more than \$87,000. BMPs include planned systems for reducing soil erosion and nutrient runoff and planned systems for protecting streams and streambanks.

In several streams throughout the basin, DWQ noted evidence of and observed several areas where livestock had direct, easy access to the streams. Fencing, or livestock exclusion, prevents livestock from entering a stream and provides an area of vegetative cover, which can secure streambanks, lower stream velocities, trap suspended sediments, and decrease downgradient erosion. Livestock exclusion is also effective in reducing nutrient, bacteria and sediment loads in a stream (Line and Jennings, 2002). Of the \$87,000 of NCACSP funds spent on BMPs in the Watauga River basin, over 85 percent (\$74,300) was spent on 14,000 feet of fence and 38 alternate water sources. For more information on NCACSP, see Chapter 6.

Besides pasturelands and row crops, Christmas tree production also has a significant presence in the Watauga River basin. Most of the tree plantations in western North Carolina are above 3,000 feet in elevation and are often located on steep, highly erodible slopes (NCSU Cooperative Extension Service, April 2005). Between 2003 and 2006, 20.5 acres of Christmas Tree Conservation Cover were installed in the Watauga River basin. NCACSP funding totaled \$2,330. More information related to Christmas tree production can be found in Chapter 1.

Forestry and Water Quality

Based on land cover information provided by the North Carolina Center for Geographic Information and Analysis (CGIA) and the USDA-NRCS, 53 percent (76,800 acres) of land in the Watauga River basin consists of forestland. Ninety-two percent of the forestland is privately owned with the remaining eight percent owned by the State Parks System (Brown, 2004). No stressors associated with land clearing or forestry activities were noted or identified in the

Watauga River basin. Where forest harvesting is identified as a potential source of water quality impact, DWQ will notify the NC Division of Forest Resources (DFR) to investigate potential violations. Chapter 7 presents more information related to the impacts of forestry on water quality.

Water Resources

Chapter 8 presents information related to minimum streamflow requirements, interbasin transfers, water quality drought conditions and source water protection. The chapter also includes the federal cataloging units, commonly known as hydrologic units, as they relate to the state subbasin boundaries.

Natural Resources

Several rare and endemic aquatic species can be found in the Watauga River basin. Many of these species, and ecological communities in which they exist, are found nowhere else in the State. Chapter 9 presents information related to the ecological significance of the basin and identifies endangered and threatened species, significant natural heritage areas and aquatic habitats, and public conservation lands that are locally significant.

Local Involvement

Local organizations and agencies are able to combine professional expertise and local knowledge not present at the state and federal level. This allows groups to holistically understand the challenges and opportunities of local water quality concerns. Involving a wide array of people in water quality projects also brings together a wide range of knowledge and interests and encourages others to become involved and invested in these projects. Working in cooperation across jurisdictional boundaries and agency lines opens the door to additional funding opportunities and eases the difficulty of generating matching or leveraged funds. This could potentially allow local entities to do more work and be involved in more activities because funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of local efforts is key to water quality improvements, and DWQ applauds the foresight and proactive response by locally based organizations and agencies to protect water quality. There are many excellent examples of local agencies and groups using these cooperative strategies throughout the state. Several local watershed projects are highlighted throughout Chapter 1. Chapter 10 also examines the local, regional and federal initiatives underway in the Watauga River basin.

Recommended Management Strategies for Restoring Impaired Waters

Beaverdam Creek is newly Impaired based on the most recent biological data and will likely be placed on the 2008 303(d) list. Land use primarily consists of open pastures; however, row crops and residential properties are also scattered throughout the watershed. DWQ will continue to monitor water quality in Beaverdam Creek and work with local agencies to encourage appropriate agricultural and residential stormwater BMPs. Public education is also needed to show the importance of good riparian zones and the use of BMPs to reduce habitat degradation and impacts from stormwater runoff.

The task of quantifying nonpoint source runoff and developing management strategies for any Impaired water is very resource intensive. This task is overwhelming, given the current limited resources of DWQ, other state and federal agencies and local governments. DWQ will collaborate with other local and state agencies and watershed groups that deal with nonpoint source pollution issues to develop management strategies for the Impaired and notable waters throughout the next *Watauga River Basinwide Water Quality Plan* assessment period.

Waters on the North Carolina 303(d) List

For the next several years, addressing water quality impairment in waters that are on the state's 303(d) list will be a DWQ priority. Section 303(d) of the federal Clean Water Act requires states to develop a list of waters not meeting water quality standards or which have Impaired uses. States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. EPA issued guidance in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list within 8-13 years. Information regarding 303(d) listing and reporting methodology can be found in Appendix VII.

Challenges Related to Achieving Water Quality Improvements

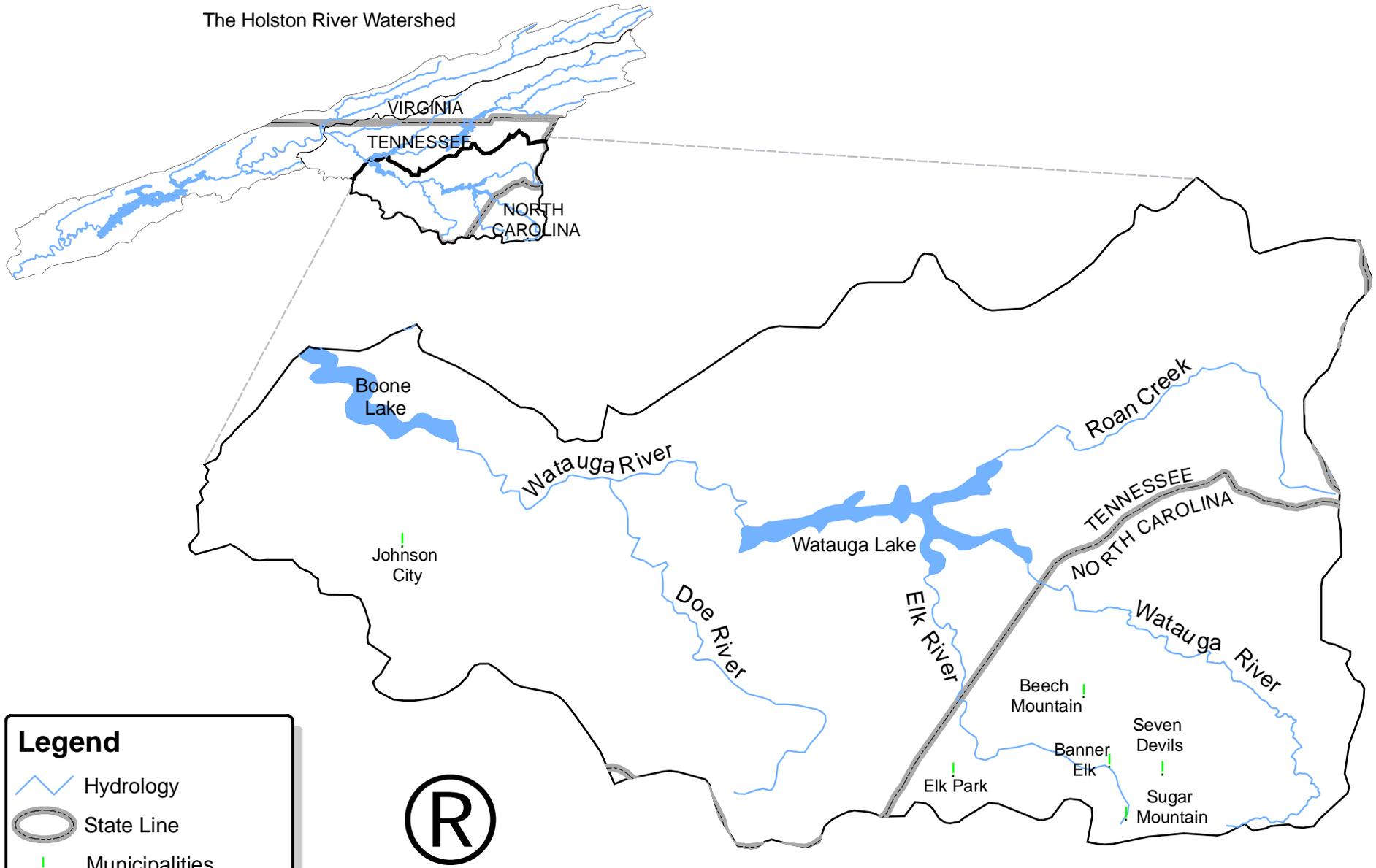
To achieve the goal of restoring Impaired waters in the Watauga River basin, DWQ will need to work closely with other state agencies and stakeholders to identify and control pollutants. The costs of restoration can be high, but several programs exist to provide funding for restoration efforts. These programs include the Clean Water Management Trust Fund (CWMTF), the NC Agricultural Cost Share Program (NCACSP), and the Ecosystem Enhancement Program (NCEEP).

Across the state, balancing economic growth and water quality protection will be a tremendous challenge. Point source impacts on surface waters can be measured and addressed through the basinwide planning process, but these often do not represent the greatest threat to water quality. The cumulative effects of nonpoint source pollution are the primary threat to water quality and habitat degradation in many areas across the state and throughout the Watauga River basin. Nonpoint source pollution can be identified through the basinwide plan, but actions to address these impacts must be taken at the local level. Such actions should include:

- Develop and enforce local erosion control ordinances.
- Require stormwater best management practices for existing and new development.
- Develop and enforce buffer ordinances.
- Conduct comprehensive land use planning that assesses and reduces the impact of development on natural resources.

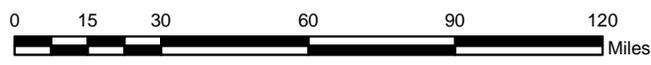
This basinwide plan presents many water quality initiatives and accomplishments that are underway throughout the basin. These actions provide a foundation on which future initiatives can be built.

Figure 1 General Map of the Entire Watauga River Basin



Legend

- Hydrology
- State Line
- Municipalities
- Watauga River Basin



Planning Section
 Basinwide Planning Unit
 December 4, 2006

* Data provided by National Atlas.

Figure 2 General Map of the Watauga River Basin in North Carolina

