Chapter 1
Hiwassee River Subbasin 04-05-01
Including: Lake Chatuge, Shooting Creek, and Brasstown Creek Watersheds

1.1 Subbasin Overview

Subbasin 04-05-01 at a Glance

Land and Water Area

Total area:	223 mi²
Land area:	195 mi²
Water area:	28 mi²

Population (County)

2000 Est. Pop.:	8,775 people
Pop. Density:	45.0 persons/mi²

Land Cover (percent)

Forest/Wetland:	69%
Water:	14.8%
Urban:	2.5%
Cultivated Crop:	6.9%
Pasture/ Managed Herbaceous:	6.8%

Counties
Clay

Municipalities
Hayesville

Aquatic Life Monitored Streams Statistics

Total Streams:	43.3 mi
Total Supporting:	34.9 mi
Total Not Rated:	8.4 mi

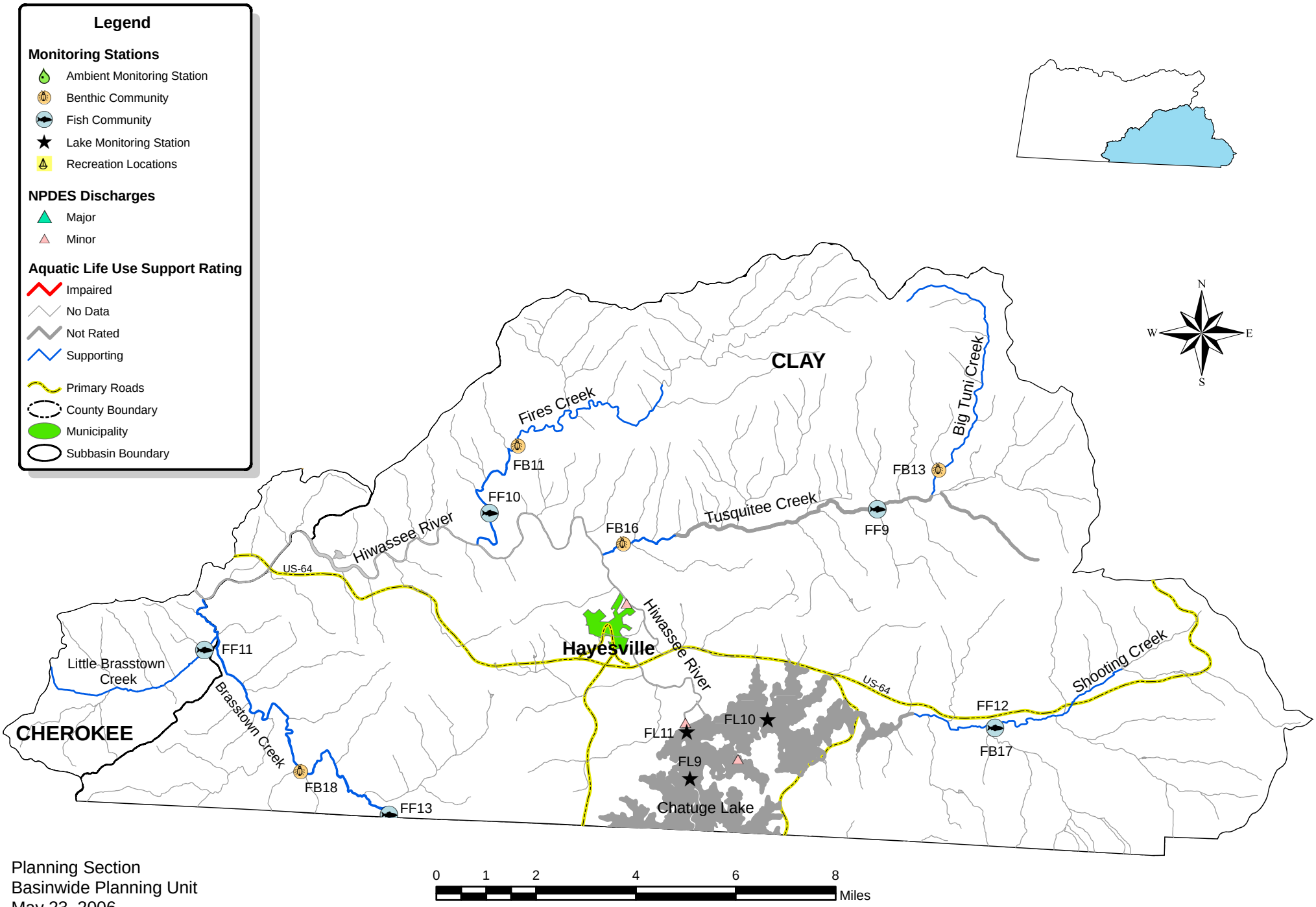
The Hiwassee River originates in the mountains of Towns County, Georgia and flows northward. Near the NC/GA state line, the river is impounded to form Lake Chatuge. Two major tributaries, Big Tuni Creek and Fires Creek, originate in the high mountains of northern Clay County. Land use in this area is mostly forest and the terrain is rugged. Conversely, Tusquitee and Brasstown Creeks flow through the broad valleys of southern Clay County where topography is gentle and more favorable for agriculture and residential land uses. Hayesville is the only municipality.

Most of the land within this subbasin is forested (69 percent), but cropland and pasture are also common (14 percent). Nearly fifteen percent of the area is surface water, reflecting the 3,629 acres of Lake Chatuge. The population of Clay County, based on 2000 census data, is 8,775 and the majority of the county lies within this subbasin boundary. The population of Clay County is expected to increase 26.4 percent over between 2000 and 2020. Refer to Appendix I and III for more information about population growth and land use changes, respectively.

There is one large NPDES discharger in this subbasin (Clay County WWTP, NC0026697) whose permitted discharge is 0.3 MGD. Since the last basinwide assessment in 1999, this facility has had an upgrade in treatment and is no longer required to perform toxicity testing. There is also a facility in Georgia (Town of Young Harris Water Pollution Control Plant, 0.24 MGD) that discharges to Brasstown Creek about six miles upstream of the North Carolina state line in Towns County. Refer to Appendix V for the listing of NPDES permit holders.

A map including the locations of the NPDES facilities and water quality monitoring stations is presented in Figure 3. Table 3 contains a summary of assessment unit numbers (AU#) and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in the subbasin. Refer to Appendix VIII for more information about use support methodology.

Figure 3 Hiwassee River Subbasin 04-05-01



Planning Section
Basinwide Planning Unit
May 23, 2006

Table 3 Hiwassee Subbasin 04-05-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Big Tuni Creek													
1-21-5	C Tr HQW	6.1 FW Miles		**S**					ND				
	From source to Tusquitee Creek				FB13	E	2004						
Brasstown Creek													
1-42	WS-IV	8.7 FW Miles		**S**					ND			Nutrient Impacts	
	From North Carolina-Georgia State Line to Hiwassee River				FF13	GF	2004					Habitat Degradation	Unknown
					FB18	E	2004					Habitat Degradation	Agriculture
Fires Creek													
1-27-(5.5)	WS-IV Tr ORW	8.6 FW Miles		**S**					ND				
	From Rocky Cove Branch to Hiwassee River				FF10	NR	2004						
					FB11	E	2004						
HIWASSEE RIVER (Chatuge Lake below elevation 1928)													
1-(1)	B	3,533.1 FW Acres		**NR**	FL11	ID			ND				
					FL10	ID							
					FL9	ID							
	From North Carolina-Georgia State line to Chatuge Dam												
Little Brasstown Creek													
1-42-11	WS-IV	4.2 FW Miles		**S**					ND			Habitat Degradation	Unknown
	From source to Brasstown Creek				FF11	GF	2004					Habitat Degradation	Agriculture
Shooting Creek													
1-5	C Tr	5.6 FW Miles		**S**					ND				
	From source to Chatuge Lake				FF12	GF	2004						
					FB17	E	2004						

Table 3 Hiwassee Subbasin 04-05-01

AU Number / Description	Classification	Length/Area		Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Tusquitee Creek													
1-21-(16.5)	WS-IV Tr HQW	1.7	FW Miles	**S**					ND			Habitat Degradation	Unknown
From Buckner Branch to Hiwassee River					FB16	E	2004						
1-21-(4.5)	C Tr HQW	5.8	FW Miles	**NR**					ND				
From Big Tuni Creek to Buckner Branch					FF9	NR	2004						

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
FF - Fish Community Survey
FB - Benthic Community Survey
FA - Ambient Monitoring Site
FL- Lake Monitoring

Results:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired

Use Support Ratings 2005:
S - Supporting, I - Impaired
NR - Not Rated
NR*- Not Rated for Recreation (screening criteria exceeded)
ND-No Data Collected to make assessment

Miles/Acres
FW- Fresh Water

m- Monitored
e- Evaluated

Results
CE-Criteria Exceeded > 10% and more than 10 samples
NCE-No Criteria Exceeded
ID- Insufficeint Data Available

Aquatic Life Rating Summary

S	m	34.9	FW Miles
NR	m	5.8	FW Miles
NR	m	3,533.1	FW Acres
NR	e	2.5	FW Miles
ND		271.5	FW Miles

Recreation Rating Summary

NR	e	2.6	FW Miles
ND		312.1	FW Miles
ND		3,533.1	FW Acres

Fish Consumption Rating Summary

I	e	314.7	FW Miles
I	e	3,533.1	FW Acres

Benthic macroinvertebrates have been collected from sites in subbasin 04-05-01 since 1985. There were 5 benthic macroinvertebrate community and 5 fish community samples collected during this assessment period. Big Tuni, Fires, and Tusquitee Creeks all maintained Excellent bioclassifications between 1999 and 2004. Shooting and Brasstown Creeks improved from Good to Excellent over the same period.

Data were also collected from three stations on Lake Chatuge. There are no ambient monitoring stations in this subbasin. Refer to the *2005 Hiwassee River Basinwide Assessment Report* at http://h2o.enr.state.nc.us/esb/Basinwide/HIW2005.pdf and Appendix IV for more information on monitoring. All streams sampled in 2004 for benthic macroinvertebrates in subbasin 04-05-01 were classified using mountain criteria.

All of the fish community sites in this subbasin were sampled by DWQ for the first time in 2004. The 2004 basinwide assessment will therefore serve as a baseline for the 2009 basinwide monitoring cycle. The North Carolina Wildlife Resources Commission manages Shooting and Tusquitee Creeks as Hatchery Supported Trout Waters (HSTW). Wild, not stocked, trout were collected from Shooting, Tusquitee, and Fires Creeks.

Shooting, Big Tuni, Fires, and Tusquitee Creeks all have supplemental trout waters (Tr) classifications. Tusquitee Creek watershed is also classified as High Quality Waters (HQW) and Fires Creek watershed is classified as Outstanding Resource Waters (ORW). Brasstown and Little Brasstown Creeks are surface water supply waters and carry the WS-IV classification.

Waters in the following sections and in Table 3 are identified by an assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, list 303(d) Impaired waters, and is used to identify waters throughout the basin plan. The AU# is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the AU# and the DWQ index segment are the same. For example, index number 11-3-(14) might be split into two assessment units 11-3-(14)a and 11-3-(14)b.

1.2 Use Support Assessment Summary

Table 4 Summary of Use Support Ratings by Category in Subbasin 04-05-01

Use Support Rating	Aquatic Life	Recreation
Monitored Waters		
Supporting	34.9 mi	0
Impaired*	0	0
Not Rated	8.4 mi	0
Total	**43.3 mi**	**0**
Unmonitored Waters		
Not Rated	2.5 mi	2.6 mi
No Data	271.5 mi	314.7 mi
Total	**274 mi**	**317.3 mi**
Totals		
All Waters**	**317.3 mi**	**317.3 mi**

* The noted percent Impaired is the percent of monitored mile/acres only.
** Total Monitored + Total Unmonitored = Total All Waters.

All surface waters in the state are assigned a classification appropriate to the best-intended use of that water. Waters are regularly assessed by DWQ to determine how well they are meeting their best-intended use. For aquatic life, an Excellent, Good, Good-Fair, Fair, or Poor bioclassification is assigned to a stream based on the biological data collected by DWQ. For more information about bioclassification and use support assessment, refer to Appendices IV and VIII, respectively. Appendix IX provides definitions of the terms used throughout this basin plan.

In subbasin 04-05-01, use support was assigned for the aquatic life, recreation, fish consumption and water supply categories. Waters are Supporting, Impaired, Not Rated, and No Data in the aquatic life and recreation categories on a monitored or evaluated basis. Waters are Impaired in the fish consumption category on an evaluated basis based on fish consumption advice issued by the Department of Health and Human Services (DHHS). All waters are Supporting in the water supply category on an evaluated basis based on reports from Division of Environmental Health (DEH) regional water treatment plant consultants. Refer to Table 4 for a summary of use support for waters in subbasin 04-05-01.

1.3 Status and Recommendations of Previously and Newly Impaired Waters

No stream segments in this subbasin were rated as impaired in the 2002 basin plan or based on recent DWQ monitoring (1999-2004). Section 1.4 below discusses specific streams where water quality impacts have been observed.

1.4 Status and Recommendations for Waters with Noted Impacts

Based on DWQ's most recent use support methodologies, the surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, water quality education on local issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. The current status and recommendations for addressing these waters are presented below, and each is identified by an AU#. Refer to Section 1.1 for more information about AU#. Nonpoint source program agency contacts are listed in Appendix VII.

1.4.1 Brasstown and Little Brasstown Creeks Including Crawford Creek [AU# 1-42, 1-42-11, and 1-42-1]

Current Status

Brasstown Creek originates in northern Georgia where it drains a portion of Towns County and the Town of Young Harris before flowing through southwestern Clay County, NC to join the Hiwassee River. Brasstown Bald is the highest point in GA and is in the headwaters of Brasstown Creek. Little Brasstown Creek is a large tributary to Brasstown creek, draining a small portion of southeastern Cherokee County. The watershed contains low density, rural residential development, pasture, hay, and row crops in addition to substantial forest cover. Brasstown Creek from the North Carolina-Georgia state line (8.7 miles) and Little Brasstown Creek from its source to Brasstown Creek (4.2 miles) are Supporting aquatic life.

DWQ has sampled the benthic community of Brasstown Creek at site FB18 three times. The sample results show a steady improvement since 1994: Fair in 1994, Good in 1999, and Excellent in 2004. DWQ also sampled the fish community at site FF13, just downstream of the GA-NC state line. This site rated Good-Fair in 2004. The fish community there indicated a shift from a cool water trout stream to a mixture of cool and warm water fish species, including 22 bluegills, one green sunfish (exotic), and one largemouth bass. There were no smallmouth bass,

few pollution intolerant species, and no trout species collected. The specific conductance at this site (40 µmhos/cm) suggested that nutrient inputs from agricultural land use and the Young Harris municipal treatment plant upstream in Georgia may be contributing to the species shift.

DWQ sampled the fish community in Little Brasstown Creek at site FF11 for the first time in 2004. The fish community received a Good-Fair rating, largely due to instream habitat problems. Biologists noted sediment accumulating in deep pools, probably originating from nonpoint sources in the watershed.

Special Studies

TVA: The Tennessee Valley Authority (TVA) sampled the fish community of Little Brasstown Creek at SR 1565 in 1995, 1997 and 1999 as part of its routine monitoring efforts. The index of biotic integrity developed by the TVA staff to summarize these data and rate this stream is different than North Carolina's methodologies (NCIBI); therefore scores and ratings assigned are not equivalent. However, these data can be used to "screen" waterbodies in further need of monitoring efforts by DWQ or in need of local restoration efforts. The rating assignment for Little Brasstown Creek improved with each of these successive assessments for undescribed reasons (1995 = Poor-Fair, 1997 = Fair, and 1999 = Good).

HRWC: The Hiwassee River Watershed Coalition (HRWC) hired a professional consultant to conduct benthic monitoring along Little Brasstown Creek in association with a watershed restoration project (discussed below). Three sites on Little Brasstown Creek, along with one reference site on Winchester Creek, were evaluated before and one year after stream restoration work was conducted. These sites were rated using methods established by NC DWQ. Winchester Creek and the sites upstream and downstream of the restoration project on Little Brasstown Creek showed no between-year differences. Winchester Creek received a Good bioclassification in both 2004 & 2005; the upstream and downstream sites rated Good-Fair. Although the site on Little Brasstown Creek within the project reach still received a Good-Fair bioclassification, there was a large improvement in habitat quality. The habitat score improved from 37 in 2004 to 70 in 2005 following restoration work. Improvements in the benthic macroinvertebrate community typically require more than one year following restoration (Lenat Consulting Services, March 2005).

The HRWC study also noted that the benthic macroinvertebrate community structure at all sites, including the reference reach, are warmer than expected for mountain streams, probably due to a lack of shading from the riparian buffer. Habitat scores in unrestored sections of Little Brasstown Creek that were monitored immediately upstream and downstream of the Carringer/Mitchell restoration project were poor, averaging 35/100 in both years (Lenat Consulting Services, March 2005).

Water Quality Initiatives

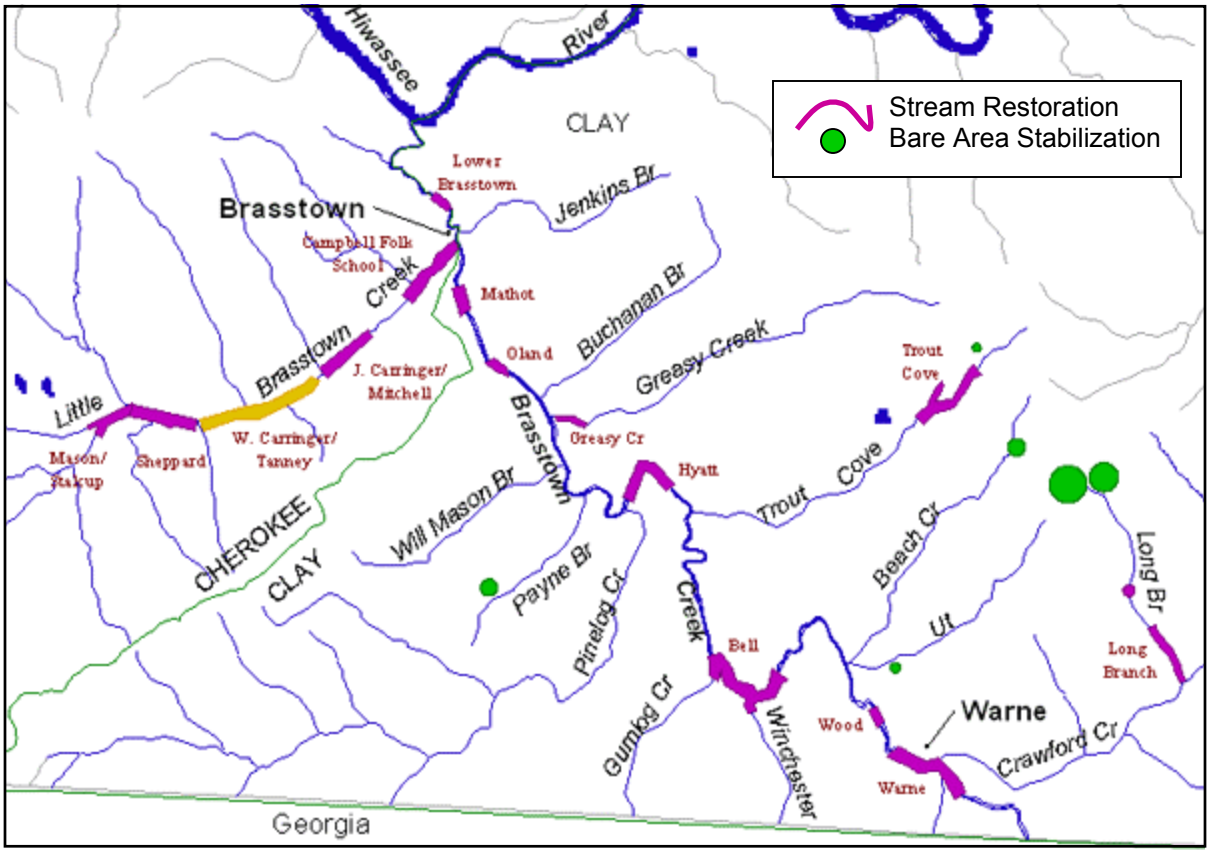
In 1999, the North Carolina Clean Water Management Trust Fund (CWMTF) awarded a $2.1 million grant to HRWC for restoration work in the North Carolina portion of the Brasstown Creek watershed. Using these funds, the Coalition was able, in partnership with the Natural Resources Conservation Service, the Clay County Soil & Water Conservation District, and 40 local landowners, to restore more than five miles (27,042 linear feet) of stream in the watershed (Figure 4). In addition, more than 50 acres of wooded riparian buffer were created and placed under a protective easement, 160 acres of critically eroding bare areas were re-vegetated, and

2,000 acres of pastureland were improved. Work under this grant was completed in December 2003.

In 2004, HRWC received an additional grant for several projects in the Little Brasstown Creek watershed that build upon work completed under the first Brasstown Creek grant. HRWC received $431,470 from CWMTF for three projects along this major tributary to Brasstown Creek. To-date, the Coalition has restored 55 percent of Little Brasstown Creek's total length (11,342 linear feet). When the current projects are completed, HRWC will have restored 70 percent (14,542 linear feet) of the stream's total length.

Additional accomplishments of the Brasstown Creek Watershed Restoration Project include $1.5 million dollars spent locally (materials and grading/clearing contractors), the purchase and rental (to cover costs only) of a no-till seed drill, and a community educated about the value of riparian buffers for controlling erosion. Specific information, including before and after pictures, about the projects shown in Figure 4 can be found at the HRWC website: www.hrwc.net. Currently, HRWC is working with an $185,000 grant from the CWMTF to monitor channel stability, vegetation survival, temperature, benthic communities, and suspended sediment at 10 restoration sites in the Brasstown Creek watershed over a 3-year period (2005-2007). As data are obtained about the success of the restoration work, HRWC will evaluate the needs within the watershed for additional water quality improvements. HRWC is also currently pursuing funding for restoration work in the Georgia portion of the watershed upstream.

Figure 4 HRWC Restoration Projects in Brasstown Creek Watershed.



2007 Recommendations

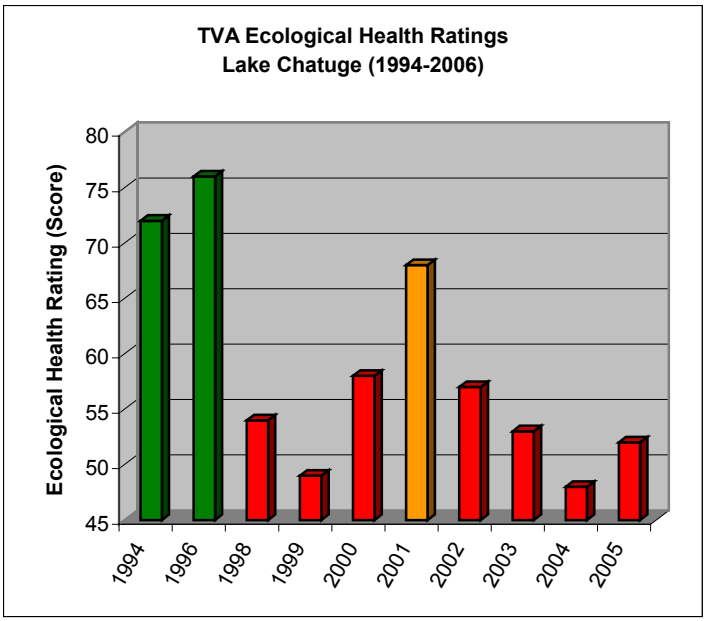
Additional efforts to prevent sedimentation and to re-establish instream habitats and riparian vegetation are needed in the Brasstown Creek watershed. HRWC has demonstrated its ability to coordinate such projects. HRWC's restoration effort in the Brasstown Creek watershed is a model program. It uses sound scientific methods and has created effective partnerships at the federal, state, and local level. DWQ strongly supports their ongoing restoration goals.

HRWC is monitoring restored reaches of the watershed using funds from the CWMTF. These funds, however, cannot be used to monitor streams without restoration projects. In order to compare water quality between the restored and unrestored streams and guide future restoration efforts, additional monitoring is need on Pinelog and Crawford Creeks. Additionally, the Clay County Soil and Water Conservation District has prioritized Crawford Creek and monitoring is needed to support their activities in the watershed – particularly suspended solids and turbidity measurements. In the next assessment cycle, DWQ will perform a special survey of fish and/or benthic communities in these creeks if resources permit.

1.4.2 Lake Chatuge [AU#1-(1)] and Hiwassee River Below Chatuge Dam [AU# 1-16.5a]

Current Status of Lake Chatuge

Lake Chatuge straddles the border of North Carolina and Georgia, and is a popular recreation area. As a result, development along the shoreline is significantly more concentrated than in the rest of the subbasin. By 2003, 42 percent of the total shoreline miles were developed. This development has resulted in the loss of critical riparian buffer and in a significant increase in the amount of impervious surfaces draining into the lake.



Lake Chatuge was monitored by DWQ in June, July, and August of 2004. Low nutrient and chlorophyll *a* concentrations were found in all months indicating low biological productivity. Water clarity was good despite frequent rainfall in summer 2004. Because of an insufficient number of samples, Lake Chatuge (7,050 acres) is not rated for aquatic life support. Bacteriological monitoring has not been conducted by DWQ and therefore Lake Chatuge is also not rated for recreation use. TVA has conducted bacteriological monitoring; the results of this sampling are discussed in the Special Studies section below.

Figure 5 TVA Ecological Health Ratings for Lake Chatuge

TVA began monitoring five ecological indicators (dissolved oxygen, chlorophyll, fish, bottom life, and sediment quality) on Lake Chatuge Reservoir in 1993. After 1994, TVA went to a two-year monitoring cycle, but resumed annual monitoring in 1999 after observing a substantial drop

in the reservoir's ecological health score in 1998. From 1998 to 2005, Lake Chatuge has rated poor every year with the exception of 2001, when it rated fair due to improved DO conditions and lower average chlorophyll concentrations (Figure 5).

Weather conditions (the timing and amount of rainfall) and the related changes in runoff have proved to be a major factor in the variation in ecological health scores for Lake Chatuge and many other reservoirs. Dissolved oxygen and chlorophyll — the indicators most responsive to changes in weather conditions — tend to rate better in reservoirs during drought conditions and worse during periods of normal to high rainfall and runoff. This is because fewer nutrients and less organic material are washed into the reservoir when rainfall and runoff are low, which tends to result in lower chlorophyll concentrations and decreased oxygen demand for decomposition of organic materials.

Comparing TVA and DWQ Lake Sampling Programs

The Tennessee Valley Authority (TVA) began a program to monitor the biological conditions of its reservoirs in 1990. The purpose of this monitoring is to provide data sufficient to reliably characterize the ecological health of the reservoirs. TVA collects data for five indicators (dissolved oxygen, chlorophyll, sediment quality, benthic macroinvertebrates, and fish communities), which are used to derive an overall reservoir ecological health rating score. Ratings are based on best-observed conditions given the environmental and operational characteristics of the dam/reservoir and professional judgment.

Of the five indicators monitored by TVA, only two (dissolved oxygen and chlorophyll *a*) are also monitored by DWQ. TVA develops a DO rating, as opposed to using the actual DO concentrations. This rating includes dissolved oxygen levels throughout the water column and requires determining the percent of the average cross-sectional length (at the location where the sampling was conducted) where the DO concentration is less than 2 mg/L. DWQ analysis only considers the surface DO concentration as a single point for comparison to the NC surface water quality standard (>4 mg/L instantaneous at the surface).

For chlorophyll-*a*, TVA recorded concentrations ranging from 16 ug/L in April to 3 ug/L in June. DWQ reported concentrations ranging from 5 ug/L in August to 1 ug/L in June. Nutrient concentrations were similar between TVA and DWQ and were considered to be low by DWQ as expected of an oligotrophic system such as Chatuge. The higher chlorophyll-a concentrations were seen in April and May. DWQ sampling focused on the time of the year when nuisance algae such as blue-greens normally become dominant (June through August). June, July and August concentrations recorded by TVA were slightly higher than DWQ's reported concentrations for the same time period (DWQ average = 2 ug/L & TVA average = 5 ug/L).

While TVA's data seem to indicate a trend toward decreasing ecological health, all surface water quality standards are being met and no designated uses are impaired. Factors that could influence the reservoir ratings developed by TVA include changes in the reservoir operations, land use changes in the watershed, and weather conditions during the sampling period. TVA's data seems to follow the general trend for many lakes in the state; increasing impacts due to non point sources as evidenced by increased chlorophyll-*a* and nutrients during high flow conditions. DWQ will continue to monitor TVA's findings and Lake Chatuge to better document changes in water quality.

Current Status of Hiwassee River Below Chatuge Dam

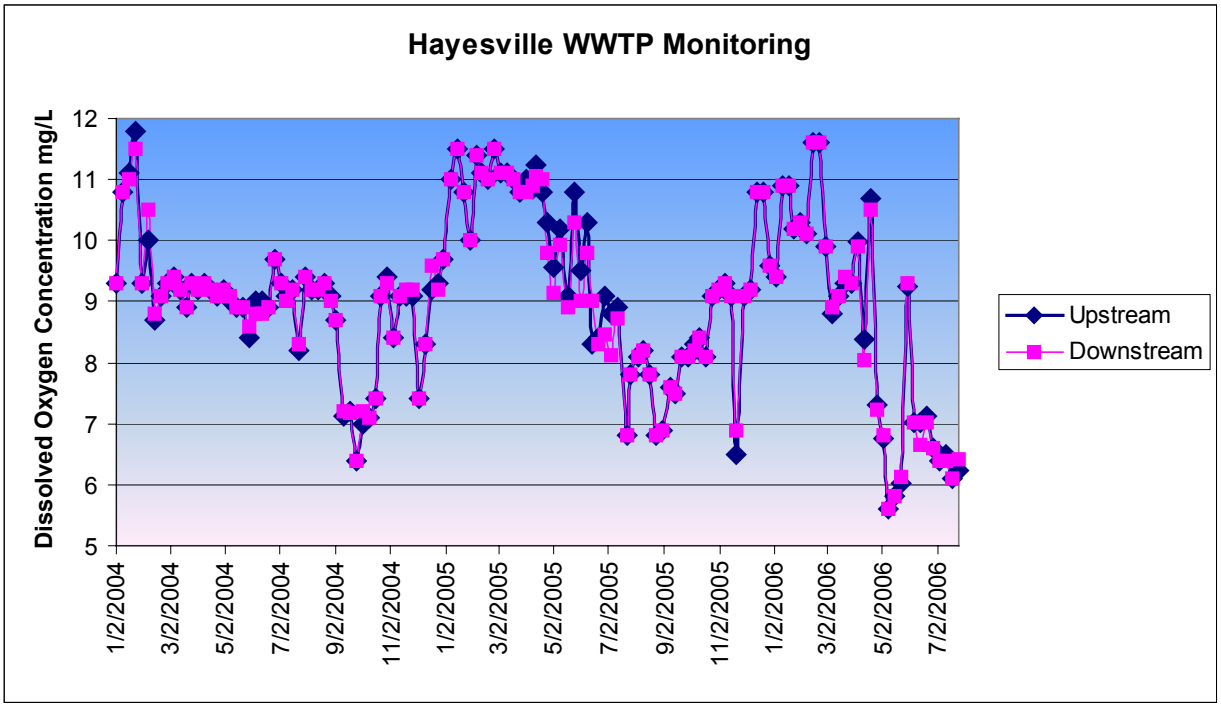
Historically, dissolved oxygen levels in the water released through Chatuge Dam were very low during the late summer months. To improve dissolved oxygen levels, TVA installed an infuser weir to improve the quality of water released from Chatuge Dam. The weir is a small dam located downstream from the powerhouse. When power is generated, water flowing from the turbine fills the pool above the weir and overflows across a deck made of wooden timbers and steel grating. The water flows through the slots in the deck, creating a series of waterfalls that introduce air into the water. The grating helps break up the falling sheets of water, entraining more air as the water falls into the downstream pool. This entrained air creates millions of bubbles in the water below the weir, producing higher dissolved oxygen levels downstream.

The Chatuge weir also maintains a minimum flow of water downstream from the dam during periods when the turbines are not operating. This is accomplished by means of special valves near the bottom of the weir that release a constant flow of water as the weir pool drains. When no hydro generation is scheduled, TVA releases water from the dam twice a day to refill the weir pool. This process helps to prevent the riverbed from drying out and provides additional habitat for fish and other aquatic life.

Below Chatuge Dam, the Clay County WWTP discharges to the Hiwassee River. This facility is required to monitor dissolved oxygen concentrations upstream and downstream of its outfall. DWQ summarized the monitoring results from January 2004 through July 2006. On average, the downstream dissolved oxygen concentration was 0.03mg/l lower than the upstream concentration. At no time was the dissolved oxygen concentration below the state water quality standard. These findings suggest the discharge has a negligible effect on dissolved oxygen concentrations in the river (Figure 6).

There were periods in which dissolved oxygen levels approached the water quality standard just upstream of the Clay County WWTP, but did not exceed it. Because these measurements were taken several miles downstream and TVA has a 4 mg/l target dissolved oxygen concentration target for its release, it is possible that the dissolved oxygen standard is actually exceeded further upstream closer to the dam release. Limited dissolved oxygen monitoring conducted by TVA below the weir does not indicate a dissolved oxygen standard violation. However, this monitoring is not continuous and is therefore not conclusive.

Figure 6 Dissolved Oxygen Concentrations Upstream and Downstream of Clay County WWTP



Special Studies

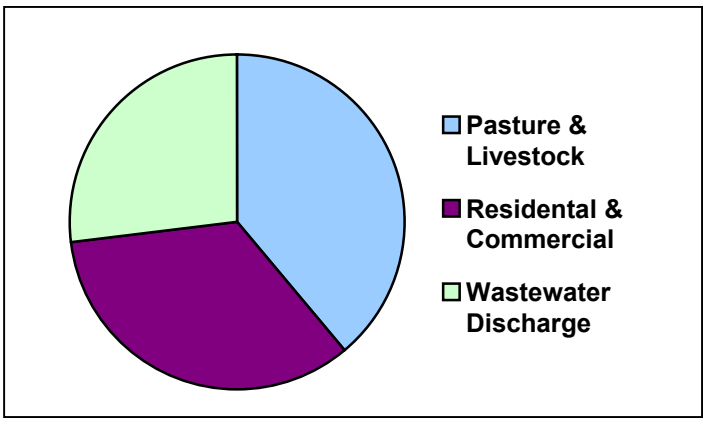
TVA: The Tennessee Valley Authority (TVA) performed fecal coliform bacteria monitoring at seven locations in Lake Chatuge in the summer of 2004 as part of a monitoring program targeting heavily used recreational areas throughout the Tennessee Valley. All geometric mean fecal coliform values found by TVA were low and well under the North Carolina water quality standard of 200/100 ml for five consecutive samples taken within a 30-day period (Rebecca Hallman, 2004; NCDENR-Division of Water Quality, August 1, 2004).

HRWC: In 2001, HRWC received an appropriation from the Georgia legislature of $216,000 to determine the causes of the Poor TVA ecological health ratings for Nottely (GA) and Chatuge Reservoirs and to develop an action plan for improving water quality conditions. Eighteen months of physical/chemical water quality data were collected by water quality professionals in 2002 (Nottely) and 2003 (Chatuge) from 11 sites in each watershed. Half of the stations were located within the reservoirs and half were sited on major tributary streams. In addition to professional monitoring, HRWC established volunteer monitoring teams to monitor additional sites on tributaries throughout the two watersheds. These teams continue to monitor 14 parameters monthly at 21 locations. The volunteer monitoring results have been published in three reports by the Environmental Quality Institute of the University of Asheville, the most recent of which is dated 2006. (Patch, 2006)

Concurrently, TVA conducted a detailed land use analysis based on low-altitude, color infrared, aerial photography for each watershed. In 2004, the physical/chemical data, land use information, flow data from gaging stations throughout the watersheds, and data from wastewater treatment plant discharges (two discharges into Lake Chatuge) were used to calibrate computer models for each watershed. Once calibrated, different scenarios were evaluated to determine how activities in the watershed affect the ecological health of Lake Chatuge and Lake Nottely.

The model results show that an excess of nutrients (primarily phosphorus) is the primary cause for concern related to Lake Chatuge's ecological health. In 2003, Lake Chatuge was receiving an estimated 9,600 pounds of phosphorus per year. There are three major sources of excess nutrients into the lake: pasture/livestock (39 percent), residential/commercial developed areas (34 percent), and treated wastewater discharges (27 percent) (Figure 7).

Figure 7 Phosphorus Loads to Chatuge Lake



The Lake Chatuge watershed contains approximately 11,000 acres of pasture and hay. Nutrients from these lands come from fertilizers (commercially-prepared and poultry waste) that are applied to the land to produce better grasses for grazing and hay for winter-feeding livestock. Often, there is not enough vegetation along streams to filter runoff from these lands, and in many cases, livestock have direct access to streams. Additionally, soil contains nutrients. When erosion of streambanks occurs, nutrients are carried directly into the lake on particles of sediment and become dissolved in the lake.

There are approximately 4,800 acres of developed areas in the Lake Chatuge watershed, primarily along highway corridors and in the City of Hiawassee, GA. Excess nutrients in stormwater runoff come from soil erosion associated with new construction, as well as from applications of fertilizer on lawns, ball fields, golf courses and landscaping. There are insufficient stormwater and erosion controls to filter runoff from these areas.

Water Quality Initiatives

HRWC, with the help of Lake Chatuge watershed stakeholders, is currently in the process of developing a Watershed Action Plan based on the results of the 4-year study described above. The Lake Chatuge Watershed Action Plan (to be published in 2007) will be a five year planning document that outlines recommendations for citizens, local governments, and other organizations/agencies working to improve water quality in the watershed that, if implemented in a timely fashion, should return the lake to Good ecological health (as routinely monitored by TVA).

2007 Recommendations

The HRWC/TVA project shows that roughly 3,750 pounds of phosphorus per year comes from 11,000 acres of agricultural land. A similar amount (3,200 pounds per year) comes from just 4,800 acres of developed land, demonstrating the large impact of developed land. Very little excess nutrients come from forested lands. If forest and agricultural lands continue to be developed without practices in place to prevent excess nutrients from flowing into the lake, the ecological health rating and water quality may decline.

DWQ supports the findings of the HRWC study and encourages efforts to implement the actions it identifies within the Lake Chatuge Watershed Action Plan to reduce sediment and nutrient

loads to the reservoir. Additionally, planning for future wastewater treatment is also needed to protect Lake Chatuge's health.

Monitoring is needed to determine if dissolved oxygen concentrations are above state standards in the Hiwassee River below Chatuge dam. The monitoring should be continuous (at least hourly) to allow daily average calculations.

1.4.3 Shooting Creek [AU#1-5]

Current Status
Shooting Creek is a major tributary to Lake Chatuge, creating one of its largest embayments when reaching the impoundment. The creek parallels US-64 for much of its length. The 1997 and 2002 sampling surveys noted that this proximity increases its susceptibility to residential and commercial development. The same remains true today, especially in the lower reach where it flows through a wide and flat valley before entering Lake Chatuge. DWQ sampled both fish (FF12) and benthic (FB17) communities during the current assessment period. Benthos have been sampled at site FB17 three times. In 1994 and 1999, the site rated Good. It improved to Excellent in 2004. In 2004, biologists observed areas of moderate bank erosion and portions of the riparian zone that had been cleared for residential purposes. Conductivity was slightly high for a mountain stream. This monitoring was conducted prior to the damaging rain events associated with hurricanes in the fall of 2002. DWQ did not assess Shooting Creek after the storms.

The fish community rated Good-Fair in 2004 due to a mixed assemblage of cool and warm water species including two catfish species (yellow and brown bullhead), and 12 yellow perch that likely migrated upstream from Lake Chatuge. This portion of Shooting Creek is classified as Trout Waters (Tr) by DWQ and is annually stocked with over 2,000 brook, rainbow, and brown trout from March to June by the Wildlife Resources Commission. Fifteen wild rainbow trout including twelve young-of-year were collected at this site, indicating that water quality is sufficient to support trout reproduction. Shooting Creek is rated Supporting from its source to Chatuge Lake (5.6 miles).

In November 2004 Clay County received $184,400 in Emergency Watershed Protection funds from the USDA Natural Resources Conservation Service (NRCS) to repair damage from hurricanes Frances and Ivan. A total of 2,000 linear feet of Eagle Fork Creek, Muskrat Creek, and Shooting Creek were restored using natural channel design techniques. The Projects were administered and supervised by the Clay County Soil and Water Conservation District and Clay County personnel. Additional accomplishments in the Shooting Creek drainage include two restoration projects funded by the North Carolina Agricultural Cost Share Program totaling 500 linear feet of restoration on Geisky and Eagle Fork Creeks.

Water Quality Initiatives
The Clay County Soil & Water Conservation District is actively seeking landowners in the Shooting Creek watershed that are in need of stream restoration work. Building on the work begun with Emergency Watershed Protection funds, the District has completed two small projects using Agricultural Cost Share monies on farms along Geisky and Eagle Fork Creeks. Depending on landowner interest, the District plans to partner with the Hiwassee River Watershed Coalition (HRWC) to submit a grant application to the NC Clean Water Management Trust Fund for more extensive restoration funding.

HRWC has four volunteer water quality monitoring stations in the Shooting Creek watershed.

2007 Recommendations
Local actions are needed to address nonpoint pollution sources in the watershed. DWQ encourages local governments to adopt and enforce local ordinances to protect existing water quality in the watershed. Refer to Chapters 5 and 6 for information on how this can be accomplished. Additionally, new development should avoid building in the floodplain and employ best management practices designed to reduce impacts to water quality.

HRWC, with the help of Lake Chatuge watershed stakeholders, is currently in the process of developing a Watershed Action Plan based on the results of the 4-year study described in Section 1.4.2. The Lake Chatuge Watershed Action Plan (to be published in 2007) will be a five year planning document that outlines recommendations for citizens, local governments, and other organizations/agencies working to improve water quality in the watershed. If implemented in a timely fashion, the lake should return to Good ecological health (as routinely monitored by TVA). The plan will include actions applicable to Shooting Creek, a major tributary to the lake. DWQ encourages citizens to volunteer their time to assist HRWC in implementing the plan and also encourages funding organizations to support plan implementation.

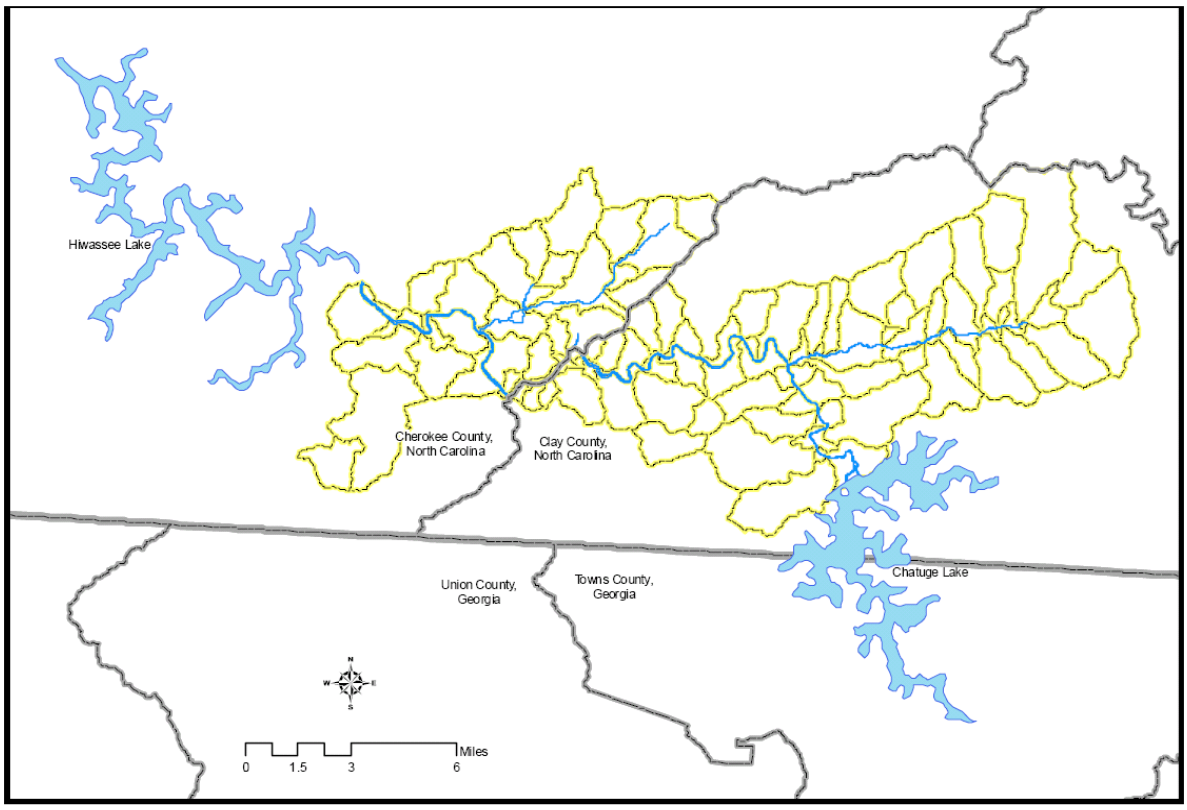
1.4.4 Tusquitee Creek [AU#1-21-(16.5)]

Current Status
Tusquitee Creek received an Excellent bioclassification in 2004 at site FB16 and the fish site at FF9 qualified as a regional reference site. Therefore, Tusquitee Creek from Big Tuni Creek to Hiwassee River (7.5 miles) is rated Supporting. Because of its excellent water quality, Tusquitee Creek is classified High Quality Water (additional discussion of the HWQ classification and rules is found in Section 1.5.6). However, biologists noted moderate bank erosion and a lack of riparian vegetation in places.

Large-scale residential developments are currently under construction in this formerly pristine watershed. Steep access roads, impervious surfaces, and lack of sediment controls are causing increased sedimentation in Tusquitee Creek. Local Soil and Water Conservation District employees have noted sediment problems after rain events on Tusquitee Creek, suggesting that runoff from residential construction may be causing sedimentation. Citizens also report a lack of awareness and enforcement of HQW rules in place to protect the watershed (See Section 1.5.6). This demonstrates a critical need for an ambient monitoring station and/or sediment monitoring station on Tusquitee Creek.

Special Studies
The North Carolina Ecosystem Enhancement Program (EEP) anticipates significant mitigation needs originating from stream disturbances related to road construction led by NCDOT. In July 2005, EEP, Hiwassee River Watershed Coalition (HRWC), and Equinox Environmental Consultation and Design started a local watershed planning process in the Hiwassee River basin. This planning effort will guide mitigation project site selection. An area that encompasses the Tusquitee Creek watershed was selected for more detailed data collection (Figure 8).

Figure 8 The Tusquitee-Peachtree-Martins Creek Watershed Study Area



A component of this local watershed planning effort is to develop detailed GIS and pollutant modeling information for both the Peachtree-Martins Creek watershed and an extended area to the east, which includes the Tusquitee watershed (Figure 8). This extended study area, the Tusquitee-Peachtree-Martins Creek study area, comprises 126 square miles in Clay and Cherokee counties. It includes the area draining to the Hiwassee River between its confluence with the Valley River upstream to Chatuge Dam. The Fires Creek watershed is excluded because it is essentially all owned and managed by the United States Forest Service. The study area includes all of six 14-digit hydrologic units (06020002-060010, -070010, -170010, -100040, -100050, and -090020) and part of two 14-digit hydrologic units (06020002-071010 and -100030). The project crosses the DWQ subbasin boundary, and is also discuss in Chapter 2 (See Section 2.3.1)

At HRWC's request, Equinox contracted with the Tennessee Valley Authority for an Integrated Pollutant Source Identification (IPSI) analysis that involves interpretation of aerial photography to assess impacts from various nonpoint sources of pollution in the watershed. The IPSI package includes a nonpoint source (NPS) inventory, desktop Geographic Information System (GIS), and pollutant loading models.

The NPS inventory is a geographic database that consists of information on watershed features such as land use/land cover, streambank erosion sites, and livestock operations that are known or suspected to be nonpoint pollution sources. The desktop GIS uses ARCGIS software, developed and supported by Environmental Systems Research Institute, Inc. (ESRI), for managing and viewing the data generated by the NPS inventory. The desktop GIS is a mapping system that allows the user to investigate relationships among various geographic features that are known or suspected to contribute NPS pollution to a selected waterbody.

The pollutant-loading model (PLM) uses Microsoft Excel software to estimate pollutant loadings based on the data generated by the NPS inventory. The pollutant loading model estimates pollutant loads to streams in the study area for total suspended solids, five-day biochemical oxygen demand, total nitrogen, and total phosphorus from the following sources: residential, commercial, industrial, transportation, cropland, pasture, orchards, forests, clear-cuts, mining, disturbed areas, livestock operations, eroding streambanks, and eroding road surfaces and road banks (TVA, 2006).

Although the Tusquitee Creek watershed wasn't ultimately included in the area chosen for EEP Local Watershed Plan Development, projects that are identified by HRWC and local agricultural agency staff within the watershed will be readily considered by EEP for mitigation efforts. Additionally, HRWC will be using the results of the IPSI for prioritization of water quality improvement projects and to serve as baseline information as the watershed continues to be developed. The chosen watershed, Peachtree-Martins, is discussed in Section 2.3.1

2007 Recommendations
Protection of existing water quality in the watershed is the highest priority. First, existing sediment and erosion control laws must be strictly enforced. Because state resources are limited, DWQ encourages local governments to develop and implement local sediment and erosion control programs. More information on creating a local program can be found in Chapter 5. Second, a plan to educate local citizens, landowners, and developers about HQW regulations is necessary.

Additionally, the gently sloped valley is attractive for residential development. Working Farm Easements on properties in the watershed could be used to protect against the negative water quality impacts associated with increased residential development. For information on the benefits of Working Farm Easements, refer to Chapter 7.

1.5 Additional Water Quality Issues within Subbasin 04-05-01

The previous sections discussed water quality concerns for specific stream segments. The following section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes, or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

This section also discusses ideas, rules and practices in place to preserve and maintain the pristine waters of the Hiwassee River basin. In subbasins 04-05-01 and 04-05-02 (Chapter 2), this is particularly important since many of the waters are designated as high quality or outstanding resource waters (HQW and ORW, respectively). Special management strategies, or rules, are in place to better manage the cumulative impact of pollutant discharges, and several landowners have voluntarily participated in land conservation, stabilization, and/or restoration projects.

1.5.1 Fires Creek Development

The recent sale of timber/paper company land in the Fires Creek watershed has resulted in rapid residential development in a formerly pristine watershed. Local Soil and Water District personnel have reported sedimentation in Fires Creek after rain events. Sediment monitoring is necessary to determine the extent of development impacts on water quality in this watershed.

Additionally, erosion control enforcement is critical to protect the water quality of this Outstanding Resource watershed.

1.5.2 Hiwassee River Tributaries Between Chatuge and Mission Dams

The Hiwassee River Watershed Coalition and the Clay County Soil and Water Conservation District report significant impacts to streams entering the Hiwassee River between Chatuge and Mission Dams. These streams include Sweetwater, Blair, South Fork Blair, Town, and Hyatt Mill Creeks. These streams are impacted by agriculture, historic channel alterations, highway impacts, and increasingly, development (both residential and commercial). All of these streams are included in the Tusquitee-Martins Creek IPSI (See section 1.4.4). Habitat degradation and sediment problems are common in each of the watersheds. A special study is needed to evaluate the extent and severity of sediment problems and the biological health of these streams. Completion of such a study in the next basin cycle would complement the IPSI findings and could be used to track improvements as mitigation projects are completed and BMPs are installed.

1.5.2.1 Hyatt Mill Creek [AU# 1-16] and Blair Creek [AU# 1-17]

These small streams are tributaries to the Hiwassee River below Lake Chatuge near Hayesville. TVA sampled these streams in 1999, and the biological community of each appears to be in good shape. Habitat scores, however, were fairly low. Nonpoint source pollution, including sedimentation, produces habitat degradation. Habitat degradation can eventually lead to impairment of aquatic life in streams. BMPs should be installed and maintained in these two watersheds to prevent further habitat degradation. Restoration activities may also be needed. The Clay County Soil and Water Conservation District identified these streams as problem areas and has prioritized them for BMP installations to reduce sediment impacts. Strong enforcement of current sediment and erosion control rules is also needed.

1.5.2.2 Town Creek [AU#1-19]

Habitat degradation impacts water quality in Town Creek. The watershed is approximately 25 percent forested, 25 percent pasture, and about 50 percent urban area (Town of Hayesville). Habitat degradation is primarily a result of streambank erosion, loss of riparian vegetation, gully erosion from improperly routed stormwater runoff, and eroding road grades and roadside ditches. Impacts from beef cattle, questionable performance of septic systems, spills from municipal wastewater collection systems, and sediment from development activities are also likely contributing to water quality degradation (Southwestern RC&D, 1998). This watershed is targeted by the Clay County Soil and Water Conservation District for BMP installation to address nonpoint source pollution. Sediment monitoring is necessary to determine the extent of development impacts on water quality in this watershed. Additionally, erosion control enforcement is critical to protect the water quality in this water supply watershed.

1.5.2.3 Sweetwater Creek [AU# 1-32]

Sweetwater Creek is identified as a significant contributor of sediment to the Hiwassee River. Land use in the watershed is a mixture of residential development, agricultural activities, and forest. US-64 parallels the creek for much of its length. This watershed is targeted by the Clay County Soil and Water Conservation District for BMP installation to address nonpoint source

pollution. Monitoring is needed to determine the extent of the sedimentation problem and to support the activities led by the District.

1.5.3 Septic System Concerns

Development of rural land in areas not served by sewer systems is occurring rapidly in the upper Hiwassee River basin. Hundreds of permit applications for onsite septic systems are approved every year. Septic systems generally provide a safe and reliable method of disposing of residential wastewater when they are sited (positioned on a lot), installed, operated, and maintained properly. Rules and guidelines are in place in both Georgia and North Carolina to protect human health and the environment. Water quality is protected by locating the systems at least 50 feet away from streams and wetlands, limiting buildable lot sizes to a ¾-acre minimum, and installing drain fields in areas that contain suitable soil type and depth for adequate filtration; drinking water wells are further protected by septic system setbacks.

Septic systems typically are very efficient at removing many pollutants found in wastewater including suspended solids, metals, bacteria, phosphorus, and some viruses. However, they are not designed to handle other pollutants that they often receive such as solvents, automotive and lubricating oil, drain cleaners, and many other household chemicals. Additionally, some byproducts of organic decomposition are not treated. Nitrates are one such byproduct and are the most widespread contaminant of groundwater in the United States (Smith, et al., 2004).

One septic system generates about 30 to 40 pounds of nitrate nitrogen per year (NJDEP, 2002). Nitrates and many household chemicals are easily dissolved in water and therefore move through the soil too rapidly to be removed. Nitrates are known to cause water quality problems and can also be harmful to human health (Smith, et al., 2004).

Proper location, design, construction, operation, and maintenance of septic systems are critical to the protection of water quality in a watershed. If septic systems are located in unsuitable areas, are improperly installed, or if the systems have not been operated and/or maintained properly, they can be significant sources of pollution. Additionally if building lots and their corresponding septic systems are too densely developed, the natural ability of soils to receive and purify wastewater before it reaches groundwater or adjacent surface water can be exceeded (Smith, et al., 2004). Nutrients and some other types of pollution are often very slow to leave a lake system. Therefore, malfunctioning septic systems can have a significant long-term impact on water quality and ecological health (PACD, 2003).

Local governments, in coordination with local health departments, should evaluate the potential for water quality problems associated with the number and density of septic systems being installed throughout their jurisdiction. Long-term county-wide planning for future wastewater treatment should be undertaken. There are water quality concerns associated with both continued permitting of septic systems for development in outlying areas and with extending sewer lines and expanding wastewater treatment plant discharges. Pros and cons of various wastewater treatment options should be weighed for different parts of the county (based on soil type, depth, proximity to existing sewer lines, etc.) and a plan developed that minimizes the risk of water quality degradation from all methods employed.

In addition, local governments, again in coordination with local health departments, should consider programs to periodically inform citizens about the proper operation of septic systems

and the need for routine maintenance and replacement. Owners of systems within 100 feet of streams or lakes should be specifically targeted and encouraged to routinely check for the warning signs of improperly functioning systems and to contact the health department immediately for assistance in getting problems corrected.

1.5.4 Sediment, Erosion, and Stormwater Concerns

Clay County Soil and Water Conservation District personnel and the Hiwassee River Watershed Coalition report a marked increase in sedimentation and turbidity in the Clay County portion of the Hiwassee River and many of its tributaries. The Clay SWCD receives continuing complaints from citizens regarding runoff issues, sediment build-up in local creeks, and pollution of wells and springs by poorly controlled stormwater. District personnel do not have the enforcement authority over these issues and must pass the complaints on to DENR Water Quality and Land Quality staff. The citizens placing the complaints and District personnel are frequently unsatisfied and frustrated by a lack of enforcement actions after complaints are placed. They have determined that, due to resource constraints, state enforcement agencies are unable to effectively monitor land-disturbing activities associated with residential development, and are failing to prevent severe impacts to the water quality in the Hiwassee River Basin.

Clay and Cherokee Counties do not have local sediment and erosion control programs. The high rate of residential development in the Hiwassee River Basin, combined with this lack of erosion control ordinances and limited enforcement at the state level, has resulted in an apparent increase in sediment loads. This is visibly evident as the Hiwassee River changes appearance from clear to muddy after storm events. Clay and Cherokee Counties are encouraged to adopt a local Sediment and Erosion Control Ordinance and local enforcement program to prevent declines in the water quality in the Hiwassee River Basin. A model ordinance can be downloaded at: http://www.dlr.enr.state.nc.us/pages/sedimentlocalprograms.html. Additionally both counties and the municipal jurisdictions within the basin should implement the voluntary Universal Stormwater Management Program (USMP) to address stormwater runoff concerns. Under the USMP, a local government will be able to meet the different post-construction requirements for many existing stormwater strategies (HWQ, Phase 2 NPDES, etc) with just a single set of requirements. More information about the program can be found at: http://h2o.enr.state.nc.us/su/usmp.htm

1.5.5 Floodplain Protection

The riverside land that gets periodically inundated by a river's floodwaters is called the floodplain. Floodplains serve important purposes. They:

- temporarily store floodwaters,
- improve water quality,
- provide important habitat for river wildlife, and
- create opportunities for recreation.

Natural floodplains help reduce the heights of floods. During periods of high water, floodplains serve as natural sponges, storing and slowly releasing floodwaters. The floodplain provides additional "storage," reducing the velocity of the river and increasing the capacity of the river channel to move floodwaters downstream.

When the river is cut off from its floodplain by levees and dikes, flood heights are often increased. The construction of levees along the Lower Missouri River, for example, has increased flood heights by as much as twelve feet. By contrast, protected floodplain wetlands along the Charles River in Massachusetts store and slowly release floodwaters -- providing as much "storage" as a medium-sized reservoir.

Natural floodplains also help improve water quality. As water courses through the floodplain, plants serve as natural filters, trapping sediments and capturing pollutants. Nitrogen and phosphorus (found in fertilizers) that wash off farm fields, suburban lawns and city streets ignite a chemical chain reaction which reduces the amount of oxygen in the water, suffocating fish and other aquatic organisms.

Many floodplain plants use nitrogen and phosphorus before they can reach the river, thereby improving water quality. Many cities have built artificial wetlands to reduce water treatment costs. Studies of heavily polluted waters flowing through Tinicum Marsh in Pennsylvania, for example, have shown significant reductions in phosphorus and nitrogen. The water treatment value of Georgia's 2,300-acre Alcovy River Swamp is more than $1 million a year. Floodplains also play an important role in the recharging of groundwater supplies (American Rivers, 2006).

Clay County is strongly encouraged to adopt and implement comprehensive floodplain protection. Doing so will help protect its aquatic resources over the long-term. Guidance on floodplain ordinance adoption is provided by the Association of State Flood Plain Managers at www.floods.org.

1.5.6 Management Strategies for Water Quality Protection

Fires Creek and Tusquitee Creek watersheds are classified as Outstanding Resource Waters and High Quality Waters, respectively. High Quality Water (HQW) and Outstanding Resource Water (ORW) are supplemental classifications to the primary freshwater classification(s) placed on a waterbody. Management strategies are associated with the supplemental HQW and ORW classifications and are intended to protect the current use of the waterbody. Below is a brief summary of these strategies and the administrative code under which the strategies are found. More detailed information can be found in the document entitled *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina* (NCDENR-DWQ, 2004). This document is available on-line at http://h2o.enr.state.nc.us/admin/rules/. Definitions of the primary and supplemental classifications can be found in Chapter 3.

HQW is intended to protect waters with water quality higher than the state's water quality standards. In the Hiwassee River basin, waters classified as Water Supply I and II (WS-I and WS-II), ORW, and waters designated by the NC Wildlife Resources Commission (WRC) as native (wild) trout waters are subject to HQW rules. Streams petitioned for WS-I or WS-II or which are considered Excellent based on biological and physical/chemical parameters may qualify for the HQW supplemental designation.

New discharges and expansions of existing discharges may, in general, be permitted in waters classified as HQW provided that the effluent limits are met for dissolved oxygen (DO), ammonia/nitrogen levels (NH_3-N), and the biochemical oxygen demand (BOD_5). More stringent limitations may be necessary to ensure that the cumulative effects from more than one discharge of oxygen-consuming wastes will not cause the dissolved oxygen concentration in the receiving

water to drop more than 0.5 milligrams per liter (mg/l) below background levels. Discharges from single-family residential structures into surface waters are prohibited. When a discharge from an existing single-family home fails, a septic tank, dual or recirculation sand filters, disinfection, and step aeration should be installed (Administrative Code 15A NCAC 2B .0224) In addition to the above, development activities which require an Erosion and Sedimentation Control Plan under the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program are required to follow stormwater management rules as specified in Administrative Code 15A NCAC 2H .1000 (NCDENR-DWQ, 1995). Under these rules, stormwater management strategies must be implemented if development activities are within one mile of and draining to waters designated as HQW. The low-density option requires a 30-foot wide vegetative buffer between development activities and the stream. This option can be used when the built upon area is less than 12 percent of the total land area or the proposed development is for a single-family residential home on one acre or greater. Vegetated areas may be used to transport stormwater in the low-density option, but it must not lead to a discrete stormwater collection system (e.g., constructed). The high-density option is for all land disturbing activities on greater than one acre. For high-density projects, structural stormwater controls must be constructed (e.g., wet detention ponds, stormwater infiltration systems, innovative systems) and must be designed to control runoff from all surfaces affected by one inch or more of rainfall. More stringent stormwater management measures may be required on a case-by-case basis where it is determined additional measures are needed to protect and maintain existing and anticipated uses of the water (Administrative Code 15A NCAC 2H .1006).

ORWs are unique and special surface waters that have some outstanding resource value (e.g., outstanding fish habitat and fisheries, unusually high levels of water-based recreation, special ecological or scientific significance). No new discharge or expansions on existing discharges are permitted. Rules related to the development activities are similar to those for HQW, and stormwater controls for all new development activities requiring an Erosion and Sedimentation Control Plan under the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program are required to follow stormwater management rules as specified in Administrative Code 15A NCAC 2H .1000 (NCDENR-DWQ, 1995). In addition, site-specific stormwater management strategies may be developed to protect the resource values of these waters.

Many of the streams in this subbasin are also classified as trout (Tr) waters, and therefore, are protected for natural trout propagation and maintenance of stocked trout. There are no watershed development restrictions associated with the trout classification; however, the NC Division of Land Resources (DLR), under the NC Sedimentation and Pollution Control Act (SPCA), has requirements to protect trout streams from land disturbing activities. Under G.S. 113A-57(1), "waters that have been classified as trout waters by the Environmental Management Commission (EMC) shall have an undisturbed buffer zone 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent of the buffer zone nearest the land-disturbing activity, whichever is greater." The Sedimentation Control Commission, however, can approve land-disturbing activities along trout waters when the duration of the disturbance is temporary and the extent of the disturbance is minimal. This rule applies to unnamed tributaries flowing to the affected trout water stream. Further clarification on classifications of unnamed tributaries can be found under Administration Code 15A NCAC 02B .0301(i)(1). For more information regarding land-disturbing activities along designated trout streams, see the DLR website at http://www.dlr.enr.state.nc.us/.