Chapter 2
Savannah River Subbasin 03-13-02
Including: Horsepasture, Thompson, and Whitewater Rivers

2.1 Subbasin Overview

Subbasin 03-13-02 at a Glance

Land and Water Area

Total area:	98 mi²
Land area:	96 mi²
Water area:	2 mi²

Population Statistics

2000 Est. Pop.:	7,267 people
Pop. Density:	75 persons/mi²

Land Cover (percent)

Forest/Wetland:	95.6%
Surface Water:	2.1%
Urban:	0.3%
Cultivated Crop:	0.1%
Pasture/ Managed Herbaceous:	1.9%

Counties

Jackson, Transylvania

Municipalities

Cashiers

Monitored Streams Statistics

Aquatic Life

Total Streams:	106.6 mi
Total Supporting:	28.7 mi
Total Impaired:	0 mi
Total Not Rated:	0 mi

Recreation

Total Streams:	3.9 mi
Total Supporting:	3.9 mi

The Horsepasture and Toxaway Rivers originate in Jackson and Transylvania counties and flow in a southeastern direction toward South Carolina's Lake Jocassee. The Horsepasture falls more than 2,000 feet in the North Carolina portion of the watershed and contains several spectacular waterfalls. Other tributaries in this subbasin include the Whitewater and Thompson Rivers.

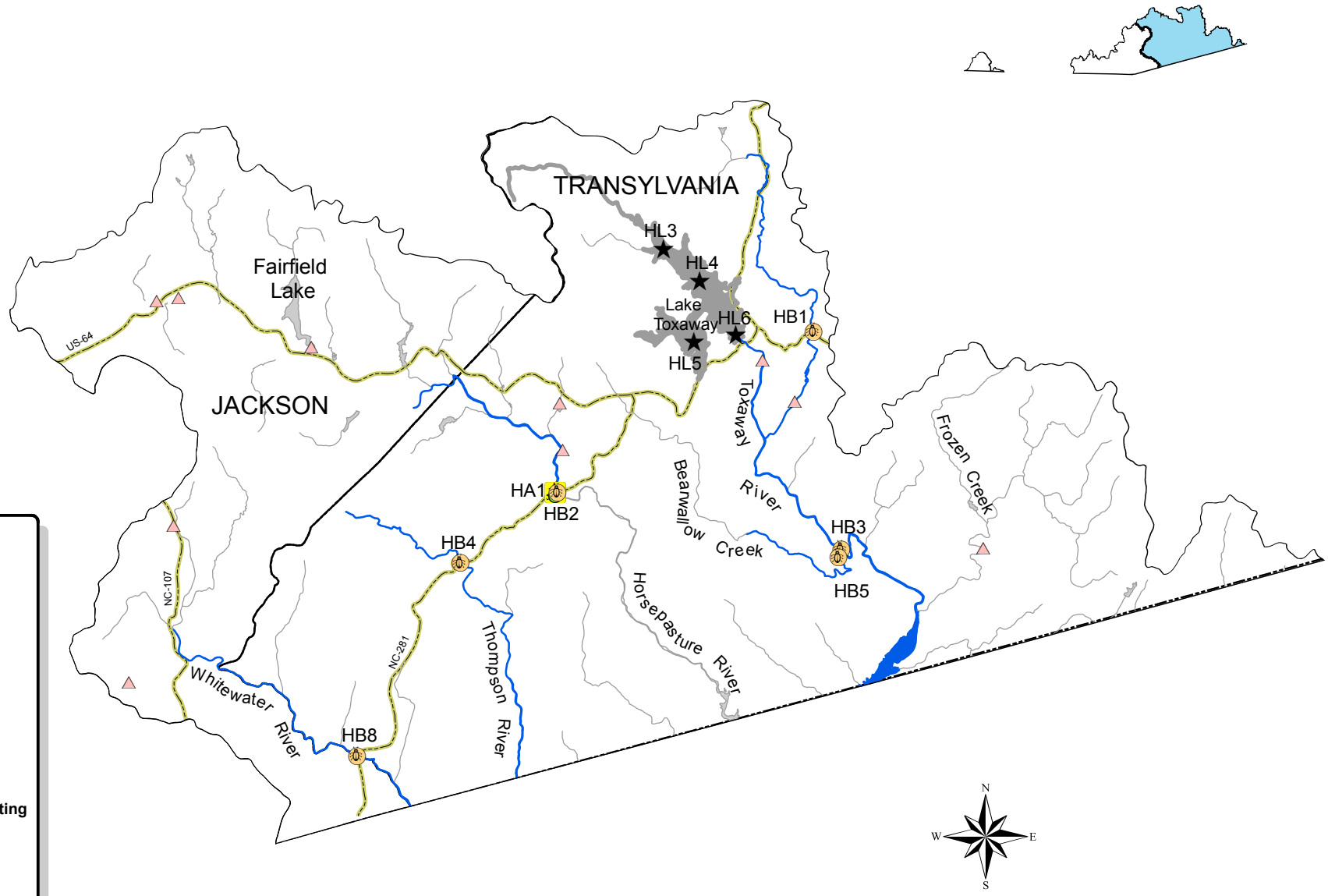
Most of the land within this subbasin is forested (95.6 percent). The Whitewater River watershed lies within the Nantahala National Forest. The Gorges State Park and Toxaway Game Lands encompass 10,000 acres in this subbasin (mostly the Toxaway River watershed). There are no municipalities; however, several residential and resort communities exist near Sapphire and Lake Toxaway.

Water quality in this subbasin is generally good to excellent. Nearly all waters are classified trout waters. Several streams including Bearwallow Creek and a portion of the Whitewater River are High Quality Waters. Additionally, 4.5 miles of the Horsepasture River are both a State Natural and Scenic River and a National Wild and Scenic River.

Additional information regarding population and land use throughout the entire basin can be found in Appendix I and III, respectively.

There are eleven NPDES dischargers in this subbasin, two of which are required to perform whole effluent toxicity testing. The Carolina Mountain Water WWTP (NC0067954, 0.006 MGD) discharges to an unnamed tributary of the Whitewater River and has had no toxicity violations since 1997. The other NPDES facility in this subbasin is the Wade Hampton Club WWTP (NC0062553, MGD 0.125). This facility discharges to an unnamed tributary to Silver Run Creek and has had no toxicity violations since 1998. For the listing of NPDES permit holders, refer to Appendix V.

Figure 5 Savannah River Subbasin 03-13-02



Legend

Monitoring Stations
- Ambient Monitoring Station
- Benthic Community
- Fish Community
- Lake Monitoring Station
- Recreation Locations

NPDES Discharges
- Major
- Minor

Aquatic Life Use Support Rating
- Impaired
- No Data
- Not Rated
- Supporting

- Primary Roads
- County Boundary
- Municipality
- Subbasin Boundary

Planning Section
Basinwide Planning Unit
July 18, 2006

Table 6 Savannah Subbasin 03-13-02

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Bearwallow Creek													
4-7-(2)	C Tr HQW	2.2 FW Miles	From a point 2.3 miles upstream of mouth to Toxaway River	**S**	HB5	E	2004		ND				
Horsepasture River													
4-13-(0.5)b	C Tr	3.9 FW Miles	From dam at Sapphire Lake to NC 281	**S**	HA1	NCE			**S**	HA1	NCE	Fecal Coliform Bacteria	Unknown
					HB2	G	2004					Fecal Coliform Bacteria	WWTP NPDES
												Habitat Degradation	Unknown
												Temperature	Unknown
Indian Creek													
4-5-(3)	C Tr	5.4 FW Miles	From Dam at Indian Lake Estates Recreation Lake to Toxaway River	**S**	HB1	E	2004		ND				
Thompson River													
4-14-6	C Tr	5.9 FW Miles	From source to North Carolina-South Carolina State Line	**S**	HB4	E	2004		ND				
TOXAWAY RIVER													
4-(4)	C	6.2 FW Miles	From Dam at Lake Toxaway Estates, Inc. to North Carolina-South Carolina State Line	**S**	HB3	E	2004		ND				
TOXAWAY RIVER (Lake Toxaway)													
4-(1)	B Tr	524.9 FW Acres	From source to Dam at Lake Toxaway Estates, Inc.	**NR**	HL3	ID			ND				
					HL4	ID							
					HL5	ID							
					HL6	ID							

Table 6 Savannah Subbasin 03-13-02

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Whitewater River													
4-14-(1.5)	C Tr HQW	5.2 FW Miles	From Little Whitewater Creek to North Carolina-South Carolina State Line	S	HB8	E	2004		ND				

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
HF - Fish Community Survey
HB - Benthic Community Survey
HA - Ambient Monitoring Site
HL- Lake Monitoring

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

Use Support Ratings 2006:
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	28.7	FW Miles
NR	m	524.9	FW Acres
ND		77.9	FW Miles
ND		125.6	FW Acres

Recreation Rating Summary

S	m	3.9	FW Miles
ND		102.8	FW Miles
ND		650.5	FW Acres

Fish Consumption Rating Summary

I	e	106.7	FW Miles
I	e	650.5	FW Acres

A map including the locations of the NPDES facilities and water quality monitoring stations is presented in Figure 5. Table 6 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 ratings.

There were 10 benthic macroinvertebrate community samples collected during this assessment period. The Whitewater River and the Thompson River maintained Excellent bioclassifications, Indian Creek improved from Good in 1999 to Excellent in 2004, and the Horsepasture River declined in bioclassification from Excellent in 1999 to Good in 2004. Data were also collected from one ambient monitoring station. This ambient station is located on the Horsepasture River mainstem at NC281. No water quality standards were violated. Refer to the *2005 Basinwide Assessment Report Savannah River Basin* at http://h2o.enr.state.nc.us/esb/Basinwide/SAV2005.pdf and Appendix IV for more information on monitoring.

Waters in the following sections and in Table 6 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.

2.2 Use Support Assessment Summary

Table 7 Summary of Use Support Ratings by Category in Subbasin 03-13-02

Use Support Rating	Aquatic Life	Recreation
Monitored Waters		
Supporting	28.7 mi	3.9 mi
Impaired*	0	0
Not Rated	524.9 ac	0
Total	**28.7 mi 524.9 ac**	**3.9 mi**
Unmonitored Waters		
No Data	77.9 mi 125.6 ac	102.8 mi 650.5 ac
Total	**77.9 mi 125.6 ac**	**102.8 mi 650.5 ac**
Totals		
All Waters**	**106.6 mi 650.5 ac**	**106.7 mi 650.5 ac**

* The noted percent Impaired is the percent of monitored miles/acres only.
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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 03-13-02, use support was assigned for the aquatic life, recreation, fish consumption and water supply categories. (Table 7) 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 7 for a summary of use support for waters in subbasin 03-13-02.

2.3 Status and Recommendations of Previously and Newly Impaired Waters

No stream segments were rated impaired in the 2002 basin plan and none were rated as impaired based on recent DWQ monitoring in the current assessment period (1999-2004). Section 2.4 below discusses specific streams where water quality impacts have been observed.

2.4 Status and Recommendations for Waters with Noted Impacts

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, education on local water quality 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#. Nonpoint source program agency contacts are listed in Appendix VII.

2.4.1 Horsepasture River [AU# 4-13-(.5)b] and Headwaters Including: Hog Back and Little Hogback Creeks, Hogback Lake [AU# 4-13-9 and 4-13-8]

Current Status

DWQ samples the Horsepasture River's benthic community at site HB2. Between 1999 and 2004 this location declined from Excellent to Good. However, it should be noted that the bioclassification at this site has varied since DWQ first sampled here in 1985 (Table 8). DWQ also maintains an ambient monitoring station at this location. Ambient data indicate that physical water quality did not change significantly at this site between 1999 and 2004 and suggests the recent variability in bioclassification may be natural. The ambient data also revealed fecal coliform bacteria concentrations are trending upwards, but do not yet violate state standards. This could be due to the increased presence of septic systems in the watershed and/or intense recreational use. The Horsepasture River is a popular swimming destination in the summer. Sapphire Lakes WWTP #1 has also had difficulty meeting its fecal coliform permit limit. DWQ is pursuing enforcement actions to correct the problem.

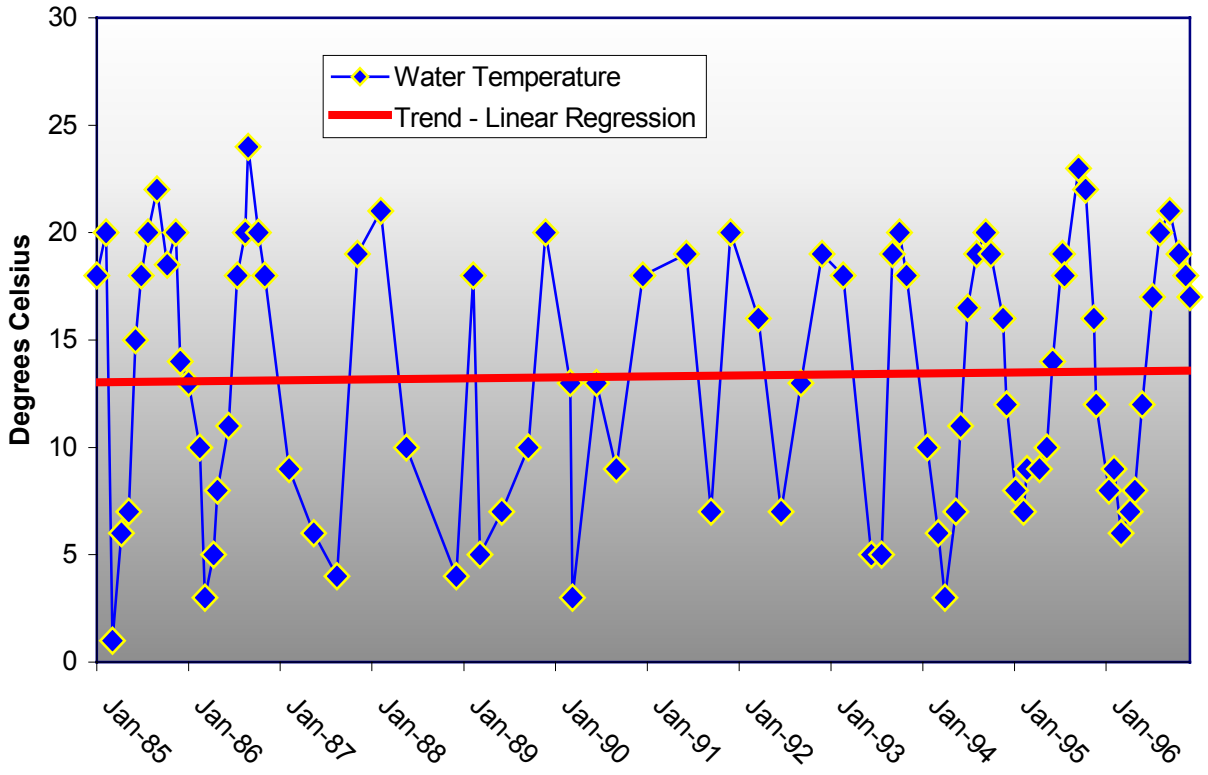
Concerned citizens provided DWQ with photographic evidence of instream habitat degradation in many tributaries of the Horsepasture River, especially the Hog Back Creek watershed. The photographs document the impact of development in the watershed and include: removal of riparian vegetation resulting in bank collapse, erosion near stormwater collection system outfalls, un-stabilized road cuts, heavy siltation in small streams, and failing erosion control structures.

Table 8 Bioclassifications for the Horsepasture River at NC281

Year	Bioclassification
1984	Good-Fair
1985	Fair
1986	Good
1987	Good
1989	Good-Fair
1994	Good
1999	Excellent
2004	Good

The average ambient water temperature appears to be rising at site HA1. This was determined by fitting a linear regression trend line for temperature data from 1985 through 1996. Because there is no flow information to accompany this data, DWQ could not perform a season-and-flow adjusted trend analysis, and these results should be considered preliminary. Some possible causes for a long-term temperature increase include a large-scale climatic shift or direct human induced changes such as increased impervious cover or riparian vegetation removal coupled with impacts from small ponds. Despite some new development, impervious surfaces remain a relatively small percentage (<2 percent) of the landscape in the Horsepasture River watershed (Figure 6). Therefore, the most likely causes of increasing water temperature include riparian vegetation removal, small ponds, and climate change. Changes due to riparian vegetation removal are relatively easy and inexpensive to correct by replanting the riparian zone with shade trees.

Figure 6 Ambient Water Temperature in the Horsepasture River



The NC Ecosystem Enhancement Program (NCEEP) has initiated an approximately 8,000-foot stream mitigation project on Logan Creek, a tributary to the Horsepasture River near the town of Cashiers in Jackson County. The project is currently in the early design phase, with construction expected to begin by the summer of 2007. For additional information about NCEEP watershed initiatives, see Section 11.3.1.

DWQ received a request to reclassify the Horsepasture River to Outstanding Resource Waters in 2006. In the summer of 2006, DWQ conducted biological studies of the river and its major tributaries to determine if they would qualify for ORW classification. A great deal of the study was conducted in rapidly developing areas. Active land clearing activities at several sites will likely affect the riparian zone's effectiveness at controlling pollutant loading including sedimentation. In at least one instance, sediment control measures apparently put in place immediately adjacent to the stream to slow these problems were circumvented. With the Horsepasture River itself starting out near, and flowing through a relatively low-gradient area from the confluence of Logan Creek to the confluence of Rock Creek, this area, including many of the tributaries may be very sensitive to sedimentation and sediment-borne pollutants. Additional controls on, or better regulation of non-point source pollutants may be needed to protect the current status of these resources and to maintain the excellent water quality observed in the lower portion of the Horsepasture River.

2007 Recommendations

Nonpoint source pollution presents the greatest threat to water quality in the Horsepasture River. In order to protect water quality, development along the river and its many tributaries must be conducted in an ecologically sound manner including an emphasis on managing stormwater runoff. Refer to Chapter 5 for information on how local governments can achieve effective stormwater control on existing and future development.

In addition to local government action, residents should take an active role in water quality management. Citizens are encouraged to report erosion problems and possible water quality violations to state and county authorities. They should also work through their homeowner associations to encourage and establish appropriate stormwater controls in their communities. Citizens can also track changes in water quality by starting a volunteer monitoring program to supplement state water quality data. Interested citizens should contact the VWIN program at the University of Asheville for guidance on how to start such a program. Residential landowners along the creek can use a variety of techniques to reduce pollution caused by runoff from their property. Residents should refer to the document "Improving Water Quality in Your Own Backyard." This pamphlet is available free of charge through the Division of Water Quality Website http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf.

2.4.2 Toxaway River (Lake Toxaway) [AU# 4-(1) & 4-(4)]

Current Status

Bottom water in Lake Toxaway was sampled in conjunction with a study being conducted by the Division of Water Resources (DWR) in response to odor complaints below the dam. In 2001, 2002, and 2003, the DWR received complaints regarding the odor of bottom water released into the Toxaway River from Lake Toxaway. Bottom water is released from the reservoir in an attempt to provide colder water in the Toxaway River downstream of the dam to support a trout fishery. In response to the public complaints, a study of the river downstream of the Lake Toxaway Dam was conducted by DWR to determine the source of the odor problem. In support

of this investigation, DWQ sampled the bottom water of Lake Toxaway near the dam to evaluate the levels of metals, particularly manganese, an element associated with taste and odor problems in drinking water. Results of this sampling indicate that both manganese and iron increased significantly in response to increased hypoxic conditions near the bottom of the lake as the summer progressed. At these elevated concentrations, staining, odor, and unpleasant taste are noticeable. Lake Toxaway is Not Rated in the aquatic life use support category because DWQ did not collect the minimum ten samples necessary to assign a use support rating.

DWQ also sampled the benthic community in the Toxaway River about five miles below the dam. At this point (Site HB3), the benthic community was rated Excellent, indicating either the dam did not have a significant impact, or the impact attenuated relatively quickly after release. The river is rated Supporting for aquatic life from the dam at Lake Toxaway to the state line.

2007 Recommendations

The Toxaway River below the lake is now protected within Gorges State Park. Therefore, the most likely threats to water quality will manifest in the lake and headwaters. In order to protect water quality in this area, development must proceed in an ecologically sound manner. Refer to Chapter 5 for recommendations on how growth and development can be managed effectively.

2.5 Additional Water Quality Issues within Subbasin 03-13-02

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 Savannah basin. In subbasins 03-13-01 (Chapter 1) and 03-13-02, this is particularly important since many of the waters are designated high quality or outstanding resource waters (HQW and ORW, respectively).

2.5.1 Management Strategies for Water Quality Protection

Municipalities and smaller outlying communities are expanding. This involves construction and development along pristine waters in Subbasin 03-13-02. HQW and ORW are supplemental classifications to the primary freshwater classification(s) placed on a waterbody (Chapter 3). Management strategies are associated with the supplemental HQW and ORW classifications and are intended to protect the current use of the waterbody. A summary of the special management strategies for HQW and ORW waters can be found in Chapter 1. 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/.

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/.

2.5.2 Septic System Concerns

Development of rural land in areas not served by sewer systems is occurring rapidly in the Savannah 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 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.

2.5.3 Wooly Adelgid Pesticide Use

Citizens in the Savannah River basin informed DWQ of widespread, improper pesticide use by untrained persons attempting to control the spread of wooly adelgid infestations in eastern hemlock stands. The eastern hemlock is common along streams in the southern Appalachians. When used improperly or excessively, pesticides intended for use on trees can runoff into nearby streams causing catastrophic declines in aquatic communities. The NC Division of Forrest Resources can advise concerned citizens on the proper techniques for wooly adelgid control. http://www.dfr.state.nc.us/