Chapter 1
Little Tennessee River Subbasin 04-04-01

Including the: Little Tennessee River, Cullasaja River, and Cartoogechaye Creek Watersheds

1.1 Subbasin Overview

Subbasin 04-04-01 at a Glance

Land and Water Area

Total area:	370 mi²
Land area:	369 mi²
Water area:	1 mi²

Population (County)

2000 Est. Pop.: 22,358 people
Pop. Density: 12 persons/mi²

Land Cover (percent)

Forest/Wetland:	89.1%
Water:	0.3%
Urban:	0.9%
Cultivated Crop:	0.9%
Pasture/ Managed Herbaceous:	8.8%

Counties

Macon

Municipalities

Franklin and Highlands

Monitored Stream Statistics

Aquatic Life

Total Streams:	139.0 mi/42.1 ac
Total Supporting:	133.2 mi
Total Impaired:	3.7 mi
Total Not Rated:	2.1 mi/42.1 ac

Recreation

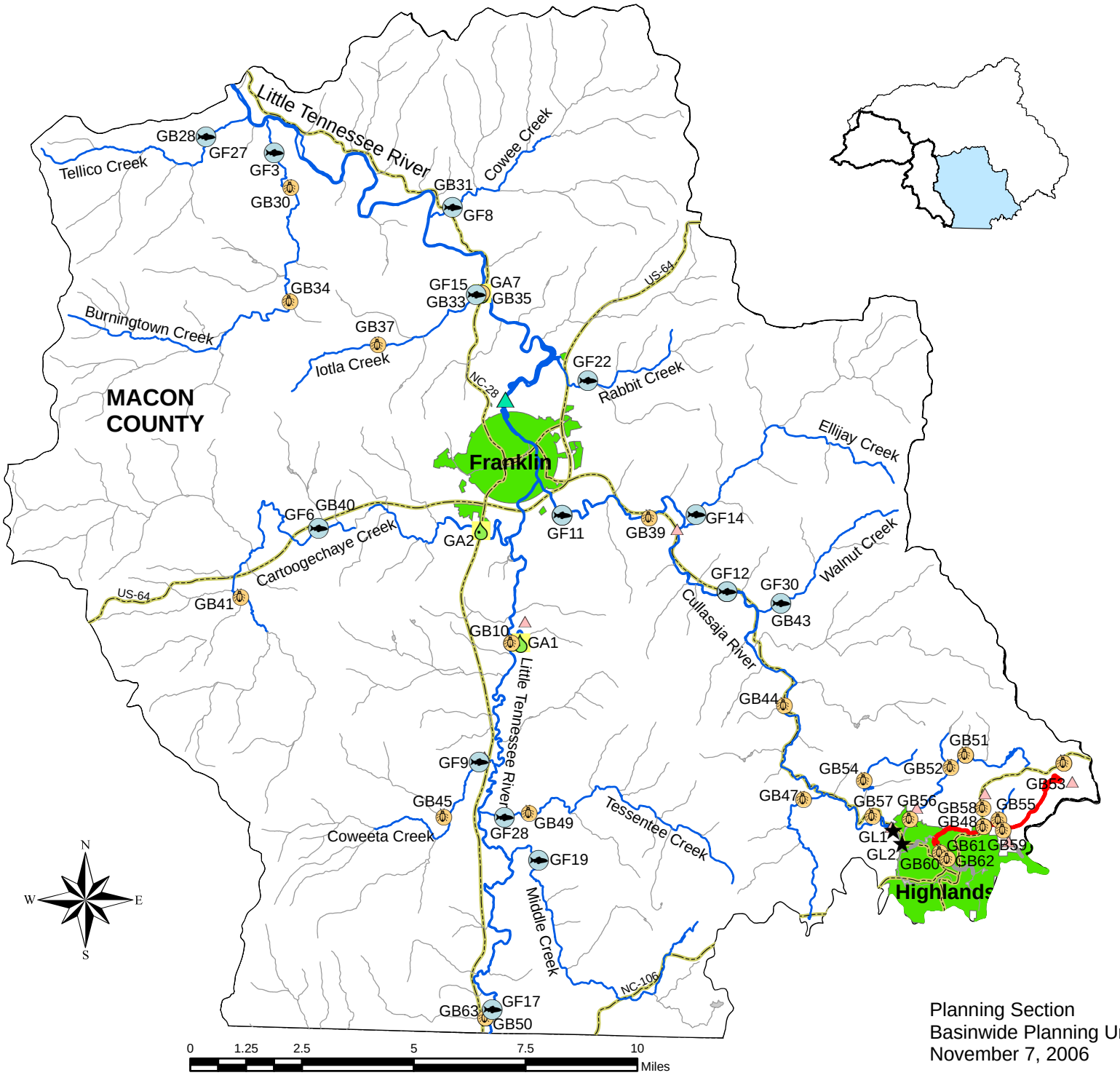
Total Streams:	35.9 mi
Total Supporting:	35.9 mi

The Little Tennessee River originates in Rabun County, Georgia and flows north into Macon County, North Carolina. Subbasin 04-04-01 contains approximately 35 miles of the Little Tennessee River from the state line to the Macon-Swain county line below Tellico Creek. The river upstream of Lake Emory (Porters Bend Dam) has a very gradual gradient as it flows through a broad valley. Below the lake, the gradient steepens and the flow quickens as it flows through the Needmore Tract towards Fontana Reservoir. Major tributaries to the Little Tennessee River in this subbasin include the Cullasaja River and Cartoogechaye Creek; smaller tributaries include Middle, Coweeta, Cowee, Tessentee, Tellico, and Burningtown Creeks.

Headwaters of many tributaries are protected within the Nantahala National Forest. Most tributaries are high gradient streams capable of supporting trout populations in their upper reaches. In the lower reaches, many of the watersheds are farmed or developed and the tributaries are affected by erosion, scour, and sediment deposition. The Town of Franklin and a portion of the Town of Highlands are the large population centers in this subbasin. Strip development is focused along US 23/441 south from Franklin towards Dillard, Rabun Gap, and Mountain City, GA. Low-density residential development is increasing throughout the watershed. Despite the development, almost 90 percent of the subbasin is forested

There are 12 NPDES permitted dischargers in this subbasin. The largest is the Town of Franklin WWTP, which discharges 1.65 MGD into the Little Tennessee River (Lake Emory). This facility is required to monitor whole effluent toxicity. Refer to Appendix V for the listing of NPDES permit holders.

Figure 3 Little Tennessee Subbasin 04-04-01



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

Recreation Use Support Rating

- Impaired
- Primary Roads
- County Boundary
- Municipality
- Subbasin Boundary

Planning Section
Basinwide Planning Unit
November 7, 2006

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Ammons Branch													
2-21-2	WS-III	0.8 FW Miles	From source to Cullasaja River	S	GB55	NI	2001		ND				
Big Creek (Randall Lake)													
2-21-5-1-(0.5)	WS-II;Tr,HQW	3.4 FW Miles	From source to a point 0.7 mile upstream of mouth	S	GB51	G	2001		ND			Sediment	Unknown
					GB51	E	2000						
Big Creek Arm of Lake Sequoyah													
2-21-5-1-(4)	WS-II;Tr,HQW,C	0.6 FW Miles	From a point 0.7 mile upstream of mouth to Lake Sequoyah, Cullasaja River	S	GB56	G	2000		ND				
Burningtown Creek													
2-38	B;Tr	11.7 FW Miles	From source to Little Tennessee River	S	GF3	E	2004		ND			Sediment	Unknown
					GB34	G	2004						
					GB30	E	2004						
Cartoogechaye Creek													
2-19-(1)	WS-III;Tr	7.7 FW Miles	From source to a point 0.5 mile downstream of Lenior Branch	S	GF6	G	2004		ND			Sediment	Unknown
												Habitat Degradation	Unknown
					GB41	E	2004						
					GB40	G	2004						
2-19-(10.5)	B;Tr	2.7 FW Miles	From Town of Franklin water supply intake to Little Tennessee River	S	GA2	NCE			S	GA2	NCE		

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Cowee Creek													
2-29	C;Tr	4.0 FW Miles		**S**					ND			Sediment	Unknown
	From source to Little Tennessee River				GF8	G	2004						
					GB31	E	2004						
Coweeta Creek													
2-10	B;Tr	4.6 FW Miles		**S**					ND				
	From source to Little Tennessee River				GF9	G	2004						
					GB45	E	2004						
Cullasaja River													
2-21-(5.5)	B;Tr	10.6 FW Miles		**S**					ND			Habitat Degradation	Unknown
	From dam at Lake Sequoyah to Little Tennessee River				GB44	G	2004						
					GB39	G	2004						
					GB57	GF	2000						
					GF12	G	1999						
					GF12	G	1999						
					GF11	GF	1999						
					GF11	GF	1999						
Cullasaja River (Lake Sequoyah)													
2-21-(3.5)b	WS-III;Tr,CA	42.1 FW Acres		**NR**	GL1	ID			ND			Nutrient Impacts	Unknown
					GL2	ID						Sediment	Unknown
	From backwaters of Lake Sequoyah to dam at Lake												

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Cullasaja River(Ravenel Lake)													
2-21-(0.5)a	WS-III;Tr	3.7 FW Miles	Source to 0.6 miles downstream of US64 (head of Mirror lake)	I	GB48	F	2004		ND			Toxic Impacts	Unknown
					GB48	F	2001					Habitat Degradation	Impoundment
					GB53	NR	2001						
					GB48	F	2000						
					GB53	NI	2000						
2-21-(0.5)b	WS-III;Tr	0.7 FW Miles	From 0.6 miles downstream of US64 (head of Mirror lake) to Mirror lake	ND					ND			Habitat Degradation	Impoundment
												Habitat Degradation	Unknown
												Toxic Impacts	Unknown
Ellijay Creek													
2-21-23	C;Tr	7.2 FW Miles	From source to Cullasaja River	S	GF14	G	2004		ND				
Houston Branch													
2-21-5-1-3-(2)	WS-II;HQW	0.9 FW Miles	From Dam at Highlands Reservoir to Big Creek	S	GB52	NI	2000		ND				
Iotla Creek													
2-27	C	5.5 FW Miles	From source to Little Tennessee River	S	GF15	GF	2004		ND			Nutrient Impacts	Agriculture
					GB37	G	2004					Habitat Degradation	Construction
					GB33	G	2004					Habitat Degradation	Agriculture

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
LITTLE TENNESSEE RIVER													
2-(1)a	C	2.1 FW Miles	From North Carolina-Georgia State line to the confluence of Mulberry Creek	I					ND			Habitat Degradation	Impervious Surface
					GF17	F	2004					Habitat Degradation	Agriculture
					GB50	GF	2004					Habitat Degradation	WWTP NPDES
					GB50	F	2000						
2-(1)b	C	15.9 FW Miles	From the confluence of Mulberry Creek to the confluence of Cartoogechaye Creek	S	GA1	NCE			S	GA1	NCE	Habitat Degradation	Unknown
					GB10	G	2004						
					GB10	GF	1999						
LITTLE TENNESSEE RIVER (Including backwaters of Lake Emory)													
2-(1)c	C	7.3 FW Miles	From the confluence of Cartoogechaye Cr. to a point 0.4 mile upstream of N.C. Hwy. 28 (located 0.42 mile upstream of mouth of Iotla Creek)	S	GA7	NCE			S	GA7	NCE	Total Suspended Solids	WWTP NPDES
					GB35	GF	2004						
LITTLE TENNESSEE RIVER (Including the backwaters of Fontana Lake at normal pool elevation 1708 fee													
2-(26.5)a	B	10.0 FW Miles	From to a point 0.4 mile upstream of N.C. Hwy. 28 (located 0.42 mile upstream of mouth of Iotla Creek) to subbasin 01/02 border	S	GA7	NCE			S	GA7	NCE		
					GB35	GF	2004						
Middle Creek													
2-8	C;Tr	8.8 FW Miles	From source to Little Tennessee River	S					ND				
					GF19	G	2004						
					GB49	E	2004						

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Description	Aquatic Life Assessment					Recreation Assessment			Stressors	Sources
				AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result		
Mill Creek													
2-21-3	WS-III;Tr	1.3 FW Miles		**NR**					ND			Lack of Organic Material	Unknown
	From source to Mirror Lake, Cullasaja River				GB62	NR	2000					Toxic Impacts	Unknown
					GB61	NR	2000					Habitat Degradation	Impoundment
					GB60	NR	2000					Habitat Degradation	Construction
Rabbitt Creek													
2-23	C;Tr	4.0 FW Miles		**S**					ND			Habitat Degradation	Impoundment
	From source to Lake Emory, Little Tennessee River				GF22	GF	2004					Habitat Degradation	Construction
												Habitat Degradation	Land Clearing
Saltrock Branch													
2-21-1	WS-III	0.8 FW Miles		**NR**					ND			Habitat Degradation	Unknown
	From source to Cullasaja River				GB59	NR	2001						
Skitty Creek (Cliffside Lake)													
2-21-6-(1)	B;Tr	1.9 FW Miles		**S**					ND				
	From source to Dam at Cliffside Lake				GB54	NI	2000						
Tellico Creek													
2-40	C;Tr	5.9 FW Miles		**S**					ND				
	From source to Little Tennessee River				GF27	G	2004						
					GB28	E	2004						
Tessentee Creek													
2-9	C;Tr	8.1 FW Miles		**S**					ND				
	From source to Little Tennessee River				GF28	G	2004						
					GB46	E	2004						

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Aquatic Life Assessment					Recreation Assessment				
Description			AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result	Stressors	Sources
Turtle Pond Creek												
2-21-8	C;Tr	4.0 FW Miles	**S**					ND				
From source to Cullasaja River				GB47	E	2004						
UT to Cullasaja River(Ravenel Lake)												
2-21-(0.5)aUT2	WS-III;Tr	1.1 FW Miles	**S**					ND				
Source to Cullasaja River				GB58	NI	2001						
Walnut Creek												
2-21-17	C;Tr	4.5 FW Miles	**S**					ND			Habitat Degradation	Construction
From source to Cullasaja River				GF30	NR	2004					Habitat Degradation	Agriculture
				GB43	E	2004						

Table 3 Little Tennessee Subbasin 04-04-01

AU Number	Classification	Length/Area	Aquatic Life Assessment					Recreation Assessment				
Description			AL Rating	Station	Result	Year/ Parameter	% Exc	REC Rating	Station	Result	Stressors	Sources

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
GF - Fish Community Survey
GB - Benthic Community Survey
GA - Ambient Monitoring Site
GL- 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	131.1	FW Miles
NR	m	2.1	FW Miles
I	m	5.8	FW Miles
NR	m	42.1	FW Acres
ND		368.9	FW Miles
ND		11.6	FW Acres

Recreation Rating Summary

S	m	35.9	FW Miles
ND		472.0	FW Miles
ND		53.7	FW Acres

Fish Consumption Rating Summary

I	e	503.1	FW Miles
I	e	53.7	FW Acres
I		4.8	FW Miles

During this assessment period, benthic macroinvertebrate samples were collected at 31 sites. Fish community samples were collected at 14 locations, and ambient water chemistry was monitored at three sites. None of the water quality variables analyzed as part of the ambient chemistry program had statistically significant exceedances over the five-year monitoring period (1999 – 2004) for the Little Tennessee River at Prentiss, for the Little Tennessee River at Iotla, and for Cartoogechaye Creek near Franklin.

Most sites monitored for benthic macroinvertebrates or fish were rated Good or Excellent; no sites were rated Poor. Two sites rated Fair, including the Little Tennessee River near the NC-GA state line and the upper reaches of the Cullasaja River near the Town of Highlands. The Little Tennessee River has at times experienced elevated conductivity due to permitted dischargers in Georgia, and the instream and riparian habitats continue to suffer from poor land use and watershed practices. The upper Cullasaja River continues to be impaired by land use practices in the area in and around the Town of Highlands. More than half of the impaired section (4.8 miles) of the upper Cullasaja River lies upstream of the Town of Highlands. Streams that have consistently been rated Excellent were Coweeta, Turtle Pond, Burningtown, and Tellico Creeks. Refer to the *2005 Little Tennessee River Basinwide Assessment Report* at http://h2o.enr.state.nc.us/esb/Basinwide/LTN2005.pdf and Appendix IV for more information on monitoring.

The riparian zones at many of the sites in the subbasin are narrow, sparsely vegetated with mature trees and mowed lawns, or in pasture. Many of the streams sampled were more turbid than expected for mountain streams. Habitat degradation is attributable to the combination of steep gradients, chronic erosion, and nonpoint source sedimentation. Many of the sites would benefit from bank stabilization and stream restoration techniques.

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.

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 04-04-01

Use Support Rating	Aquatic Life	Recreation
Monitored Waters		
Supporting	133.2 mi	35.9 mi
Impaired*	3.7 mi (2.7%)	0.0
Not Rated	2.1 mi 42.1 ac	0.0 0.0
Total	**139.0 mi** **42.1 ac**	**35.9 mi**
Unmonitored Waters		
No Data	368.9 mi 11.6 ac	472.0 mi 53.7 ac
Total	**368.9 mi** **11.6 ac**	**472.0 mi** **53.7 ac**
Totals		
All Waters**	**507.9 mi** **53.7 ac**	**507.9 mi** **53.7 ac**

* The noted percent Impaired is the percent of monitored miles/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 04-04-01, 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 04-04-01.

1.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2002) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2008 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an AU#. Information regarding 303(d) listing and reporting methodology is presented in Appendix VI.

1.3.1 Little Tennessee River [AU# 2-(1)a]

2002 Recommendations
DWQ recommended further communication with GA EPD and stressed the need for BMP installation throughout the watershed in both North Carolina and Georgia.

Current Status
DWQ sampled the fish and benthic communities at sites GF17 and GB50, respectively. Extremely high conductivity levels (highest of any fish site in the basin) continue to show

impacts from point source dischargers. However, the benthic population improved from Fair in 1999 to Good-Fair in 2004. The Little Tennessee River from the state line to the confluence of Mulberry Creek (2.1miles) remains Impaired in the Aquatic Life category because of a Fair bioclassification at site GF17.

The Little Tennessee River watershed above sites GF17 and GB50 is approximately 56 square miles, mostly in Georgia. There are four NPDES permitted facilities within the river's watershed in Georgia. The largest is commonly referred to as Rabun Mills. The Little Tennessee Watershed Association (LTWA) compared their fish community data to discharge operations at Rabun Mills between years 1990 and 2002. Fluctuations in their data correlated well with plant operations upstream. For example, the fish community improved from 1992 to 1993 while the plant was not operating. The plant resumed operation under a more restrictive permit in 1994 and fish populations improved gradually through 1997. This trend reversed in the period 1998 – 2002 and coincided with anecdotal and visual observations of impacts from the discharge. At the time of publication, the plant is again idle. However, problems related to Dillard and Sky City WWTP's, agriculture, road construction, small industries, urbanization, residential development, and failing septic systems remain a concern. Beginning downstream of the NC/GA state line, Little Tennessee River is Designated Critical Habitat for the Appalachia elktoe mussel, further raising the importance of clean water in the river.

2007 Recommendations

Because the Little Tennessee is affected by both point and nonpoint sources of pollution, reversing impairment in this reach will require corrective action on both fronts. DWQ will continue conversations with GA EPD to find opportunities to improve NPDES discharger performance. Protective measures should be written into the NPDES permit for any new operation at the old Rabun Mills plant. These measures should be prepared and made available to potential new owners before assuming operation of the plant.

Ultimately, DWQ is required to develop a TMDL for this river segment and will seek cooperation from Georgia. Georgia will be required to implement the terms of the TMDL once EPA approves it. Local action is also needed to address nonpoint source pollution through installation of BMPs and riparian zone protection/restoration.

1.3.2 Upper Cullasaja River Watershed Including Cullasaja River (Ravenel Lake) [AU# 2-21-(0.5)] and Mill Creek [AU# 2-21-3]

The upper Cullasaja River Watershed is located in southeastern Macon County and contains most of the Town of Highlands and surrounding lands (Figure 4). The 14.4 square mile watershed lies on the Highlands Plateau, a high elevation area noted for exceptionally high rainfall (80 - over 100 inches per year). The watershed was historically logged and many of the streams dammed and/or channelized. Estimates provided by the Upper Cullasaja Watershed Association (UCWA) indicate land use in the watershed was approximately 50 percent residential-commercial-industrial (high level of impervious cover), and 50 percent forested as of 2004. Streams begin demonstrating negative impacts as imperviousness exceeds 10 percent of a watershed (Chapter 6).

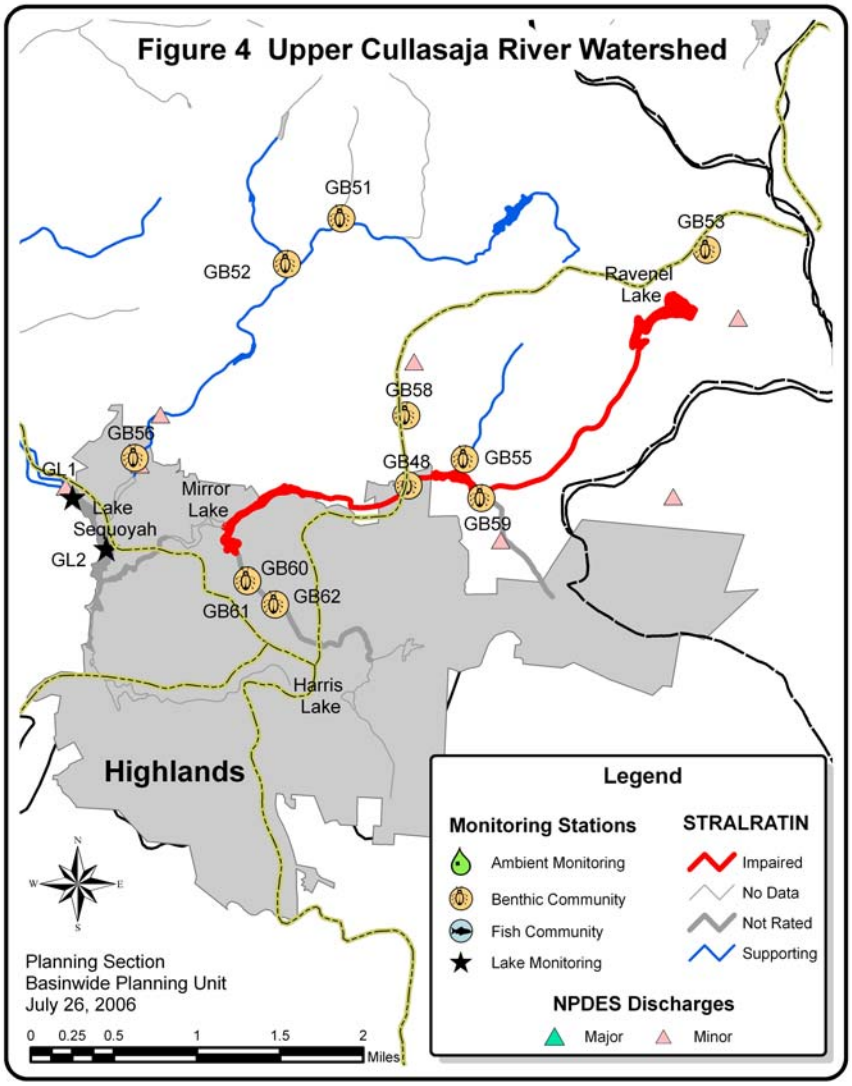
The watershed includes *all* streams draining to the Cullasaja River from its headwaters to Big Creek. Within this watershed, the Cullasaja River from its source to Macon County SR-1545 (2.2 miles) and Mill Creek from its source to Mirror Lake (1.3 miles) are listed as Impaired on

North Carolina's 303(d) list. Other significant drainages include the *Cullasaja River from SR-1545 to Big Creek, Big Creek itself, and Monger Creek.* These streams are not impaired, but are discussed here because of their direct connection to the impaired segments.

2002 Recommendations

The Cullasaja River upstream of Lake Sequoyah (4.8 miles) and Mill Creek (1.4 miles) were impaired for aquatic life based on benthic macroinvertebrate collections in the 1990's. DWQ recommended a variety of strategies that together could improve habitat and water quality in the Upper Cullasaja River Watershed. These recommendations included; developing a plan to address the impact of dams on movement of benthic macroinvertebrates, protection and restoration of vegetated riparian zones, nutrient and pesticide management, and extensive erosion control.

Figure 4 Upper Cullasaja River Watershed



Current Status of the Upper Cullasaja River

DWQ conducted extensive sampling in the upper Cullasaja River Watershed as part of a Watershed Assessment and Restoration Project (WARP) and its Basinwide Assessment program. A wide range of data was collected to evaluate potential causes and sources of impairment. Data collection activities included: benthic macroinvertebrate sampling; assessment of stream habitat, morphology, and riparian zone condition; water quality sampling to evaluate stream chemistry and toxicity; analysis of stream bed sediment for chemistry and toxicity; and characterization of watershed land use, conditions and pollution sources. A total of 17 benthic samples were collected, ranging from Fair on the Cullasaja River (site GB48) to Excellent in Big Creek (site GB51).

The WARP study determined that sedimentation is a significant problem in many of the impoundments, but the primary causes of biological impairment in the Cullasaja River are dam-related issues including the prevention of fish and benthic macroinvertebrate colonization and migration, lower water levels, increased temperature, and shifts in food availability. The lack of

organic microhabitat (sticks and leaf packs), pesticides, elevated cadmium, and low dissolved oxygen levels also contribute to impairment.

Current Status of Mill Creek

Revised assessment methods prevent updating the use support rating for Mill Creek because of its small size. It is, therefore, Not Rated at sites GB60, GB61, GB62. A number of stressors likely act together to impact the biological community in Mill Creek and it will remain on the 303(d) List of Impaired Waters until a documented improvement in the benthic community occurs. Multiple stressors cumulatively cause impairment to the stream, but current information does not identify any single stressor as a primary cause of impairment. The following stressors are believed to cumulatively cause impairment:

1) Scour of benthic macroinvertebrates and organic microhabitats from urban storm flows for areas downstream of Highlands' town center.
2) The lack of upstream colonization sources for the benthic community after storms and other impacts due to toxicants and in-stream impoundments in tributaries.
3) The lack of organic microhabitat (leafpacks, sticks) aquatic species in Mill Creek above the town center. Toxicants are a potential stressor in the Mill Creek mainstem.

According to LTWA data, water quality in Mill Creek has improved slightly, first when the WWTP discharge was moved and second when leaks at the old WWTP were repaired.

Current Status of Other Tributaries

Several other streams were also evaluated during the WARP study. Big Creek, Houston Branch, and Ammons Branch watersheds are mostly forested with minimal disturbance and considered Supporting for aquatic life. Saltrock Branch, however, is heavily impacted by a golf community and would benefit greatly from habitat restoration efforts. Because of its small size, it is Not Rated for aquatic life.

Current Status of Lake Sequoyah

DWQ's Lakes Assessment Unit evaluated Lake Sequoyah in summer 2004. The lake, classified as Trout Waters (Tr), had last been sampled by DWQ in 1999. In 2004, notable problems included elevated temperatures, turbidity, and low dissolved oxygen. Each of these negatively affects trout populations. Frequent rainfall events in the watershed during 2004 may have contributed to the increase in nonpoint source runoff, decreased water clarity, and increased total phosphorus in comparison with levels observed in 1999, a drier year. Aquatic life in Lake Sequoyah is Not Rated because of an insufficient number of samples.

The Upper Cullasaja Watershed Association (UCWA) has noted Lake Sequoyah, along with most impoundments in the watershed, has shown significant impacts from sediment deposition. Much of this sedimentation occurred prior to the enacting of local sediment and erosion control measures but continues as development on steep slopes progresses (Chapter 6). Reducing current sediment loads and removing existing sediment deposits are high priorities for many local watershed residents.

In 2005, Hurricane Ivan aggravated flooding and erosion problems in the watershed leaving large sediment deposits near critical drinking water intakes. The Town of Highlands, Upper Cullasaja Watershed Association, and the Mirror Lake Improvement Association are working together to secure funds to remove built-up sediment in the lakes and pave eroding gravel roads.

Water Quality Initiatives

The Upper Cullasaja Watershed Association and the Town of Highlands have taken many significant steps towards addressing water quality issues over the last assessment period. Since its inception, UCWA's primary focus has evolved from rainfall measurement and erosion control to understanding and implementing effective stormwater management in the watershed.

UCWA received a Regional Geographic Initiative grant from the U.S. Environmental Protection Agency to determine stakeholder concerns and issues within the watershed and define possible solutions. In 2004, UCWA compiled their findings in the Upper Cullasaja River Watershed Strategy and Action Plan. The action plan divides the watershed into four subbasins including: Upper Cullasaja River, Mill Creek, Monger Creek, and Big Creek. General recommendations are given for the entire watershed and specific tasks are outlined for each watershed. In cooperation with agents from North Carolina State University, UCWA proceeded to publish an addendum to the 2004 Action Plan that included a detailed assessment of both Mill and Monger Creeks and an assessment of stream restoration opportunities in those watersheds. Several of the key recommendations supported by DWQ are outlined below under "2007 Recommendations."

Concurrent with the efforts described above, UCWA has been collecting monthly rainfall data throughout the Highlands Plateau since 2000 and joined the Volunteer Water Information Network (Chapter 13) program in 2005. With the help of this data and future data, UCWA plans to work with the Town of Highlands to develop and implement the town's comprehensive stormwater management plan.

The Town of Highlands has received a $40,000 Clean Water Management Trust Fund grant to develop a new stormwater management plan. The plan will include an inventory of existing stormwater infrastructure, mapping of the stormwater system, stormwater modeling, preparation of a Master Plan document, development of a stormwater-related capital improvement plan, financial analysis, and an ordinance and policy review. Data provided by UCWA will be instrumental in preparation of this plan. UCWA will also continue to seek opportunities to partner with the Town of Highlands in managing urban stormwater runoff through specific retrofit, conservation, and BMP-based projects.

The Town of Highlands receives drinking water from the Cullasaja and Big Creek watersheds. In 2005, the Town extended its extraterritorial jurisdiction (ETJ) into areas outside the Town limits, encompassing a large portion of the watershed. One objective for extending the ETJ was to better manage the Cullasaja and Big Creek watersheds, which are classified WS-III and WS-II respectively. Over the next five years, UCWA plans to work with the Town of Highlands in a project that would identify and map perennial streams in these watersheds, both inside and outside the Town limits, which are not currently identified on USGS maps. This will make better protection of water resources possible through enforcement of the natural vegetative buffer requirements in the Town's existing watershed regulations. UCWA also intends to provide documentation of soil erosion and sources of sediment loading in these streams.

2007 Recommendations

Substantial planning and assessment exercises were successfully completed during the last assessment cycle. Two documents, the Upper Cullasaja Watershed Strategy and Action Plan (UCWA, 2004) and the WARP study report (DENR, 2002) provide extensive recommendations and justification for improved management and restoration activities in the watershed. During the next assessment cycle, efforts should be focused on implementing those recommendations.

Of the many recommendations outlined in these documents, DWQ feels the following recommendations are the highest priority. They are listed in no particular order.

- Evaluate and implement the following at each of the impoundments in the upper Cullasaja River watershed; minimum and/or bypass flows, sediment transport devices, and fish passages. Doing so will allow passage of aquatic organisms and help address sediment build up, elevated temperatures, and low dissolved oxygen levels. If the problems associated with dams are not addressed, then the recovery potential for the Cullasaja River is limited and other strategies listed below will have limited effect.
- Complete restoration projects at all sites identified in the Upper Cullasaja Watershed Strategy and Action Plan. Successful completion will improve habitat conditions and stormwater management in the watershed.
- Pesticide and nutrient management programs should be evaluated and improved to further decrease the use of these materials and their potential to enter lakes and streams. Homeowners and landscapers should also be educated about the responsible use of pesticides, fertilizers, and hydroseed mix.
- Woody vegetation should be planted along cleared streams, and large woody debris and rock clusters should be placed in the stream channel where wooded buffers are not planted. This action will stabilize eroding streambanks, provide shade, and produce leaf packs and other organic instream habitat.

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, 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#. Refer to Section 1.1 for more information about AU#. Nonpoint source program agency contacts are listed in Appendix VII.

1.4.1 Burningtown Creek [AU# 2-38]

Current Status

Burningtown Creek is the largest tributary to the Little Tennessee River downstream of Franklin. Compared with much of the county, its watershed is largely undeveloped excepting light residential and agricultural activities. The stream provides habitat for several sensitive species including the spotfin chub, hellbender salamander, smoky dace, and the sicklefin redhorse. DWQ sampled the fish and benthic communities at sites GF3 and GB30, respectively. Both sites received Excellent bioclassifications, but some minor impacts from sedimentation were noted. DWQ also sampled the upstream benthic community at site GB34. The site rated Good, slightly lower than the downstream site.

LTWA monitors Burningtown Creek and two of its tributaries, Younce Creek and Left Prong Burningtown Creek. Their data shows a healthy fish population in Burningtown Creek and the Left Prong. Younce Creek is degraded, but by unknown causes. They report impacts from cattle near the mouth of Burningtown Creek.

2007 Recommendations
Further investigation is needed into the causes of degradation in Younce Creek. Once identified, an appropriate solution can be determined. Cattle owners should consult with the Macon County Soil and Water Conservation District to find ways to reduce impacts from their livestock.

1.4.2 Cartoogechaye Creek Watershed Including Cartoogechaye Creek [AU# 2-19-(1) and 2-19-(10.5)], Allison Creek [AU# 2-19-3], Blaine Branch [AU# 2-19-13], Jones Creek [AU# 2-19-2], Mill Creek [AU# 2-19-9], Wayah Creek [AU# 2-19-8-(8)]

Current Status
Cartoogechaye Creek is the second largest tributary to the Little Tennessee River in this subbasin. It enters the river near the backwaters of Lake Emory. The creek's watershed drains west-central Macon County, and provides drinking water to the Town of Franklin. The benthic community at site GB40 rated Good in 2004, down from Excellent in 1999. The habitat was good, indicating the decline is likely due to a change in water quality. Site GB41, in the headwaters, rated Excellent. The fish community at site GF6 rated Good. The watershed becomes more urbanized and stresses stream health as it approaches Franklin.

Special Studies
The Little Tennessee Watershed Association (LTWA) also monitored fish communities in the Cartoogechaye watershed at 14 locations. Their monitoring results indicate a high incidence of the parasitic infection called blackspot. Blackspot is often associated with organic enrichment, but can be found in healthy streams. LTWA reports blackspot was in decline in 2006. Further monitoring will determine if the trend will continue.

LTWA also evaluated several tributaries to Cartoogechaye Creek. Blaine Branch and Mill Creek (not to be confused with Mill Creek in Highlands) suffer from channelization, bank erosion, development, and riparian zone disturbance. LTWA suspects Wayah Creek may have been impacted by the LBJ Job Corps waste water treatment plant, but this plant recently connected to the Town of Franklin sewer system. LTWA expects conditions in the creek to improve after this connection. Allison Creek is under increased pressure from development.

In 1998, LTWA monitoring noted a dramatic decline in the fish community at a site near the Macon County Recreation Park. Further investigation into the decline led to the identification of an undocumented point source pollution problem. The problem was corrected and the fish community improved immediately. This successful resolution indicates the practical value of volunteer monitoring programs. Local volunteer programs provide monitoring resolution DWQ does not have the resources to provide. In this case, local actions were able to correct a water quality problem in a timely manner.

2007 Recommendations
Nutrient and erosion control measures are necessary on both agricultural and residential areas. Residential landowners can use a variety of techniques to reduce pollution caused by runoff from their property. Residents should refer to Chapter 6 and the document "Improving Water Quality

in Your Own Backyard." This pamphlet is available free of charge through the Division of Water Quality and online at http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf. The impacts from agricultural operations can be reduced through use of agricultural best management practices. There are a variety of funding sources that can be used to make installation of these improvements more affordable to farm owners. Chapter 9 describes many of these programs. The Macon County Soil and Water District and local NRCS staff can assist farm owners with choosing appropriate BMPs and identifying funding.

The Cartoogechaye Creek watershed also presents many opportunities for stream restoration and stabilization projects. The detailed watershed information provided by LTWA should be used to direct resources toward the most significant problems in the watershed.

1.4.3 Cowee Creek [AU# 2-29]

Current Status
Cowee Creek drains the northeast corner of Macon County, an area with historical ruby mining operations and scattered residential and pasture areas. DWQ sampled the fish community at site GF8 and the benthic community at site GB31 in 2004. The fish community was rated Good and the benthic community rated Excellent, improving steadily from Good-Fair in 1994. Biologists noted turbid water and slight sedimentation, but also collected the most pollution intolerant fish species than at any other site in the subbasin.

LTWA collected fish samples on Cowee Creek and three of its larger tributaries: Caler Fork, Matlock Creek, and Beasley Creek. Their results compare well with the DWQ samples and indicate the fish community in the downstream reach is in good health. However, they note significant impacts in and above Caler Fork, where sediment has a more significant impact. LTWA measured the single largest drop in stream health at their site on Caler Fork. They report turbidity problems on this stream even during dry spells. LTWA noted Matlock Creek is also deteriorating, perhaps due to an increase in organic loading from development. Beasley is in good condition and supports a healthy population of rainbow trout.

2007 Recommendations
Further investigation is needed to determine the cause of deterioration observed in Matlock and Caler Creeks. If residential activities are identified as a primary stressor, residents should implement BMPs to reduce runoff from their property. Residents should refer to Chapter 6 and the document "Improving Water Quality in Your Own Backyard." This pamphlet is available free of charge through the Division of Water Quality and online at http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf. Residents are also encouraged to report sediment problems to the DENR Regional Office in Asheville.

1.4.4 Iotla Creek [AU# 2-27]

Current Status
The Iotla Creek watershed contains large amounts of agriculture and the Macon County Regional Airport. Impacts from these land use practices are evident in both DWQ and LTWA sample results. DWQ sampled this stream in two locations in 2004. The fish and benthic communities were evaluated downstream of the airport at sites GB33 and GF15. At this location, the benthic community rated Good and the fish community rated Good-Fair. Biologists noted sediment problems, nutrient enrichment, and trash. The fish habitat rated lowest of any in the subbasin.

The benthic community was sampled upstream at site GB37 and received a Good bioclassification. The habitat at this site is similar to the downstream benthic site. An agricultural ditch enters the creek just upstream of the sample location and adds to the sediment problems observed.

Samples collected by LTWA confirm the instream habitat in Iotla Creek is some of the poorest in the basin and much of the lower reach has been channelized. Despite these problems, LTWA notes the spotfin chub has been collected near the confluence with the Little Tennessee River.

2007Recommendations
The nutrient and sediment impacts from agricultural activities should be reduced. These impacts can be reduced through use of agricultural best management practices. There are a variety of funding sources that can be used to make installation of these improvements more affordable to farm owners. Chapter 9 describes many of these programs. The Macon County Soil and Water District and local NRCS staff can assist farm owners with choosing appropriate BMPs and identifying funding.

1.4.5 Little Tennessee River and Lake Emory [AU# 2-(1)b and 2-(1)c]

Current Status
The Little Tennessee River from the GA-NC state line to Mulberry Creek is considered Impaired and is discussed in section 1.3.1. The Little Tennessee River from Mulberry Creek to Lake Emory is not impaired and is discussed here. The Little Tennessee River gains volume rapidly as it flows into North Carolina, becoming a major river. Land use in the watershed south of Franklin is a mix of light commercial, agriculture, scattered residences and broken tracts of forest. DWQ sampled the benthic community at GB10 and maintains ambient sampling stations at site GA1 and GA7. Habitat problems include very poor riparian vegetation, lack of pools, and infrequent riffles. DWQ performed a seasonally and flow adjusted trend analysis on the ambient chemistry and determined significant upward trends in both total phosphorus and water temperature over the period 1994 – 2004.

The Lake Emory segment is a run-of-river impoundment created in the 1920's by construction of Porter Bend Dam at Franklin. DWQ considered it shallow and eutrophic based on samples collected in 1988. In 1994, DWQ Lake Assessment Unit ceased sampling this reservoir because sediment accumulation prevented boat access. Sediment deposition had become so pronounced that vegetation had become established on sediment bars and the upstream areas resembled a braided stream rather than a lake. DWQ determined Lake Emory was no longer functioning as a reservoir and TVA gave it an ecological health rating of Very Poor.

The USGS conducted an analysis of sediment loads to Lake Emory from 2000-2001. The study compared sediment loads from the Cullasaja River, Cartoogechaye Creek, and the mainstem Little Tennessee River. This study noted that riparian agricultural activities and increasing urbanization in the upper portion of the watershed in the towns of Highlands and Franklin have increased the river's sediment load. The study also notes the dam has trapped many of those sediments, protecting the downstream habitat in the Needmore area.

Downstream of Lake Emory, water quality and habitat improves significantly. TVA has been monitoring this reach since 1998, rating it Good or Excellent each time. This section of river is one of the healthiest major rivers in the southeast and supports a complete biological community.

In 2004, a major conservation purchase was completed in the Needmore area, protecting the flood plain along 26 miles of the river (See section 1.5.1). While this purchase was a significant move forward towards permanent protection for the river, recent data from NCWRC, USFWS, and citizen observations indicate the river remains threatened by upstream pollution. Unpublished data from NCWRC indicate the Appalachian elktoe population below Lake Emory is in decline. Excess sediment is being deposited in the reach as development continues upstream and outside the Needmore Tract without sufficient erosion control. Historically, many wetland areas both in and around the Needmore tract we damaged and now need restoring.

2007 Recommendations
The heavy sediment in Lake Emory and increasing loads in the downstream reach demonstrates the need for strong sediment and erosion control, wetland restoration, and streambank stabilization throughout the entire watershed. Macon County has adopted a Soil Erosion & Sedimentation Control Ordinance that helps reduce erosion problems originating from certain new land disturbing activities. This ordinance must be vigorously enforced. Erosion from agricultural operations can be reduced through use of agricultural best management practices. There are a variety of funding sources that can be used to make installation of these improvements more affordable to farm owners. Chapter 9 describes many of these programs. The Macon County Soil and Water District and local NRCS staff can assist farm owners with choosing appropriate BMPs and identifying funding. Wetland restoration opportunities should be pursued as they arise.

1.4.6 Rabbit Creek [AU# 2-23]

Current Status
The Rabbit Creek watershed lies northeast of Franklin and drains the Holly Springs community. DWQ evaluated the fish community at site GF22 in 2004, when it received a Good-Fair bioclassification. The riparian zone was significantly degraded and needs restoration. The riparian zone included manicured lawns, pastures, unstable banks, and invasive weeds. The stream was more turbid than most streams in the subbasin.

LTWA has been sampling Rabbit Creek for many years. From 1990 to 2000, the fish community rating steadily improved. Recovery from disturbance during golf course construction and removal of cattle access may be responsible for the improvement. Unfortunately, LTWA data began showing a decline in 2001 and 2002. The negative changes appear to be related to increasing sedimentation originating from poor land use practices in Cat Creek, a tributary to Rabbit Creek.

Cat Creek suffers from severe habitat degradation due to land clearing activities, channelization, livestock access, and several small impoundments. In 2000, a half-mile reach of Cat Creek was re-channelized and the riparian zone was cleared. This action resulted in a significant increase in streambank erosion and sediment delivery to Rabbit Creek.

2007 Recommendations
Restoration in Cat Creek will likely improve conditions in Rabbit Creek. Restoration options should be evaluated and if deemed feasible, a restoration plan for Cat Creek should be developed and executed. In the meantime, residential landowners can use a variety of techniques to reduce pollution caused by runoff from their property. Residents should refer to Chapter 6 and the document "Improving Water Quality in Your Own Backyard." This pamphlet is available free

of charge through the Division of Water Quality and online at http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf. The impacts from agricultural operations can be reduced through use of agricultural best management practices. There are a variety of funding sources that can be used to make installation of these improvements more affordable to farm owners. Chapter 9 describes many of these programs. The Macon County Soil and Water District and local NRCS staff can assist farm owners with choosing appropriate BMPs and identifying funding.

1.4.7 Walnut Creek [AU# 2-21-17]

Current Status
Walnut Creek is a tributary to the middle reaches of the Cullasaja River and is adjacent to the Ellijay Creek watershed. It is a high gradient Southern Appalachian-type trout stream with plunge pools and riffles. DWQ sampled the fish and benthic communities in 2004 (sites GF30 and GB43). The benthic site was sampled in response to complaints of dead fish, soapy water, and development. There are no NPDES discharges in the watershed, but conductivity was elevated for a mountain stream. The results from the benthic sample suggest instream habitat appears to be declining. Increased residential development along the stream banks and agricultural activities in the watershed are affecting the riparian and in-stream habitats by increasing the sediment load. The stream is significantly embedded with sand at site GB43. The fish site technically qualified as a regional reference site based on land use calculations and despite noted sediment problems. The fish community was typical of many un-impacted trout streams (low species diversity, a reproducing population of naturalized rainbow trout, and mottled sculpin being the numerically dominant species).

2007 Recommendations
Residential landowners can use a variety of techniques to reduce sediment runoff from their property. Residents should refer to Chapter 6 and the document "Improving Water Quality in Your Own Backyard." This pamphlet is available free of charge through the Division of Water Quality and online at http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf. The impacts from agricultural operations can be reduced through use of agricultural best management practices. There are a variety of funding sources that can be used to make installation of these improvements more affordable to farm owners. Chapter 9 describes many of these programs. The Macon County Soil and Water District and local NRCS staff can assist farm owners with choosing appropriate BMPs and identifying funding.

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

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 Little Tennessee River basin. This is particularly important because many of the waters are designated as high quality or outstanding resource waters (HQW and ORW, respectively). Those surface waters given an Excellent bioclassification may be eligible for reclassification to a High Quality Water (HQW) or Outstanding Resource Water (ORW). These streams are shown in Table 3. 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 The Land Trust for the Little Tennessee River Corridor Protection Project: Protecting Water Quality Through Land Conservation

The LTLT is a locally-led 501(c)3 non-profit organization based in Macon County with a mission to conserve the waters, forests, farms, and heritage of the Upper Little Tennessee and Hiwassee River Valleys. Since 1997, the LTLT has been a driving force for water quality protection in the Little Tennessee basin. Through a multitude of partnerships, LTLT has channeled resources into three programs: rural land conservation, land stewardship and restoration, and outreach and education—each of which is having direct and positive impacts on water quality in the basin.

Principal among these, LTLT's rural land conservation program helps to protect water quality by protecting private lands, such as headwater forest areas or bottomland floodplains, from inappropriate development. This is accomplished by working with private landowners to place conservation easements on their property, by accepting gifts of land, and by purchasing at-risk properties.

Since January 2002, a strategic goal of LTLT has been the protection, through easement or purchase, of 75 percent of the land fronting the main stem of the Little Tennessee River between Franklin and Fontana Reservoir. The 25 miles of free-flowing Little Tennessee River downstream of the town of Franklin is considered by many to be the "Noah's Ark" of Blue Ridge rivers due to its rich biological diversity, being home to half the native, freshwater fish species in North Carolina and the greatest diversity of freshwater mussels in the State. The river corridor also encompasses the most intact archeological landscape remaining of the 18th century Cherokee and is a key link in a forested corridor connecting the Nantahala and Cowee Mountain Ranges.

A keystone to this river corridor conservation project was achieved in January 2004, when the 4500-acre Needmore Tract was purchased by the State of North Carolina. The Tract encompasses 26 miles of Little Tennessee River frontage-- over half of this reach of river--along with 37 miles of tributary streams. LTLT helped unite efforts by rural residents, local governments, sportsmen and environmentalists to conserve this extraordinary landscape. The $19 million dollar purchase was made possible by $7.5 million from the Ecological Enhancement Program, $6.6 million from the Clean Water Management Trust Fund, $1.5 million from the Natural Heritage Trust Fund, $2 million from the US Fish and Wildlife Service and $2 million from private foundations and individual donations, including from LTLT and its supporters. The Tract is now managed by the NC Wildlife Resources Commission.

LTLT has continued to expand this work to conserve this entire river corridor, both upstream and downstream of Franklin. By December 2006, LTLT expects to have protected 16 additional parcels along this lower reach of the Little Tennessee River, totaling 663 acres and 5.44 miles, bringing the total river frontage protected to 63 percent. In addition, LTLT continues to protect key nodes along the Little Tennessee River upstream of Franklin, with 6 parcels containing over 180 acres and almost 3 miles of river frontage protected so far.

1.5.2 Management Strategies for Water Quality Protection

Municipalities and smaller outlying communities are being pressured to expand and this involves construction and/or development in areas of pristine waters along the Little Tennessee River and its tributaries. 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 5.

HQW is intended to protect waters with water quality higher than the state's water quality standards. In the Little Tennessee 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 that petitioned for WS-I or WS-II or 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/.

Those streams noted as having Excellent bioclassifications in Table 3 may qualify for HQW or ORW classification. There may also be many more streams in the basin that qualify for such designation that DWQ has not monitored. DWQ relies on citizen requests to initiate the stream reclassification process (See Section 5.1.4) and encourages requests for reclassification to HQW or ORW when it is warranted. Appropriate stream classification will help to protect water quality in the long-term.

Native Southern Appalachian Brook Trout occupy many high elevation streams in the Little Tennessee River Basin. They are the only trout native to the southern Appalachian Mountains and require clear, cold streams to survive. They are very sensitive to excess sediment. Efforts to restore and expand their populations across the basin will benefit from designation as HQW or ORW. Those streams that can support Native Appalachian Brook Trout should be identified and evaluated for qualification as HQW or ORW.

1.5.3 Septic System Concerns

Development of rural land in areas not served by sewer systems is occurring rapidly in the Little Tennessee 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 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 phosphorous (found in fertilizers) that wash off farm fields, suburban backyards 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 will use nitrogen and phosphorous before they can reach the river, 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 phosphorous 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).

County governments are 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 a www.floods.org.

1.5.5 Special Management Strategies for Threatened and Endangered Species

Several streams in Little Tennessee River subbasin 04-04-01 are home to Federally listed Threatened and Endangered Species. The Little Tennessee River hosts the Appalachian Elktoe, Littlewing Pearlymussel, and the Spotfin Chub. The Spotfin Chub is also found in 11 tributaries to the Little Tennessee River downstream of Lake Emory including Cowee Creek. Recent studies indicate the Spotfin may also be present in Licklog Creek, pushing the total colonized

tributaries to 12. The entire river from the GA/NC state line to Fontana Lake is designated as critical habitat. Section .0100 of the Administrative Code states the following:

> Certain waters provide habitat for federally-listed aquatic animal species that are listed as threatened or endangered by the U.S. Fish and Wildlife Service or National Marine Fisheries Service under the provisions of the Endangered Species Act, 16 U.S.C. 1531-1544 and subsequent modifications. Maintenance and recovery of the water quality conditions required to sustain and recover federally-listed threatened and endangered aquatic animal species contributes to the support and maintenance of a balanced and indigenous community of aquatic organisms and thereby protects the biological integrity of the waters. The Division shall develop site-specific management strategies under the provisions of 15A NCAC 2B .0225 or 15A NCAC 2B .0227 for those waters. These plans shall be developed within the basinwide planning schedule with all plans completed at the end of each watershed's first complete five year cycle following adoption of this Rule. Nothing in this Rule shall prevent the Division from taking other actions within its authority to maintain and restore the quality of these waters.

An interagency team from the USFWS, the NC Wildlife Resources Commission and the NC Natural Heritage Program was asked to develop technical reports to support NCDWQ's development of site-specific management strategies to restore water quality in the Little Tennessee River Basin. It is intended to provide a framework for getting additional stakeholder input prior to formulating the water quality management strategy which will be completed through rule-making by NCDWQ (with the requisite public involvement and Environmental Management Commission oversight).