Chapter 3 -
Summary of Water Quality Information for the Little Tennessee River Basin

3.1 General Sources of Pollution

Human activities can negatively impact surface water quality, even when the activity is far removed from the waterbody. With proper management of wastes and land use activities, these impacts can be minimized. Pollutants that enter waters fall into two general categories: *point sources* and *nonpoint sources*.

Point Sources

Piped discharges from:

- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state.

Nonpoint Sources

- Construction activities
- Roads, parking lots and rooftops
- Agriculture
- Failing septic systems and straight pipes
- Timber harvesting
- Hydrologic modifications

Nonpoint sources include a broad range of land use activities. Nonpoint source pollutants are typically carried to waters by rainfall, runoff or snowmelt. Sediment and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, oil and grease, pesticides and any other substance that may be washed off of the ground or deposited from the atmosphere into surface waters.

Unlike point sources of pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given these characteristics, it is difficult and resource intensive to quantify nonpoint contributions to water quality degradation in a given watershed. While nonpoint source pollution control often relies on voluntary actions, the state has many programs designed to reduce nonpoint source pollution.

Every person living in or visiting a watershed contributes to impacts on water quality. Therefore, each individual should be aware of these contributions and take actions to reduce them.

Cumulative Effects

While any one activity may not have a dramatic effect on water quality, the cumulative effect of land use activities in a watershed can have a severe and long-lasting impact.

3.2 Description of Surface Water Classifications and Standards

North Carolina's Water Quality Standards program adopted classifications and water quality standards for all of the state's river basins by 1963. The program remains consistent with the Federal Clean Water Act and its amendments. Water quality classifications and standards have also been modified to promote protection of surface water supply watersheds, high quality waters, and the protection of unique and special pristine waters with outstanding resource values.

Surface Water Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Most supplemental classifications have been developed to provide special protection to sensitive or highly valued resource waters. Table A-19 briefly describes the best uses of each classification. A full description is available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina*. Information on this subject is also available at DWQ's website: http://h2o.enr.state.nc.us/wqhome.html.

Table A-19 Primary and Supplemental Surface Water Classifications

PRIMARY FRESHWATER AND SALTWATER CLASSIFICATIONS	
Class	**Best Uses**
C and SC	Aquatic life propagation/protection and secondary recreation.
B and SB	Primary recreation and Class C uses.
SA	Waters classified for commercial shellfish harvesting.
WS	*Water Supply watershed*. There are five WS classes ranging from WS-I through WS-V. WS classifications are assigned to watersheds based on land use characteristics of the area. Each water supply classification has a set of management strategies to protect the surface water supply. WS-I provides the highest level of protection and WS-IV provides the least protection. A Critical Area (CA) designation is also listed for watershed areas within a half-mile and draining to the water supply intake or reservoir where an intake is located.
SUPPLEMENTAL CLASSIFICATIONS	
Class	**Best Uses**
Sw	*Swamp Waters*: Recognizes waters that will naturally be more acidic (have lower pH values) and have lower levels of dissolved oxygen.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.
HQW	*High Quality Waters*: Waters possessing special qualities including excellent water quality, Native or Special Native Trout Waters, Critical Habitat areas, or WS-I and WS-II water supplies.
ORW	*Outstanding Resource Waters*: Unique and special surface waters which are unimpacted by pollution and have some outstanding resource values.
NSW	*Nutrient Sensitive Waters*: Areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.

* Primary classifications beginning with "S" are assigned to saltwaters.

Statewide Water Quality Standards

Each primary and supplemental classification is assigned a set of water quality *standards* that establish the level of water quality that must be maintained in a waterbody to support the uses associated with each classification. Some of the standards, particularly for HQW and ORW waters, outline protective management strategies aimed at controlling point and nonpoint source pollution. These strategies are discussed briefly below. The standards for C waters establish the basic protection level for all state surface waters. With the exception of swamp waters, all of the other primary and supplemental classifications have more stringent standards than for C, and therefore, require higher levels of protection.

Some of North Carolina's surface waters are relatively unaffected by pollution sources and have water quality higher than the standards that are applied to the majority of the waters of the state. In addition, some waters provide habitat for sensitive biota such as trout, juvenile fish, or rare and endangered aquatic species. These waters may be designated as HQW or ORW.

Trout Waters

Different water quality standards for some parameters, such as dissolved oxygen, temperature and turbidity, have been developed to protect freshwaters for natural trout propagation and survival of stocked trout. These water quality standards result in more restrictive limits for wastewater discharges to trout waters (Tr). There are no watershed development restrictions associated with the Tr classification. However, the NC Division of Land Resources does require a 25-foot vegetated buffer between Tr waters and graded construction sites.

A state fishery management classification, Designated Public Mountain Trout Waters, is administered by the NC Wildlife Resources Commission. It provides for public access to streams for fishing and regulates fishing activities (seasons, size limits, creel limits, and bait and lure restrictions). Although many of these waters are also classified Tr by DWQ, this is not the same classification.

High Quality Waters

Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules

Criteria for HQW Classification

- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native and special native trout waters or primary nursery areas by the Wildlife Resources Commission (WRC).
- Waters designated as primary nursery areas by the Division of Marine Fisheries.
- Critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture.
- Waters classified by DWQ as WS-I, WS-II and SA are HQW by definition, but these waters are not specifically assigned the HQW classification because the standards for WS-I, WS-II and SA waters are at least as stringent as those for waters classified HQW.

established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. The low density option requires a 30-foot vegetated buffer between development activities and the stream; whereas, the high density option requires structural stormwater controls. In addition, the Division of Land Resources requires more stringent erosion controls for land-disturbing projects within one mile and draining to HQWs.

Outstanding Resource Waters

A small percentage of North Carolina's surface waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource.

The ORW rule defines outstanding resource values as including one or more of the following:

- an outstanding fisheries resource;
- a high level of water-based recreation;
- a special designation such as National Wild and Scenic River or a National Wildlife Refuge;
- within a state or national park or forest; or
- a special ecological or scientific significance.

The requirements for ORW waters are more stringent than those for HQWs. Special protection measures that apply to North Carolina ORWs are set forth in 15A NCAC 2B .0225. At a minimum, no new discharges or expansions are permitted, and a 30-foot buffer or stormwater controls for most new developments are required. In some circumstances, the unique characteristics of the waters and resources that are to be protected require that a specialized (or customized) ORW management strategy be developed.

Water Supply Watersheds

The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local governments administer the program, which is based on state minimum requirements. There are restrictions on wastewater discharges, development, landfills and residual application sites to control the impacts of point and nonpoint sources of pollution.

There are five water supply classifications (WS-I to WS-V) that are defined according to the land use characteristics of the watershed (Table A-18). The WS-I classification carries the greatest protection for water supplies. No development is allowed in these watersheds. Generally WS-I lands are publicly owned. WS-V watersheds have the least amount of protection and do not require development restrictions. These are either former water supply sources or sources used by industry. WS-I and WS-II classifications are also HQW by definition because requirements for these levels of water supply protection are at least as stringent as those for HQWs. Those watersheds classified as WS-II through WS-IV require local governments having jurisdiction within the watersheds to adopt and implement land use ordinances for development that are at least as stringent as the state's minimum requirements. A 30-foot vegetated setback is required on perennial streams in these watersheds.

Classifications and Standards in the Little Tennessee River Basin

There are a large number of trout waters (Tr) and High Quality Waters (HQW) in the Little Tennessee River basin. In subbasin 04-04-01, the Big Creek watershed and a portion of Rattlesnake Branch, both located near Highlands in the Cullasaja River watershed, are (respectively) WS-II and WS-I watersheds, which are, by definition, HQW.

Some of the most famous trout streams in North Carolina are found in subbasin 04-04-02, including Hazel Creek, Forney Creek, Deep Creek and Noland Creek in the Great Smoky Mountains National Park. A large number of streams throughout the subbasin carry the supplemental classification of HQW. The Tuckasegee River and its tributaries (including Pathertown Creek) from the source to Tennessee Creek are classified Outstanding Resource Waters (ORW). The Nantahala River watershed, from its source to the confluence with Roaring Fork, in subbasin 04-04-03 is currently classified as ORW.

In subbasin 04-04-04, the upper half of the Snowbird Creek watershed, along with several tributaries to Long Creek, is classified HQW. Other portions of the Long Creek watershed (Town of Robbinsville's water supply) are classified WS-I, which are by definition, HQW.

Figure A-12 presents water supply watersheds, HQWs and ORWs for the Little Tennessee River basin. Classification and standards for the entire basin can be found in a separate document entitled *Classifications and Water Quality Standards Assigned to the Waters of the Little Tennessee River Basin*. This document may be obtained by calling the Planning Branch of DWQ at (919) 733-5083. It can also be accessed through the DWQ Water Quality Section website at http://h2o.enr.state.nc.us/wqhome.html.

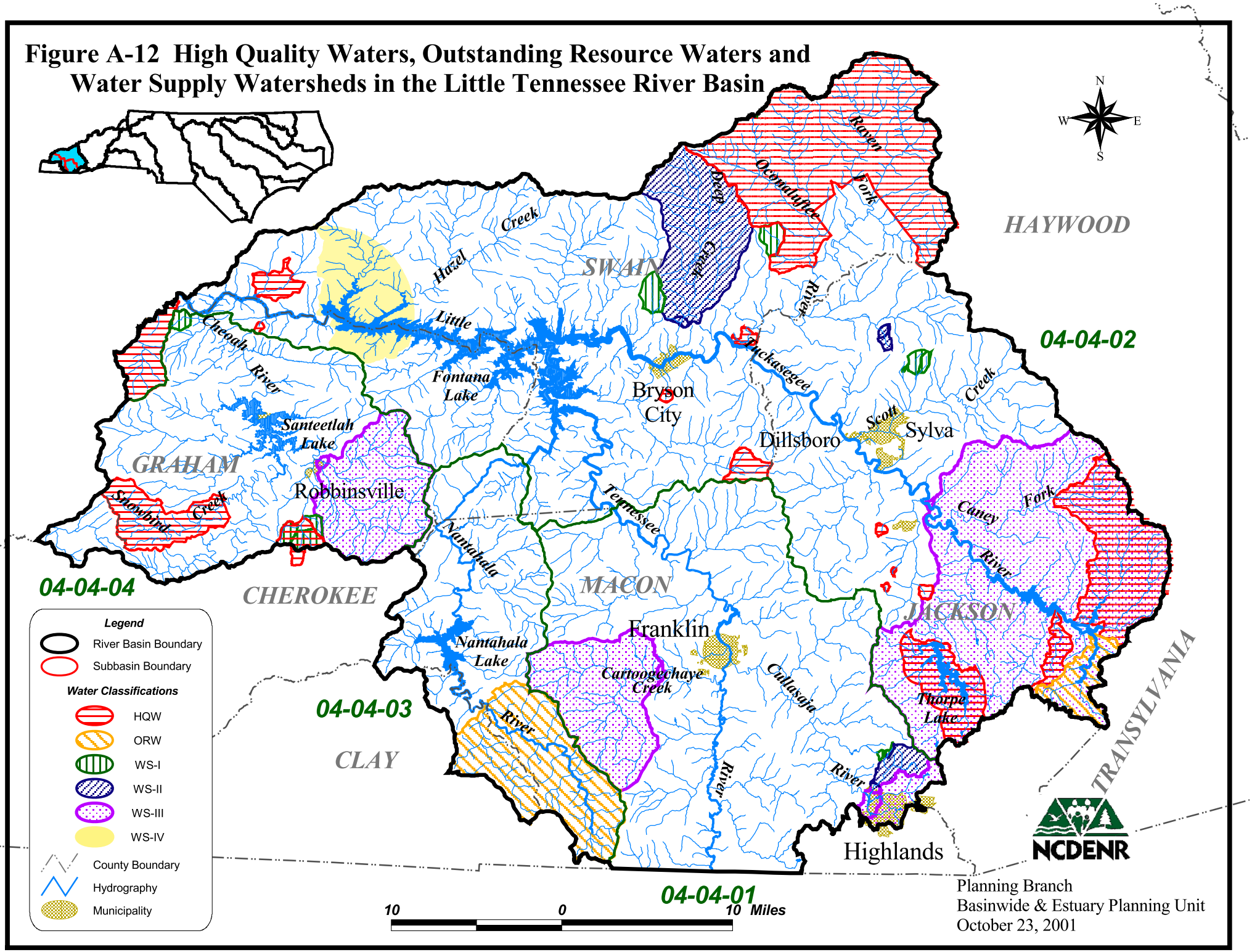
Pending and Recent Reclassifications in the Little Tennessee River Basin

The Little Tennessee River from 0.4 miles above the NC 28 bridge near Iotla to Fontana Lake is currently being considered for reclassification from Class C to Class B. Data have been collected, and DWQ staff support this reclassification. Public hearings will be held in spring of 2002 to obtain public input. This reclassification would affect permit limits for NPDES discharges into the Little Tennessee River.

A request was received in July 2000 from the Watershed Association for the Tuckasegee River (WATR) for reclassification of a portion of the Tuckasegee River from Class C to Class B Tr. This request has been submitted to the Environmental Sciences Branch for data collection.

Several streams in subbasin 04-04-04 would likely meet criteria for reclassification to HQW or ORW. These streams include Snowbird Creek, Little Snowbird Creek and West Buffalo Creek.

Figure A-12 High Quality Waters, Outstanding Resource Waters and Water Supply Watersheds in the Little Tennessee River Basin



3.3 DWQ Water Quality Monitoring Programs in the Little Tennessee River Basin

Staff in the Environmental Sciences Branch and Regional Offices of DWQ collect a variety of biological, chemical and physical data. The following discussion contains a brief introduction to each program, followed by a summary of water quality data in the Little Tennessee River basin for that program. For more detailed information on sampling and assessment of streams in this basin, refer to the *Basinwide Assessment Report* for the Little Tennessee River basin, available from the Environmental Sciences Branch website at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

DWQ monitoring programs for the Little Tennessee River Basin include:

- Benthic Macroinvertebrates (Section 3.3.1)
- Fish Assessments (Section 3.3.2)
- Aquatic Toxicity Monitoring (Section 3.3.3)
- Lake Assessment (Section 3.3.4)
- Ambient Monitoring System (Section 3.3.5)

3.3.1 Benthic Macroinvertebrates

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since macroinvertebrates have life cycles of six months to over one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification rating to each benthic sample based on the number of different species present in the pollution intolerant groups of Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies), commonly referred to as EPTs, and a Biotic Index value, which gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina. Bioclassifications fall into five categories ranging from Poor to Excellent.

Overview of Benthic Macroinvertebrate Data

Appendix II lists all the benthic macroinvertebrate collections in the Little Tennessee River basin between 1983 and 1999, giving site location, collection date, taxa richness, biotic index values and bioclassifications. More than 200 benthic macroinvertebrate samples have been collected from 111 sites in the Little Tennessee River basin. Approximately 77 percent of all samples collected since 1983 received Excellent or Good bioclassifications. Table A-20 lists the most recent bioclassifications (by subbasin) for all benthos sites in the Little Tennessee River basin. Of these most recent bioclassifications, 85 percent were Excellent or Good.

Table A-20 Summary of Benthic Macroinvertebrate Ratings for All Freshwater Benthos Sites (using the most recent rating for each site) in the Little Tennessee River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Total
04-04-01	14	5	5	4	0	28
04-04-02	34	15	3	1	0	53
04-04-03	5	10	3	1	0	19
04-04-04	8	3	0	0	0	11
Total (#)	**61**	**33**	**11**	**6**	**0**	**111**
Total (%)	**55%**	**30%**	**10%**	**5%**	**0%**	**100%**

In 1999, 34 sites were sampled during basinwide surveys (not including special study sites). For these most recent collections, Figure A-13 presents the following bioclassifications: Excellent – 23 (67%), Good – 8 (24%), Good-Fair – 2 (6%), Fair – 1 (3%), Poor – 0. In 1994, 31 of these same sites were sampled. Only 87 percent received Excellent or Good bioclassifications, compared with 91 percent in 1999. However, many of these short-term changes were likely related to differences in flow regimes between 1994 and 1999, rather than actual improvements in water quality.

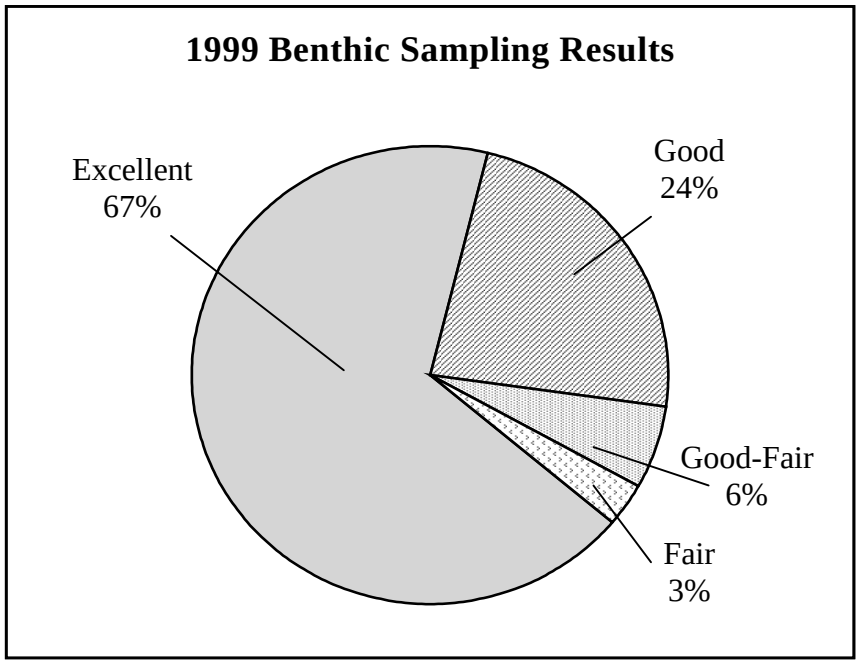


Figure A-13 Bioclassifications for 34 Little Tennessee River Basin Benthic Macroinvertebrate Sites Sampled by DWQ in 1999

Long-term (greater than 5 years of data) changes in bioclassification were evaluated at 13 sites in the Little Tennessee River basin. These data indicated a positive change in bioclassification at

three of the 13 sites (23%). Water quality did not decline at any of the long-term monitoring sites. Improvements in water quality were likely related to upgraded or better performing wastewater treatment plants. Examples include Scotts Creek below the Town of Sylva's WWTP and the Cheoah River below the Robbinsville WWTP.

3.3.2 Fish Assessments

Sixty-eight fish species have been collected from the Little Tennessee River basin in North Carolina. Special status has been granted to eight of these species by the US Department of the Interior, the NC Wildlife Resources Commission or the NC Natural Heritage Program under the North Carolina State Endangered Species Act (G.S. 113-311 to 113-337).

The North Carolina Index of Biotic Integrity is one of the tools DWQ uses to summarize all classes of factors such as water and habitat quality, flow regime and energy sources which influence the freshwater fish communities of wadeable streams throughout the state. No stream fish community basinwide monitoring was conducted by DWQ during 1999 in the Little Tennessee River basin because of recent revisions and a reexamination of the criteria and metrics.

3.3.3 Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity by their NPDES permit or by administrative letter. Other facilities may be tested by DWQ's Aquatic Toxicology Laboratory.

The Aquatic Toxicology Unit maintains a compliance summary (Figure A-14) for all facilities required to perform tests and provides a monthly update of this information to regional offices and DWQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

Three facilities in the Little Tennessee River basin have NPDES permits which require whole effluent toxicity (WET) monitoring. These facilities are the Franklin, Bryson City and Tuckasegee Water and Sewer Authority Plant 1 wastewater treatment plants.

The number of facilities conducting WET testing increased from one in 1987 (first year that whole effluent toxicity limits were written into permits in North Carolina) to three by 1992. The compliance rate of these three facilities has been greater than 96 percent since 1990.

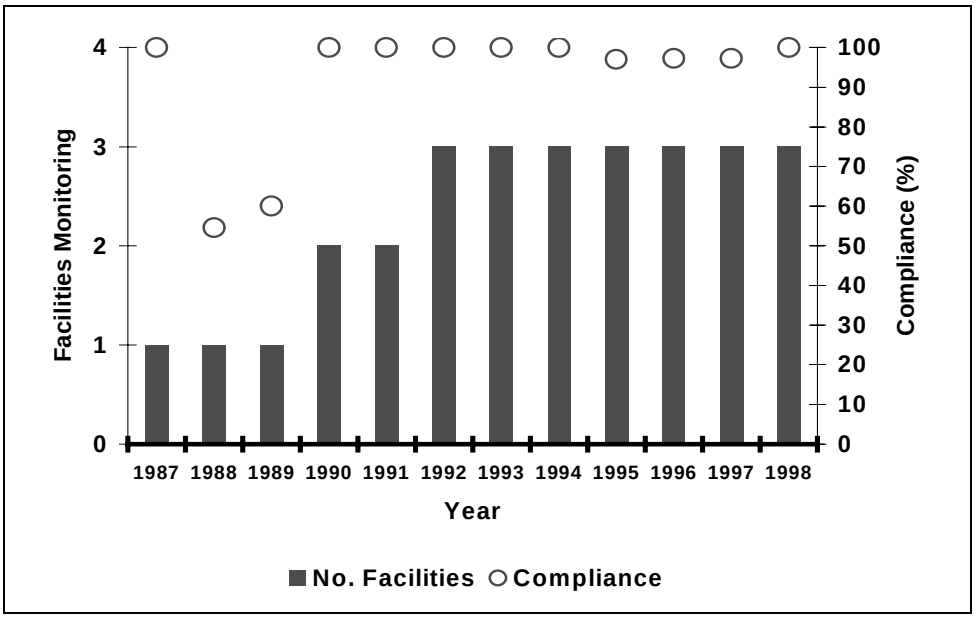


Figure A-14 Summary of Compliance with Aquatic Toxicity Tests in the Little Tennessee River Basin

3.3.4 Lake Assessment

Eight lakes in the basin were sampled as part of the Lake Assessment Program in the summer of 1999: Lake Sequoyah on the Cullasaja River; Wolf Creek; Bear Creek and Cedar Cliff Reservoirs on the Tuckasegee River; Thorpe Reservoir on the West Fork Tuckasegee River; Nantahala Reservoir on the Nantahala River; Cheoah Reservoir on the Little Tennessee River; and Sanateetlah Lake on the Cheoah River. NC Trophic State Index scores are presented in Figure A-15. Refer to Appendix II for more information about how these scores are calculated.

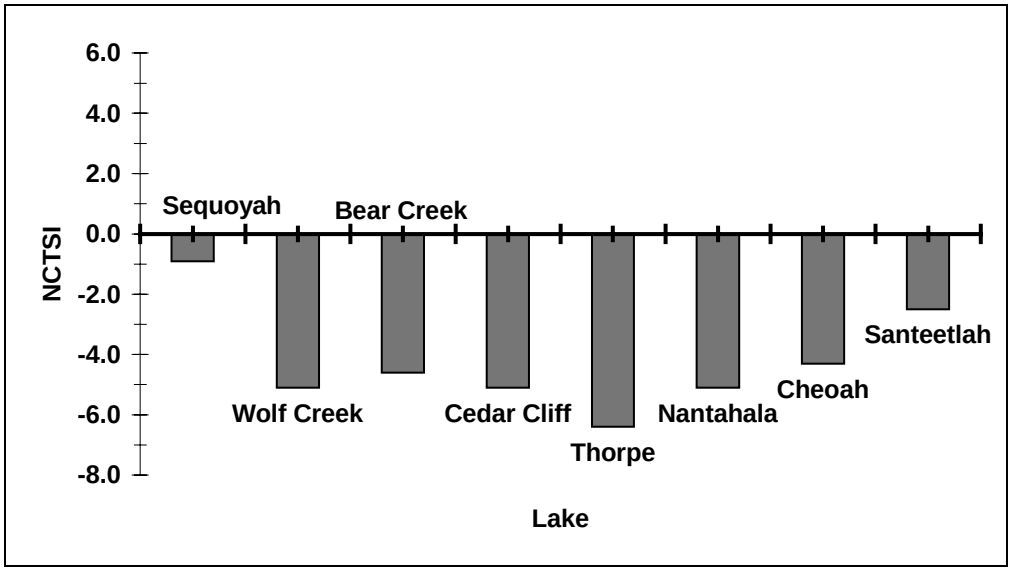


Figure A-15 North Carolina Trophic State Index Scores for Monitored Lakes in the Little Tennessee River Basin (1999)

Six of the eight lakes had exceptional water clarity and low biological productivity resulting in oligotrophic conditions, as is expected in the mountain region. Two lakes demonstrated water quality conditions which are of concern. Lake Sequoyah near the Town of Highlands was moderately productive (mesotrophic) and had chlorophyll *a* values which were greater than the state water quality standard of 15 ug/l for lakes classified as Trout Waters. Seven species of algae collected from this lake are known to contribute taste and odor problems in drinking water. Please refer to Section B, Chapter 1 (page 77) for a discussion of causes and sources of degradation and recommendations for improving water quality in Lake Sequoyah.

The West Buffalo and Snowbird Creek arms of Santeetlah Lake have been exhibiting symptoms of accelerated eutrophication such as algae blooms and elevated dissolved oxygen saturation levels. A second special study (first was in 1993) was conducted from April through October 1999. This study determined that the mainstem of Santeetlah Lake was continuing to support its designated uses. The West Buffalo Creek arm was determined to be impaired and only partially supporting the aquatic life/secondary recreation and primary recreation designated uses. The Snowbird Creek arm was found to be experiencing accelerated eutrophication and cannot tolerate additional nutrient loading. Please refer to Section B, Chapter 4 (page 102) for an in-depth discussion of causes and sources of pollution and management strategies for Santeetlah Lake.

3.3.5 Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collection of physical and chemical water quality data. North Carolina has more than 400 water chemistry monitoring stations statewide, including seven stations in the Little Tennessee River basin. Table A-21 lists the stations in the Little Tennessee River basin where samples are collected monthly and analyzed for 27 different parameters. The location of these stations is shown on individual subbasin maps in Section B.

Table A-21 Ambient Monitoring System Stations within the Little Tennessee River Basin

Subbasin/ Station code	Station	County	Classification*
04-04-01			
G0035000	Little Tennessee River at SR 1651 near Prentiss NC	Macon	C
G0130000	Cartoogechaye Creek at SR 1152 near Franklin NC	Macon	B Tr
G2000000	Little Tennessee River at NC Hwy 28 at Iotla NC	Macon	C
04-04-02			
G8550000	Oconaluftee River at SR 1359 at Birdtown NC	Swain	C Tr
G8600000	Tuckasegee River at SR 1364 at Bryson City	Jackson	C
04-04-03			
G3510000	Nantahala River near Rainbow Springs NC	Swain	B Tr ORW
04-04-04			
G9550000	Cheoah River at SR 1138 at Robbinsville NC	Graham	C Tr

* An index for DWQ freshwater classifications can be found in Part 3.2 of this Section (Table A-18).

Generally, water quality at all locations is good. Fecal coliform bacteria (a pathogen indicator) concentrations have decreased significantly over time (Table A-22).

Table A-22 Summary of Fecal Coliform Bacteria Collections from the Little Tennessee River Basin Ambient Monitoring Stations (1973-1999)

Site	Collection Range (Date)	No. of Samples	Geometric Mean	No. of Samples >200 col/100ml	% of Samples >200 col/100 ml
Little Tennessee River at Prentiss	4/29/81 – 6/22/89	72	274.0	45	62.5%
	9/6/89 – 8/26/94	14	18.7	2	14.3%
	9/28/94 – 8/26/99	**49**	**11.5**	**4**	**8.2%**
Little Tennessee River at Iotla	7/29/68 – 8/24/89	150	254.8	84	56.0%
	9/6/89 – 8/26/94	17	24.4	2	11.8%
	9/28/94 – 8/26/99	**49**	**14.4**	**4**	**8.2%**
Cartoogechaye Creek	8/23/71 – 8/24/89	42	120.3	18	42.9%
	9/6/89 – 8/26/94	20	23.1	3	15.0%
	9/28/94 – 8/26/99	**49**	**13.7**	**2**	**4.1%**
Nantahala River	4/29/81 – 8/24/89	94	13.4	2	2.1%
	9/6/89 – 8/26/94	48	2.3	0	0.0%
	9/28/94 – 8/26/99	**48**	**1.2**	**0**	**0.0%**
Oconaluftee River	1/31/85 – 8/24/89	36	75.4	9	25.0%
	9/6/89 – 8/4/94	17	4.0	0	0.0%
	9/20/94 – 8/4/99	**50**	**3.2**	**1**	**2.0%**
Tuckasegee River	8/13/74 – 8/24/89	139	294.3	91	65.5%
	9/6/89 – 8/4/94	15	7.9	1	6.7%
	9/20/94 – 8/4/99	**50**	**6.6**	**4**	**8.0%**
Cheoah River	4/2/74 – 6/15/89	142	278.6	78	54.9%
	9/6/89 – 8/4/94	17	11.5	0	0.0%
	9/20/94 – 8/4/99	**50**	**13.2**	**2**	**4.0%**

Note: Rows in bold represent the current basinwide assessment period.

Dissolved oxygen concentrations continued to remain above 7.0 mg/l, and high turbidity values were only associated with large precipitation events. No temporal patterns could be observed for nutrients, and concentrations were not considered indicative of water quality problems.

3.4 Other Water Quality Research

North Carolina actively solicits "existing and readily available" data and information for each basin as part of the basinwide planning process. Data meeting DWQ quality assurance objectives are used in making use support determinations. Data and information indicating possible water quality problems are investigated further. Both quantitative and qualitative information are accepted during the solicitation period. High levels of confidence must be present in order for outside quantitative information to carry the same weight as information collected from within DWQ. This is particularly the case when considering waters for the 303(d) list. Methodology for soliciting and evaluating outside data is presented in *North Carolina's 2000 § 303(d) List* (NCDENR-DWQ, October 2000).

DWQ data solicitation includes the following:

- Information, letters and photographs regarding the uses of surface waters for boating, drinking water, swimming, aesthetics and fishing.
- Raw data submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples. Maps showing sampling locations must also be included.
- Summary reports and memos, including distribution statistics and accompanied by documentation of quality assurance methods used to collect and analyze the data.
- Contact information must accompany all data and information submitted.

Tennessee Valley Authority

During March 1999, Tennessee Valley Authority (TVA) biologists collected information on fish, benthic macroinvertebrates and habitat characteristics at four sites on streams in the North Carolina portion of the Little Tennessee River basin. These currently unpublished data are presented in Table A-23.

The benthic data collections were limited to the number of EPT families, with a maximum of about 25 families/site. TVA's EPT rating is not equivalent to DWQ's benthic bioclassification. TVA's IBI score is not equivalent to DWQ's fish community IBI score. TVA uses IBI information as a watershed screening tool, and the criteria have not been calibrated using regional reference data. The TVA habitat assessment score has a maximum value of 52.

Table A-23 Biological and Habitat Data Collected by the Tennessee Valley Authority from the Little Tennessee River Basin, March 1999

Stream	Location	Subbasin	County	# EPT Families	TVA EPT Rating*	# Fish Species	Total # Fish	TVA IBI	Habitat Score
Little Tennessee River	NC 28	04-04-02	Macon	15	Good	33	523	56	39
Caney Fork Creek	Off SR 1737	04-04-02	Jackson	22	Excellent	15	421	34	39
Cullowhee Creek	Off SR 1001	04-04-02	Jackson	21	Excellent	19	799	40	35
Tuckasegee River	Off SR 1001	04-05-02	Jackson	22	Excellent	11	144	26	44

* TVA EPT ratings are not equivalent to DWQ bioclassifications.

TVA also monitors the ecological health of its reservoirs annually. The TVA reservoir rating system is based on the assignment of a numerical score which is then used to define each of five reservoir indicators (algae, dissolved oxygen, fish, benthic macroinvertebrates and sediment) as Poor, Fair or Good. Fontana received Fair reservoir ratings in 1999 and 2000. Details are provided on TVA's website at http://www.tva.gov/environment/ecohealth/fontana.htm.

US Army Corps of Engineers and US Geological Survey

The Corps of Engineers (COE) in conjunction with Macon County is conducting a feasibility study of potential ecosystem restoration measures in the upper Little Tennessee River. The primary goals are protection and enhancement of threatened and endangered species populations and wetland restoration. The focus of the study is to directly address both the existing sedimentation problem in Lake Emory and the continued inflow of sediment from the upstream watershed. In November 2000, COE partnered with the US Geological Survey to characterize both suspended and bedload sediment transport into Lake Emory from three major tributaries: Cartoogechaye Creek, Cullasaja River and Little Tennessee River. The suspended sediment concentration in water leaving Lake Emory will also be measured. Further information about the COE ecosystem restoration will be provided in the next Little Tennessee River Basinwide Water Quality Plan (2007).

3.5 Use Support Summary

3.5.1 Introduction to Use Support

Surface waters are classified according to their best intended uses. Determining how well a waterbody supports its uses (*use support* status) is an important method of interpreting water quality data and assessing water quality. Surface waters are rated *fully supporting* (FS), *partially supporting* (PS) or *not supporting* (NS). The ratings refer to whether the classified uses of the water (i.e., aquatic life protection, primary recreation and water supply) are being met.

For example, waters classified for fish consumption, aquatic life protection and secondary recreation (Class C for freshwater or SC for saltwater) are rated FS if data used to determine use support meet certain criteria. However, if these criteria were not met, then the waters would be rated as PS or NS, depending on the degree of degradation. Waters rated PS or NS are considered to be impaired. Waters lacking data, having inconclusive data, or for which assessment criteria have not yet been developed, are listed as not rated (NR). More specific methods are presented in Appendix III.

Use support ratings for surface waters:

- *fully supporting (FS)*
- *partially supporting (PS)*
- *not supporting (NS)*
- *not rated (NR)*

Historically, the non-impaired category was subdivided into fully supporting and fully supporting but threatened (ST). ST was used to identify waters that were fully supporting but had some notable water quality concerns and could represent constant, degrading or improving conditions. North Carolina's past use of ST was very different from that of the US Environmental Protection Agency (EPA), which uses it to identify waters that

demonstrate declining water quality (EPA Guidelines for Preparation of the Comprehensive State Water Quality Assessments [305(b) Reports] and Electronic Updates, 1997).

Impaired waters categories:

- Partially Supporting
- Not Supporting

Given the difference between the EPA and North Carolina definitions of ST and the resulting confusion that arises from this difference, North Carolina no longer subdivides the non-impaired category. However, these waters and the specific water quality concerns remain identified in the basin plans so that data, management and the need to address the identified concerns are not lost.

Beginning in 2000 with the *Roanoke River Basinwide Water Quality Plan*, DWQ assesses ecosystem health and human health risk through the development of use support ratings for six categories: aquatic life and secondary recreation, fish consumption, shellfish harvesting, primary recreation, water supply and "other" uses. These categories are tied to the uses associated with the primary classifications applied to NC rivers and streams. A single water could have more than one use support rating corresponding to one or more of the six use support categories. For many waters, a use support category will not be applicable (N/A) to the use classification of that water (e.g., water supply is only applied to Class WS waters). This method of determining use support differs from that done prior to 2000; in that, there is no longer an *overall* use support rating for a water. For more detailed information regarding use support methodology, refer to Appendix III.

3.5.2 Comparison of Use Support Ratings to Streams on the 303(d) List

Section 303(d) of the Clean Water Act requires states to identify waters not meeting standards. EPA must then provide review and approval of the listed waters. A list of waters not meeting standards is submitted to EPA biennially. Waters placed on this list, termed the 303(d) list, require the establishment of total maximum daily loads (TMDLs) intended to guide the restoration of water quality. See Appendix IV for a description of 303(d) listing methodology.

Waters are placed on North Carolina's 303(d) list primarily due to a partially or not supporting use support rating. These use support ratings are based on biological and chemical data. When the state water quality standard is exceeded, then this constituent is listed as the problem parameter. TMDLs must be developed for problem parameters on the 303(d) list. Other strategies may be implemented to restore water quality; however, the waterbody must remain on the 303(d) list until improvement has been realized based on either biological ratings or water quality standards.

The 303(d) list and accompanying data are updated as the basinwide plans are revised and TMDLs are developed. In some cases, the new data will demonstrate water quality improvement and waters may receive a better use support rating. These waters may be removed from the 303(d) list since water quality improvement has been attained. In other cases, the new data will show a stable or decreasing trend in overall water quality resulting in the same, or lower, use support rating. Attention remains focused on these waters until water quality standards are being met.

3.5.3 Use Support Ratings for the Little Tennessee River Basin

Aquatic Life/Secondary Recreation

The aquatic life/secondary recreation use support category is applied to all waters in North Carolina. Therefore, this category is applied to the total number of stream miles (2564.6) and lake acres (21,158.4) in the North Carolina portion of the Little Tennessee River basin. Table A-24 presents use support ratings by subbasin for both monitored and evaluated waters in the aquatic life/secondary recreation category.

Approximately 20 percent of stream miles (524.7) and 33 percent of lake acres (6,881) were monitored for the protection of aquatic life and secondary recreation by DWQ during this basinwide planning cycle (Table A-25). Impaired waters account for 2.4 percent of monitored stream miles and 4.1 percent of monitored lake acres. Refer to page 57 for details regarding impaired waters in all use support categories.

Table A-24 Aquatic Life/Secondary Recreation Use Support Ratings for Monitored and Evaluated Waters Listed by Subbasin (1995-1999)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
04-04-01	406.0 mi 150 ac	6.7 mi 0.0 ac	0.0 mi 0.0 ac	121.0 mi 548 ac	533.7 mi 748.0 ac
04-04-02	1183.7 mi 12,424.2 ac	2.3 mi 0.0 ac	0.0 mi 0.0 ac	234.7 mi 3,193.3 ac	1420.7 mi 15,617.5 ac
04-04-03	183.9 mi 1,606 ac	1.0 mi 0.0 ac	0.0 mi 0.0 ac	72.5 mi 120.6 ac	257.4 mi 1,726.6 ac
04-04-04	253.8 mi 2,569 ac	2.9 mi 280 ac	0.0 mi 0.0 ac	96.0 mi 497.3 ac	352.7 mi 3,066.3 ac
TOTAL	**2027.4 mi 16,749.2 ac**	**12.9 mi 280 ac**	**0.0 mi 0.0 ac**	**524.2 mi 4,359.2 ac**	**2564.5 mi 21,158.4 ac**
Percent Miles	79.1%	0.5%	0%	20.4%	100%
Percent Acres	79.2%	1.3%	0%	20.6%	100%

Table A-25 Aquatic Life/Secondary Recreation Use Support Summary Information for Waters in the Little Tennessee River Basin (1999)

Aquatic Life/Secondary Recreation Use Support Ratings	Monitored and Evaluated Waters*			Monitored Waters Only**	
	Miles or Acres	%		Miles or Acres	%
Fully Supporting	**2027.4 mi 16,749.2 ac**	**79.1% 79.2%**		**508.7 mi 6,601 ac**	**97.0% 96.0%**
Impaired	**12.9 mi 280 ac**	**0.5% 1.3%**		**12.9 mi 280 ac**	**2.4% 4.1%**
Partially Supporting	*12.9 mi 280 ac*	*0.5% 1.3%*		*12.9 mi 280 ac*	*2.4% 4.1%*
Not Supporting	*0.0 mi 0.0 ac*	*0.0%*		*0.0 mi 0.0 ac*	*0.0% 0.0%*
Not Rated	**524.2 mi 4,359.2 ac**	**20.4% 10.6%**		**3.1 mi 0.0 ac**	**0.6% 0.0%**
TOTAL	**2564.5 mi 21,158.4 ac**			**524.7 mi 6,881 ac**	

* = Percent based on total of all streams, both monitored and evaluated. ** = Percent based on total of all monitored streams.

Fish Consumption

Like the aquatic life/secondary recreation use support category, fish consumption is also applied to all waters in the state. Fish consumption use support ratings are based on fish consumption advisories issued by the NC Department of Health and Human Services (NCDHHS). Currently, there are no fish consumption advisories specific to the NC portion of the basin. Therefore, all waters are considered to be fully supporting the fish consumption category. No waters were monitored for fish consumption during this basinwide cycle because of the lack of any significant contaminant concerns in the Little Tennessee River basin.

Primary Recreation

There are 237.3 stream miles and 16,879.2 lake acres currently classified for primary recreation in the Little Tennessee River basin. Table A-26 presents use support ratings by subbasin for monitored and evaluated waters in the primary recreation category.

Approximately 58 percent of stream miles (136.8) and 40 percent of lake acres (6,731) were monitored for the protection of primary recreation by DWQ over the past five years (Table A-27). Impaired waters account for 4.2 percent of monitored lake acres. Primary recreation use support ratings are based on swimming advisories issued by the NC Department of Health and Human Services (DHHS).

Table A-26 Primary Recreation Use Support Ratings for Monitored and Evaluated Waters Listed by Subbasin in Miles (1995-1999)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total (Class B waters)
04-04-01	24.0 mi 0.0 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	41.3 mi 0.0 ac	65.3 mi 0.0 ac
04-04-02	69.8 mi 12,424.2 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	37.0 mi 0.0 ac	106.8 mi 12,424.2 ac
04-04-03	36.0 mi 1,606 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	36.0 mi 1,606 ac
04-04-04	7.0 mi 2,569 ac	0.0 mi 280 ac	0.0 mi 0.0 ac	22.2 mi 0.0 ac	29.2 mi 2,849.0 ac
TOTAL	**136.8 mi 16,599.2 ac**	**0.0 mi 280 ac**	**0.0 mi 0.0 ac**	**100.5 mi 0.0 ac**	**237.3 mi 16,879.2 ac**
Percent Miles	57.6%	0%	0%	42.4%	100%
Percent Acres	98.3%	1.7%	0%	0%	100%

Table A-27 Primary Recreation Use Support Summary Information for Waters in the Little Tennessee River Basin (1999)

Primary Recreation Use Support Ratings	Monitored and Evaluated Streams*			Monitored Streams Only**	
	Miles	%		Miles	%
Fully Supporting	**136.8 mi 16,599.2 ac**	**57.6% 98.3%**		**136.8 mi 6,451 ac**	**100% 95.8%**
Impaired	0.0 mi 280 ac	**0.0% 1.7%**		**0.0 mi 280 ac**	**0.0% 4.2%**
Partially Supporting	*0.0 mi 280 ac*	*0.0% 1.7%*		*0.0 mi 280 ac*	*0.0% 0.0%*
Not Supporting	*0.0 mi 0.0 ac*	*0.0% 0.0%*		*0.0 mi 0.0 ac*	*0.0% 0.0%*
Not Rated	**100.5 mi 0.0 ac**	**42.4% 0.0%**		**0.0 mi 0.0 ac**	**0.0% 0.0%**
TOTAL	**237.3 mi 16,879.2 ac**			**136.8 mi 6,731 ac**	

* = Percent based on total of all streams, both monitored and evaluated. ** = Percent based on total of all monitored streams.

Water Supply

There are 530.6 stream miles and 2,426 lake acres currently classified for water supply in the Little Tennessee River basin. All were evaluated within the past five years; all are fully supporting. A basinwide summary of current water supply use support ratings is presented in Table A-28.

Table A-28 Water Supply Use Support Summary Information for Waters in the Little Tennessee River Basin (1999)

Water Supply Use Support Ratings	Evaluated Waters	
	Miles	%
Fully Supporting	**530.6 mi 2,426 ac**	**100%**
Impaired	**0.0 mi 0.0 ac**	**0% 0%**
Not Rated	**0.0 mi 0.0 ac**	**0% 0%**
TOTAL	**530.6 mi 2,426 ac**	

Use Support Summary

Table A-29 presents impaired waters (in all categories), listed by subbasin, in the Little Tennessee River basin that were monitored by DWQ within the last five years. Ratings for each applicable use support category are shown, even though only one use may be impaired. Impaired ratings are shown in bold followed by the number of miles (streams or rivers) or acres (lakes) where the corresponding use is impaired. Descriptions of impaired segments, as well as problem parameters, are outlined in Appendix III. Management strategies for each water are discussed in detail in the appropriate subbasin chapter.

Color maps showing current use support ratings for monitored waters in the Little Tennessee River basin are presented in Figure A-16. When use support ratings have been assigned to more than one category for a particular water, the rating that represents the most severe impairment is shown on the map (e.g., The Cullasaja River is fully supporting water supply, but is partially supporting aquatic life/secondary recreation. The river is shown as partially supporting.)

Table A-29 Monitored Impaired Waters within the Little Tennessee River Basin (as of 2000)[1]

				Use Support Categories/Rating– Impaired Miles (or Acres)				
Impaired Water	**Subbasin**	**Chapter in Section B**	**Classification[2]**	**Aquatic Life/ Secondary Recreation**	**Fish Consumption**	**Primary Recreation**	**Water Supply**	**Potential Sources**
Cullasaja River	04-04-01	1 (pg 77)	WS-III Tr	PS – 3.2 mi	FS	*N/A*	FS	NP
Mill Creek	04-04-01	1 (pg 77)	WS-III Tr	PS – 1.3 mi	FS	*N/A*	FS	NP
Little Tennessee River	04-04-01	1 (pg 77)	C	PS – 2.2 mi	FS	*N/A*	*N/A*	P, NP
Beech Flats Prong	04-04-02	2 (pg 88)	C Tr HQW	PS – 2.4 mi	FS	*N/A*	*N/A*	NP
Santeetlah Lake (West Buffalo Creek Arm)	04-04-04	4 (pg 102)	B Tr	PS – 280 ac	FS	PS – 280 ac	*N/A*	P

FS	Fully Supporting	P	Point Sources	N/A	Not Applicable
PS	Partially Supporting	NP	Nonpoint Sources		

Notes

[1] These waters are currently, or will be placed, on the 303(d) list, and a TMDL and/or management strategy will be developed to address causes and sources of impairment. Refer to Appendix IV for further information regarding 303(d) listing methodology.

[2] An index for DWQ freshwater classifications can be found in Part 3.2 of this section on page 39 in Table A-19.

Figure A-16 Use Support Ratings for Monitored Waters in the Little Tennessee River Basin