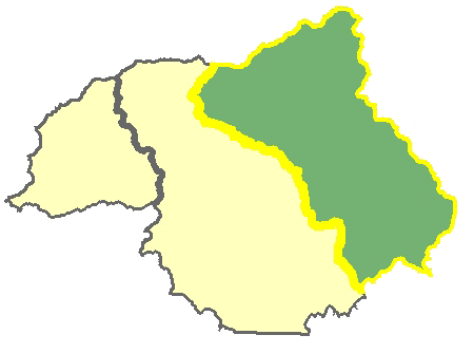
Tuckasegee River Subbasin



HUC 06010203

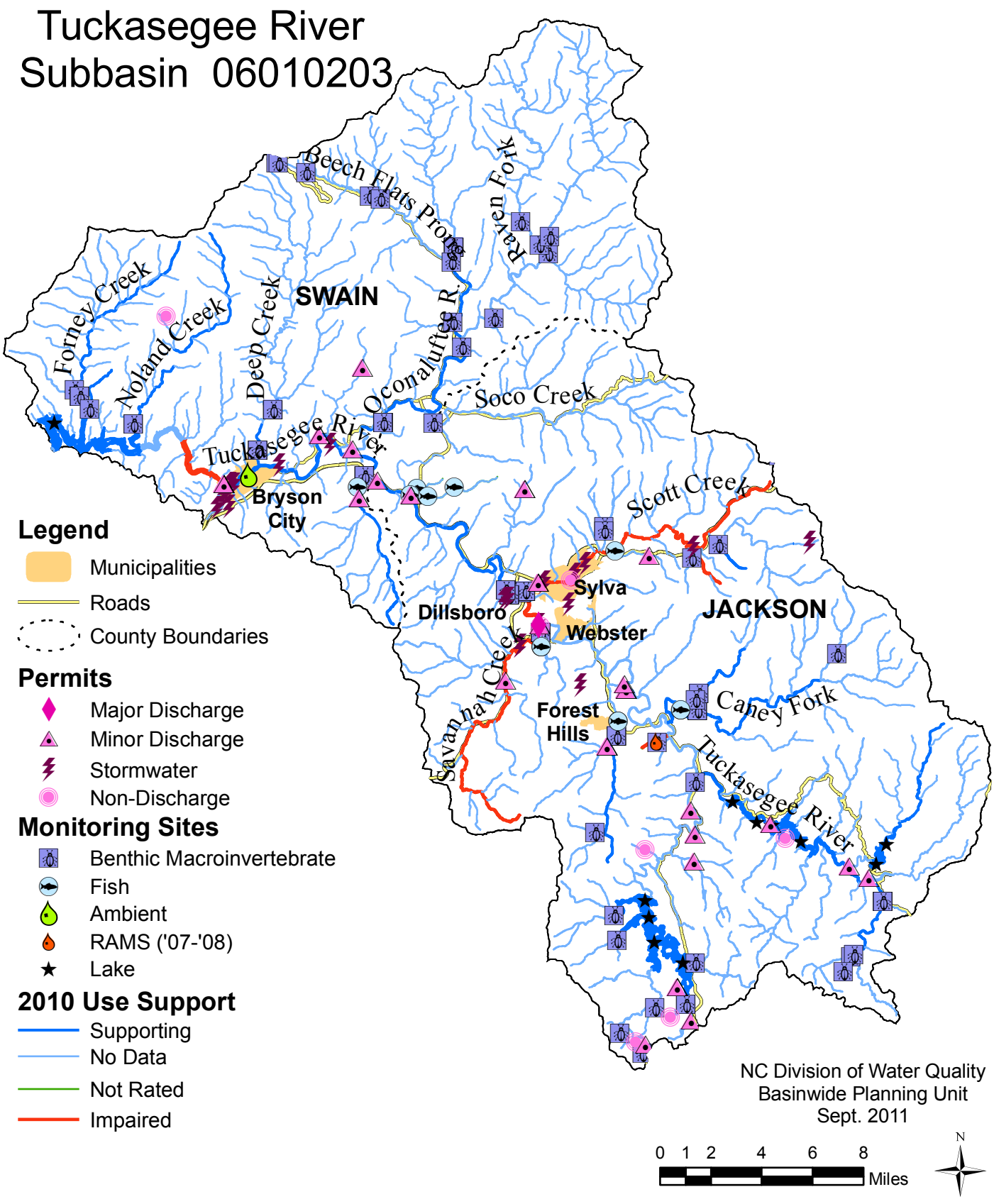
Includes: Tuckasegee River, Caney Fork, Scott Creek, Savannah Creek & Oconaluftee River

Watershed at a Glance

Counties:	Population:	2006 Land Cover:	Permitted Facilities:
Jackson, Swain	2000: 41,737	Open Water.....1%	NPDES
Municipalities:	2010: 49,162	Developed.....5%	Wastewater Discharge.....22
Bryson City, Dillsboro, Forest Hills, Sylva, Webster		Forested.....89%	Wastewater Nondischarge....8
EPA Level IV Ecoregions:	**Area** 734 mi²	Scrub.....1%	Stormwater.....16
High Mtns., Southern Metasedimentary Mtns, Southern Crystalline Ridges & Mtns		Agriculture..... .....4%	Animal Operations.....0

Figure 1-1: NLCD 2006 Land Cover

Figure 1-2: Tuckasegee River Subbasin Map (06010203)



Water Quality Overview

The Tuckasegee River Subbasin, hydrologic unit 06010203, was represented in previous Basin Plans as Subbasin 04-04-02. This subbasin covers 734 sq. miles and is 89% forested; containing portions of Nantahala National Forest and Great Smoky Mountains National Park (Figure 1-1). There are approximately 3,429 reservoir acres and ~998 classified stream miles, not including the numerous unnamed tributaries. The Tuckasegee River drains into Fontana Lake just downstream of Bryson City.

This subbasin contains some of the most pristine high quality waters in the state and supports numerous trout streams (Figure 1-3). Water quality issues of concern in this subbasin include impacts from developments on steep slopes, agricultural runoff, stream bank erosion, limited riparian cover and individual onsite wastewater failures. Waterbodies currently on the 2010 303(d) list of Impaired waters include: a 1.3 mile unnamed tributary to the Tuckasegee River, Scott Creek, Sugarloaf Creek, Savannah Creek and 170 acres of the Tuckasegee River Arm of Fontana Lake. A map of the subbasin showing Impaired streams, monitoring and permit locations is shown in Figure 1-2.

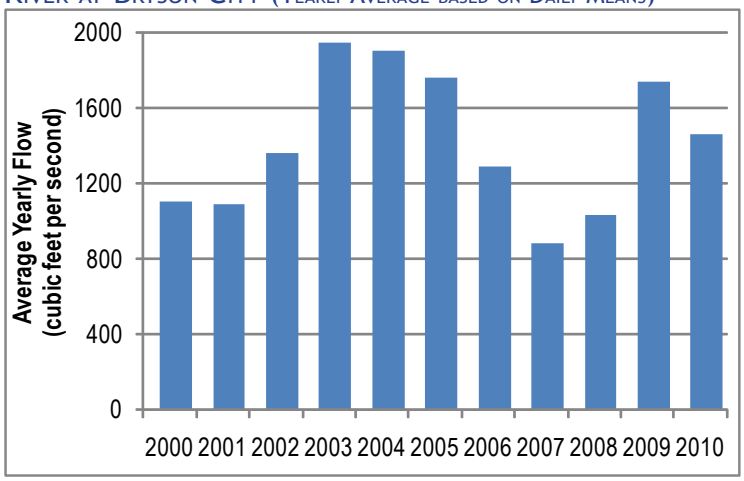
Figure 1-3: Stream Classifications

For more information regarding stream classifications see: http://portal.ncdenr.org/web/wq/ps/csu/

Stream Flow

Stream flow is monitored at US Geological Survey gaging stations. Flow, often abbreviated as "Q", is measured in terms of volume of water per unit of time, usually cubic feet per second (cfs). There are four gaging stations in this subbasin. Figure 1-4 provides an example of average stream flow over a 11 year period and gives an idea of which years received heavier precipitation. For more information about instream flow see DWR website: http://www.ncwater.org/About_DWR/Water_Projects_Section/Instream_Flow/welcome.html.

Figure 1-4: Stream flow at USGS 03513000 Tuckasegee River at Bryson City (Yearly Average based on Daily Means)



The flow rate in a stream can impact the measurement of physical and chemical parameters. In particular, droughts can have major affects on parameters such as dissolved oxygen, turbidity, pH, and others by reducing stream flow. Most recently this subbasin was in drought conditions in 2007 and 2008 (see page 17 AMS Report). Drought effect on discharge in the Tuckasegee River was somewhat reduced by the almost daily releases of water

from the Duke Energy hydroelectric facility at the lower end of the West Fork of the Tuckasegee River. The Oconaluftee River, with no dam control, the drought effect was more pronounced. Annual average streamflow for 2007 was the lowest in since data collection in ~1946. Low precipitation over the 2007-08 winter accentuated the drought with recovery not starting until the storms in November 2008.

Biological Monitoring

Biocriteria have been developed using the diversity, abundance, and pollution sensitivity of the organisms that inhabit flowing waterbodies in NC. One of five bioclassifications are typically assigned to each water body sampled: Excellent, Good, Good-Fair, Fair and Poor. Not Impaired and Not Rated designations are reserved for samples that were not eligible to be assigned one of the five typical bioclassification categories. Typically, a "Not Impaired" rating is equivalent to a Good-Fair or better bioclassification and a "Not Rated" designation is equivalent to a Fair or worse bioclassification. The reasons for not being able to assign one of these five typical bioclassifications may be a lack of appropriate bio-criteria or atypical sampling conditions (e.g., drought). These bioclassifications are used to assess the various impacts of both point source discharges and nonpoint source runoff. The resulting information is used to document both spatial and temporal changes in water quality, and to complement water chemistry analyses, ambient toxicity data, and habitat evaluations. In addition to assessing the effects of water pollution, biological information is also used to define High Quality or Outstanding Resource Waters, support enforcement of stream standards, and measure improvements associated with management actions. The results of biological investigations have been an integral part in North Carolina's basinwide monitoring program.

Biological samples were collected during the spring and summer months of 2004 and 2009-10 by the DWQ-Environmental Sciences Section as part of the five-year basinwide sampling cycle. Fourteen benthic macroinvertebrate sites and three fish community sites were evaluated in 2009-10, representing seventeen distinct localities. Each basinwide biological station monitored during the current cycle is shown in Figure 1-5 and color coded based on its current rating. The majority of benthic macroinvertebrate samples taken in this watershed received an Excellent rating. Several fish community sites resulted in a Not Rated status, due to the absence of criteria for rating high gradient mountain trout waters, while others rated Good. There were an additional 8 samples taken at new locations.

Figure 1-5: Biological Sites Current Ratings

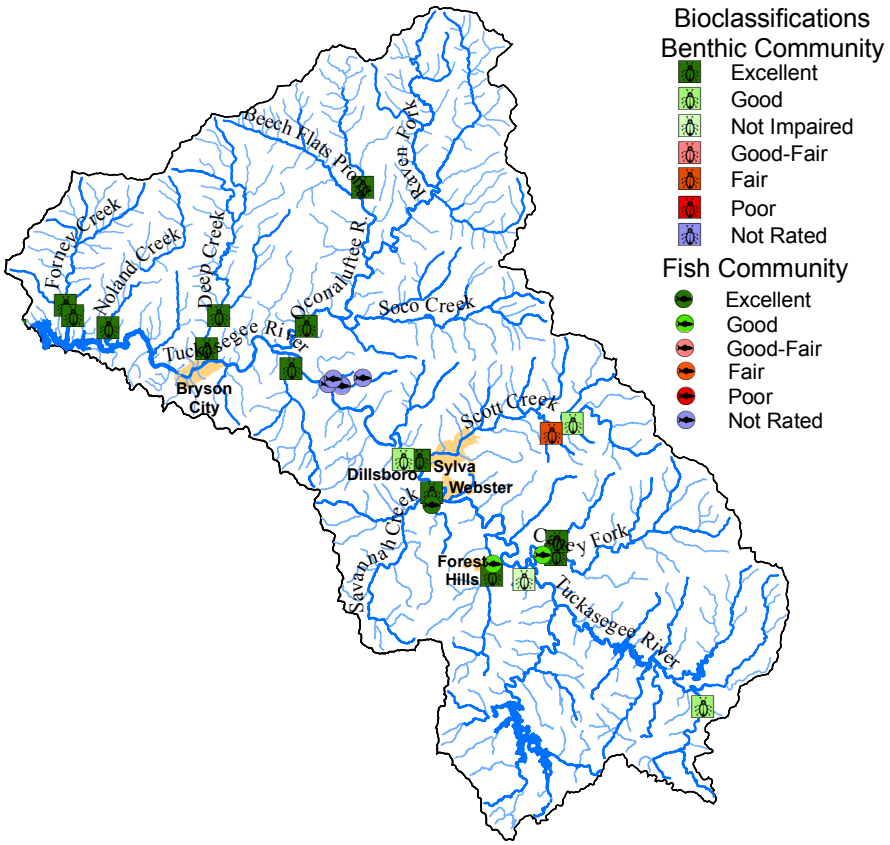
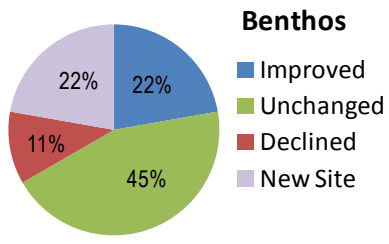


Figure 1-6: Benthic Macroinvertebrate Sample Status



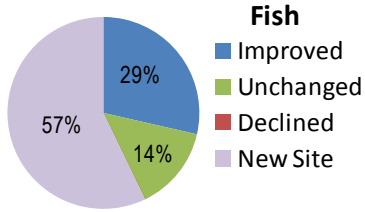
Benthos

Among the benthic macroinvertebrate sample sites, four sites improved, two declined and eight retained the same bioclassification in 2009-2010 as observed in 2004. There were an additional four benthic samples taken to support special studies. Figure 1-6 shows the distribution of these samples.

Fish

Among the three fish community sites, two improved from 2004 while the one remaining site maintained the same bioclassification in 2009 from that observed in 2004. There were an additional four fish community samples taken to support special studies. Figure 1-7 shows the distribution of these samples.

Figure 1-7: Fish Community Sample Status



For more information about biological data in this watershed, see the 2010 Little Tennessee River Basinwide Assessment Report. Detailed data sheets for each sampling site can be found in Appendix 1-B.

Long Term Ambient Monitoring

The DWQ's Ambient Monitoring System (AMS) is a network of stream stations strategically located for the collection of physical and chemical water quality data. There is one AMS station (G8600000) in this subbasin; data has been collected from this site since 1973. The following discussion of ambient monitoring parameters includes concentration value graphs for AMS station G8600000 over a 11 year period (2000-2010). Each major parameter is discussed, even if no current impairment exists. The graphs are not intended to provide statistically significant trend information, but rather an idea of how changes in land use or climate conditions can affect parameter readings over the long term. The difference between median and mean results indicate the presence of outliers in the data set. Box and whisker plots of individual ambient stations were completed by parameter for data between 2005 and 2009 by DWQ's Environmental Sciences Section (ESS) and can be found in the Little Tennessee River Basin Ambient Monitoring System Report.

pH

As seen in Figure 1-8, which represents the data window for the 2010 303(d) list, ambient site G8600000 had at least one sample that fell below the pH standard of 6su, but it did not exceed the standard in 10% or more of the samples. Over 11 years (Figure 1-9), there were four incidences of pH dropping below the minimal standard of 6 su at AMS G8600000.

At a Random Ambient Monitoring System site (G4210000) on an unnamed tributary to Tuckasegee River at State Road 1172 near East Laport, samples taken recorded low pH levels resulting in Impairment.

Figure 1-8: Percentage of Samples Exceeding the pH <6 Standard between 2004-2008

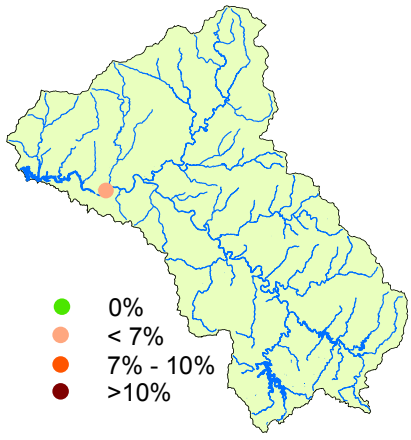
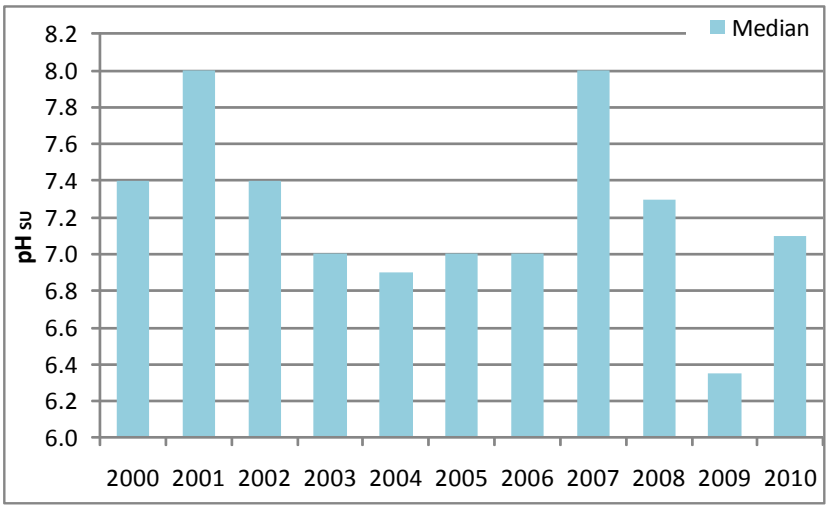


Figure 1-9: Summarized pH data at AMS G8600000 site between 2000-2010



Dissolved Oxygen

As seen in Figure 1-10, which represents the data window for the 2010 303(d) list, ambient station G8600000 did not have any exceedances of DO standards. Over the past 11 years (Figure 1-11), no samples were collected with dissolved oxygen levels below the 4mg/l instantaneous standard for Class C waters.

Figure 1-10: Percentage of Samples Exceeding the DO <4 Standard between 2004-2008

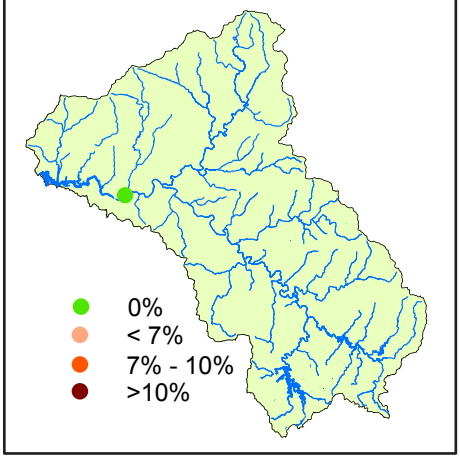
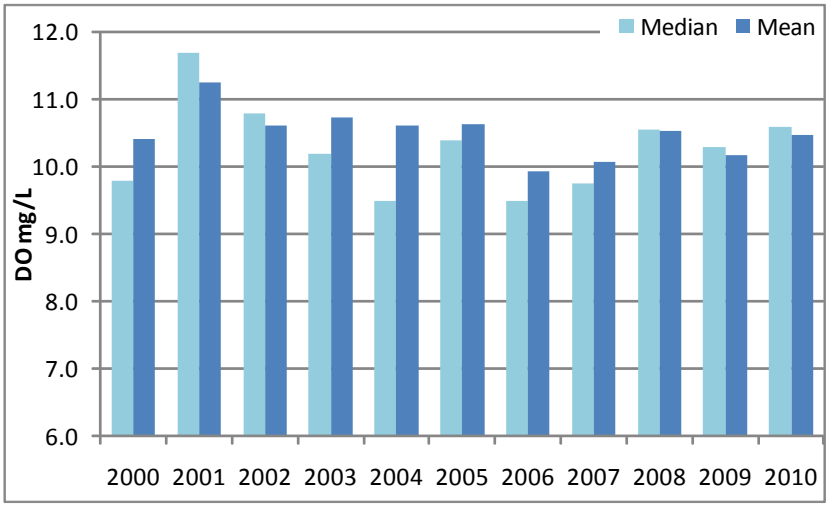


Figure 1-11: Summarized DO data at AMS G8600000 site between 2000-2010.



Fecal Coliform Bacteria

Fecal coliform bacteria occurs in water as a result of the overflow of domestic sewage and from other nonpoint sources of human and animal waste, including pets, wildlife and farm animals. The fecal coliform bacteria standard for freshwater streams is not to exceed the geometric mean of 200 colonies/100 ml or 400 colonies/100 ml in 20% of the samples where five samples have been taken in a span of 30 days (5-in-30). Only results from a 5-in-30 study are used to indicate whether a stream is Impaired or Supporting. Waters with a use classification of B (primary recreational waters) are prioritized for 5-in-30 studies.

As seen in Figure 1-12, which represents the data window for the 2010 303(d) list, ambient station G8600000 exceeded the 400 colonies/100ml in at least one sample. There were eight incidences of high bacteria counts as indicated by several peaks in mean values over the eleven compared years, shown in Figure 1-13 . There are three waterbodies Impaired because of elevated fecal coliform bacteria detected in 5-in-30 data collected in August 2005: Savannah Creek, Scott Creek and Tuckasegee River.

Figure 1-12: Percentage of Samples Exceeding the Fecal Coliform Bacteria >400 Standard between 2004-2008

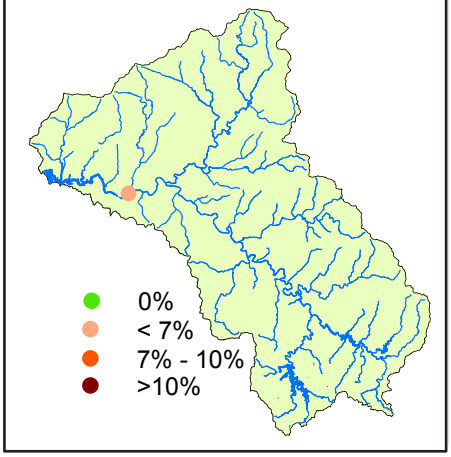
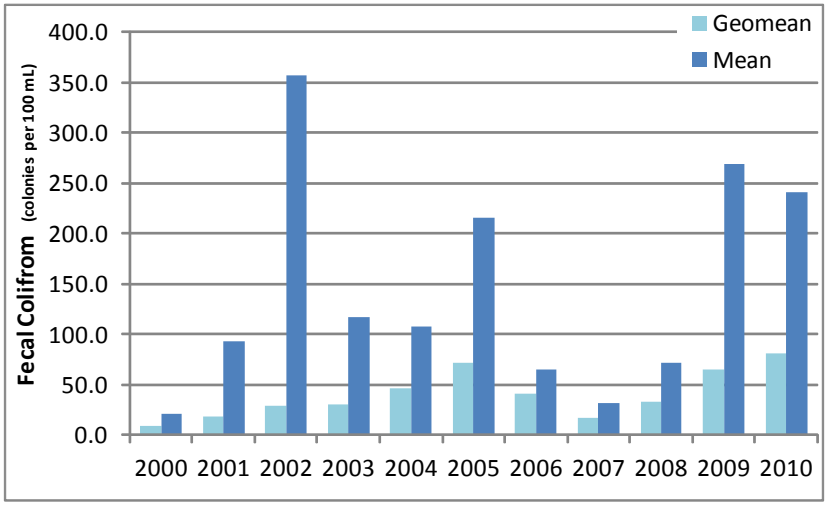


Figure 1-13: Summarized Fecal Coliform Bacteria data at AMS G8600000 site between 2000-2010.



Turbidity

As seen in Figure 1-14, which represents the data window for the 2010 303(d) list, ambient site G8600000 did not have any samples that exceeded 50NTUs. Over the past 11 years (Figure 1-15), only one sample at exceeded the standard of >50 NTUs for Class C waters.

Figure 1-14: Percentage of Samples Exceeding the >50 Turbidity Standard between 2004-2008

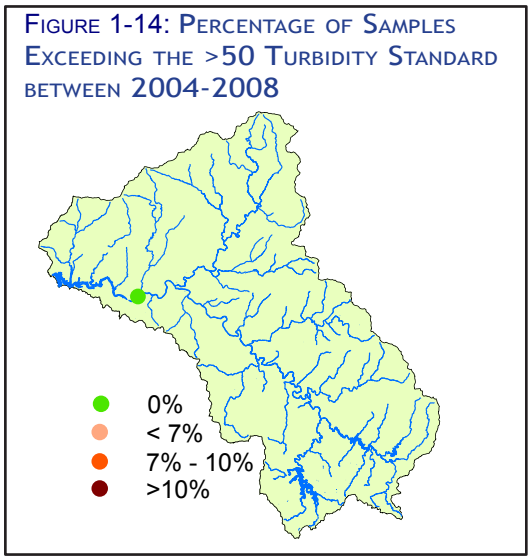
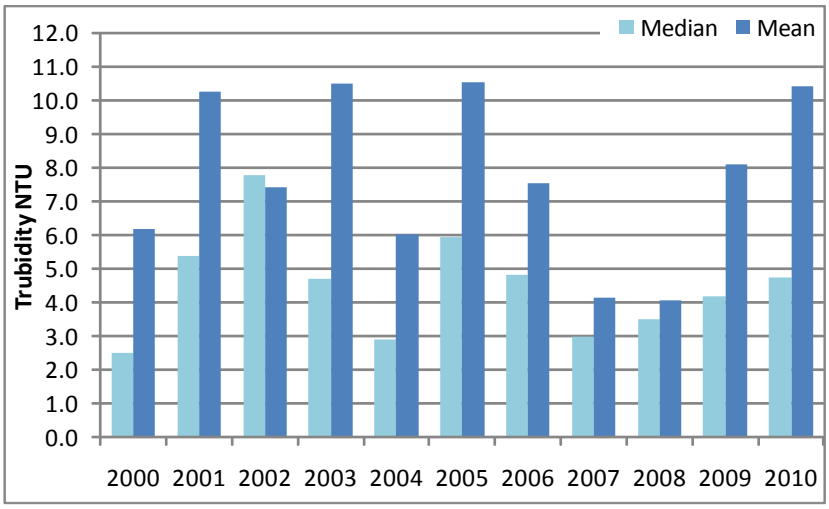


Figure 1-15: Summarized Turbidity data at AMS G8600000 site between 2000-2010.

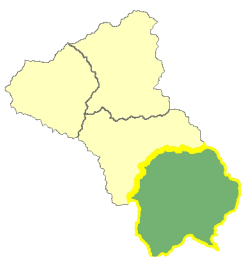


Protection and Restoration Opportunities

The following section provides more detail about specific streams where special studies have occurred or stressor sources information is available. Within this document, biological sample site IDs ending in an "F" denote fish community and a "B" denote macroinvertebrate community. Specific stream information regarding basinwide biological samples sites are available in Appendix 1B. Use support information on all monitored streams can be found in Appendix 1A. Detailed maps of each of the watersheds are found in Appendix 1C or by clicking on the following small maps.

To assist in identifying potential water quality issues citizens, watershed groups and resource agencies can gather and report information through our Impaired and Impacted Stream/ Watershed survey found here: http://portal.ncdenr.org/web/wq/ps/bpu/about/impactedstreamssurvey.

Upper Tuckasegee River Watershed (HUC 0601020301)



This watershed encompasses 152,466 acres and has an estimated 2010 population of 15,325 people. A majority of the watershed is within a WS-III area.

West Fork Tuckasegee River/ Thorpe Lake [2-79-23-(1)] (WS-III,B;HQW) also known as Glenville Lake, is a man-made impoundment on the Tuckasegee River located in Jackson County. The lake is used for recreational fishing, swimming, and boating. Owned by Duke Energy, the reservoir also has been used for hydroelectric power generation since its construction in 1941. Thorpe Lake was monitored by DWQ in 2009, which determined the Lake is still oligotrophic as it has been since it was first monitored in 1988. Trillium

Links & Village WWTP discharges into Hurricane Creek which a tributary to Thorpe Lake. The facility has had several permits violations over the past five years, including exceedances for BOD, TSS, ammonia and low DO.

Wolf Creek (Wolf Creek Lake) [2-79-9-(1)] (WS-III,B;Tr,HQW) Wolf Creek Reservoir is a small hydroelectric reservoir built by Nantahala Power and Light Company in 1955 on the Tuckasegee River and is currently owned by Duke Energy. Wolf Creek Reservoir has a forested watershed. The shoreline of the lake has a relatively low density of private homes, however evidence of land clearing and new home construction was observed in 2009. Monitoring by DWQ field staff of Wolf Creek Lake was conducted monthly from May through September, 2009. Data collected indicated that the lake's trophic state to be oligotrophic. This trophic state has not changed since monitoring by DWQ began in 1988.

Tuckasegee River [AU# 2-79-(0.5)] (WS-III,B;Tr,ORW) was sampled at site GB38 in 2009 resulting in an Good benthos bioclassification.

Tuckasegee River/ Bear Creek Lake [2-79-(5.5)b & 2-79-(5.5)c] (WS-III,B;Tr) is a hydroelectric impoundment of the Tuckasegee River. Most of the 194 mi^2 upland drainage area is forested with steep slopes and clean, fast-moving streams. Bear Creek Lake was built in 1953 and is currently owned by Duke Energy. DWQ field staff monitored Bear Creek Lake five times from May through September in 2009. This reservoir has remained oligotrophic since it was first monitored by DWQ in 1994. In past evaluations of Bear Creek Reservoir, it was observed that the shoreline was predominantly forested with a relatively undisturbed drainage area that helped to maintain the reservoir's low nutrient concentration and very clear water. It was noted in 2009 that residential development has significantly increased along the shoreline and in the watershed of this reservoir.

Tuckasegee River/ Cedar Cliff Lake [2-79-(5.5)c] (WS-III,B;Tr) is a picturesque mountain lake on the Tuckasegee River. The lake is owned by Duke Energy and was built in 1952. Water quality in the lake supports swimming, boating, and trout fishing. The name of the lake was probably derived from a sheer rock cliff, which faces it from the north. This lake was sampled in 2009 by DWQ, which determined the Lake is still oligorophic as it has been since it was first monitored in 1988.

Unnamed tributary to Tuckasegee River [2-79-(24)ut4] was sampled for macroinvertebrate communities in 2007 resulting in a Not Impaired status. A Random Ambient Monitoring System site (G4210000) also collected data along this tributary between Jan. 2007 - Dec. 2008. Data collected included normal field parameters along with metals, volatile organics, semi-volatiles, and pesticides. Over 18% of the samples had low pH, but no other water quality problems were detected. This creek is now Impaired for Aquatic Life because of the low pH levels.

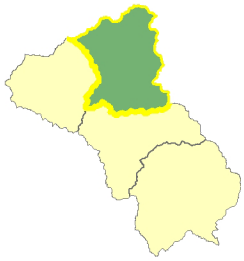
Caney Fork [AU# 2-79-28-(2.5)] (WS-III;Tr) drains a small portion of east-central Jackson County, a mostly forested landscape, and ultimately feeds into the Tuckasegee River. Caney Fork, for most of it's length, is paralleled by roadway and is lined by agricultural fields and residences. The stream is lacking significant riparian vegetation and is often denuded on both sides streambanks. However, most of the watershed is forested thereby protecting the Excellent water quality that has persisted in Caney Fork over the last two decades. The stream was sampled at sites GB27 and GF4 resulting in an Excellent benthos and Good fish community bioclassifications.

Moses Creek [2-79-28-8] (WS-III;Tr) is a tributary of Caney Fork. This stream has a catchment that is largely forested with only the lower segment paralleling a rural residential road. It was noted that riparian loss was occurring due to residential lawns, some upstream agriculture, and the nearby road. The Creek was sampled at site GB26 in 2010 resulting in an Excellent benthos rating.

Cullowhee Creek [AU# 2-79-31a & b] (C;Tr) flows north through Jackson County in the southwestern portion of North Carolina. The majority of the headwaters are forested and of good water quality. The lower portion of the watershed includes Western Carolina University, light commercial, and residential development.

The stream through this section was historically moved and channelized resulting in poor habitat and flood protection. In 2009, DWQ sampled Cullowhee Creek at two locations upstream of the university. The benthic community at site GB29 rated Excellent, and the fish community at GF13 received a Good bioclassification. The biologists noted high levels of sand, silt and macrophytes. Although Cullowhee Creek rated as Excellent in 2009, habitat degradation is an issue and may negatively affect the fauna in the future.

Oconaluftee River Watershed (HUC 0601020302)

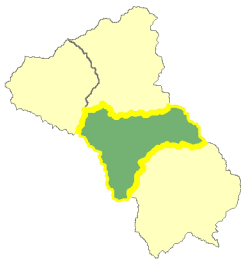


This watershed encompasses 120,226 acres and has an estimated 2010 population of 8,833 people.

Bradley Fork {AU# 2-79-55-12-(11)] (B;Tr,HQW) a tributary to the Oconaluftee River, is located within Great Smoky Mountain National Park and as such has a completely undeveloped and forested watershed. This stream has high recreational usage among the public as it lies next to a campground just inside the park border The creek was sampled in 2009 at site GB1 resulting in an Excellent benthos bioclassification.

Oconaluftee River [AU# 2-79-55-(16.5)] (C;Tr) is a large tributary to the Tuckasegee River draining the eastern portion of Great Smoky Mountain National Park. The lower segment of this river is tracked on both sides by roads and receives large amounts of urban runoff from Cherokee. High development pressures have introduced sediments into the river and removed large amounts of riparian vegetation. The River was sampled in 2009, at site GB11, resulting in an Excellent benthos bioclassification, however the Excellent rating is likely supported from the unimpacted tributaries as conditions in the Oconaluftee River itself are deteriorating.

Middle Tuckasegee River Watershed (HUC 0601020303)



This watershed encompasses 104,486 acres and has an estimated 2010 population of 19,373 people.

Savannah Creek [AU# 2-79-36] (C;Tr) watershed drains the west-central portion of Jackson County. Savannah Creek itself flows alongside US 441 and NC 116 for much of its length before joining the Tuckasegee River near Webster. Traditionally, land use in the watershed was agricultural with light residential and commercial activity along the transportation corridors. Residential development is increasing substantially and elevating sediment and erosion concerns. DWQ does not have an ambient monitoring station but DWQ did sample fecal coliform bacteria concentrations in Savannah Creek as part of a Class B (Recreation) use-attainability study for the Tuckasegee River initiated in 2003. The samples exceeded state standards and indicate Savannah Creek, from its source to the Tuckasegee River (13.4 miles), is Impaired in the recreation category. The sources of fecal coliform contamination are unknown, but may include failing septic systems and/or agricultural runoff. DWQ also sampled the fish and benthic communities at sites GF23 and GB23, both resulting in Excellent ratings. However, these data do not reflect the habitat threats posed by development in the watershed. Many stream reaches have been channelized and riparian vegetation removed.

The Watershed Association for the Tuckasegee River (WATR) is currently writing a watershed plan and coordinates sampling in the Savannah Creek Watershed. Data collected at Savannah Creek and its largest tributary, Greens Creek, from July 2003 through September 2010 show turbidity levels that exceed the 10 NTU standard for trout habitat waters.

	Savannah Ck.	Greens Ck.
N	89	87
Exceeding 10 NTUs	~37%	~33%
Mean	19.4	9.7
Median	7.7	7.5
Maximum	450	80

Measurements exceeded turbidity standards 37% of the time for Savannah Creek and 33% for Greens Creek [AU# 2-79-36-11]. These results were obtained despite the regional drought conditions. Monthly sampling also detected high flow and high turbidity conditions during the summers of 2007 and 2008.

WATR notes that DWQ's sample site at NC116 is not representative of stream conditions. The monitoring site at bridge on NC116 has a relatively large gradient as compared to stream reaches up and downstream. The station occupies a small water gap in a local ridge and it has a rocky substrate. These factors combine to yield a short zone that does not accumulate deposited sediments and is favorable habitat for macroinvertebrates WATR recommends that if it is necessary to acknowledge this biologically productive stream segment, then Savannah Creek should be divided into three assessment reaches. Moving upstream from the confluence, the first reach is a section of stream that is characterized by low gradient. It passes through a wide floodplain with agriculture, and stream banks are unstable and eroding. The second assessment reach starts with the high gradient segment at Bridge along NC116. In the upstream direction it forms a large curve in an isolated patch of flood plain, again dedicated to agriculture. This reach extends into a larger water gap paralleled by Rt 116. The high gradient section in the water gap, a place frequented by anglers, marks the upper end of this section. The third assessment reach starts at the mid point in the water gap and extends upstream for the remaining length of Savannah Creek.

Since the temporary moratorium on construction in 2008 and the downturn in home building in 2009, the relative effect of construction on erosion and turbidity has decreased significantly. Enforcement, and especially clarity and enforcement of temporary and final vegetative cover, remains critically important to improving water quality in the Savannah Creek watershed. Developing agriculture buffers and public education on maintaining fallow land, road ways and road ditches are recommended. Fecal coliform contamination sources in the Savannah Creek watershed should be identified and corrected. Additionally, sediment and erosion control problems should be addressed to prevent further habitat degradation.

Water Quality Initiatives

WATR is working diligently to inform the public on the critical role of stream side buffers in maintaining a healthy aquatic ecology and good water quality. Partnering with the Town of Dillsboro WATR volunteers and staff have build the Stream Buffer Demonstration Trails at Monteith Farmstead Park. These short nature trails with educational signs are specifically aimed at informing the landowners, and stream-side landowners in particular, about the necessity of riparian buffers to healthy mountain streams. This work has been supported by **Resourceful Communities Program**. WATR also has conducted youth environmental education events funded by the Cherokee Preservation Foundation, the USDA Natural Resources Conservation Service, and by WATR members and contributors.

Scott Creek [AU# 2-79-39] (C;Tr) is a large, swift tributary to the Tuckasegee River. Draining northeastern Jackson County, US 19/23 and Old US 19/23 parallel the creek is for most of its length. The stream passes through many residential areas before entering the urban environment in Sylva and Dillsboro. DWQ sampled fecal coliform bacteria concentrations in Scotts Creek as part of a Class B Recreation use-attainability study for the Tuckasegee River initiated in 2003. The samples exceeded state standards and indicate Scotts Creek, from its source to the Tuckasegee River (15.3 miles), is Impaired in the recreation category.

Rafting on Scott Creek

The sources of fecal coliform contamination are unknown, but may include failing septic systems, leaking sewer systems and/or nonpoint source runoff. In 2009, DWQ evaluated the benthic macroinvertebrate community at site GB167 resulting in an Excellent bioclassification. This is an noted improvement compared to the 2004 conditions, however the Creek still has turbidity and habitat issues. The stream channel is highly modified and the bank is armored by riprap.

The Morningstar of Jackson WWTP facility discharges into Blanton Branch (AU# 2-79-39-10) which is a tributary to Scott Creek. In 2010 the facility exceeded fecal coliform bacteria levels.

A small pond dam failure in the Balsam Mountain Preserve development occurred on June 7, 2007. The resultant sediment and debris slide entered Sugarloaf Creek [AU# 2-79-39-5-1] (C) and finally the lower segments of Scott Creek. A special benthos study was completed in 2007 to assess the impacts from the dam failure. A total of three streams were sampled in this study. Two of the streams sampled (Sugarloaf Creek and Scott Creek) were directly affected by the sediment. The third stream, Licklog Branch [2-79-39-3-6] (C), was sampled as a comparative reference site to Sugarloaf Creek and was similar in both landuse and drainage area. Results of the study indicate that the dam failure did affect the macroinvertebrate community in Sugarloaf Creek as it had a “Fair” bioclassification while the reference site was “Good”. The downstream reaches of Scott Creek received an “Excellent” bioclassification.

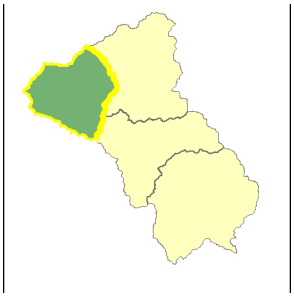
Tuckasegee River [2-79-(35.5)a & 2-79-(35.5)b & 2-79-(38)] (C;Tr) receives effluent from the municipalities of Sylva, Webster, and Dillsboro and drains almost the entirety of Jackson County. The River is Impaired for recreational uses due to exceedances of the fecal coliform bacteria levels. The Jackson County WWTP has had numerous permit violations within the five years, including exceedances in fecal coliform bacteria, BOD, TSS levels and low pH.

Downstream [AU# 2-79-(40.5)] the in the Tuckasegee River a biological sample was taken in 2009 at site GB19 resulting in an Good benthos bioclassification. The most significant event for aquatic biology in the Tuckasegee River watershed was the removal of the low-head dam at Dillsboro in early winter of 2009. Prior to dam removal, Duke Energy pumped out and removed much of the impounded sediment. Dam removal allows fish species to migrate upstream, with the potential for host species for the endangered Appalachian Elktoe Mussel to also migrate upstream. As part of the dam removal, the river bank along the former impoundment has been restored with stone armoring at the toe of the slope affected by water level changes caused by daily discharge related to hydroelectric generation.

Camp Creek [AU# 2-79-49] (C) watershed, including the Beck Branch [AU# 2-79-49-1] (C) watershed, encompasses approximately 4.5 square miles in northwestern Jackson County. The creek is a tributary to the Tuckasegee River. Visible landuses in the watershed include forest, rural residential, infrastructure (secondary roads and US 441), commercial, active pastures, horse pastures, and fallow fields. There is one NPDES permitted discharger to Camp Creek (NC0074250) with no recent permit violations. DWQ received a request to reclassify Camp Creek to trout waters in 2004. In 2005, the fish community was sampled at several sites in the Camp Creek watershed to determine if determine if there were wild, reproducing populations of trout in Camp Creek and Beck Branch. The survey did indicate significant habitat problems in the watershed. The primary habitat problems were unstable, eroding stream banks, and narrow or non-existent riparian vegetation. In this Camp Creek reclassification/use attainability study, it was determined after sampling 4 locations that only the upper 2.3 square mile watershed of the creek met the trout waters regulation criteria. Suitable instream habitats were present at the lower two sites on Camp Creek for trout, but the lack of wide forested riparian zones and nonpoint source runoff may prevent their occupation of those reaches of the creek on a year-round basis. Stream restoration activities would benefit the likelihood of trout recolonizing, inhabiting on a year-round basis, and reproducing in the middle and lower reaches of the creek. (memorandum 20050605).

Conley Creek (Connelly Creek) [2-79-52] (C;Tr) is a small tributary to the Tuckasegee River and drains a small portion of southeastern Swain County. Only the lower portion of the watershed is developed, consisting mostly of residences and a golf course, while majority of the upper watershed is forest. The stream follows a road for much of its length which has reduced or removed the riparian on one side for much of the segment. However, overall habitat was good and the stream banks were stable with little erosion. The Creek was sampled in 2009 resulting in an Excellent benthos bioclassification.

Lower Tuckasegee River Watershed (HUC 0601020304)



This watershed encompasses 92,429 acres and has an estimated 2010 population of 5,630 people. A majority of the watershed (the northern portion) falls within the Great Smoky Mtn National Park.

Deep Creek [2-79-63-(16) & 2-79-63-(21)] (B;Tr) flows through a primarily forested area and has high recreational use draining into the Tuckasegee River. The lower 1.8 miles of the creek are not within the Great Smoky Mtns National Park and the land use turns to agriculture. Sedimentation was noted in this reach of the Creek but not enough to prevent the sample site GB7 from receiving an Excellent benthos bioclassification. The Creek has maintained an Excellent rating for the last 20 years.

However, Deep Creek experienced effluent overflow from a sewer spill in 2010 that was captured on video. The video can be viewed through this youtube link: http://www.youtube.com/user/RogerWATR

Noland Creek [2-90] (C;Tr) lies within the south central portion Great Smoky Mountain National Park and drains into Fontana Lake. It is an undeveloped and forested watershed. The habitat of Noland Creek is exceptional and consists of a series of cascades, riffles, and pools; site GB6 rated Excellent in 2009.

Forney Creek [2-97] (C;Tr,ORW) lies within and drains the south-central portion of Great Smoky Mtns into Fontana Lake. It is an entirely undeveloped and forested watershed. The habitat of this stream is as expected for a stream in a natural setting and consists of a series of riffles, cascades, and pools with excellent riparian zones. The Creek rated Excellent in 2009 at site GB4.

Tuckasegee River [2-(78)a] (C) downstream of Bryson City from Lemmons Creek to Peachtree Creek is Impaired for Recreational uses due to exceedances of fecal coliform bacteria levels. Just upstream is AMS station G8600000 which also detected high levels of fecal coliform bacteria and had several incidences of low pH. Bryson City's WWTP discharges into the Tuckasegee River and over the last five years has had several incidences of permit violations, including fecal coliform bacteria and TSS.

Notable Waters

Table 1-1 lists waterbodies identified as needing additional protection and potential restoration actions. The fourth and fifth columns of this table list potential stressors and sources that may be impacting a stream based on in-field observations, monitoring data, historical evidence, permit or other violations, and other staff and public input. In many cases, additional study is needed to determine exact source(s) of the impact. The last column includes a list of recommended actions.

Table 1-1: Notable Waters

Stream Name	AU#	Class.	Stressor	Source	Status	Actions Needed
Cullowhee Creek	2-79-31a 2-79-31b	C;Tr	sediment, nutrients	development	S	S&E, P
Oconoaluftee R	2-79-55-(16.5)	C;Tr	sediment	development	S	S&E, P
Savannah Creek	2-79-36	C;Tr	fecal coliform bacteria, sediment	development, agriculture, failing septic systems	I	S&E, BMPs
Scott Creek	2-79-39	C;Tr	fecal coliform bacteria, sediment	non-point source runoff, failing septic systems, impoundments	I	R, BMPs
Tuckasegee R	2-79-(35.5)a 2-79-(35.5)b 2-79-(38) [2-(78)a	C; Tr C; Tr C C	fecal coliform bacteria	WWTP, non-point source runoff	I	BMPs

AU # = Assessment Unit # or stream segment/reach

Class. = Classification (e.g., C, S, B, WS-I, WS-II, WS-III, WS-IV, WS-V, Tr, HQW, ORW, SW, UWL)

Stressor = chemical parameters or physical conditions that at certain levels prevent waterbodies from meeting the standards for their designated use.(e.g., low/high DO, nutrients, toxicity, habitat degradation, etc.)

Status = I=Impaired, IM= Impacted, S=Supporting, IP= Improving,

Actions Needed = R= restoration, P= protection, SC= stormwater controls, SS= stressor study, E= education, LO= local ordinance, BMPs, SSP= species protection plan, F= forestry BMPs, Ag= Agriculture BMPs, NMC= nutrient mgnt controls, S&E= sediment and erosion controls

Table 1-2: NPDES Permits within the Tuckasegee River Subbasin

NPDES Permits within the Tuckasegee River Subbasin			
Permit #	**Permit Type**	**Outfall location**	**Facility Name**
NPDES Permits within the Upper Tuckasegee River Watershed			
NC0075736	WWTP	Grassy Swamp Cr	Whiteside Estates Inc
WQ0017530	Non-discharge	irrigation	Highlands Cove
WQ0028693	Non-discharge	reuse	Mountaintop Golf & Lake Club
NC0066958	WWTP	Hurricane Cr	Blue Ridge School
NC0059200	WWTP	Hurricane Cr	Trillium Links & Village LLC
NC0038687	WWTP	Trout Cr	Singing Waters Camping Resort
WQ0031427	Non-discharge	irrigation	Legasus of North Carolina LLC
NCG500127	Wastewater	W Fork Tuckasegee R	Thorpe Hydroelectric Station
NCG500126	Wastewater	W Fork Tuckasegee R	Tuckasegee Hydroelectric Station
NCG500125	Wastewater	W Fork Tuckasegee R	Cedar Cliff Hydroelectric Station
NCG500124	Wastewater	W Fork Tuckasegee R	Bear Creek Hydroelectric Plant

NPDES Permits within the Tuckasegee River Subbasin			
Permit #	**Permit Type**	**Outfall location**	**Facility Name**
NCG500123	Wastewater	Tennessee Cr	Tennessee Cr Hydroelectric Station
WQ0029233	Non-discharge	reuse	Bear Lake Reserve
NCG550374	Wastewater	Tilley Cr	Cullowhee Valley Baptist Church
NCG510066	groundwater remediation	Tuckasegee R	Lewis Oil Company
NC0074624	WTP	Tuckasegee R	Western Carolina University
NCG150027	Stormwater	Ditch to Tuck. R	Jackson County Airport
NPDES Permits within the Oconaluftee Watershed			
NCG500129	Wastewater	Oconaluftee R	Bryson Hydroelectric Station
NPDES Permits within the Middle Tuckasegee River Watershed			
NCG210134	Stormwater	Scott Cr	T&S Hardwoods Inc
NCG100168	Stormwater	Scott Cr	Dr Automotive
NCG050383	Stormwater	Scott Cr	Stonewall Packaging, LLC
NCG140158	Stormwater	Scott Cr	Southern Concrete Materials Inc
NCS000295	Stormwater	Scott Cr	Jackson Paper Manufacturing Co.
NC0020214	WWTP	Scott Cr	Sylva WWTP
NC0032808	WWTP	Blanton Br	Morningstar of Jackson
NCG080191	Stormwater	Yellow Bird Br	United Parcel Service Inc
WQ0005207	Non-discharge	Wastewater Recycling	Jackson Paper Manufacturing Co.
NCG551046	Wastewater	Savannah Cr	single family residence
NCG080730 NCG080731	Stormwater	South Fork Blair Cr	Rolling Frito-Lay
WQ0005763	Non-discharge	Biosolids	Tuckasegee Water & Sewer Authority
NC0000264	WWTP	Tuckasegee R	Jackson Co Industrial Park
NC0039578	WWTP	Tuckasegee R	Jackson County WWTP
NCG110111	Stormwater	Tuckasegee R	Tuckasegee Water & Sewer Authority
NCG160031	Stormwater	Tuckasegee R	Dillsboro Asphalt Plant
NCG020247	Stormwater	Tuckasegee R	Dillsboro Quarry
NCG550375	Wastewater	W Fork Dicks Cr	single family residence
NC0074250	WWTP	Camp Creek	Gateway Chevron
NC0084441	WWTP	Connelly Cr	Smoky Mountain Country Club
NPDES Permits within Lower Tuckasegee River Watershed			
NCG530095	Wastewater	Cooper Cr	Cooper Creek Trout Farm
NC0061620	WWTP	Tuckasegee R	Hide Away Campground
NC0026557	WWTP	Tuckasegee R	Town of Bryson City
NCG210098 NCG210095	Stormwater	Tuckasegee R	Powell Industries
WQ0005557	Non-discharge	Wastewater Recycling	Mini Apolis Grand Prix Corp
NCG050249	Stormwater	Cochran Br	Consolidated Metco Inc
NCG140395	Stormwater	Cochran Br	Southern Concrete Materials Inc
NCG210392	Stormwater	ditch to Cochran Br	Zickgraf Hardwood Flooring LLC
NCG160199	Stormwater	ditch to Cochran Br	Hmc Paving & Construction Co Inc

References & Useful Websites

NC Division of Water Quality

Biological Assessment- http://portal.ncdenr.org/c/document_library/get_file?uuid=de0dbb2d-3417-44c4-9736-1710d2e18d43&groupId=38364

Ambient Report- http://portal.ncdenr.org/c/document_library/get_file?uuid=ac3b7afe-e2f1-4d1e-93df-c2ba9d897888&groupId=38364

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303(d) List- http://portal.ncdenr.org/web/wq/ps/mtu/assessment

Impaired & Impacted Survey- http://portal.ncdenr.org/web/wq/ps/bpu/about/impactedstreamssurvey

NC Division of Water Resources

Flow- http://www.ncwater.org/Permits_and_Registration/Instream_Flow/

Watershed Association for the Tuckasegee River (WATR)

http://watrnc.wordpress.com/