

3.5 Beech Creek HUC 060101030305

Covering approximately 40 square miles with development centered around the Town of Beech Mountain, the Beech Creek watershed is a popular destination for winter and summer enthusiasts. The Town of Beech Mountain spans across portions of both Watauga and Avery Counties, includes a small portion of the Elk River watershed and is the highest (5,506 feet) incorporated community east of the Mississippi River. The 2010 population in the Beech Creek watershed was estimated to be around 2,475 people with an estimated permanent population of 350 living within the town’s jurisdictional boundary (Table 3.28; LWSP, 2015). During the winter months, population can soar to well over 10,000 with people visiting the Beech Mountain Resort or renting or living in vacation homes in the area. In the watershed, Beech Creek Bog and Beech Creek Slopes are designated as outstanding resource areas by the North Carolina Natural Heritage Program (NHP).



Table 3.28: Land Use and Estimated Population – Beech Creek Watershed

Land Use Type	Acres	Square Miles	Percent
Open Water	3.31	0.0	0.0%
Developed	1,983.0	3.1	7.7%
Bare Earth	197.3	0.3	0.8%
Forest	20,989.7	32.8	81.4%
Grassland	696.9	1.1	2.7%
Agriculture	1,897.6	3.0	7.4%
Wetland	10.8	0.0	0.0%
Total Area	25,778.5	40.3	100%

(NCLD, 2011)

Calendar Year	Population and Projections*
2000	2,348
2010	2,475
2020*	-
2030*	-

*Methodology has not been developed to predict population projections on the HUC 12 scale.

(OSBM, 2014)

Overall, water quality in the watershed remains good with Beech Creek (AU 8-20) seeing a slight decrease in the benthic community between 2008 and 2013. The decrease is likely due to increased nonpoint source runoff from upstream residential and agricultural areas and increased scour due to high flow events prior to sampling. Five benthic sites and two fish sites were sampled during cycle 4 (2004-2009). Three benthic sites were sampled during cycle 5 (2009-2014). All sites were meeting criteria for aquatic life.

Residents in the Town of Beech Mountain rely on surface water for their drinking water supply while the remaining population relies on groundwater through a community well or individual private wells. There are two recreational facilities that withdraw water from this watershed and are registered with the Water Withdraw and Transfer Registration (WWATR) Program. These facilities rely on surface water for irrigating golf courses or making snow during the winter months. Two NPDES wastewater facilities are in the watershed (Table 3.29). One non-discharge permit for the town’s composting facility is also located in the watershed (Table 3.30).

Table 3.29: NPDES Wastewater Permits HUC 060101030305

Permit Number	Facility Name	Receiving Stream	Permitted Flow (MGD)
NC0022730	Grassy Gap Creek WWTP	Buckeye Creek	0.080
NC0069761	Pond Creek WWTP	Pond Creek	0.400
Permit Type: Minor – Discharging 100% Domestic < 1MGD			

Table 3.30: Non-Discharge Permits HUC 060101030305

Permit Number	Facility Name	Permit Type
WQ0002523	Town of Beech Mountain Residuals Composting Facility and Distribution Program	Distribution of Residual Solids (503)

3.5.1 Stream Assessments

3.5.1.1 Laurel Creek AU 8-17

Laurel Creek is a small stream with a drainage area of approximately seven square miles. The sampling site is located approximately 0.5 mile upstream of the confluence with the Watauga River. Most of the land in the watershed is forested with rural residential properties and agricultural land scattered throughout. No NPDES facilities discharge to Laurel Creek.

Sampling Year	Benthic Rating (LB8)	Fish Rating (LF6)
2004	Good	Not Rated
2008	Excellent	Not Rated
2013	Good	-

In 2008, the benthic community (LB8) received an Excellent bioclassification, the highest the site has ever received. The site represented the highest abundance recorded in the watershed and included eight new taxa. The large increase in richness and abundance is likely the result of a sharp reduction in nonpoint source runoff due to drought conditions. This conclusion was further supported in 2013 when the benthic community received a Good benthic bioclassification. More precipitation and higher stream flows in 2013 likely resulted in the shift back to Good with similar numbers observed during 1999 and 2004 sampling.

In 2008, the fish biologists noted that the habitat consisted of high gradient riffles and plunge pools of various sizes. Intact riparian buffers, stable streambanks and a good canopy were also noted. Because criteria have not been developed for small, mountain headwater streams, the site (LF6) was given a Not Rated bioclassification. There were no obvious water quality concerns in the watershed, but biologists noted that fish diversity was low. Fish were not sampled in Laurel Creek in 2013.

3.5.1.2 Beech Creek AU 8-20

From the benthic sampling site (LB2), the watershed is approximately 20 square miles and contains a mix of forested, agricultural and residential land. Beech Creek receives stormwater runoff from the Town of Beech Mountain and discharge from two minor NPDES wastewater facilities. The benthic sampling site (LB2) is located approximately 0.5 mile upstream of the confluence with the Watauga River and contains a substrate of boulders and rubble. In 2004, the site received an Excellent bioclassification and biologists noted that this benthic site is the only known North Carolina locality for

Sampling Year	Benthic Rating (LB2)	Fish Rating (LF4)
2004	Excellent	Not Rated
2008	Excellent	Not Rated
2013	Good	-

the intolerant caddisfly, *Ceratopsyche walkeri*. In 2008, the benthic community received an Excellent bioclassification for the fourth consecutive sampling cycle. The species richness increased but several pollution tolerant species were observed indicating that the stream is impacted by the higher concentrations of instream waste from upstream dischargers and low-flow conditions due to drought (less dilution).

In 2013, increased precipitation resulted in high flows throughout the river basin. The higher flows impacted species richness and abundance in several watersheds including Beech Creek. Beech Creek received a Good benthic bioclassification, the lowest it has received since sampling began in 1994. Several intolerant species that were found in 2008 were not found in 2013 indicating that the community and the bioclassification is likely influenced by increased nonpoint source runoff from upstream residential and agricultural areas and increased scour from high flow events.

The fish sampling site (LF4) is located upstream of the benthic site (LB2) and is approximately 1.5 miles above the confluence with the Watauga River. In 2008, habitat consisted of riffles, runs and a few side pools. Biologists also noted good riparian coverage, a full canopy and stable streambanks. BAB observed that there was less auto salvage debris in the stream when compared to that observed in 2004 and a berm was built above the right bank near a known salvage yard. There was a moderately diverse fish community with cold and cool water species identified. Because criteria have not been developed for small, mountain headwater streams, the fish community was given a Not Rated bioclassification. The fish community was not sampled in Beech Creek in 2013.

3.5.1.3 Watauga River AU 8-(16)

Overall, water quality in this most downstream stretch of the river appears to be stable with the benthic community (LB11) receiving an Excellent bioclassification in 2008 and 2013. In 2008, samples were collected under unprecedented drought conditions yet species richness and abundance improved slightly when compared to 2004 results. In

Sampling Year	Benthic Rating (LB11)
2004	Excellent
2008	Excellent
2013	Excellent

2013, higher than normal precipitation and flow conditions resulted in several intolerant species being found during basinwide monitoring. Habitat consisted of deep pools, various rocky substrates, leaf packs and root mats. BAB observed that water quality in this section of the river is likely influenced by upstream nonpoint source runoff and annual flow conditions rather than point sources with the closest point source located 19 river miles upstream. Most of the land use in the catchment is a combination of forest, pasture and rural residential properties.

3.5.1.4 Special Study – Stone Mountain Branch AU 8-21

Unnamed Tributary to Stone Mountain Branch AU 8-21ut3

Between 2005 and 2007, a total of 122 small streams in 25 counties in eight river basins were sampled to establish a five-tiered bioclassification hierarchy for streams with drainage areas less than or equal to 3.0 mi² in mountain and piedmont ecoregions. Stone Mountain (LB45) is a

Sampling Year	Benthic Rating (LB45)	Benthic Rating (LB50)
2007*	Not Impaired	Not Impaired
*Special Study (DWQ, 2009)		

small tributary to the Watauga River. An unnamed tributary to Stone Mountain Branch (LB50) was included. Both were used as reference sites for aquatic habitat in forested landscapes. Both streams were reported as Not Impaired. More information about the small streams study can be found on the Water Sciences Section (WSS) Biological Assessment Branch (BAB) [publications page](#).

3.5.2 Water Use

There are three Public Water Supply (PWS) Systems located in the Beech Creek watershed. Two are community systems and serve an estimated population of 2,443 people (Table 3.31). The third PWS system is a non-community well. North Carolina General Statute requires all units of local government that provide or plan to provide public water service prepare a local water supply plan (LWSP). Based on statute, the Town of Beech Mountain is required to submit a LWSP. Residents not served by one of these three systems rely on private groundwater wells for their drinking water supply.

Table 3.31: Public Water Supply Systems in HUC 060101030305

PWS Name	PWS ID	PWS Type	Population Served
WOODLAND MEADOWS	01-06-124	Community	25
TOWN OF BEECH MOUNTAIN	01-95-104	Community	2,418
RIVERVIEW GROCERY	01-95-545	Transient Non-Community	25

3.5.2.1 Local Water Supply Plans (LWSP)

Beech Mountain PWS ID 01-95-104

Based on information presented in the 2015 LWSP, the Beech Mountain PWS system serves a year-round population of 340 people and a seasonal population of 5,120 anytime during the months of January, February, March, June, July, August and December. Average water demand (referred to as Total Demand in the LWSP) was reported at 0.311 million gallons per day (MGD), but the available water supply (referred to as Total Supply in the LWSP) is reported as 0.300 MGD. A maximum daily withdraw of 0.770 MGD was reported in December 2015. This results in a peak factor of 2.48. This peak factor can be used to calculate the projected maximum daily demand (measured in MGD) which is presented in Table 3.32.

In 2012, the Division of Water Resources (DWR) determined that the town's LWSP could not be approved because the system could not meet the current and long-term water supply needs of its customer base (Table 3.32; Figure 3.3). The concern was formally documented in a memo sent to the town mayor in February 2014. In March 2014, the town passed a resolution requesting that the town enter into an agreement with the Department of Environmental Quality (DEQ) to identify water supply needs, potential sources and storage options, and conduct the associated studies, environmental evaluations, and planning and budget estimates needed for acquiring a new or additional water supply source.

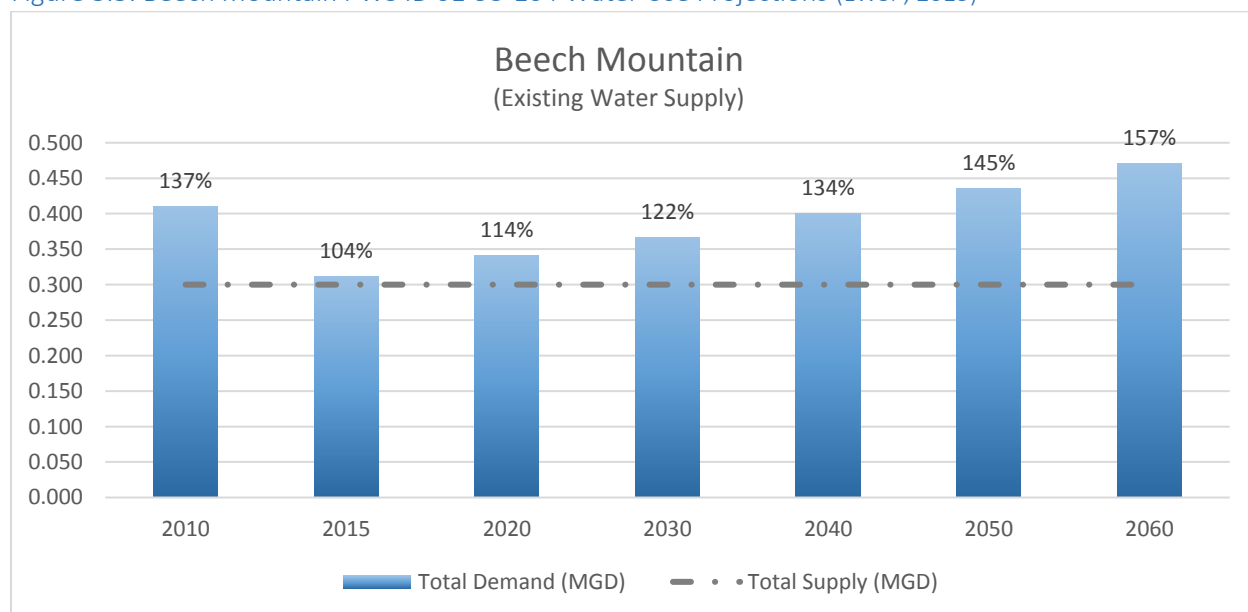
Working with DWR, the town recognized that the unaccounted-for amount of water reported in the 2015 and 2016 LWSP is "unacceptably high". The loss is due to how the system was constructed by the initial developer before the system was incorporated by the town. In 2015, the town estimated that it would cost \$16 million to replace all 53 miles of water lines in the distribution system (LWSP, 2015). The town has committed to a long-range plan to replace 0.5 miles of water line each year beginning with the main trunk lines. Consequently, average daily demand decreased between 2010 and 2015 (Table 3.32). Since 2011, the town has replaced 95 percent of the water meters, began using digital readouts to identify leaks, and has constructed a new water treatment facility (WTP). The town estimates these efforts have resulted in water loss being reduced from 85 to 47 percent. In addition, water rates have increased to provide for system upgrades, and the town plans to replace the main transmission line to relieve flow restrictions in the system and encourages year-round voluntary water conservation measures (LWSP, 2015; LWSP,

2016). DWR continues to work with the town to identify how best to meet current and future water supply needs.

Table 3.32: Beech Mountain PWS ID 01-95-104 Water Use Projections (LWSP, 2010; LWSP, 2015)

	2010	2015	2020	2030	2040	2050	2060
Average Water Demand (MGD)*	0.410	0.311	0.341	0.366	0.401	0.436	0.471
Maximum Daily Demand (MGD)**	0.826	0.770	0.846	0.908	0.995	1.081	1.170
Available Water Supply (MGD)***	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Average Daily Demand as Percent of Supply	137%	104%	114%	122%	134%	145%	157%
<p>*Average water demand (referred to as Total Demand in the LWSP) includes the amount of water used for system processes (backwash water, water used in the treatment process but not distributed and water needed to maintain water quality in the distribution lines) and unaccounted-for water. In 2015, the amount of unaccounted-for water reported by the PWS was 0.147 MGD. The PWS acknowledges that the unaccounted-for water is unacceptably high. It is attributed to poor design and workmanship by the initial owners and operators.</p>							
<p>**Maximum daily demand for 2010 and 2015 was reported in the respective LWSP. Maximum daily demand for 2020 through 2060 is calculated using a peak factor of 2.48. The peak factor is calculated based off of numbers reported in the 2015 LWSP and is the maximum daily demand divided by the average daily demand (MGD) (maximum daily demand/average daily demand = peak factor; average daily demand x peak factor = maximum daily demand).</p>							
<p>***Available water supply (referred to as Total Supply in the LWSP) is reported by the Beech Mountain PWS. The system relies on surface water from Buckeye Lake (an impoundment on Buckeye Creek) to supply water to its customers.</p>							

Figure 3.3: Beech Mountain PWS ID 01-95-104 Water Use Projections (LWSP, 2015)



The town manages two wastewater treatment facilities with 1,713 connections. Water is also distributed to properties that use septic systems (Table 3.33). In 2005, the town identified a problem with inflow and infiltration into the Grassy Gap wastewater treatment plant (WWTP). Over \$1.0 million has been spent to replace the sewer lift station, manhole covers and sewer lines (LWSP, 2015).

Table 3.33: Beech Mountain PWS ID 01-95-104 Wastewater Management (LWSP, 2015)

Wastewater Management	Number
Sewer Connections	
Grassy Gap WWTP NC0022730*	1,713
Pond Creek WWTP NC0069761**	
Septic Systems	303

*Receiving stream Buckeye Creek 8-20-3-(2.5)

**Receiving stream Pond Creek 8-20-2

3.5.2.2 Water Withdrawal & Transfer Registration (WWATR) Data

Two facilities are registered with the state as withdrawing more than 100,000 gallons per day. Both are for recreational purposes – golf course irrigation or snow making for winter activities. Table 3.35 includes the facility name, source water and the annual average use (MGD) reported in 2015.

Table 3.35: Water Withdraw Registration HUC 060101030305 (WWATR, 2015)

Facility Name	Facility ID	Use Type	Source Water	Annual Average Daily Use (MGD)
Beech Mountain Club	0766-0001	Recreation - Golf Course (May – October)	Lake	0.033
Ski Beech (Beech Mountain Resort, Inc.)*	0404-0001	Recreation - Snow Making (November – February)	Pond	0.301

*Based on report submitted in 2014.

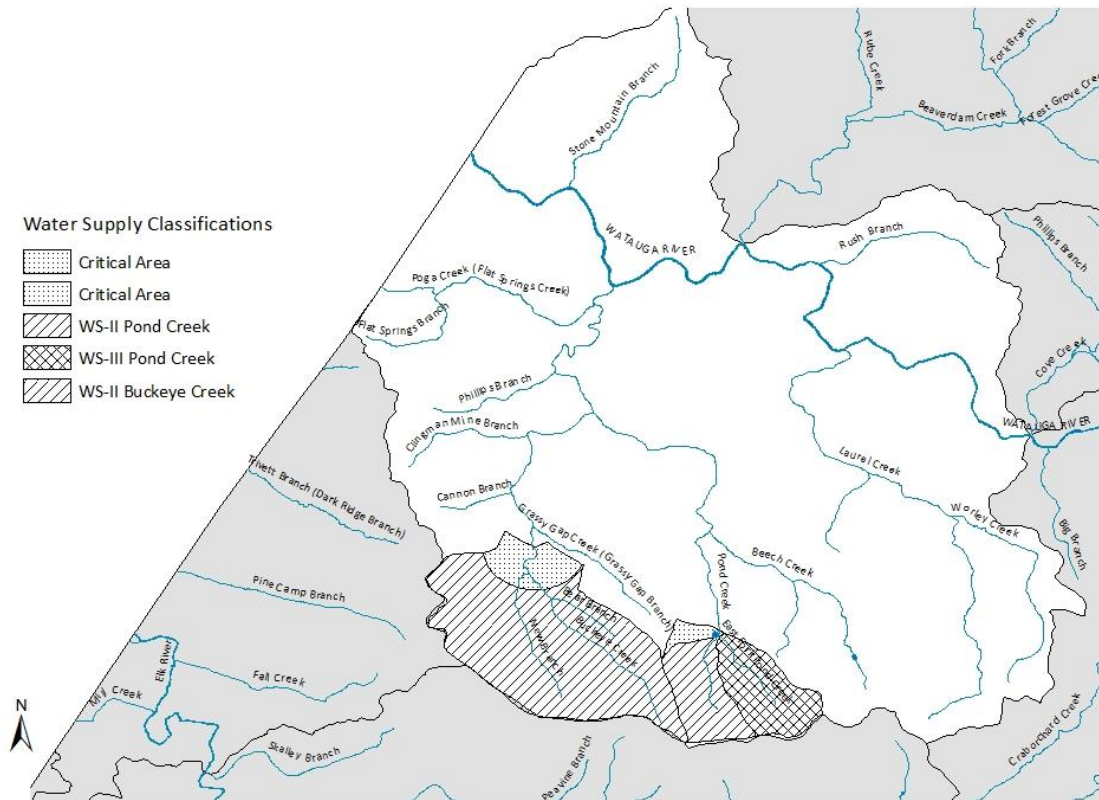
3.5.3 Classifications and Management Strategies

Because portions of Beech Creek and two of its tributaries along with West Fork Pond Creek are classified as WS-II, special management measures are in place to protect their use as public water supplies. Streams designated as WS-II are also HQW by definition. East Fork Pond Creek is classified as WS-III and several streams also have the supplemental Trout (Tr) classification. Streams classified as WS-II through WS-IV require that local governments with jurisdiction in these watersheds adopt and implement land use ordinances for new development that are at least as stringent as the state’s minimum requirements. A 30-foot and 100-foot vegetated buffer is required on perennial streams in these water supply watersheds for new development that is considered low density or high density, respectively. There are restrictions on wastewater discharges, landfills and residual application sites to control the impacts of point and nonpoint sources of pollution to public water supplies. Zoning ordinances are in place for the Town of Beech Mountain and managed by the Planning and Inspections Department.

Table 3.34: Water Supply Stream Names and Classifications

AU Number	Stream Name	Description	Classification
8-20-3-(0.5)	Buckeye Creek	From source to a point 0.2 mile downstream of Bear Branch	WS-II;Tr,HQW
8-20-3-(1.5)	Buckeye Creek	From a point 0.2 mile downstream of Bear Branch to Town of Beech Mountain water supply intake located 0.3 mile upstream of mouth of Grassy Gap Creek	WS-II;Tr,HQW,CA
8-20-3-1	Bear Branch	From source to Buckeye Creek	WS-II;HQW
8-20-3-2-(1)	New Branch	From source to a point 0.3 mile upstream of mouth	WS-II;HQW
8-20-3-2-(2)	New Branch	From a point 0.3 mile upstream of mouth to Buckeye Creek	WS-II;HQW,CA
8-20-2-1-(1)	West Fork Pond Creek	From source to backwaters of Santis Lake	WS-II;Tr,HQW
8-20-2-1-(2)	West Fork Pond Creek (Santis Lake)	From backwaters of Santis Lake to Pond Creek	WS-III;Tr,CA
8-20-2-2	East Fork Pond Creek	From source to backwaters of Santis Lake, West Fork Pond Creek	WS-III;Tr
8-20-2.5-(1)	Unnamed Tributary to Pond Creek (Lake Coffey)	From source to dam at Lake Coffey (Town of Beech Mountain, Beech Mountain Resort, Inc. water supply intake)	WS-II;Tr,HQW,CA

Figure 3.4: Water Supply Watersheds in HUC 060101030305



3.5.4 Protecting Water Resources in the Beech Creek Watershed

Several agencies and organizations are actively working throughout the basin to protect water resources. Agencies or organizations that have identified specific priorities, concerns or restoration projects in the Beech Creek watershed are included here.

3.5.4.1 NC Wildlife Resources Commission (WRC)

The Wildlife Resources Commission (WRC) identifies four species of greatest conservation need (SGCN) in the Watauga River basin. SGCN identified in the 2015 Wildlife Action Plan (WAP) include one crayfish species, two freshwater fish and one freshwater mussel. WRC identifies erosion and sedimentation from nonpoint sources as well as narrow riparian corridors or lack thereof as the primary problems impacting habitats and affecting aquatic species in the basin.

The Beech Creek watershed along with the Watauga River headwaters, Cove Creek and Dutch Creek watersheds have been identified as Tier 2 conservation priority areas by the WRC. Tier 1 are considered highest priority and Tier 2 are high priority areas. WRC recommends surveys to identify species distribution in the watersheds. Long-term monitoring is also needed to assess species and ecosystem health over time. Monitoring will also assist with understanding species resiliency to changing water quality conditions. WRC also recommends research to investigate aquatic community responses to restoration activities as well as water withdraws. Research is also needed to investigate the potential for

species reintroduction of native mussels to the basin. Education and management measures are recommended to prevent the introduction or spread of invasive nonnative species, and WRC supports stream and riparian area conservation and restoration initiatives throughout the basin to protect, improve or enhance existing conditions. More information about can be found in Section 4.5.18 of the [2015 Wildlife Action Plan \(WAP\)](#).

Table 3.36: SGNC Identified in the Watauga River Basin

Taxa Group	Scientific Name	Common Name	Federal/State Status*
Crayfish	<i>Cambarus eeseehensis</i>	Grandfather Mountain Crayfish	FSC / -
Fish	<i>Cottus carolinae</i>	Banded Sculpin	-
Fish	<i>Salvelinus fontinalis</i>	Brook Trout (native)	-
Mussel	<i>Lasmigona subviridis</i>	Green Floater	FSC / E

*FSC – Federal Species of Concern
E – Endangered (State)

3.5.4.2 NCDA&CS DSWC Agriculture Cost Share Program (ACSP)

Between 2004 and 2014, several BMPs were installed in the watershed. BMPs included measures to reduce sediment, nutrient and erosion in streams. Additional information about the ACSP and the total number of BMPs installed, total cost as well as the benefits (soil saved and nutrient reduction) can be found in the chapter titled Nonpoint Source Pollution and Programs to Protect Water Resources.

3.5.5 References

North Carolina Department of Agriculture & Consumer Services (NCDA&CS) Division of Soil and Water Conservation (DSWC). March 2017. Agriculture Cost Share Program (ACSP) BMP Manual.

<http://www.ncagr.gov/SWC/costshareprograms/ACSP/BMPs.html>.

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North Carolina Department of Environment and Natural Resources (DENR) Division of Water Quality (DWQ) Environmental Sciences Section (ESS). May 2012. Supplemental Classification Study: Watauga River Basin in Avery and Watauga Counties HUC 06010103.

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<http://www.ncwildlife.org/Plan>.