

Section 3

Watershed Chapters

These chapters include detailed information on the watershed scale. A watershed is defined as the geographic area within the boundary of a drainage divide. The watershed boundary follows the highest ridgeline around the stream drainage area to the bottom, or the lowest point in the land area, where water flows out of the watershed. The watershed includes land and water. For the Watauga River basin, the watershed chapters are written on a hydrologic unit code (HUC) of 12. Hydrologic units are arranged or nested within each other, from the largest geographic area (2-digit HUC) to the smallest geographic area (12-digit HUC). Each hydrologic unit is identified by a unique sequence of numbers based on the scale of the HUC. More general information about the river basin can be found in the overview chapter and includes a description of the river basin (geography and ecoregion), county population projections, land use, stream flow, classifications and standards, programs in place to protect water quality, and concerns identified in the basin. An overview of monitoring data and how water quality is assessed in the basin can be found in the monitoring data and water quality assessment chapter.

3.1 Watauga River Headwaters HUC 060101030301

Covering just over 26 square miles, the headwaters of the Watauga River straddle Avery and Watauga counties and includes several tourist destinations including ski resorts, golf courses, gated communities, trout fishing and gem mining. Seven Devils, Foscoe and portions of Sugar Mountain are in the watershed along with many natural areas identified by the NC Natural Heritage Program (NHP) including Snakeden Mountain and Dun Vegan Mountain. Portions of Grandfather Mountain, Julian Price Memorial Park, Moses Cone Park and the Blue Ridge Parkway area also located in the watershed. Almost the entire watershed has special management strategies in place to protect the trout (Tr), high quality water (HQW) and outstanding resource water (ORW) designations.



Water quality in the watershed remains good and even excellent in some places, but changes in land use and stream flow are evident in the upper most section of the river where benthic communities have fluctuated between Good-Fair, Good, and Excellent over the past three monitoring cycles. Five benthic sites were sampled during cycle 4 (2004-2009). Five benthic and four fish sites were sampled during cycle 5 (2009-2014). Three of the fish sites were Not Rated because criteria and metrics have not been developed by the Biological Assessment Branch (BAB) for Southern Appalachian trout streams. The remaining sites were meeting criteria for aquatic life – benthic and fish.

Table 3.1: Land Use and Estimated Population – Watauga River Headwaters

Land Use Type	Acres	Square Miles	Percent
Open Water	57.0	0.1	0.3%
Developed	1,782.9	2.8	10.6%
Bare Earth	6.9	0.0	0.0%
Forest	14,091.6	22.0	83.9%
Grassland	171.4	0.3	1.0%
Agriculture	678.8	1.1	4.0%
Wetland	15.4	0.0	0.1%
Total Area	16,803.9	26.3	100.0%

(NCLD, 2011)

Calendar Year	Population and Projections*
2000	2,282
2010	2,599
2020	-
2030	-

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

(OSBM, 2014)

Fifteen NPDES wastewater dischargers are in the watershed (Table 3.2). Biological monitoring indicates that the facilities are having little impact in the watershed expect during drought conditions when flow is low and there is less dilution of wastewater. One non-discharge permit was issued in the watershed (Table 3.3). No stormwater permits were listed.

Table 3.2: NPDES Permits in HUC 060101030301

Permit Number	Facility Name	Receiving Stream	Permitted Flow (MGD)
NC0030473	Mill Ridge Development WWTP	Watauga River	0.052
NC0032123	Hound Ears WWTP	Watauga River	0.140
NC0032191	Hebron Colony & Grace Home WWTP	Watauga River	0.009
NC0032212	Yonahlossee WWTP	Lance Creek	0.150
NC0033448	Valley Creek Apartments WWTP	Valley Creek	0.005
NC0035149	Seven Devils Resort	Unnamed Tributary	0.120
NC0042358	Adams Apple Condominiums WWTP	Watauga River	0.020
NC0049174	Smoketree Lodge	Watauga River	0.010
NC0050610	The Ponds WWTP	Watauga River	0.076
NC0058891	Valley Creek WWTP	Valley Creek	0.900
NC0062961	Tynecastle WWTP	Watauga River	0.030
NC0070408	Art Plaza WWTP	Watauga River	0.035
NC0087963	Buckeye Creek WWTP	Thunderhole Branch/ Laurel Creek	0.050
NC0088579	Stone Bridge WWTP	Lance Creek	0.050

Permit Number	Facility Name	Receiving Stream	Permitted Flow (MGD)
NC0089036	NC 105 WWTP	Watauga River	0.150
Permit Type: Minor – Discharging 100% Domestic < 1MGD			

Table 3.3: Non-Discharge Permits in HUC 060101030301

Permit Number	Facility Name	Permit Type
WQ0003590	The Greater Foscoe Mining Company	Closed-Loop Recycle

3.1.1 Stream Assessments

3.1.1.1 Watauga River AU 8-(1)a

(from source to Laurel Creek)

The benthic community (LB14) in the upper most section of the river fluctuates between Good and Excellent with significant improvements seen since the 1999 and 2004 basinwide monitoring cycles. In 2013, the benthic community received a Good bioclassification, and many intolerant species were collected which resulted in the site being only one point away from being rated Excellent. No deleterious effects from the upstream dischargers have been observed during the history of basinwide monitoring. Long-term water chemistry data and the fluctuating bioclassification ratings suggest that this segment is more likely influenced by changes in upstream land use and fluctuations in stream flow rather than point sources.

Sampling Year	Benthic Rating (LB14)	Fish Rating (LF9)
2004	Good	Good-Fair
2008	Excellent	-
2013	Good	Good-Fair

Located downstream of the benthic site and approximately 1 mile upstream of the Shulls Mill dam, the fish community (LF9) received a Good-Fair bioclassification. There was very little change in habitat since the station was last sampled in 2004 and consisted of deep runs and swift riffles with slick bedrock, boulders and cobble. Abundant periphyton (an indicator of nutrient enrichment from both point and nonpoint sources of pollution) was also observed, temperature was elevated due to the open canopy, and specific conductance was high for a mountain stream indicating that the river is likely influenced by nonpoint source runoff. Eighteen species are known from the site and the community has a skewed trophic structure with the dominant species being an omnivore. The Watauga River has the supplemental classification of Trout (Tr) from its source to the bridge at US Hwy 321. No naturally reproducing populations of Brown or Rainbow Trout were documented by DWR when it was sampled in 2013, but the North Carolina Wildlife Resources Commission (WRC) notes that Rainbow Trout are abundant in this section of the river (WRC, 2018.) Because public fishing access is no longer available, WRC no longer manages a Delayed Harvest Waters trout fishery in the headwaters of the Watauga River. In addition, site LF9 is located off of SR 1557 on private property. It will be discontinued as a basinwide monitoring site because of access restrictions.

Further downstream on the river, the benthic community (LB13/LB18) received an Excellent bioclassification for the fifth consecutive monitoring cycle. A total of eight small dischargers are located upstream of the sampling site with two located less than 2.5 miles upstream. Specific conductance was higher in 2008 suggesting that drought induced low-flow conditions elevated effluent concentrations. In 2013, however, increased precipitation and water levels resulted in specific conductance returning to more “normal” readings.

Sampling Year	Benthic Rating (LB13/LB18)
2004	Excellent
2008	Excellent
2013	Excellent

3.1.1.2 Boone Fork (Price Lake) AU 8-7

Upstream, the benthic community (LB4) received its fifth consecutive Excellent bioclassification. The station was sampled twice – once in July 2013 and again in June 2014 using newly updated sampling methods for streams with drainage areas less than three square miles. The results for both suggest minimal upstream pollutant sources. The area is dominated by forests found in the Julian Price Memorial Park and along the Blue Ridge Parkway.

Sampling Year	Benthic Rating (LB4)
2004	Excellent
2008	Excellent
2013	Excellent
2014	Excellent

Downstream, the benthic community (LB3) received its third consecutive Excellent bioclassification. Fluctuations between taxa richness and abundance between 2008 and 2013 are likely contributed to varying flow conditions. In 2008, the basin was experiencing low-flow conditions due to drought. In 2013, however, the basin experienced higher flows and increased precipitation. Overall, there continues to be a stable, pollution intolerant community and excellent water quality.

Sampling Year	Benthic Rating (LB3)
2004	Excellent
2008	Excellent
2013	Excellent

3.1.1.3 Special Studies

Three streams – Shanty Spring Branch, Cannon Branch and Bee Tree Creek – were sampled in 2009 as part of a special study requested by the North Carolina Chapter of the American Fisheries Society (AFS). The special study was requested to determine if the streams are eligible for the supplemental classification of Trout (Tr). Supporting documentation was provided by the North Carolina Wildlife Resources Commission (WRC), and the fish communities were sampled by DWR in 2009. Benthic macroinvertebrates were also sampled as part of the study to determine if the streams are eligible for the supplemental classification of High Quality Waters (HQW).

Fish communities were evaluated in all three streams, but ratings were not applied to the sites because criteria and metrics have not been developed by BAB for Southern Appalachian trout streams. Benthic samples were not collected in Shanty Spring Branch because stream flow in the creek was extremely low and could not be sampled. Benthic samples were not collected from Cannon Branch and Bee Tree Creek either because they already carry the supplemental classification of Outstanding Resource Waters (ORW).

Based on data submitted by WRC and because data collected by the Biological Assessment Branch (BAB) showed evidence of multiple age classes and trout species, all three streams and all their unnamed tributaries are eligible for the supplemental classification Tr. Additional information related to land use changes in the watershed may be necessary to pursue the supplemental classification for these streams.

In addition to the special study requested by the North Carolina Chapter of the American Fisheries Society (AFS), a special study was also conducted in Cold Prong and Boone Fork. Cold Prong is a tributary to Boone

Fork and land is dominated by forests found in the Julien Price Memorial Park and along the Blue Ridge Parkway. Cold Prong was assessed for the first time in July 2007 and received a Not Impaired bioclassification. The benthic community found in the stream was typical of small mountain streams and undisturbed watersheds and included several pollution intolerant species. Boone Fork (LB63) was sampled above LB4 in May 2014 at the request of WRC to study the feeding ecology of native brook trout. LB63 was rated Excellent. No formal data sheet or memo is available for the study.

Shanty Spring Branch AU 8-2

Shanty Spring Branch is a tributary to the Watauga River in the upper most portion of the watershed. The stream reach was sampled in November 2007 by WRC and again in June 2010. WRC documented a reproducing and persistent population of Brook Trout both times. In 2017, WRC continued to document a robust Brook Trout population at two locations in Shanty Spring Branch (WRC, 2018).

Sampling Year	Fish Rating (LF20)
2009*	Not Rated
*Special Study (DWQ, 2012)	

No fish were collected in October 2009 by BAB (LF20), and the biologists observed that habitat consisted of very shallow pools and riffles filled with sand and sediment from very localized land disturbing activities. Even under the low-flow conditions observed in 2011, the habitat score was rated as moderately high quality and the sampling reach had wide, intact, vegetated buffers. Despite the absence of trout (most likely due to upstream land disturbing activities), Shanty Spring Branch is eligible for the supplemental classification of Tr based on data submitted by WRC and habitat characteristics in the watershed.

Cannon Branch AU 8-7-5

Bee Tree Creek AU 8-7-6

Cannon Branch and Bee Tree Creek are tributaries to Boone Fork. Brown trout representing multiple sizes and ages were collected in both streams. Habitat in Cannon Branch (LF15) consisted of shallow riffles, plunge pools and abundant leaf packs, but WRC noted that upper reaches of Cannon Branch are impacted by ponds and sediment (WRC, 2018). Habitat in Bee Tree Creek (LF14) consisted of deep plunge pools, bedrock slides and boulder riffles. Based on data collected by BAB and data submitted by the NCWRC, Cannon Branch and Bee Tree Creek are eligible for the supplemental classification Tr.

Sampling Year	Fish Rating (LF15)
2009*	Not Rated
*Special Study (DWQ, 2012)	

Sampling Year	Fish Rating (LF14)
2009*	Not Rated
*Special Study (DWQ, 2012)	

3.1.2 Water Use

There are 29 Public Water Supply (PWS) Systems located in the watershed. Eight are community systems and an additional five wells are considered adjacent. The state defines adjacent wells as those systems where two or more systems are adjacent to each other and owned or operated by the same supplier and together have 15 or more connections or serve 25 or more people. Collectively, the systems serve an estimated population of 3,051 people (Table 3.4). This includes year-round and seasonal populations. 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 Seven Devils is required to submit a LWSP. Residents not served by a PWS rely on private groundwater wells for drinking water.

Table 3.4: Public Water Supply Systems in HUC 060101030301

PWS Name	PWS ID	PWS Type	Population Served
MISTY MOUNTAIN	01-14-107	Community	355
FOSCOE VALLEY MHP	01-95-103	Community	45
CRYSTAL MOUNTAIN	01-95-110	Community	78
HOUND EARS WATER SYSTEM	01-95-112	Community	976
MILL RIDGE POA	01-95-115	Community	200
SEVEN DEVILS, TOWN OF	01-95-118	Community	400
SMOKETREE LODGE	01-95-432	Community	80
ECHOTA S/D	30-95-002	Community	800
BLUE RIDGE ESTATES	30-95-004	Community	36
GRANDFATHER BUSINESS CENTER	01-06-537	Transient Non-Community	25
GRANDFATHER MOUNTAIN CAMPGRD	01-95-134	Transient Non-Community	95
HEBRON COLONY	01-95-436	Transient Non-Community	36
PRICE PARK CAMPGROUND	01-95-501	Transient Non-Community	100
GREEN MANSIONS VILLAGE	01-95-503	Transient Non-Community	25
GRANDVIEW RESTAURANT	01-95-510	Transient Non-Community	25
THE 1861 FARM HOUSE MARKET	01-95-533	Transient Non-Community	25
COUNTRY RETREAT FAM BILLIARDS	01-95-536	Transient Non-Community	25
FOSCOE COUNTRY CORNER	01-95-540	Transient Non-Community	25
WESTGLOW SPA	01-95-546	Transient Non-Community	25
AGATE'S INN AT THE PONDS	01-95-553	Transient Non-Community	25
APPALACHIAN ADVENT CHRIST CG	30-95-005	Transient Non-Community	80
INN AT CRESTWOOD	30-95-016	Transient Non-Community	25
BUFFALO CAMP RV PARK	30-95-025	Transient Non-Community	356
GAMEKEEPER	30-9-5029	Transient Non-Community	25
SLEEPY HOLLOW_WELL 1	30-95-032	Adjacent*	20
SLEEPY HOLLOW_WELL 4	30-95-035	Adjacent*	8
SLEEPY HOLLOW_WELL 3	30-95-034	Adjacent*	22
SLEEPY HOLLOW_WELL 5	30-950-36	Adjacent*	16
SLEEPY HOLLOW_WELL 2	30-95-033	Adjacent*	15
*Adjacent Systems are defined as 2 or more systems that are adjacent, owned or operated by same supplier of water, and together serve 15+ connections or 25+ people.			

3.1.2.1. Local Water Supply Plans (LWSP)

Seven Devils PWS (PWS ID 01-95-118) serves portions of Avery and Watauga counties and is best known as the site of Hawksnest, a snow tubing and zipline park in the Appalachian Mountains. Sixty-five percent of the population served lives in Watauga County. The remaining 35% reside in Avery County. The town is required to submit a LWSP based on the number of connections (531) and the estimated total population of 1,209, which includes a year-round population of 209 residents (as reported in 2015) and

an estimated seasonal population of 1,000. Based on demand, Seven Devils’ seasonal use occurs during the months of January, February, May, June, July, August and September. Seven Devils PWS does not participate in regional water supply planning and relies on billing records and monthly reports to plan for future use. Based on current demand, the amount of available water and future projections, the PWS expects to meet their water demands through 2060 (Table 3.5; Figure 3.1). Residents served by the Seven Devils PWS rely on septic systems for wastewater treatment (Table 3.6).

Table 3.5: Seven Devils PWS ID 01-95-118 Water Use Projections (LWSP, 2015)

	2010	2015	2020	2030	2040	2050	2060
Total Demand (MGD)	0.088	0.039	0.030	0.030	0.031	0.031	0.032
Total Supply (MGD)	0.195	0.195	0.195	0.195	0.195	0.195	0.195
Demand as Percent of Supply	45%	20%	15%	15%	16%	16%	16%
*Total demand includes the amount of water used for system process (backwash water, water used in the treatment process and not distributed and water needed to maintain water quality in the distribution system) and unaccounted-for water. In 2015, the PWS reported an unaccounted-for amount of 0.004 MGD.							
**Seven Devils PWS relies on three groundwater wells (or sources) to supply water to its customers. A 12-hour safe supply yield has been calculated for each well and all three are used on a regular basis.							

Figure 3.1: Seven Devils PWS ID 01-95-118 Water Use Projections (LWSP, 2015)

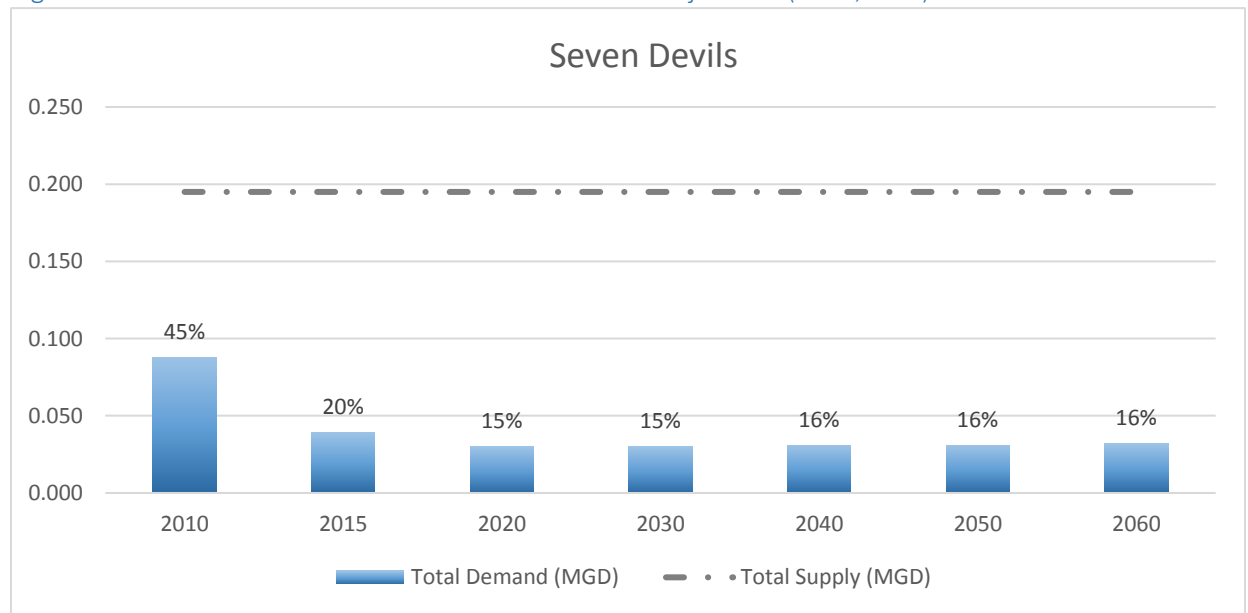


Table 3.6: Seven Devils PWS ID 01-95-118 Wastewater Management (LWSP, 2015)

Wastewater Management	Number
Sewer Connections	0
Septic Systems	370

3.1.3 Classifications and Management Strategies

Because the Watauga River and several of its tributaries have the supplement classification of Trout (Tr), High Quality Waters (HQW) and Outstanding Resource Waters (ORW), special management strategies are in place to protect water quality. From its source to the U.S. Highway 321 bridge, the Watauga River is also Class B. Lance Creek and an unnamed tributary that runs through a resort lake in Seven Devils are also Class B. Waters with a B classification are managed for primary recreation, including frequent or organized swimming. Class B waters must meet water quality standards for fecal coliform bacteria. Ordinances are in place for controlling erosion and sedimentation in Avery and Watauga counties. Both counties also have a Land Use Plan. Both plans are available online on the county websites.

Table 3.7: Stream Names and Classifications

AU Number	Stream Name	Description	Classification
8-(1)	WATAUGA RIVER	From source to U.S. Hwy. 321 Bridge	B; Tr; HQW
8-4	Valley Creek	From source to Watauga River	C; Tr
8-4.5-(1)	Unnamed Tributary to Watauga River (Seven Devils Resort Lake)	From source to dam at Seven Devils Resort Lake	B; Tr
8-4.5-(2)	Unnamed Tributary to Watauga River	From dam at Seven Devils Resort Lake to Watauga River	C; Tr
8-5	Moody Mill Creek	From source to Watauga River	C; Tr
8-5-1	Spice Bottom Creek	From source to Moody Mill Creek	C; Tr
8-6	Unnamed Tributary at Camp Rainbow	From source to Watauga River	C; Tr
8-7	Boone Fork (Price Lake)	From source to Watauga River	C; Tr; ORW
8-7-1	Cold Prong	From source to Boone Fork	C; Tr; ORW
8-7-2	Laurel Creek	From source to Price Lake, Boone Fork	C; Tr; ORW
8-7-3	Sims Creek (Sims Pond)	From source to Boone Fork	C; Tr; ORW
8-7-3-1	Hoot Camp Branch	From source to Sims Creek	C; ORW
8-7-4	Green Branch	From source to Boone Fork	C; ORW
8-7-5	Cannon Branch	From source to Boone Fork	C; ORW
8-7-6	Bee Tree Creek	From source to Boone Fork	C; ORW
8-8-(1)	Lance Creek	From source to Dam at Camp Yonahlossee Bathing Lake	B; Tr
8-8-(2)	Lance Creek	From Camp Yonahlossee Bathing Lake to Watauga River	C; Tr

3.1.4 Protecting Water Resources in the Watauga River Headwaters

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 Watauga River headwaters are included here.

3.1.4.1 NCDEQ Division of Mitigation Services (DMS)

The Watauga River headwaters and Dutch Creek are combined in the [2009 River Basin Restoration Priority \(RBRP\) Plan](#) issued by the Division of Mitigation Services (DMS). The combined watershed is one of three targeted local watersheds (TLWs) identified for priority planning and restoration project funds. Even though the combined watershed is rich in natural assets, development, land clearing activities and impervious surface cover are contributing to habitat degradation especially along the highway corridors (NC-105 and NC-194). Land conservation, preservation and restoration of riparian buffers and streams are identified as priorities in the combined watershed. DMS also recommends improved stormwater management and sediment and erosion control practices for steep slopes and any new construction activities within the combined watershed.

3.1.4.2 NC Wildlife Resources Commission (WRC)

The Wildlife Resources Commission (WRC) identifies four species of greatest conservation need (SGCN) in the Watauga River basin. SGNC 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.

Table 3.8: 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)

The Watauga River headwaters along with the Dutch Creek, Cove Creek and Beech 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 \(WAP\)](#).

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

Between 2004 and 2014, one BMP was installed in the watershed to reduce the amount of nutrients reaching the waters of the state. 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.

3.1.4.4 MountainTrue – Watauga Riverkeeper

Elevated stream temperatures were noted as a major water quality and aquatic habitat concern by several resource agencies including the Watauga Riverkeeper. Elevated stream temperatures are often the result of changes in natural conditions (i.e., impoundments, vegetation removed along streambanks) or changes in weather patterns (i.e., drought, higher than normal air temperatures during the summer months).

Shulls Mill is a breached dam on privately owned land near the headwaters of the Watauga River. Areas immediately upstream and downstream have been noted as potential aquatic habitat areas for the Hellbender (*Cryptobranchus alleganiensis*). Removal of the structure could protect and improve aquatic and floodplain connectivity. Removing the dam could also eliminate a potential liability for the property owner (Hill, 2018).

3.1.5 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.

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Personal Communication. Written by Andy Hill, Watauga Riverkeeper and MountainTrue High Country Director. Email July 26, 2018.