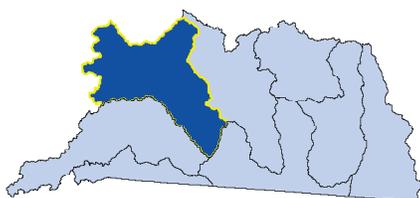


BROAD RIVER HEADWATERS WATERSHED



HUC 0305010503

Includes Buffalo Creek, Cove Creek, Mountain Creek, & Cleghorn Creek

GENERAL WATERSHED DESCRIPTION

Beginning in the mountains and flowing into the inner piedmont, the headwaters of the Broad River originates upstream of Lake Lure in Buncombe, Henderson, McDowell, and Rutherford Counties. The boulder-strewn section of the Broad River, between Bat Cave and Lake Lure, is locally referred to as the Rocky Broad River. Flat, Hickory, and Reedypatch Creeks are the largest tributaries above Lake Lure; Buffalo Creek forms a major arm of the lake; and Cove, Mountain, and Cleghorn Creeks are tributaries below the lake (Figure 1-2). Land cover is predominantly forested (Figure 1-1); however, property along portions of the Broad River and Lake Lure are being rapidly developed for second homes, vacation lodges, and recreational activities (i.e., golf courses and individual horse farms). Nonpoint source pollution from developmental actions such as these, in or near stream corridors and lake shorelines affects water quality and aquatic habitats.

WATER QUALITY OVERVIEW

Of the 291 stream miles in the Broad River Headwaters watershed, 91 miles were monitored by DWQ. Of these monitored waters, 73 percent are Supporting for their designated uses* and 13 percent are Impaired*. Close to 33 percent of monitored waters in this watershed are either Impaired or impacted* due to habitat degradation related to general agriculture, natural conditions and mine drainage. Nutrient impacts from stormwater and wastewater treatment plants are the cause of 18 percent of these waters being impaired or impacted. (Table 1-1)

WATERSHED AT A GLANCE

COUNTIES

Rutherford, Buncombe, Henderson, McDowell

MUNICIPALITIES

Chimney Rock Village, Lake Lure, Rutherfordton, Spindale

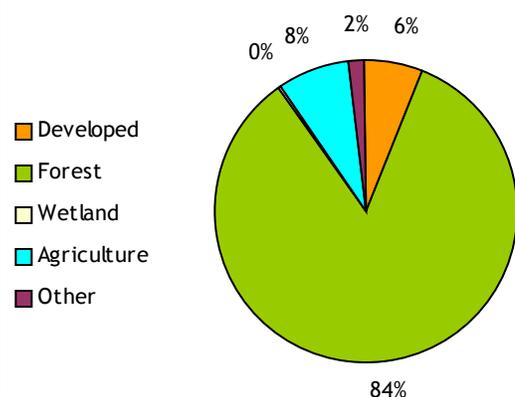
PERMITTED FACILITIES

NPDES WWTP:	2
NPDES Nondischarge:	2
NPDES Stormwater:	5
Animal Operations:	2

MONITORED STREAM MILES (AL)

Total Streams:	91.32 mi
Total Supporting:	62.12 mi
Total Impaired:	14.1 mi
Total Not Rated:	15.1 mi

FIGURE 1-1: BROAD RIVER HEADWATERS WATERSHED LAND COVER



NRI: National Land Cover Data, 2001

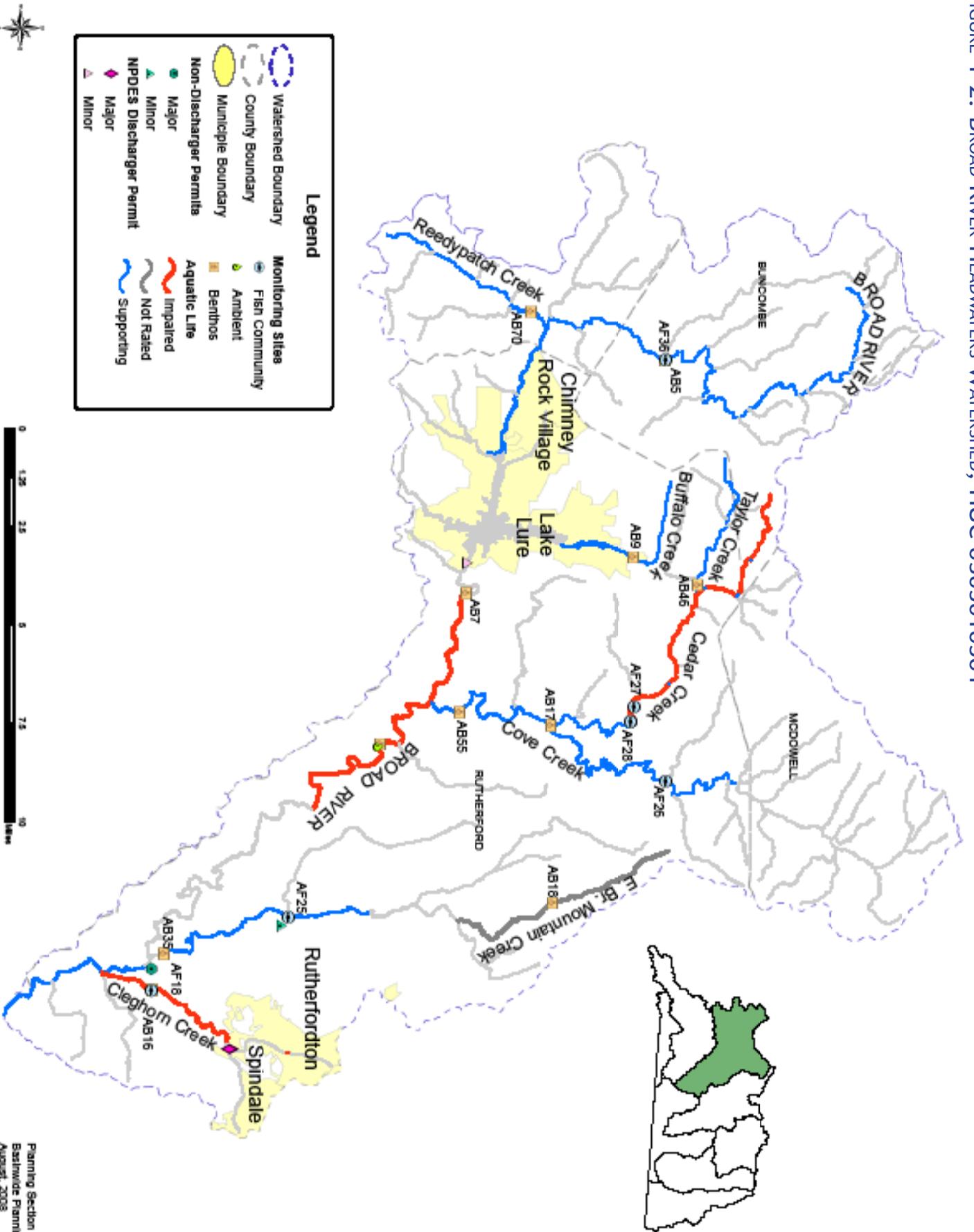
Biological monitoring was conducted at ten basinwide sites; four of these were sampled for the first time in 2005. Three additional biological sites were sampled as part of a special study. One ambient station was also monitored monthly in the Broad River Headwaters.

Overall, water quality is good in the Broad River Headwaters; however, DWQ biologists noted several streams with heavy sedimentation and streambank erosion.

Currently, there are one major and one minor NPDES permitted facilities in this watershed. The minor NPDES permit is the Lake Lure Wastewater Treatment Plant, which is permitted to discharge 1 million gallons per day into the Broad River below Lake Lure. The major NPDES permit is held by the City of Rutherfordton's Wastewater Treatment Plant, which is required to preform **toxicity testing**. Since 2000, the City of Rutherfordton's WWTP has had 22 violations. Non-compliance issue for these facilities are discussed on [page 5](#) of this chapter.

* There terms are defined in the [Glossary Chapter](#).

FIGURE 1-2: BROAD RIVER HEADWATERS WATERSHED, HUC 0305010501



Planning Section
 Basinwide Planning Unit
 August, 2008

How to Read this Document

This document was written to correspond with our new [Online Geographic Document Distribution \(OGDD\)](#) tool using Google Earth™. If you are unable to use Google Earth™, this document provides maps and associated water quality information and a discussion of water quality trends occurring in the watershed. Google Earth™ is an independent software program which can be downloaded to personal, business, and most local and state government computers; the program allows you to view satellite imagery of the earth’s surface along with location identifiers. DWQ’s Basinwide Planning Unit created a “transparency” layer to Google Earth™ with basinwide water quality data, which allows a user to locate their watershed, pinpoint a waterbody and use support ratings, find a location of a permit and provides links to PDF watershed reports. The uses for this tool will expand as the tool evolves. For more information on how to download Google Earth™ and DWQ’s data visit [DWQ’s Basinwide Planning’s OGDD](#) website. Please contact Melanie Williams for more information at melanie.williams@ncmail.net or 919-807-6447.

Impaired streams are those streams not meeting their associated water quality standards in more than 10 percent of the samples taken within the assessment period (January 1, 2002 through December 31, 2006) and impacted streams are those not meeting water quality standards in 7 to 10 percent of the samples. The [Use Support](#) report provides information on how and why water quality ratings are determined and DWQ’s “[Redbook](#)” describes, in detail, water quality standards for each waterbody classification. For a general discussion of water quality parameters, potential issues, and rules please see “[Supplemental Guide to North Carolina’s Basinwide Planning: Support Document for Basinwide Water Quality Plans](#)”.

[Appendix 1-A](#) provides descriptions of Use Support ratings for all monitored waterbodies in the subbasin.

[Appendix 1-B](#) provides a summary of each ambient data monitoring station.

[Appendix 1-C](#) provides summaries of biological and fish assessment monitoring sites.

TABLE 1-1: MONITORED STREAM SEGMENTS IN THE BROAD RIVER HEADWATERS

ASSESSMENT UNIT NUMBER	STREAM NAME	LENGTH (MILES)	CLASS.	2008 IR CATEGORY*	IMPAIRED	IMPACTED	POTENTIAL STRESSORS (POTENTIAL SOURCES)	DWQ SUBBASIN
9-(1)	BROAD RIVER	19.0	C;Tr	2	-	-		03-08-01
9-(22)b	BROAD RIVER	9.8	C	5	X	-	Habitat Degradation (Mine Drainage)	03-08-01
9-15	Reedypatch Creek	5.5	C;Tr	2	-	-		03-08-01
9-20	Buffalo Creek	4.1	C;Tr	2	-	-		03-08-01
9-23-(9)	Cove Creek	14.5	C	2	-	-		03-08-01
9-23-14-3	Taylor Creek	4.3	C;Tr	2	-	-		03-08-01
9-23-14a	Cedar Creek	8.5	C;Tr	3a	-	X	Habitat Degradation (Natural Conditions), Nutrient Impact	03-08-01
9-23-14b	Cedar Creek	3.6	C;Tr	2	-	-		03-08-01
9-25-(3.5)	Mountain Creek	6.9	WS-IV	2	-	X	Habitat Degradation (Natural Conditions & Mine Draining), Nutrient Impact	03-08-02
9-25-2	East Branch Mountain Creek	6.6	C	3a	-	X	Habitat Degradation (General Agriculture/ Pasture)	03-08-02
9-26b	Cleghorn Creek	4.3	C	5	X	-	Habitat Degradation (Stormwater Runoff, WWTP NPDES) Nutrient Impact (Stormwater Runoff, WWTP NPDES)	03-08-02

*The 2008 IR Categories definitions can be found on the first page of Appendix 1-A

CURRENT STATUS OF IMPAIRED & IMPACTED WATERS

BROAD RIVER AU#: 9-(1), 9-(22)b

Two benthic sites were sampled in the Broad River above (AB5) and below (AB4) Lake Lure. Site AB5 is located near the confluence with Flat Creek and is the most upstream site sampled in the Broad River Headwaters. To date, this site has maintained its Excellent rating and continues to support a pollution intolerant benthic and fish community. Overall, the instream habitat was favorable (habitat score 87 out of 100); however, the scarcity of pools, removal of riparian vegetation for agricultural use, and moderate streambank erosion lowered the score. Heavy rains during the time of sampling made the water turbid, an indication of potential land-disturbing activities upstream of the site. This segment of the Broad River is considered Supporting in the aquatic life category.

Located approximately six miles below the dam at Lake Lure, site AB4 received a Fair bioclassification, a significant drop from the Good rating it received in 2000. Encompassing approximately 190 square miles at this point, the overall habitat score (41 out of 100) was low due to inadequate instream habitat and minimal riparian area. The substrate was mostly sand (65 percent) with some gravel (25 percent) and rubble (10 percent). A sand dredging operation was observed just upstream on the right streambank. The 2005 benthic sample was collected in late September and previous samples were collected in July, during low flow conditions. Seasonal differences could influence the species present, but such an overall decline in species from 2000 to 2005 indicates a decline in water quality. This section of the Broad River is Impaired in the aquatic life category. This impairment and low bioclassification rating may be due to the lack of flow released from the Lake Lure dam. Site AA1 is also located here. No water quality standards were exceeded at this station.

Recommendations: Minimum flow and stage release requirements are needed for the Lake Lure dam. Extreme periodic low and high flows could be causing this biological impairment. DWQ will work with the Division of Water Resources and other agencies to address this situation. Restore vegetated areas along streambanks of these segments to help filter excess nutrients from farmlands and stabilize streambanks.

BUFFALO CREEK AU#: 9-20

Buffalo Creek was sampled at site AB9 as part of a special study requested by the DWQ Planning Section and the DWQ Regional Office Staff in Asheville. The request was made to evaluate the benthic community in response to increased development pressure in this section of Lake Lure. Site AB9 received a Good benthic bioclassification and numerous pollution intolerant species were collected. Considering the current bioclassification and types of species collected, Buffalo Creek is considered Supporting in the aquatic life category; however, biologists noted a visible increase in turbidity shortly after a rain event. Such an increase in turbidity indicates potential land-disturbing and/or construction activities upstream of the sampling site. Visual observations made throughout the Buffalo Creek watershed confirmed extensive pressure for residential development in and around the area surrounding Lake Lure.

COVE, TAYLOR & CEDAR CREEKS AU#: 9-23-(9), 9-23-14-3, 9-23-14a

Cove Creek and its tributaries drain northwestern Rutherford County, southwestern McDowell County, and the extreme southeastern corner of Buncombe County. Benthic (AB17) and fish sites (AF26, AF27, AF28) were sampled in Cove and Cedar Creeks. One benthic site (AF46) was also sampled in Taylors Creek as part of a special study in the Catheys Creek watershed. Taylors Creek and portions of Cove and Cedar Creeks are Supporting in the aquatic life category; however, the headwater of Cedar Creek is Impaired (Table 1-1).

Sites AF27 and AF28 are located in the Cedar Creek sub-watershed and were sampled based on a recommendation presented in the 2003 basin plan to document differences in the fish communities between two road crossings (SR 1008 and SR 1371). Within the 0.7-mile stretch the instream characteristics change from slow moving with sand and gravel runs (AF27) to high gradient, swift flows, boulder and bedrock shelves, plunge pools and riffles (AF28). The quality of instream habitats, substrates and the quantity and quality of the pools and riffles resulted in habitat scores of 61 out of 100 at site AF27 and 90 at site AF28.

Differences were also observed in the fish communities. Site AF27 rated Fair and site AF28 rated Good. The number of fish and diversity metrics were lower than expected at site AF27. The bluehead chub was the most abundant species present, indicating that nutrient enrichment from nonpoint sources may be impacting the stream. Even though the watershed has a drainage area of 21.3 square miles at site AF27, the stream may have naturally low fish diversity for a headwater stream. The stream has the supplemental classification of trout waters (Tr), but DWQ biologists did not find a reproducing trout populations (i.e., one with multiple age classes and sizes) at site AF27. The site slightly downstream (AF28), however, had a more balanced fish community. Two pollution intolerant species were present, and DWQ biologists found a reproducing population of naturalized, wild, rainbow trout.

In Cove Creek, fish and benthic samples resulted in Good (AF26) and Excellent (AB17) bioclassifications. Instream, riparian, and watershed characteristics were of exceptional quality at site AF26, resulting in a habitat score of 85 out of 100. Thirteen species of fish were collected with the bluehead chub being the dominant species (an indicator of nutrient enrichment).

Site AB17 is downstream of site AF26 and received an Excellent bioclassification. The substrate was almost entirely sand (70 percent) with infrequent pools and riffles, and riparian zones were narrow due to agricultural land use. DWQ biologists identified sedimentation and agricultural land use as habitat concerns for the Cove Creek watershed and noted that the substrate in 2000 was only 20 percent sand compared to the 70 percent seen in 2005.

In June 2003, Taylor Creek was sampled as a large stream control site for a special study in the Catheys and Hollands Creek watershed. Taylor Creek is a tributary to Cedar Creek with similar size, gradient, and temperature characteristics when compared to Catheys Creek; however, the Taylor Creek watershed contains more rocks with long sandy segments in the low gradient areas further downstream. Residential development was observed upstream of the sampling site (SR1314), but conservation measures were in place to protect the streambanks and residential property. Site AB46 rated Excellent. More information on the Catheys Creek watershed special study can be found [here](#).

MOUNTAIN CREEK AU#: 9-25-(3.5)

Mountain Creek drains the west-central portion of Rutherford County, and like many streams throughout the basin, it carries heavy sand bedloads. Consequently, there is a sand-dipping operation just upstream of the fish community sample location. Fish (AF25) and benthic (AB35, AB18) sites were sampled in the Mountain Creek watershed. Sites AF25 and AB35 both received Good-Fair bioclassifications. In 2005, the diversity of fish met expectations, but the total number of fish collected (98) and the percentage of species with multiple age groups were well below expectations. Similar observations have been made in streams where the flow fluctuates dramatically from extremely low flows to extremely high flows. This may be the case for Mountain Creek. The bluehead chub was the most abundant species (55 percent) and is an indicator that nutrient enrichment from nonpoint sources may be impacting the stream. The benthic community (AB35) was sampled further downstream and had a representative mix of both moderately pollution tolerant and intolerant species. The substrate was almost entirely sand (80 percent), and the low habitat score (52) reflected the homogeneous substrate, narrow riparian zone on the left bank, and failing streambanks.

East Branch Mountain Creek (AU# 9-25-2) is a tributary to Mountain Creek. It was sampled in June 2003 as a benthic control site for a special study in the Catheys and Hollands Creek watershed. The site was selected to generate comparison data for other small streams in the special study area. Much of the headwater area is forested, but land cover immediately adjacent to the stream is agricultural (i.e., pasture and row crops). Site AB18 was assigned a bioclassification rating of Not Rated. This Not Rated bioclassification would have resulted in a Good if the drainage area was greater than three square miles. Because of the adjacent land cover, there were many breaks in the riparian zone, which often results in high sediment loads. Some streambank erosion was also observed. More information on the Catheys Creek watershed special study can be found in [Chapter 9](#).

CLEGHORN CREEK AU#: 9-26b

Cleghorn Creek drains the southwestern portion of Rutherford County and includes the Towns of Rutherfordton and Spindale. Much of the land cover in the headwaters of Cleghorn is dominated by residential and commercial use while the lower sections drain agricultural lands. Benthic (AB16) and fish (AF18) sites were sampled. Substrate was a mix of sand (60 percent) and gravel (30 percent) with a small amount of rubble (10 percent). Instream habitat was inadequate, and streambanks were eroding. Site AB16 received a Fair bioclassification, a decline from the Good-Fair it received during the previous assessment period. The decline is likely attributed to both point and nonpoint sources associated with the existing land cover. Site AF18 received a Good-Fair. Nearly two-thirds of all of the fish collected were bluehead chub, indicating nutrient enrichment from nonpoint source runoff could be impacting water quality. Cleghorn Creek is Impaired for biological integrity.

Recommendations: Streambank/vegetated area restoration is needed to stabilize streambanks and filter pollutants from stormwater runoff. Increase efforts to implement stormwater BMPs in residential and commercial areas.

Recommendations for this watershed can be found later in this chapter.

SIGNIFICANT NON-COMPLIANCE ISSUES

Enforcement action has been taken against the Town of Lake Lure's WWTP (permit NC0025381) for daily, weekly and

monthly exceedences in the permitted limit for total suspended solids (TSS), fecal coliform bacteria and ammonia. These exceedences may have been caused by the lack of flow being released from the Lake Lure dam just upstream. The town is working with DWQ to ensure that the effluent discharged from the facility is within the permitted water quality standards. Upon the most recent inspection (June 2007), the facility is in compliance with existing permit limits.

The Town of Rutherfordton WWTP (permit NC0025909) is located upstream of the sampling sites on Cleghorn Creek. In addition to daily monitoring, the facility is required to evaluate the whole effluent toxicity (WET). In 2000, the facility began to experience frequent failures of the WET limits. Evaluation of the facility's copper and zinc monitoring data indicated that the effluent had reasonable potential to produce levels that were above the Action Level Policy standards in Cleghorn Creek. Acting in response to DWQ's Action Level Policy, the facility undertook toxicity identification evaluation studies to determine whether copper and/or zinc were contributing to the observed toxicity. These studies indicated that both metals were contributors to the standard exceedence. Per the Action Level Policy, limits for both metals were included in the facility's permit effective May 2004.

Several other violations are also on file for the Rutherfordton WWTP and include permit violations for fecal coliform bacteria, ammonia and chlorine. DWQ has been working with the facility through a special order of consent (SOC). A SOC is an agreement between the permit holder (the Town of Rutherfordton) and the NC Environmental Management Commission (EMC) that relaxes the limits set for particular parameters under the existing permit for a period of time until actions can be taken to reduce, eliminate or prevent water quality degradation. In the case of the Rutherfordton WWTP, the SOC relaxed limits on biological oxygen demand (BOD), total suspended solids (TSS), ammonia, and chronic toxicity from August 2005 through August 2007. Inspections conducted by DWQ indicate that the facility is on schedule with updating and repairing equipment. DWQ will continue to work with the Rutherfordton WWTP to ensure the facility stays on schedule and within its permit limits.

LOCAL INITIATIVES

UPPER BROAD RIVER WATERSHED PROTECTION PROGRAM (UPBRWPP)

The UPBRWPP is dedicated to protecting soil and water resources throughout the Broad River headwaters and provides assistance to numerous property owners and partners to reduce the impacts of erosion. The program began in 1999 when community members became concerned about sedimentation and flooding around the Town of Lake Lure. Through grants provided by the NC Clean Water Management Trust Fund (CWMTF), Section 319 Nonpoint Source Program, as well as Henderson, Buncombe and Rutherford Counties, the program has provided assistance for numerous projects. The program works on a voluntary basis and provides up to 90 percent of the cost of erosion control measures once they have been properly installed. Projects include technical assistance, grading contractor oversight and streambank restoration. **To date, 118 conservation plans have been written, 56 of which have been implemented. Under those 56 conservation plans, erosion control measures were established on approximately 50 acres and 63.3 acres of riparian corridors have been protected.** The UPBRWPP is continually working with voluntary landowners that have existing erosion and sediment problems that predate 2003. More information on the UPBRWPP can be found on the [UPBRWPP website](#).

TOWN OF LAKE LURE COMPREHENSIVE PLAN

In June 2007, the Town of Lake Lure adopted a comprehensive plan to ensure that new development and future planning meets the goals of conservatively managing growth, developing a sustainable economy, promoting and preserving the Town's character, enhancing and preserving the natural environment, improving public infrastructure (e.g., transportation), and providing public services efficiently. The plan provides a long-term vision but will be reviewed annually and updated every five years to acknowledge changes in community goals and planning objectives. The North Carolina Sedimentation Control Commission can delegate authority to implement the Sedimentation Pollution Control Act to cities and counties that adopt a qualifying local erosion and sediment control ordinance in compliance with State requirements. The staff of the local program review erosion and sediment control plans and enforce compliance with the approved plan within their jurisdictions. The Town of Lake Lure is a delegated authority and has made great strides in addressing sediment and erosion control issues within the town's city limits. More information about erosion control can be found at the [Town of Lake Lure's website](#). A copy of the Town's comprehensive plan can also be found at the [Town's website](#).

WATERSHED RECOMMENDATIONS

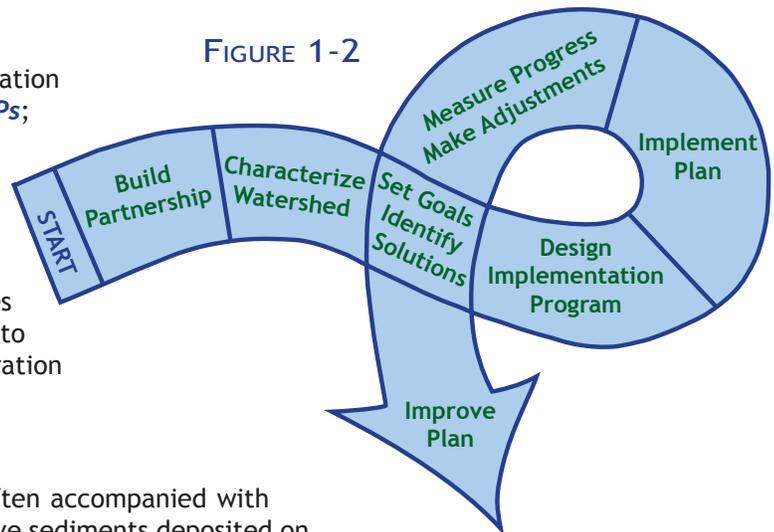
Habitat Degradation

In most cases habitat is degraded by the cumulative effect of several stressors acting in concert. These stressors often originate in the upland portions of the watershed and may include impervious surfaces, sedimentation and erosion

from construction, general agriculture, and other land disturbing activities.

Many tools are available to address habitat degradation including: *urban stormwater BMPs*; *agricultural BMPs*; ordinance and/or rule changes at the local, state, and federal level; volunteer activism; and education programs. Figure 1-2 illustrates the general process for *developing watershed restoration plans*. This process can and should be applied to streams impaired or impacted by habitat degradation. Interested parties should contact the *Basinwide Planning Program* to discuss opportunities to begin the planning and restoration process in their chosen watershed.

FIGURE 1-2



Turbidity

Turbidity is a measure of cloudiness in water and is often accompanied with excessive sediment deposits in the streambed. Excessive sediments deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), impair fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can make it more difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can cause taste and odor problems, block water supply intakes, foul water treatment systems, and fill reservoirs (USEPA, 1999 and Waters, 1995). Sand and silt were noted in the stream substrate at many of the biological sample sites in the Broad River Headwaters.

Soil erosion is the most common source of turbidity and sedimentation and while some erosion is a natural phenomenon, human land use practices accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations, excessive stormwater flow off impervious surfaces are all potential sources. The distribution of turbidity violations and sample locations make it difficult to isolate a single source of erosion in the Broad River Headwaters. It appears, however, violations are highest near agricultural areas, and transitional suburban areas. Violations are lowest in the upper watershed where land cover is predominantly forest. This trend demonstrates the importance of *protecting and conserving stream buffers and natural areas*.

It is likely that a combination of human caused land disturbances and natural erosion are causing the majority of turbidity violations in this watershed, with human causes being the leading contributor. To appropriately address turbidity and sediment problems in the Broad River Headwaters, an assessment to determine the contribution of human accelerated erosion sources relative to natural processes should be undertaken. All reasonable efforts to reduce or eliminate human sources of erosion should be implemented immediately. These efforts can be organized by developing watershed restoration plans based on the process outlined in Figure 1-2. Plans are needed for each watershed with a turbidity stressor.

Nutrient Impact

Nutrients refer to phosphorus (P) and nitrogen (N), which are common components of fertilizers, animal and human waste, vegetation, aquaculture and some industrial processes. Nutrients in surface waters come from both point and nonpoint sources including agriculture and urban runoff, wastewater treatment plants, forestry activities and atmospheric deposition. While nutrients are beneficial to aquatic life in small amounts, excessive levels can stimulate algal blooms and plant growth, depleting dissolved oxygen in the water column.

Nutrient impacts in this watershed are mainly from agriculture, commercial and residential property stormwater runoff. Riparian buffers are needed along streams to filter excess nutrients and other contaminants before the runoff reaches the stream. Excessive fertilizing of residential lawns and golf courses also significantly impacts water quality. Education, along with encouraging the use of riparian buffers, can reduce the amount of phosphorus and nitrogen entering surface waters.

Other

The Town of Lake Lure's comprehensive plan provides an introduction to existing infrastructure as well as steps to meet future development goals. Post-construction stormwater controls and policies should be established for new development activities required to submit an erosion and sediment control plan to the Town for approval. The impact of stormwater from new development may be mitigated by practices, which treat and store stormwater runoff before it affects downstream waterbodies. In addition, the Town can encourage low-impact development designs that reduce

the amount of impervious surface cover and the amount of stormwater that leaves a homeowner or commercial business site. More information about post-construction best management practices (BMPs) can be found [here](#). More information about low-impact development can be found [here](#).

REFERENCES & SUPPORTING DOCUMENTATION

- Town of Lake Lure. June 2007. *Town of Lake Lure 2007-2027 Comprehensive Plan*. Prepared by LandDesign, Inc. www.townoflakelure.com/LL_comp_plan.htm.
- Town of Lake Lure. Town Services - Erosion Control. Web site access September 14, 2007. www.townoflakelure.com/erosion_control.htm.
- NCDENR Division of Water Quality. April 2006. *Basinwide Assessment Report - Broad River Basin*. <http://h2o.enr.state.nc.us/esb/Basinwide/Broad2006FinalAll.pdf>.
- NCDENR Division of Water Quality. February 2003. *Broad River Basinwide Water Quality Plan*. <http://h2o.enr.state.nc.us/basinwide/Broad/2002/plan.htm>.
- U.S. Environmental Protection Agency (EPA). Post-Construction Stormwater Management in New Development and Redevelopment. Web site access September 19, 2007. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=min_measure&min_measure_id=5.
- U.S. Environmental Protection Agency (EPA). Low Impact Development (LID) and Other Green Designs Strategies. Web site access September 19, 2007. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=124.
- U.S. Environmental Protection Agency (USEPA) 1999. Protocol for Developing Sediment TMDLs. First Edition. EPA 841-B-99-044. U.S. EPA, Office of Water, Washington D.C.
- Waters, T.F. 1995. Sediment in streams—Sources, biological effects, and control. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, MD.