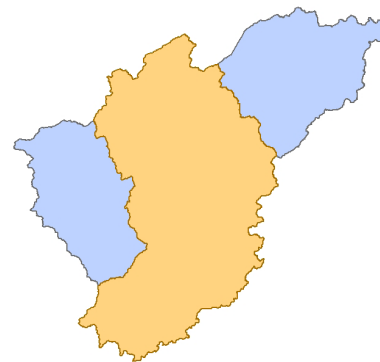


Chapter 1

Upper French Broad River

Part of Hydrologic Unit Code 06010105



Subbasin Overview

The Upper French Broad River subbasin encompasses 1,658 square miles from its headwaters in western Transylvania County to the Tennessee-North Carolina state line, making it the largest subbasin in the basin. It is made up of the following old DWQ subbasins: 03-04-01, 03-04-02, 03-04-02, and 03-04-04. Major tributaries to the French Broad River include: Big Laurel Creek, Cane Creek, Davidson River, Hominy Creek, Little River, Mills River, Mud Creek, Sandymush Creek, Spring Creek, and Swannanoa River.

The Mills River, Little River, and portions of the French Broad River support populations of the Federally endangered Appalachian Elktoe. This mussel species, once found throughout the mountains of western North Carolina requires clean, well-oxygenated water that flows at a moderate to fast pace. They also require stable, relatively silt-free, gravelly or rocky stream bottoms (USFWS, 2008).

Population and Land Cover

This is the most populous subbasin in the basin. Population and land use patterns correlate to the natural environment in that most of the population and agriculture can be found in the Broad Basins ecoregion. This is because the land is less sloped and the soils are more suitable for development and agriculture. As a result, urban development and agricultural activity have been concentrated in valleys near the waterways and in many cases up to the stream banks.

Permits

NPDES Wastewater Discharge

There are 93 NPDES individual wastewater discharge permits in this subbasin with a total permitted flow of 66.2 million gallons per day (MGD). Four of those dischargers are permitted to discharge one MGD or more of treated wastewater. They are the French Broad River Water Reclamation Facility (40 MGD), Davidson River Village LLC (Former Ecusta Mill) (13 MGD), Hendersonville WWTP (6 MGD), and Brevard WWTP (2.5 MGD). It should be noted that Davidson

WATERSHED AT A GLANCE

COUNTIES

Buncombe, Haywood, Henderson, Madison, Transylvania and Yancey

MUNICIPALITIES

Asheville, Biltmore Forest, Black Mountain, Brevard, Canton, Flat Rock, Fletcher, Hendersonville, Hot Springs, Laurel Park, Mars Hill, Marshall, Mills River, Montreat, Rosman, Weaverville and Woodfin

POPULATION

1990: 279,614 or
169 per mi² 2000:
334,743 or 202 per mi²

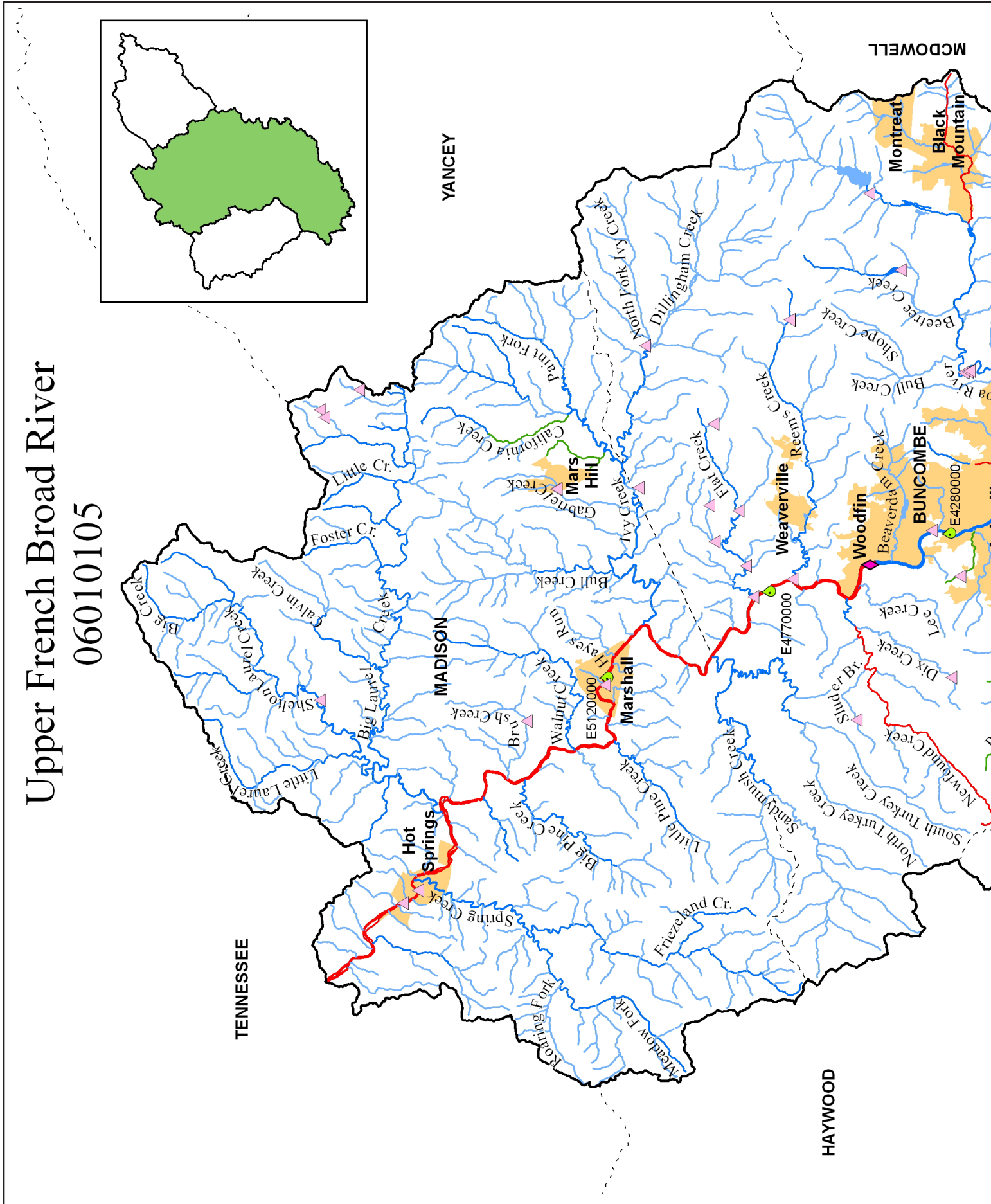
2001 LAND COVER

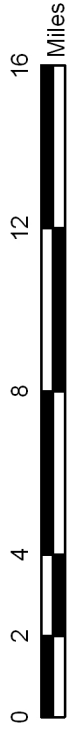
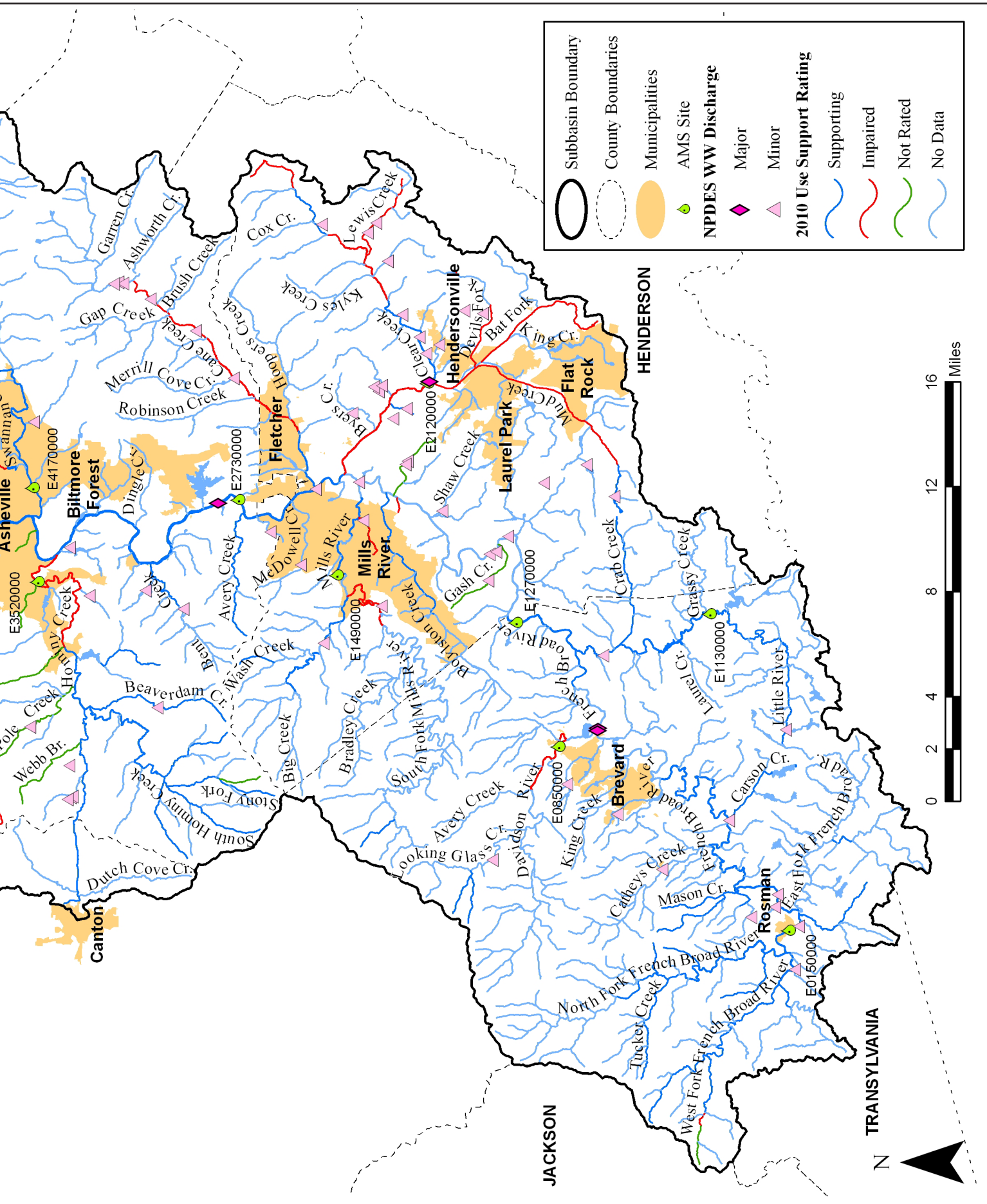
Developed: 12.4
%
Forest: 69.6
% Agriculture:
14.0 %
Other:
4.0 %

EPA LEVEL IV ECOREGIONS

Southern Crystalline Ridges and Mountains
Southern Metasedimentary Mountains
Southern Sedimentary Ridges
High Mountains
Broad Basins

FIGURE 1-1: UPPER FRENCH BROAD RIVER SUBBASIN (06010105)





River Village does not discharge process wastewater. It treats landfill leachate and only discharges during heavier rainfall events. Figure 1-1 shows the location of all NPDES individual wastewater permits in this sub-basin. For a complete list of all NPDES wastewater permits (both individual and general), see Appendix V.

While compliance at wastewater treatment plants has improved, many collection systems continue to report frequent sanitary sewer overflows (SSOs). State Statute 143-215.1C requires that wastewater collection system owners report all SSO incidents. The main causes of SSOs are broken or clogged sewer lines, pump station failures, and inadequate treatment capacity. The following are some ways to prevent SSOs from occurring:

- Sewer system cleaning and maintenance;
- Reducing infiltration and inflow through system rehabilitation and repairing broken or leaking service lines; and
- Enlarging or upgrading sewer, pump station, or sewage treatment plant capacity and/or reliability.

There are 11 permitted trout farms in the basin. This number excludes farms not meeting permit coverage requirements related to annual fish production and feed usage. (See *NPDES General Permit NCG530000* for more information.) Macroinvertebrate and chemical sampling data collected in streams utilized by certain farms indicate negative impacts to water quality. Additional data need to be collected and analyzed. In an effort to support the industry in the region and improve and protect water quality, a collaborative approach has been undertaken, enlists trout farmers, NC Department of Agriculture and Consumer Services, NC Cooperative Extension and DWQ. The outcomes should be a better understanding of farm operations, best management practices, water resource protection, and regulatory needs. The NCG530000 permit will be renewed in July 2012. Any necessary permit modifications to fully protect surface waters utilized by trout farm operations will be considered and discussed by the DWQ and stakeholders during the renewal period.

During this process, DWQ encourages trout farms to contact their local extension service and/or research institutions to use management measures, such as those recommended/developed by DWQ in Collaborative Assessment for Watershed and Streams (CAWS) Project (funded by an EPA 104(b)(3) grant), including:

- Use hand feeding as much as possible to reduce the amount of food that enters the raceways and stream;
- Use high quality feed, which results in less manure production;
- Clean raceways regularly and land apply the manure as fertilizer; and
- Consider reducing the amount of fish being raised if the assimilative capacity has been exceeded.

The Asheville Steam Electric Plant is the only coal-fired power plant with a NPDES individual discharge permit that utilizes ash ponds in the basin. The first pond was first used in 1964 and is now closed; however, a second pond was installed in 1982 and is currently in use. These ash ponds are used to store waste generated by the process of removing pollutants from the atmospheric emissions. The plant is required to monitor the effluent from these ponds and report to DWQ. The Division of Land Quality is responsible for ensuring the structural integrity of the ponds. In June 2009, EPA posted a list of potential high hazard impoundments containing coal combustion residuals. Both of the Asheville Steam Electric Plant ponds were listed.

Stormwater Permits

The DWQ *Stormwater Permitting Unit* of the *Wetlands and Stormwater Branch* is responsible for the development, planning, and implementation of statewide stormwater control policies, strategies, and rules designed to protect the surface waters of North Carolina from impacts of stormwater pollutants and run-off volumes. This unit handles permitting for industrial, municipal, and post-construction (for development projects) stormwater programs, as well as provides technical assistance to the regulated community, engineers, industry, citizens, and local governments. For a list of stormwater permits in the basin, refer to Appendix V.

Animal Operations

There are eight permitted cattle operations in the Upper French Broad River subbasin. While this makes up over half of the animal operations in the basin, it is a small amount when compared to concentrations of such activities in the piedmont and coastal plain. However, DWQ, the Division of Soil and Water Conservation, local soil and water conservation districts, NRCS, RC&Ds, and funding agencies, and farmers all work together to install management measures (i.e, livestock exclusion from streambanks, alternate water supplies for livestock watering) to protect water quality.

Ambient Water Quality

There were 12 sites sampled as part of the DWQ's Ambient Monitoring System. Of those 12 sites, three resulted in turbidity impairments and one in a low pH impairment. Two sites exceeded the screening criteria for fecal coliform bacteria, but five samples in a 30-day period are required to make a determination on whether those waterbodies should be impaired. Based on 5-in-30 sampling that was done in 2009, these waters were not impaired.

The DWQ collected data at two Random Ambient Monitoring System sites in 2007 and 2008. An Unnamed Tributary to the French Broad River was impaired for low dissolved oxygen based on sampling at one RAMS site. The other site, located on an Unnamed Tributary to Mud Creek, did not exceed any standards for any parameters sampled.

Biological Health

DWQ collected 102 benthic macroinvertebrate samples in the Upper French Broad River watershed from January 2004 - December 2008 at 97 different locations. Figure 1-2 shows the current site rating for all benthic macroinvertebrate sampling sites in which at least one sample was taken during the assessment period. Figure 1-3 illustrates how those site ratings changed. Fish communities were sampled 15 times at 14 different locations in the Upper French Broad River watershed from January 2004 - December 2008.

FIGURE 1-2: CURRENT BENTHOS SITE RAT-

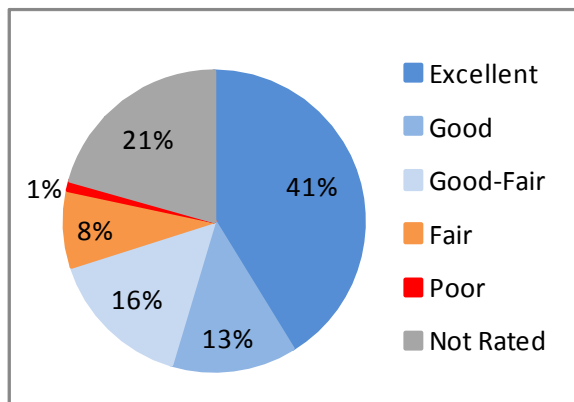
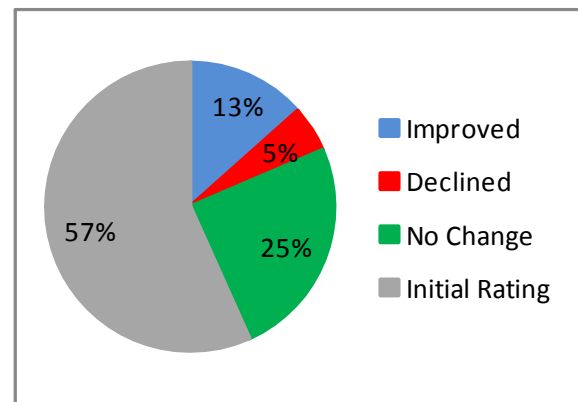


FIGURE 1-3: CHANGE IN BENTHOS RATINGS



Two fish kills were reported in the Upper French Broad River subbasin between January 2004 and December 2008 which were caused by a waste spill and pesticide runoff. DWQ is working with stakeholders in both these subwatersheds to identify and address all problems that threaten water quality.

Lake Sampling

Three lakes were sampled in the subbasin during the summer of 2007: Lake Julian, Beetree Reservoir, and Kenilworth Lake. Both Beetree Reservoir and Kenilworth Lake are supporting all their designated uses, while Lake Julian is Not Rated due to an insufficient number of samples.

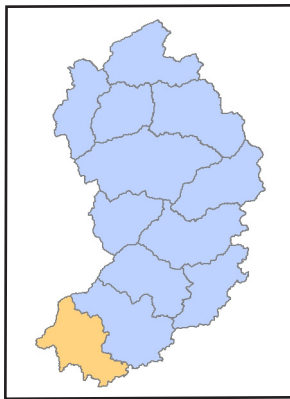
Local Water Quality

The North Carolina portion of the Upper French Broad River subbasin has twelve 10-digit hydrologic units. Table 1-1 lists these watersheds with a summary of their sizes and the number of locations that were sampled between January 2004 and December 2008.

TABLE 1-1: 10-DIGIT HYDROLOGIC UNIT OR WATERSHEDS IN THE UPPER FRENCH BROAD RIVER SUBBASIN

10-DIGIT HUC	NAME	SQUARE MILES	BENTHIC SITES	FISH COM. SITES	AMBIENT SITES
0601010501	Headwater French Broad River	129.8	15	0	1
0601010502	Davidson River - French Broad River	167.5	7	1	3
0601010503	Mud Creek	112.6	10	0	2
0601010504	Mills River - French Broad River	132.6	10	3	2
0601010505	Hominy Creek	103.9	9	2	1
0601010506	Swannanoa River	132.7	2	0	1
0601010507	Cane Creek - French Broad River	153.8	7	2	1
0601010508	Ivy Creek	161.1	5	2	0
0601010509	Sandymush Creek - French Broad River	235.8	6	2	2
0601010510	Big Laurel Creek	132.3	16	0	0
0601010511	Walnut Creek - French Broad River	95.2	5	1	1
0601010512	Spring Creek - French Broad River	106.0	5	1	0

Headwater French Broad River Watershed (0601010501)



This watershed contains the Town of Rosman and a small outlying portion of the Town of Brevard. There are five minor NPDES individual wastewater discharge permits in the watershed with permitted flows totaling 0.46 MGD. The Town of Brevard's water supply comes from a surface water intake located on Catheys Creek. Approximately 44 percent of this watershed is in the Pisgah National Forest. Several streams in this watershed provide habitat for the Hellbender Salamander, which is a US Fish and Wildlife Service Species of Concern.

West Fork French Broad River Subwatershed (060101050102)

West Fork French Broad River [AU# 6-2-(0.5)b] is Impaired as a result of a Fair bio-classification rating at benthic macroinvertebrate sampling site EB43. Special studies were conducted in 2002 and 2003 to determine the impacts on the benthic macroinvertebrate and fish community populations from a trout farm discharge to this section of the West Fork French Broad (BAU memorandum B-20020125, F-20031120; NCDENR-DWQ, 2004). A review of the studies cited above indicates that the trout farm is likely one of several factors having a negative impact on stream water quality.

DWQ encourages trout farms to contact their local extension service and/or research institutions to use management measures such as those recommended/developed by DWQ in Collaborative Assessment for Watershed and Streams (CAWS):

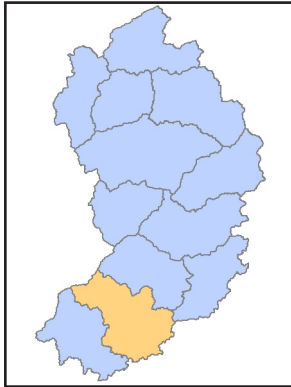
- Use hand feeding as much as possible to reduce the amount of food that enters the raceways and stream;
- Use high quality feed, which results in less manure production;
- Clean raceways regularly and land apply the manure as fertilizer; and
- Consider reducing the amount of fish being raised if the assimilative capacity has been exceeded.

For additional information see the *West Fork French Broad CAWS Report*.

Cherryfield Creek - French Broad River Subwatershed (060101050105)

Peter Weaver Creek [AU# 6-10a and 6-10b] and Morgan Mill Creek [AU# 6-10-1b and 6-10-1c] were Impaired in 2002 for aquatic life due to a lack of ecological and biological integrity. In 2002, the Watershed Assessment and Restoration Program (WARP), now known as the Watershed Assessment Team (WAT), completed a water quality study of Peter Weaver Creek and Morgan Mill Creek that resulted in the development of management strategies to improve water quality. Peter Weaver Creek and Morgan Mill Creek are currently rated as Supporting for aquatic life.

Davidson River - French Broad River Watershed (0601010502)



This watershed contains almost all of the Town of Brevard. There are two major and six minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 5.78 MGD. Both the Dupont and Holmes State Forests are found in the eastern part of the watershed. Over one-quarter of the watershed is part of the Pisgah National Forest, including both Looking Glass Rock and John Rock Registered Heritage Areas.

Davidson River Subwatershed (060101050202)

The Davidson River is home to two Federal Species of Concern: the Hellbender Salamander and the French Broad Crayfish. Wetlands along the Davidson River also support populations of the Federally Threatened Bog Turtle. Over 93 percent of this watershed is managed by either the United States Forest Service or the National Park Service.

Davidson River [AU# 6-34-(15.5)] is Impaired for low pH because 15.4 percent of the samples exceeded the water quality standard at ambient monitoring site E0850000. Normally, pH in French Broad River Basin should be 6-9 s.u. The cause of low pH has yet to be determined. The pH meter was replaced in April 2010 and the samplers received additional training. It is still too early to determine if low pH values were result of sampling errors or some other cause. A TMDL is currently being developed by the Tennessee Department of Environment and Conservation for low pH in the Great Smoky Mountains National Park caused mainly by acidic atmospheric deposition. Implementation of this TMDL may help reduce atmospheric deposition in North Carolina by reducing the amount of atmospheric pollution coming from Tennessee. It is uncertain whether the low pH in the Davidson River is the result of atmospheric deposition or some other source. DWQ will continue to monitor this location and work with the National Park Service and National Forest Service to determine the cause(s).

In May 2007, a fish kill of approximately 22,700 was reported near the confluence of the Davidson River and the French Broad River. The event was caused by a waste spill as contract engineers were working to drain and remove old waste storage tanks at the Davidson River Village LLC (formerly Ecusta Mill) plant site. The leaked substance included sodium hydrosulfide, according to the North Carolina Department of Health and Human Services - Division of Public Health. A break underneath the plant property allowed the material to run into an underground stormwater system, into drainage ditches, and the Davidson River. A civil penalty assessment of \$13,608 was made against Davidson River Village LLC as a result of the spill. Davidson River Village LLC did fish replacement after the kill.

Williamson Creek - French Broad River Subwatershed (060101050203)

In 2005 and 2006, the North Carolina Ecosystem Enhancement Program (EEP) restored 2,119 linear feet of stream along three reaches of Kings Creek. Prior to restoration, Kings Creek had been straightened and was incised due to historic channel and buffer alterations. EEP has been monitoring this site to ensure that the restoration was successful and will continue to monitor the site until at least 2013.

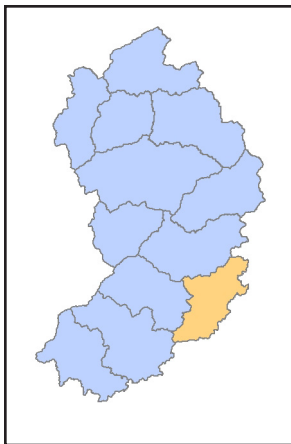
Upper and Lower Little River Subwatershed (060101050204 and 060101050205)

Mountain Sweet Pitcher Plant is on the Federal Endangered species list and has been found within this subwatershed in a few wetland areas. Another wetland plant, Swamp Pink, can also be found here and is on the Federal Threatened species list. Little River, below Cascade Dam, contains the Appalachian Elktoe which is a freshwater mussel listed on the Federal Endangered species list. The entire Little River watershed would benefit from greater protection through increased conservation.

Layday Creek - French Broad River Subwatershed (060101050206)

French Broad River [AU# 6-(27)c] is a class B water because it is used heavily for recreation that often involves prolonged skin contact with the water. This river segment is regularly screened for fecal coliform bacteria levels at ambient monitoring site E1270000. Due to high levels of bacteria in 2009, a special study was conducted between July 13, 2010 and August 12, 2010 that consisted of five fecal coliform bacteria samples taken over a 30 day period. Five samples in a 30 day period are required to make a use support determination. The geometric mean for those samples was 167 colonies/100 mL, meaning that this stream segment is currently meeting water quality standards for human health.

Mud Creek Watershed (0601010503)



This watershed contains Hendersonville, most of Flat Rock, and eastern Laurel Park. There are 17 minor and one major NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 6.54 MGD. Based on the 2001 National Land Cover data set the watershed is 28.9 percent urban and 25.3 percent agricultural making it one of the most altered watersheds in the basin. The southwestern portion of the watershed is highly urbanized, while the northeast portion is mostly agricultural.

In 2000, the Land-of-Sky Regional Council of Governments convened local stakeholders to combine and focus stream improvement efforts. Since then, the Mud Creek Watershed Council has remained an informal yet active coalition of partner agencies, organizations, local government officials and staff, and private entities.

Some specific measures implemented include: pesticide application management; streambank stabilization; stream restoration; pasture watering system installation; and certification of professional landscapers in the areas of stream stabilization and restoration. In 2007, Henderson County adopted a new local Sedimentation and Erosion Control ordinance.

Mud Creek Watershed Council efforts were recognized by EPA in 2009. Efforts in Clear Creek subwatershed resulted in 50 percent of the assessment units in that subwatershed being restored. These improvements were officially approved by EPA under a policy measure known as SP12. For more information visit the [***Mud Creek Watershed Use Restoration website***](#).

Upper Mud Creek Subwatershed (060101050301)

Bat Fork [AU # 6-55-1a and 6-55-1b] has been sampled for benthic macroinvertebrates 11 times at six different locations between 1989 and 2009. None of them have ever received a rating greater than Fair. Site EB50, the uppermost site, has a drainage area smaller than three square miles. It was sampled in the spring of 2010 using the new small stream criteria sampling and rated Good-Fair; however, restoration opportunities still exist in the headwaters of Bat Fork.

Devils Fork [AU # 6-55-8-2b] is impaired for biological integrity due to sample taken at EB80 in 2000 that rated Poor. This site is located in Hendersonville at US Highway 64 and land use in the drainage area is a mixture of agriculture and urban. The stream is highly channelized and lacks adequate buffers in many areas.

Mud Creek [AU # 6-55b] is impaired for biological integrity due to a Fair rating at benthic macroinvertebrate sampling site EB119 in August of 2007. This section of stream runs through an agricultural area, lacks a buffer for a distance of approximately two miles, and has a modified channel.

Mud Creek [AU # 6-55c] is impaired for biological integrity due to Fair ratings at benthic macroinvertebrate sampling site EB120 in 2001 and EB309 in 2000. Benthic macroinvertebrate sampling site EB122 received a Poor rating in 2001. Also, fish community sampling site EF35 was rated Poor in 2002. All of these sites are located in urban areas.

A 319 Nonpoint Source Pollution Control Grant was awarded to the Carolina Mountain Land Conservancy to restore 3,300 linear feet of stream channel, 10 acres of riverine wetlands, and 5.3 acres on non riverine wetlands. The non riverine wetland to be restored is known as Ochlawaha Bog and is considered by the North Carolina Natural Heritage Program to be a significant resource of the State. It also supports a Federally Endangered plant, the Bunched Arrowhead. This project is expected to be completed in June 2011.

Clear Creek Subwatershed (060101050302)

Lewis Creek [AU # 6-55-11-6] was sampled for benthic macroinvertebrates at two different locations in 2006. Both sites EB112 and EB113 rated Fair, even though one site is upstream and one site is downstream of the Western Justice Academy wastewater discharge. EB112 and EB113 both had very low habitat scores of 28 and 45 out of a possible 100.

A 319 Nonpoint Source Pollution Control Grant was awarded to the Henderson County Cooperative Extension Service to develop the Lewis Creek nine element watershed restoration plan; provide education; restore 1,500 linear feet of stream; and install agricultural best management practices. The stream restoration took place on Lewis Creek and Byers Creek immediately upstream of site EB112. This project was completed August 2009.

The North Carolina Ecosystem Enhancement Program (EEP) is currently in the design phase of a project to restore 1,750 linear feet of Lewis Creek between EB112 and EB113. Additional stream restoration and BMP installation is still needed throughout this mostly agricultural watershed.

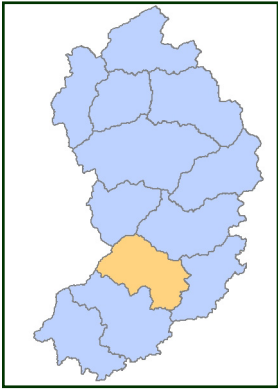
Clear Creek [AU # 6-55-11-(1)a] was Impaired in 2000 due to a benthic macroinvertebrate sample at site EB76; however, at this point the stream does not meet the minimum drainage area of three square miles for conventional sampling. Site EB76 was re-sampled in spring 2010 using small stream criteria and received a rating of Good.

Clear Creek [AU # 6-55-11-(1)c] is Impaired for biological integrity due to a Poor bioclassification rating at benthic macroinvertebrate sampling site EB74, and Clear Creek [AU # 6-55-11-(5)a] is Impaired for biological integrity due to a Fair bioclassification rating at benthic macroinvertebrate sampling site EB72. Potential causes include pesticides from apple orchards and overall habitat degradation. Some agricultural impacts may be due to legacy pesticides and/or current-use products. The distinction is unknown without further study.

Lower Mud Creek Subwatershed (060101050303)

Mud Creek [AU # 6-55d] is Impaired for biological integrity due to a Fair rating at benthic macroinvertebrate sampling site EB123 in 2007. This section of the creek may be suffering from local habitat degradation and cumulative water quality impacts from throughout the watershed.

Mills River - French Broad River Watershed (0601010504)



Approximately 42 percent of this watershed is part of the Pisgah National Forest. The southern and central portions of the Town of Mills River are also in this watershed. There are 11 minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 1.08 MGD.

Mills River is one of the few remaining areas that still support populations of the Federally Endangered Appalachian Elktoe. This mussel species, once found throughout the mountains of western North Carolina, requires clean, well-oxygenated water that flows at a moderate to fast pace. They also require stable, relatively silt-free, gravelly or rocky stream bottoms (USFWS, 2008).

In the Summer of 2008, DWQ staff in the Asheville Regional Office conducted an investigation of agricultural pesticides in the Mills River watershed. Main crops grown in the watershed include corn, peppers, and tomatoes. These fields are located along the Mills River, lower North Fork Mills River, and lower South Fork Mills River. Pesticides were found throughout the lower portions of the Mills River-French Broad River watershed. Pesticides detected above their practical quantization limits include chlorothalonil, dicamba, dimethoate, metolachlor, and 2,4-D (Lavery and Williams, 2009). However, only chlorothalonil and dimethoate were detected above aquatic life standards and none were above human health or water supply standards.

In the Summer of 2010, another round of pesticide sampling occurred in the watershed. Chlorothalonil, dieldrin, dimethoate, metolachlor, DDT 4,4 and DDE 4,4 were all found above their respective aquatic life standards. Chlorothalonil, dieldrin, and DDT 4,4 were all found above both human health and water supply standards. Some of these pesticides have been banned.

While education and the installation of pesticide mixing stations has taken place in many areas in the watershed, continued focus on and funding for proper pesticide use is needed in order to protect aquatic life and the water quality of this drinking water supply.

The Mills River Partnership was recognized by EPA in 2008. Efforts in Mills River subwatershed resulted in 47 percent of the assessment units in that subwatershed being restored. These improvements were officially approved by EPA under a policy measure known as SP12.

Boylston Creek Subwatershed (060101050401)

Boylston Creek [AU # 6-52-(0.5)] was sampled on July 17, 2006 to determine whether it met the criteria for Trout Waters classification (BAU Memorandum F-20060829). It was determined that it does qualify to be reclassified from class C to C;Tr. A Public Hearing was held in October 2008 to solicit comments. The reclassification was approved by the Environmental Management Commission on March 12, 2009 and by the Rule Review Commission on April 16, 2009. Session Law 2010-157 (passed on July 22, 2010) delays the reclassification of Boylston Creek until July 1, 2011, provided there is no further action taken. Additional public meetings were held at the Mill Creek Community Center and in Transylvania County on October 26, 2010 to solicit comments. There is legislation pending in the 2011 General Assembly that may determine the fate of the trout reclassification. Trout Waters require a 25 foot buffer and stricter domestic and industrial wastewater treatment standards.

South Fork Mills River Subwatershed (060101050402)

South Fork Mills River was sampled for benthic macroinvertebrates at three locations with each being sampled once in June and again in August of 2009. All samples rated Excellent, suggesting that benthos has recovered from incidents of pesticide pollution (i.e., July 2007 fish kill) to pristine habitat in the upper portion of the subwatershed (BAU Memorandum B-20100526). The 2007 fish kill (mainly rainbow trout) was attributed to pes-

ticide (chlorothalonil) from tomato fields. The incident was documented by DWQ and water samples showed the presence of chlorothalonil in field runoff and samples collected from the river. The event occurred after heavy rain following pesticide application. This area of the South Mills River supports a documented population of the Federally Endangered Appalachian Elktoe mussel (*Alasmidonta raveneliana*). A follow up survey conducted on July 29, 2007 indicated that all mussels collected in the South Mills River were in good condition. Benthic macroinvertebrate samples, taken in August 2007 showed a substantial impact from the pesticide (BAU memorandum B-20070925), but the most recent assessment should result in the South Fork Mills River [AU # 6-54-3-(17.5)] being listed as restored (no longer Impaired). Because pesticides remain a concern in this subwatershed, cooperative efforts will continue to protect aquatic life and the water quality of this drinking water supply.

Over the past few years, the Camp Highlander WWTP had problems meeting its permit limits for biological oxygen demand, fecal coliform bacteria, and flow. Previously, a sand filter system with two septic tanks was utilized to treat the wastewater. In May 2010, a new state-of-the-art subsurface non-discharge system went into operation. However, Camp Highlander is retaining its discharge permit in case flow exceeds the rate at which the new drip irrigation system can infiltrate.

Mills River Subwatershed (060101050403)

Brandy Branch [AU # 6-54-6] is Impaired for biological integrity due to a benthic macroinvertebrate sample taken at site EB163 in October of 1994 that rated Fair. Brandy Branch, located entirely within the Town of Mills River municipal boundaries is in a Water Supply III watershed and is a high priority for stream restoration. This stream has been channelized and receives an excess amount of stormwater runoff. The drainage area associated with site EB163 is less than three square miles and could be sampled again if resources allow using small streams criteria to either confirm impairment or determine that the stream is now supporting.

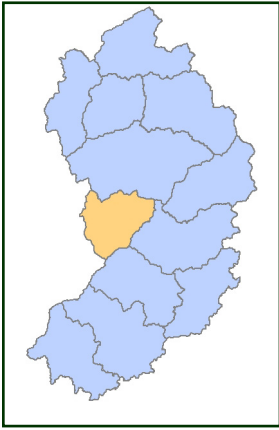
Benthic macroinvertebrate sampling site EB396 on the North Fork Mills River was sampled once in June and again in August 2009. The results showed a dramatic decline of pollution intolerant species despite a habitat score of 90 out of 100. In June, the site rated Excellent, but fell to Good-Fair in August (BAU Memorandum B-20100526). During the 2008 pesticide study this location exceeded the aquatic life standard for the pesticide dimethoate which is highly toxic to aquatic organisms. Because pesticides remain a concern in this subwatershed, cooperative efforts will continue in order to protect aquatic life and the water quality of this drinking water supply.

Shaw Creek - French Broad River Subwatershed (060101050404)

An Unnamed Tributary to the French Broad River [AU # 6-(47.5)ut23] is Impaired due to low dissolved oxygen levels at random ambient monitoring system site E1445000. This location was monitored from January 2007 through December of 2008. In May of 2007 a benthic macroinvertebrate special study was conducted on this creek at site EB360. Since this sample was taken prior to the development of small streams criteria it could not be rated.

Gash Creek [AU # 6-47] is Not Rated for biological integrity due to an inconclusive benthic macroinvertebrate sample taken in 2002. Mill Pond Creek [AU # 6-51] is Not Rated for biological integrity due to an inconclusive benthic macroinvertebrate sample taken in 2007.

Hominy Creek Watershed (0601010505)



This watershed contains part of western Asheville and a small portion of northeastern Canton. There are seven minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 0.25 MGD.

South Hominy Creek Subwatershed (060101050501)

Four sites in the South Hominy Creek subwatershed were sampled in November 2003 for the purpose of evaluating the fish communities at the request of the Wetlands Restoration Program, now known as the Ecosystem Enhancement Program (EEP). Land alterations in the valleys in the middle portion of the subwatershed had led to degraded stream riparian zones, embedded substrates, a general lack of pools, and open canopies. The fish communities in upper South Hominy Creek and Stony Fork were least impacted by the alterations. At Beaverdam and Warren Creeks, the fish communities were

impacted by nearby land use practices. Nutrients did not seem to be an issue at any of the sites. Reproducing and multiple age class populations of trout were found in South Hominy Creek, Beaverdam Creek and Stony Fork. It was determined that select sites in this watershed would benefit from restoration efforts to reduce sediment inputs, increase canopy cover and riparian zones, and return the stream channels to a more functional state (BAU Memorandum F-20040326).

In January 2006, EEP and Buck Engineering completed the *South Hominy Creek Local Watershed Plan*. This document reported that the major stressors for streams in this subwatershed are: channelization; excess sedimentation from unpaved roads and driveways; stream bank erosion, and eroding uplands; localized nutrient and fecal coliform bacteria pollution from livestock access; and lack of adequate riparian buffers.

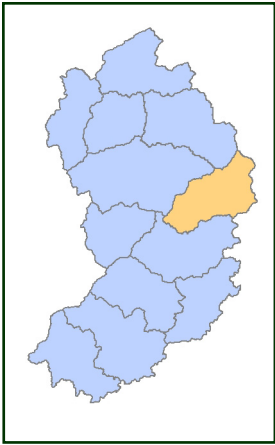
EEP has initiated a restoration project in an upper portion of South Hominy Creek between Sams Branch and Stony Fork. This project involves 6,500 linear feet of stream restoration, enhancement, and preservation, as well as 1.4 acres of wetland enhancement and preservation. EEP is also working with three landowners to improve livestock practices. This project is being planned around seasonal restriction on in-stream construction in trout waters. This project is in the design and permitting phase and is expected to be completed by the Summer of 2011.

The Biological Assessment Unit (BAU) in conjunction with the Watershed Assessment Team (WAT) and the EEP collected benthic macroinvertebrate samples from three locations in South Hominy Creek subwatershed in the summer of 2010. If resources allow, these site will be revisited once restoration is complete to determine if the benthic organisms have benefited from the channel restoration (BAU Memorandum B-20100524).

Lower Hominy Creek Subwatershed (060101050503)

Hominy Creek [AU # 6-76d] is Impaired for turbidity because 11.8 percent of the samples exceeded the standard of 50 NTUs at ambient monitoring system site E3520000. It is also impaired for biological integrity due to five consecutive Poor or Fair ratings at benthic macroinvertebrate sampling site EB105 since 1992. This portion of Hominy Creek is Not Rated for fecal coliform bacteria because it exceeded the screening criteria with 22 percent of the samples being greater than 400 colonies per 100 mL. Five samples in a 30 day period are required to make a use support determination. Only after all class B waters that exceeded the screening criteria have had 5-in-30 sampling conducted, will this stream have a 5-in-30 sampling conducted if time and budgetary constraints allow.

Swannanoa River Watershed (0601010506)



This watershed contains Montreat, Black Mountain, eastern Asheville and northern Biltmore Forest. There are six minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 0.16 MGD. Two of Asheville's main water supply sources are in the headwaters of this watershed and are protected by Clean Water Management Trust Fund easements.

RiverLink is a regional non-profit group actively working to improve water quality in the Swannanoa River watershed. They have implemented several projects in the Swannanoa River watershed to reduce stormwater runoff and sedimentation. Some of these projects were funded by a 319 Nonpoint Source Grant and others by a Clean Water Management Trust Fund Grant. These projects resulted in improvements in water quality in Swannanoa River watershed. For more information about these projects visit the [RiverLink water quality webpage](#).

Upper Swannanoa River Subwatershed (060101050602)

The Swannanoa River [AU # 6-75a] is currently Impaired due to a Fair bioclassification rating given to benthic macroinvertebrate sampling site EB144. This site was sampled in 1987, 2002, and 2003 with every sample resulting in a Fair rating.

The Town of Black Mountain was awarded an American Recovery and Reinvestment Act grant by DWQ's CG&L Section to cover 50 percent of the cost of an infrastructure project that is expected to improve water quality. The project involves the construction of six off-line regional extended stormwater wetland detention/sedimentation areas upstream of Lake Tomahawk and the replacement of the existing inlet control structure and valve. This project will create over 21.5 acre-feet (34,600 yd³) of additional storage capacity and prevent sediment (TSS) from entering the lake by providing sediment removal and storage in a location designed for easy sediment removal. The new regional stormwater detention areas will utilize native riparian wetland vegetation to assist in the removal of additional urban runoff pollutants such as nitrogen and phosphorus. The stormwater detention areas will also provide flood control and reduce the erosive velocities of stormwater runoff.

Middle Swannanoa River Subwatershed (060101050603)

Beetree Creek was impounded in 1926 to form Beetree Reservoir, a water supply for the City of Asheville. The City of Asheville owns all of the 4,838 acre watershed, which is undeveloped. The lake is not used for recreation and access is restricted.

Beetree Reservoir was monitored by DWQ staff from May - September 2007. Nutrient concentrations in Beetree Reservoir in May through August indicated that it was oligotrophic. This changed to mesotrophic in September with an increase in chlorophyll *a* concentration. Beetree Reservoir continued to support its designated use as a water supply reservoir in 2007.

Lower Swannanoa River Subwatershed (060101050604)

Ross Creek [AU # 6-78-23b] is currently Impaired due to a Poor bioclassification rating given to benthic macroinvertebrate sampling site EB134 in 1999. This site was sampled again in 2002 as part of a special study but the data were inconclusive, so it has remained impaired. This site is just downstream from a densely developed commercial area.

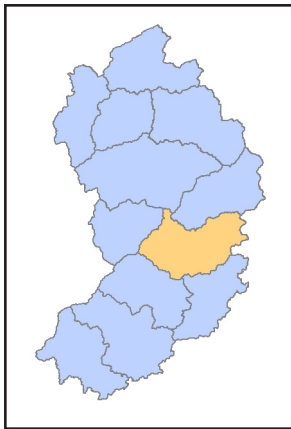
Kenilworth Lake is a small reservoir located on Ross Creek. This lake is situated in the community of Kenilworth, which is part of the City of Asheville. Kenilworth Lake was monitored by DWQ from April - September 2007. Nutrient concentrations in this small reservoir ranged from low to elevated, and chlorophyll *a* values ranged from low to moderate. DO values at the sampling site near the dam were strongly stratified from June

through September, with elevated values near the surface and hypoxic conditions occurring at a depth of four meters. Chlorophyll *a* values ranged 10 µg/L in August to 26 µg/L in September.

Green algae and diatoms dominated the phytoplankton community in June. These algae are considered to be a beneficial food source for fish and other aquatic life. In July, the community shifted to blue-green algae, primarily *Anabaena sp.* and *Aphanizomenon sp.* Blue-green algae are considered to be an indicator of nutrient enrichment. Kenilworth Lake was determined to be eutrophic. Nonpoint source nutrient loading from the urbanized watershed into the lake may be contributing to the increased biological productivity of this lake.

The Ross Creek subwatershed assessment and management plan was created in August 2007. It not only characterizes the watershed, but also provides potential management measures to be implemented with the expected result of improved water quality. In addition, Army Corps of Engineers (ACOE) is in the beginning stages of a ACOE Section 206 watershed restoration effort that will build on existing efforts. ACOE, City of Asheville, RiverLink and some other stakeholders are interested in coordinated efforts to improve Ross Creek.

Cane Creek - French Broad River Watershed (0601010507)



This watershed contains Fletcher and the northern part of the Town of Mills River, as well as southern Asheville and southern Biltmore Forest. There are eight minor and one major NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 5.06 MGD. Some dairies had some waste discharge and application problems, but by working with DWQ, these problems have been corrected.

Upper Cane Creek Subwatershed (060101050701)

The Cliffs at High Carolina is a golf course community that is currently under development on just under 3,000 acres. As a result of a lawsuit by the Western North Carolina Alliance and Trout Unlimited, the developer has agreed to limit the piping of trout streams from an originally planned 3,132 linear feet to 1,655 linear feet.

Lower Cane Creek Subwatershed (060101050703)

Cane Creek [AU # 6-57-(9)a] is Impaired for biological integrity due to a Poor rating at benthic macroinvertebrate sampling site EB66. There are both urban and agricultural areas upstream of this sampling location, as well as five minor NPDES individual wastewater dischargers.

EPP is in the design phase of a project that would restore approximately 4,344 linear feet of two unnamed tributaries to Cane Creek and create 6.34 acres of bottomland hardwood forest wetlands. This project is located downstream of sampling site EB66. Additional stream restoration and BMP installation is needed upstream of EB66.

Avery Creek - French Broad River Subwatershed (060101050704)

French Broad River [AU# 6-(54.5)b] is a class B water because it is used heavily for recreation that often involves prolonged skin contact with the water. This river segment is regularly screened for fecal coliform bacteria levels at ambient monitoring site E2730000. Due to initial high levels of bacteria in 2009, a special study was conducted between October 12, 2010 and October 19, 2010 that consisted of five fecal coliform bacteria samples. Five samples in a 30 day period are required to make a use support determination. The geometric mean for those samples was 259 colonies/100 mL, meaning that this stream segment is not meeting water quality standards for human health and will be placed on the 2012 303(d) list for fecal coliform.

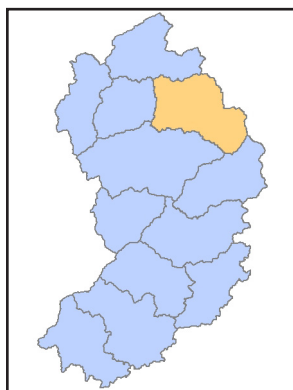
EPP contracted with a private company to restore approximately 3,800 linear feet of an unnamed tributary of Line Creek that was completed in 2002. In 2007 contractor performed 2,100 feet of stream restoration maintenance.

Lake Julian, an impoundment of Powell's Creek was constructed in 1963. This lake was created as a source of cooling water for the Asheville Steam Electric Plant, which is owned by Progress Energy Carolinas. Lake Julian has a 12.4 km² watershed which is primarily residential and urban. Recreational boating (electric motors, only) and fishing are allowed on the lake. Sport fish caught in Lake Julian include catfish, large mouth bass and tilapia.

DWQ monitored Lake Julian May - September 2007. Turbidity and chlorophyll *a* values were low and nutrient concentrations ranged from low to moderate. Lake Julian was determined to be consistently oligotrophic since it was first monitored by DWQ in 1990.

Mean surface water temperatures in Lake Julian ranged from 25.6 °C in May to 36.5 °C in August. These temperatures are similar to those observed in 1990 and 2002. The Asheville Steam Electric Plant NPDES wastewater permit requires the temperature of the discharged water from Outfall 002 not to exceed a monthly average of 44.4°C based on daily temperatures. The mixing zone for Outfall 002 is defined as all of Lake Julian. Lake Julian continued to support its designated uses in 2007.

Progress Energy routinely monitors the water quality of Lake Julian, including identification of any natural or power plant-induced water quality changes to the lake and any introductions or impacts from nonnative plant and animal species. The study conducted in 2004 determined that Lake Julian continued to have low nutrient concentrations and biological productivity as compared with previous sampling years. Water temperature and DO profiles were also similar to those observed in the previous 10 years. All measured values for arsenic and selenium in the lake were below reporting limits (<1 µg/L). Fishery habitat improvement efforts continued in 2002 with the placement of wooden pallet fish attractors in the lake as well as discarded Christmas trees (Progress Energy, June 2005).



Ivy Creek Watershed (0601010508)

Mars Hill is the only municipality located in this watershed. There are three minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 0.43 MGD.

Little Ivy Creek Subwatershed (060101050802)

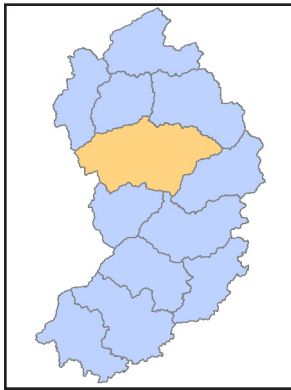
A 319 Nonpoint Source Pollution Control Grant was awarded to the Madison County Soil and Water Conservation District to install agricultural best management practices in the Little Ivy Creek subwatershed, which is also part of the water supply watershed for Mars Hill. This project was completed in February 2010. For more information

visit the [*Little Ivy Creek Watershed Use Restoration website*](#).

Bull Creek Subwatershed (060101050804)

In 2007, Bull Creek [AU # 6-96-16] received an Excellent rating at benthic macroinvertebrate sampling site EB353 and a Good-Fair rating at fish community monitoring site EF13. In September 2009, the BAU conducted a use attainability/reclassification study on Bull Creek [AU # 6-96-16] and West Fork Bull Creek [AU # 6-96-16-2]. Benthic macroinvertebrate site EB377 on Bull Creek rated Good and EB378 rated Good-Fair. It was determined that development and agriculture in the upper part of Bull Creek watershed are having an impact on water quality in Bull Creek and that some improvement is needed before it would qualify for HQW reclassification.

Sandymush Creek - French Broad River Watershed (0601010509)



This watershed contains the Town of Woodfin, as well as, northern and central portions of Asheville. There are nine minor and one major NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 40.4 MGD.

The Sandymush Game Land is entirely within this watershed and protects approximately 2.5 miles along the west bank of the French Broad River, as well as large portions of Sandymush Creek and Turkey Creek.

Beaverdam Creek - French Broad River Subwatershed (060101050901)

French Broad River [AU# 6-(54.5)c] is a class B water because it is used heavily for recreation that often involves prolonged skin contact with the water. This river segment is regularly screened for fecal coliform bacteria levels at ambient monitoring site E4280000. Due to high levels of bacteria in 2009, a special study was conducted between July 13, 2010 and August 12, 2010 that consisted of five fecal coliform bacteria samples. Five samples in a 30 day period are required to make a use support determination. The geometric mean for those samples was 125 colonies/100 mL, meaning that this stream segment is currently meeting water quality standards for human health.

Newfound Creek Subwatershed (060101050902)

The USGS sampled Newfound Creek at five locations and sampled five of its tributaries for *Escherichia coli*. Water column samples were taken on May 28, 2003 during low flow and on November 19, 2003 during high flow. Sediment samples were also taken during low flow. During low flow conditions, Dix Creek and Newfound Creek between Brooks Branch and Red Hill Branch had the highest bacteria levels. During high flow conditions, Round Hill Creek and Dix Creek had the highest bacteria levels. One sediment sample that may indicate a possible source of bacteria was at the confluence of Sluder Branch and Newfound Creek. Coliphage virus analysis was used in an attempt to determine whether the bacteria was from human or animal sources. The results showed that Round Hill Branch was dominated by human sources, while Sluder Branch bacteria was from mainly animal sources. All other locations were inconclusive (Giddings and Oblinger, 2003).

A **TMDL for Newfound Creek** [AU #s 6-84b, 6-84c; 6-84d] was approved by EPA on February 8, 2005 for fecal coliform bacteria. There is no current fecal coliform data at this time; therefore, these stream segments remain Impaired for fecal coliform bacteria. The development of this TMDL was funded in part by a 319 Non-point Source Pollution Control Grant that was awarded to the Buncombe County Soil and Water Conservation District. Another 319 Nonpoint Source Pollution Control Grant was awarded to the Buncombe County Soil and Water Conservation District to implement the TMDL by installing agricultural best management practices in the Newfound Creek watershed. This project is expected to be complete in August 2011.

Newfound Creek [AU #s 6-84a, 6-84b, 6-84c; 6-84d] is currently impaired for biological integrity due to Fair ratings at benthic macroinvertebrate sampling sites EB129 in 2002 and 2007.

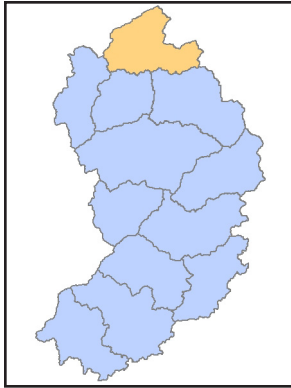
EEP has initiated a restoration project on Newfound Creek between Brooks Branch and Round Hill Branch that is currently in the design phase. This project involves the restoration of approximately 4,649 linear feet, as well as, the enhancement of 5,700 linear feet of Newfound Creek and six of its tributaries. Additionally, 0.85 acres of wetlands will be enhanced.

The WaDE Program has recently identified and made repairs to several failing septic system in the Newfound Creek watershed. The Buncombe County Soil and Water Conservation District has also been working on live-stock exclusion projects to reduce bacteria levels in Newfound Creek.

Lee Creek - French Broad River Subwatershed (060101050907)

French Broad River [AU # 6-(54.5)d] is Impaired for turbidity because 13.5 percent of the samples exceeded the standard of 50 NTUs at ambient monitoring system site E4770000.

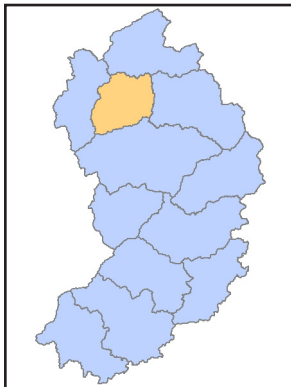
French Broad River [AU# 6-(54.5)d] is a class B water because it is used heavily for recreation that often involves prolonged skin contact with the water. This river segment is regularly screened for fecal coliform bacteria levels at ambient monitoring site E4770000. Due to high levels of bacteria in 2009, a special study was conducted between October 12, 2010 and October 19, 2010 that consisted of five fecal coliform bacteria samples. Five samples in a 30 day period are required to make a use support determination. The geometric mean for those samples was 25 colonies/100 mL meaning that this stream segment is currently meeting water quality standards for human health.



Big Laurel Creek Watershed (0601010510)

This is an extremely rural watershed with a population density of just over 22 people per square mile based on the 2000 census. There are four minor NPDES individual wastewater discharge permits in this watershed with permitted flows totaling 0.042 MGD.

A use attainability/reclassification study was conducted at 15 benthic macroinvertebrate sampling sites throughout the Big Laurel Creek watershed in 2006. All but one benthic macroinvertebrate sampling site rated Excellent while the other site rated Good. A public hearing was held in Hot Springs on March 31, 2009 to solicit comments from the public regarding the reclassification of the watershed. As of September 2009, all streams in this watershed are classified as Outstanding Resource Waters (ORW).



Walnut Creek - French Broad River Watershed (0601010511)

Marshall is the only municipality in this watershed. There are two minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 0.41 MGD.

Little Pine Creek - French Broad River Subwatershed (060101051102)

Little Pine Creek [AU # 6-104] rated Excellent at benthic macroinvertebrate sampling site EB349 in 2007. Little Pine Creek was sampled again in 2009 at benthic macroinvertebrate sampling site EB380, which is located further upstream from EB349, to determine if it might qualify for reclassification. Site EB380 received a rating of Good and therefore, it was determined that reclassification may not be appropriate at this

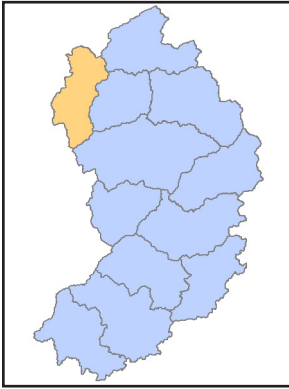
time.

French Broad River [AU # 6-(54.5)f] is Impaired for turbidity because 11.8 percent of the samples exceeded the standard of 50 NTUs at ambient monitoring system site E5120000.

Big Pine Creek - French Broad River Subwatershed (060101051103)

Big Pine Creek [AU # 6-108] and Doe Branch [AU # 6-110] were sampled for benthic macroinvertebrates in 2007. Doe Branch watershed may qualify for HQW reclassification because of an Excellent rating at site EB347. Big Pine Creek benthic sampling site EB348 also rated Excellent in 2007. Big Pine Creek was sampled again in 2009 at benthic macroinvertebrate sampling site EB379, which is located further upstream from EB348, to determine if it might qualify for reclassification. Site EB379 received a rating of Good; therefore, it was determined that reclassification may not be appropriate at this time.

Spring Creek - French Broad River Watershed (0601010512)



Hot Springs is the only municipality in this watershed. There are two minor NPDES individual wastewater discharge permits in this watershed, with permitted flows totaling 0.09 MGD.

Meadow Fork and Spring Creek Subwatersheds (060101051201)

A use attainability/reclassification study was conducted at four benthic macroinvertebrate sampling sites throughout Meadow Fork and Spring Creek watersheds in 2006. All sites rated Excellent and a public hearing was held in Hot Springs on March 31, 2007 to solicit comments from the public regarding the reclassification of these watersheds. As of September 2009, all streams in these two watersheds are classified as Outstanding Resource Waters (ORW).

Recommendations

Stormwater management, erosion control and pesticide education should be increased. The installation of BMPs that control stormwater and prevent its associated pollutants from reaching surface waters is encouraged.

A considerable amount of resources have been expended in the Newfound Creek subwatershed. If resources allow, Newfound Creek should be sampled during the 2012 biological data collection period so that any improvements made through work currently being done by the EEP, the WaDE Program, and the Buncombe County S&WC District can be assessed for the 2014 Integrated Report that will be used for the next basinwide water quality plan.

DWQ should continue to support the Mud Creek and Mills River subwatershed efforts in improving water quality in those watersheds. These are both important agricultural and fast growing subwatersheds.

FIGURE 1-4: HEADWATERS FRENCH BROAD RIVER WATERSHED WITH 2010 USE SUPPORT

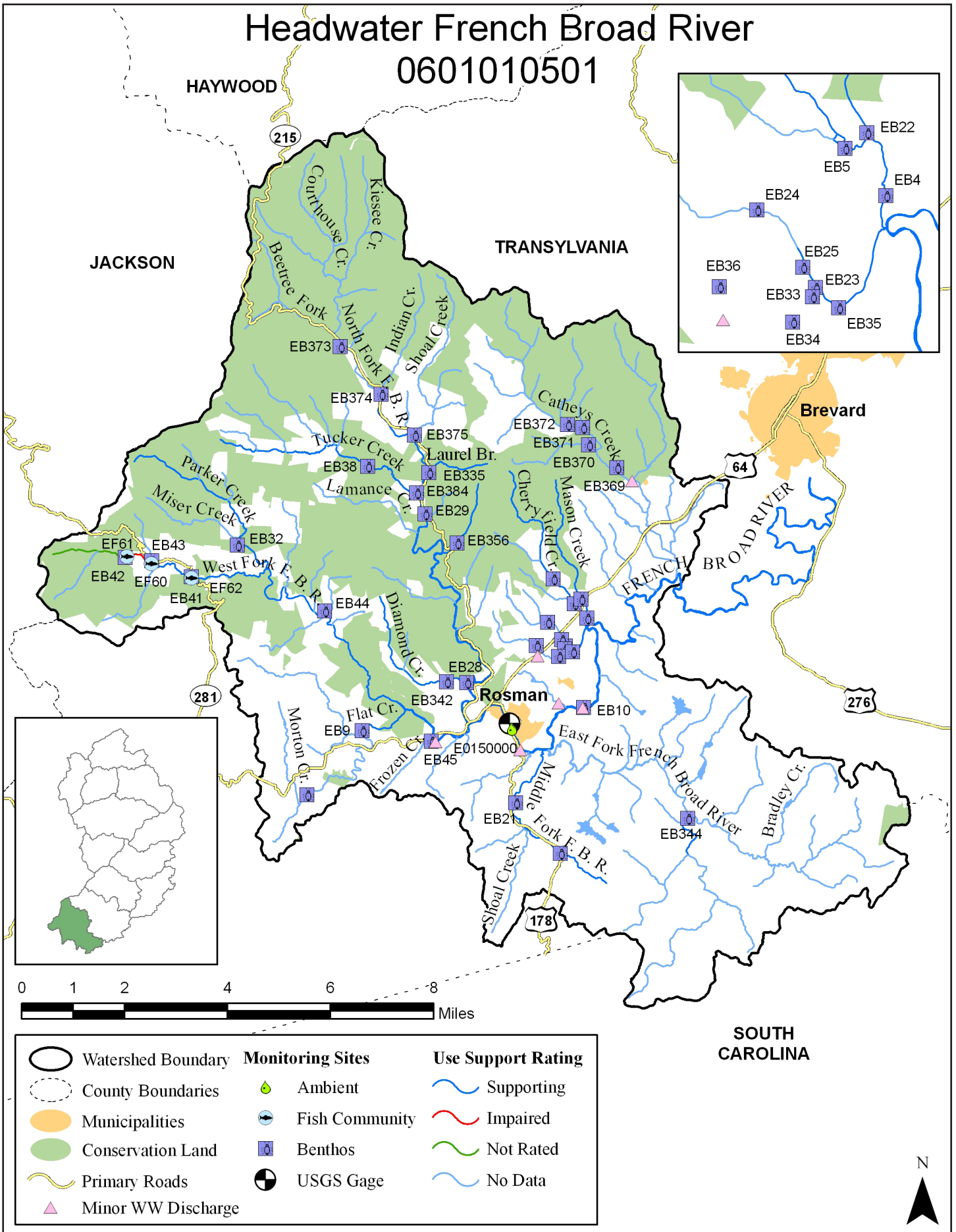


FIGURE 1-5: DAVIDSON RIVER WATERSHED WITH 2010 USE SUPPORT

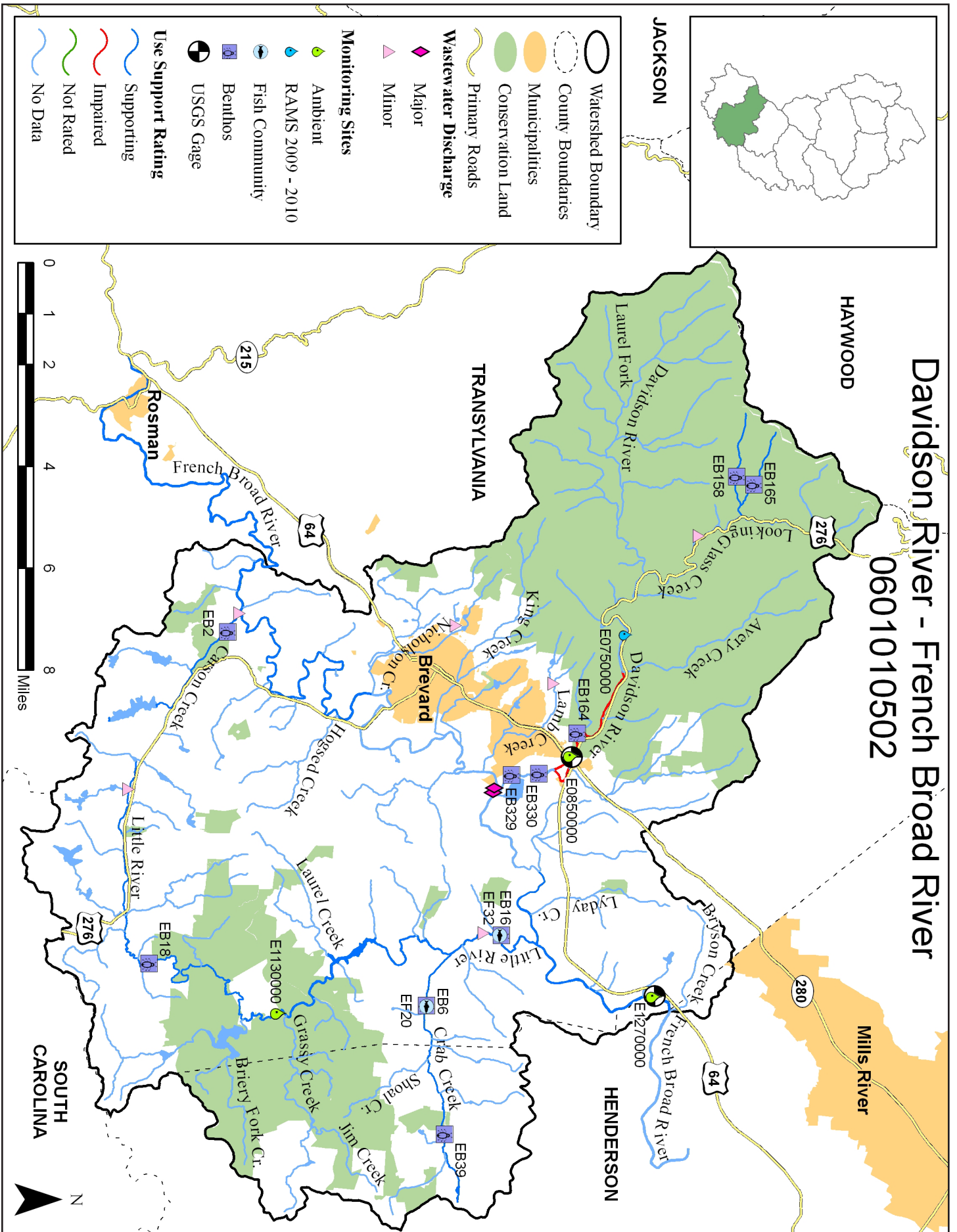


FIGURE 1-6: MUD CREEK WATERSHED WITH 2010 USE SUPPORT

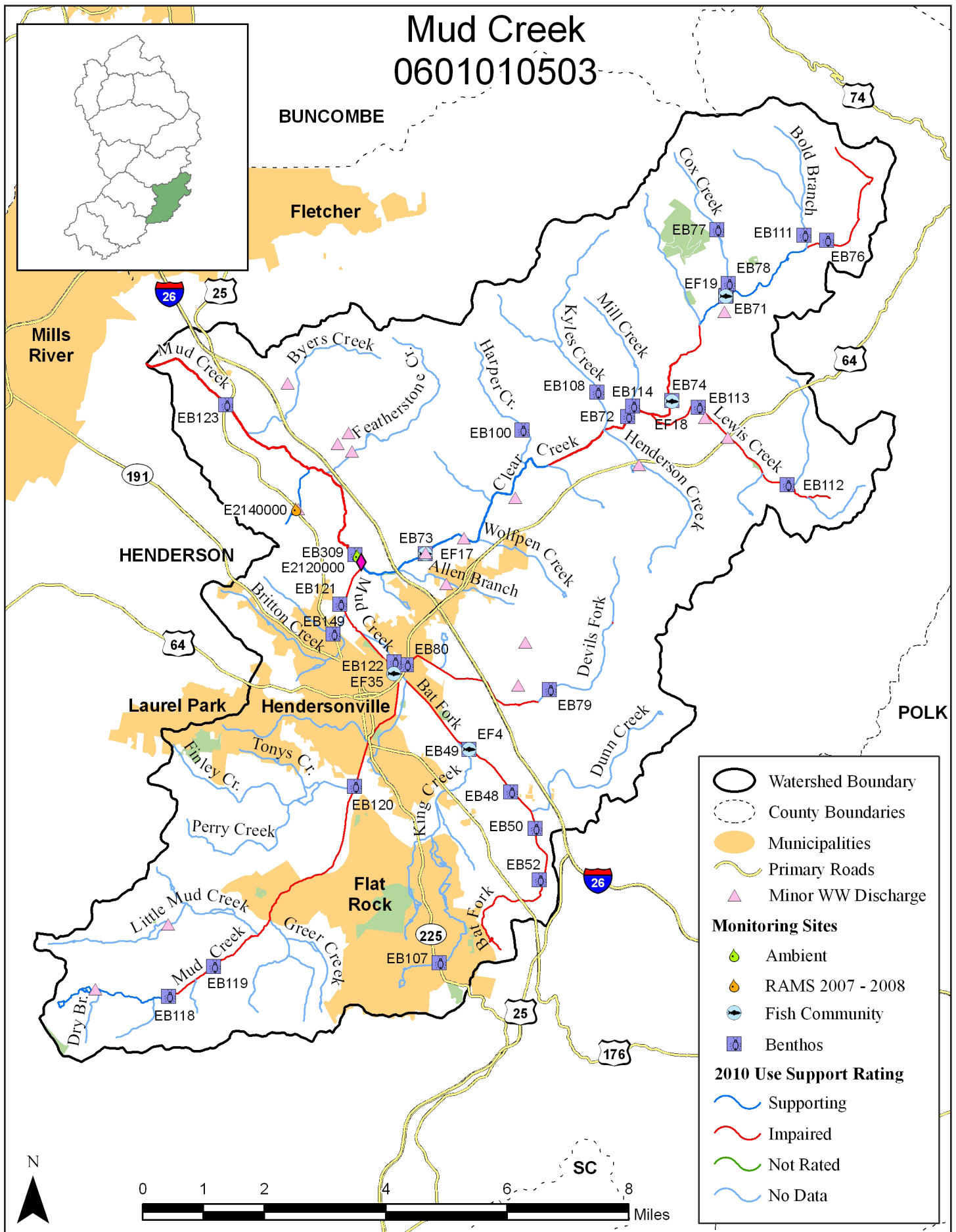
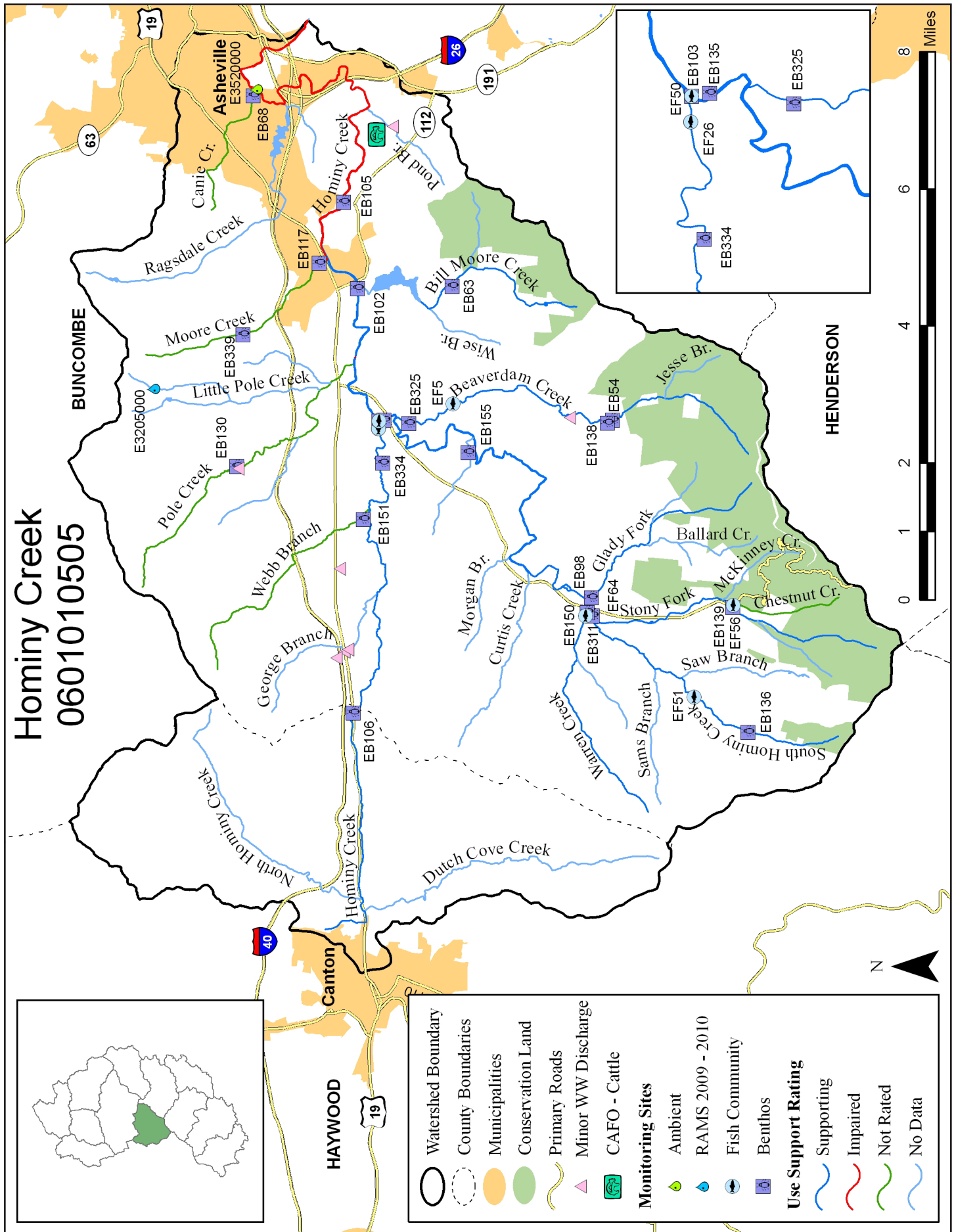


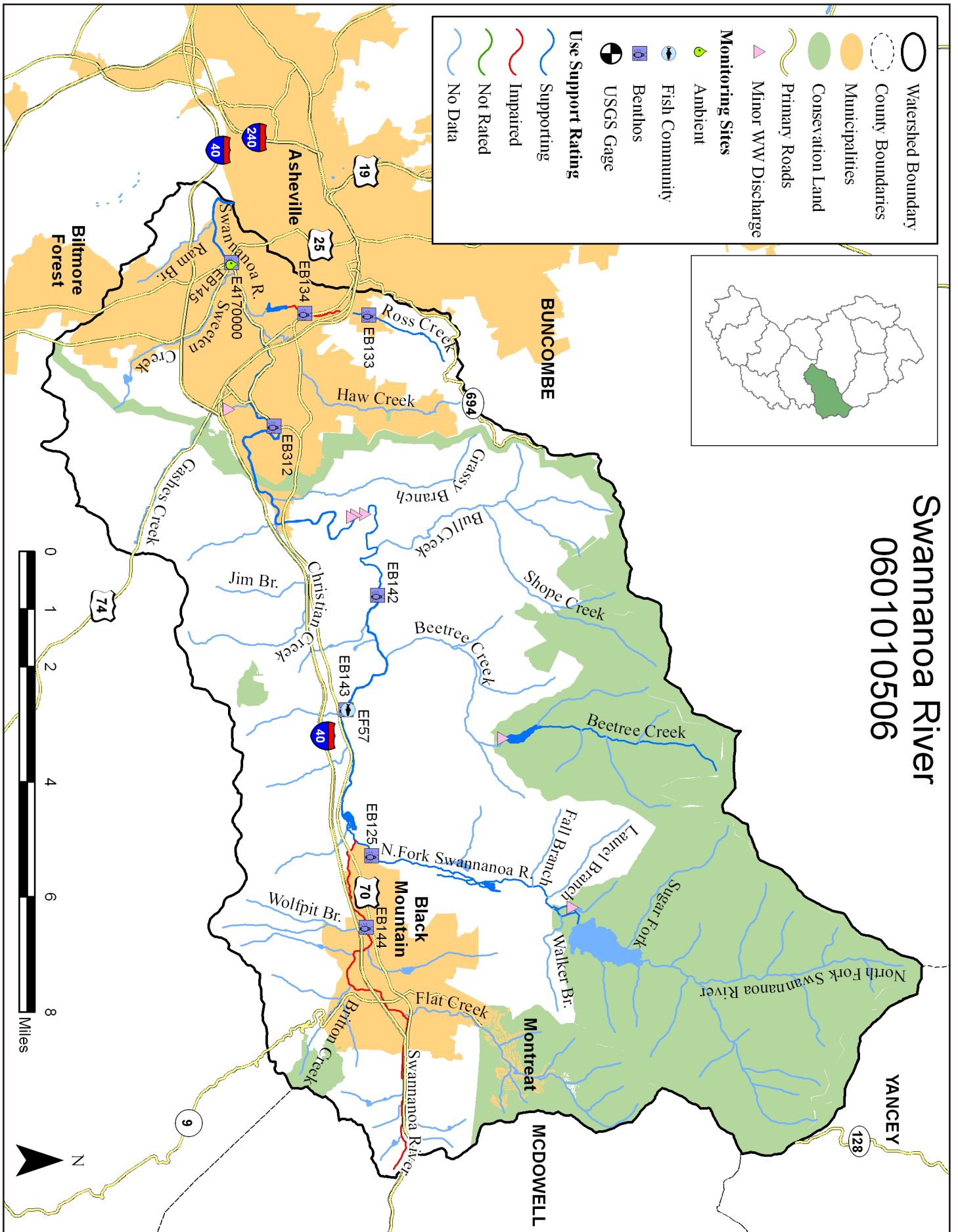
FIGURE 1-8: HOMINY CREEK WATERSHED WITH 2010 USE SUPPORT



Hominy Creek
0601010505

	Watershed Boundary
	County Boundaries
	Municipalities
	Conservation Land
	Primary Roads
	Minor WW Discharge
	CAFO - Cattle
Monitoring Sites	
	Ambient
	RAMS 2009 - 2010
	Fish Community
	Benthos
Use Support Rating	
	Supporting
	Impaired
	Not Rated
	No Data

FIGURE 1-9: SWANNANOVA RIVER WATERSHED WITH 2010 USE SUPPORT



Swannanoa River
0601010506

FIGURE 1-10: CANE CREEK WATERSHED WITH 2010 USE SUPPORT

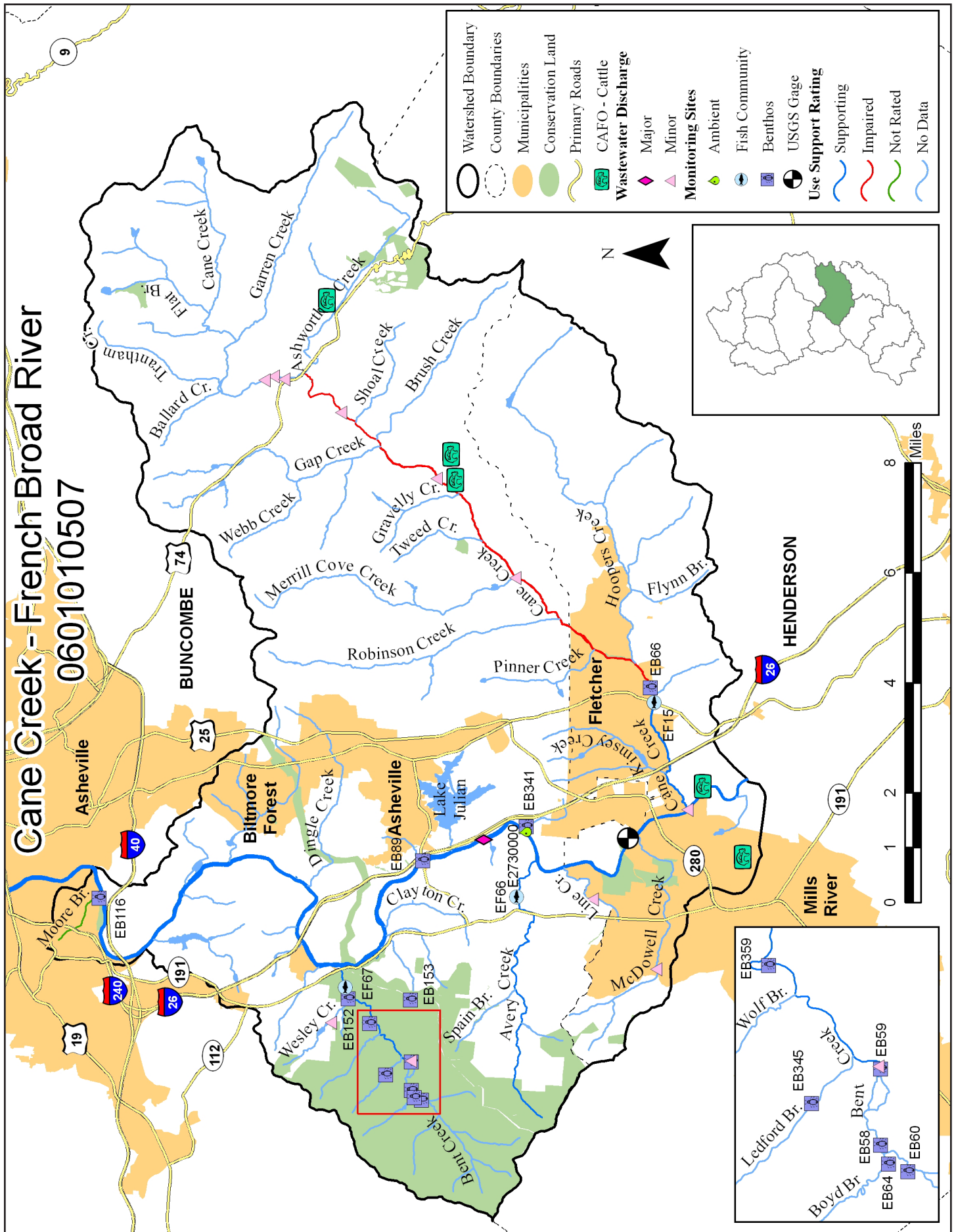


FIGURE 1-11: IVY CREEK WATERSHED WITH 2010 USE SUPPORT

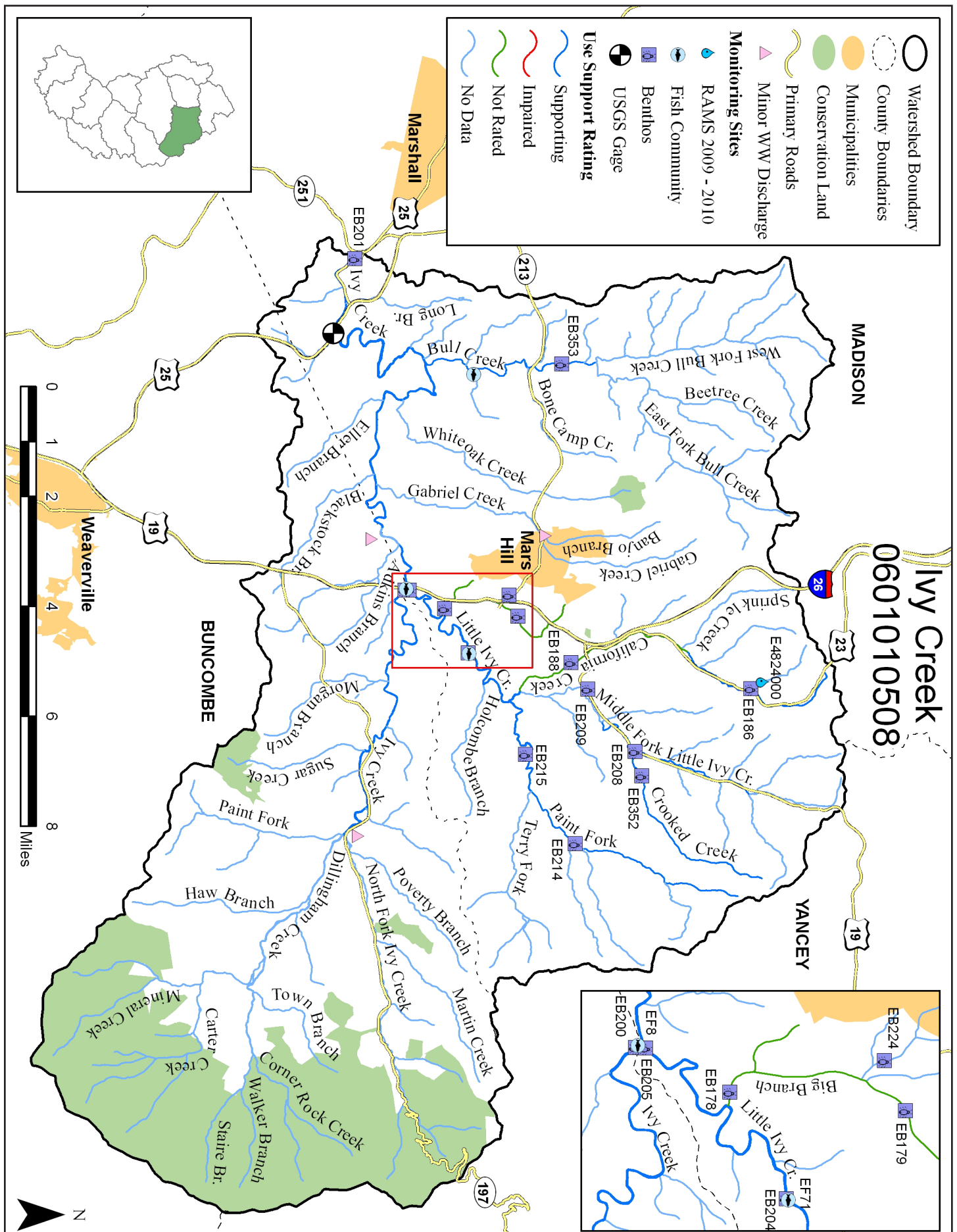


FIGURE 1-12: SANDYMUSH CREEK WATERSHED WITH 2010 USE SUPPORT

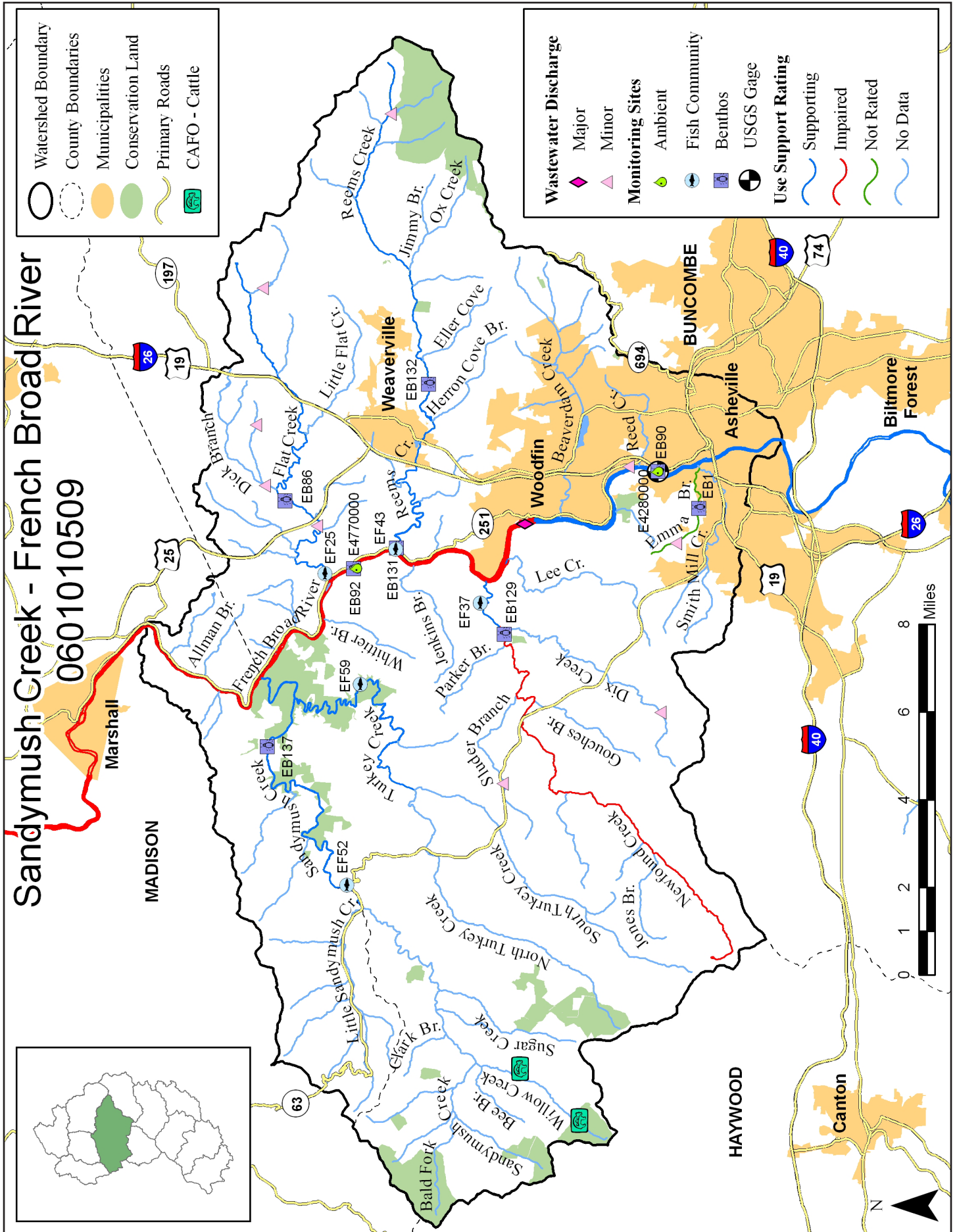


FIGURE 1-13: BIG LAUREL CREEK WATERSHED WITH 2010 USE SUPPORT

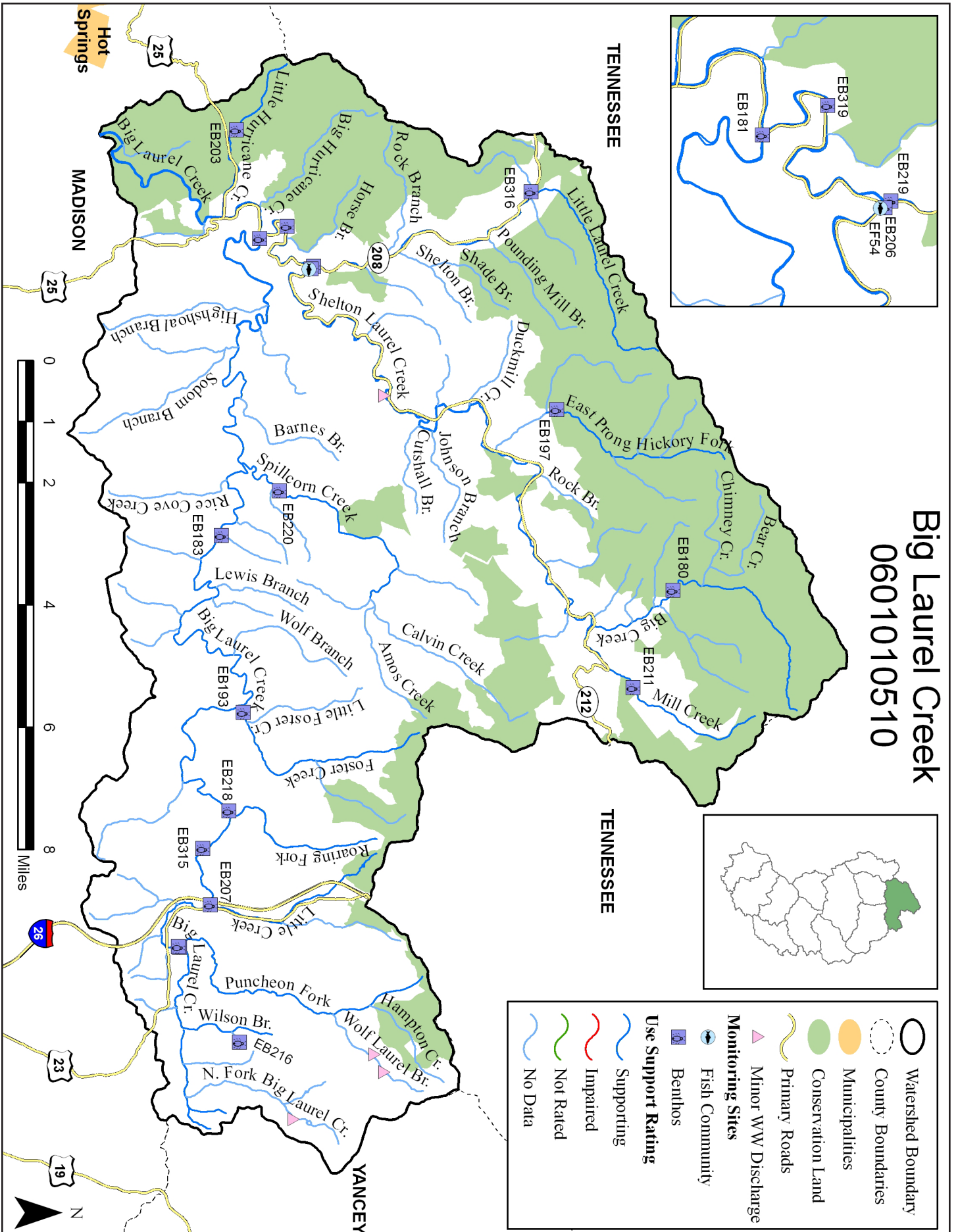


FIGURE 1-14: WALNUT CREEK WATERSHED WITH 2010 USE SUPPORT

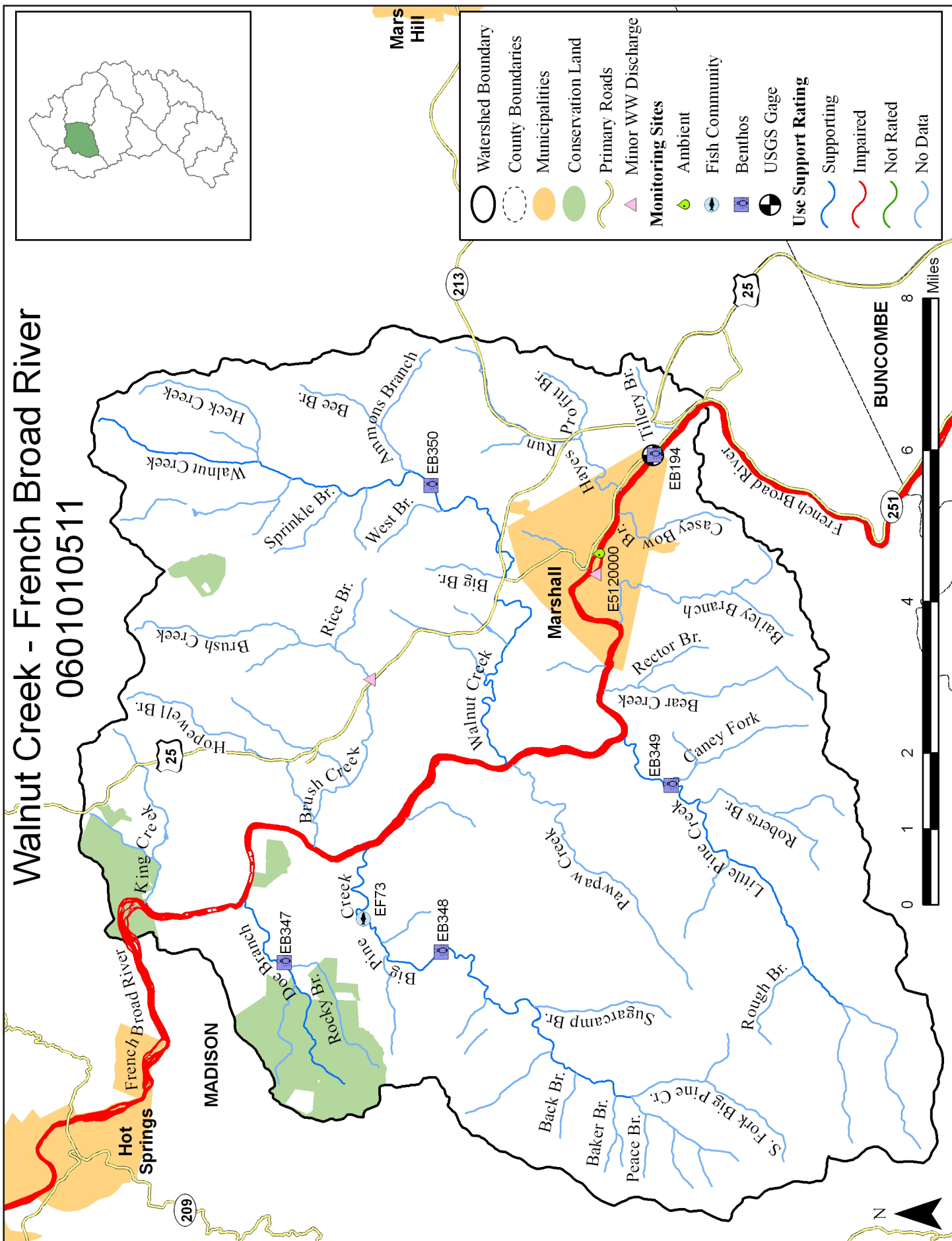


FIGURE 1-15: SPRING CREEK WATERSHED WITH 2010 USE SUPPORT

Spring Creek - French Broad River 0601010512

