French Broad River Basinwide Water Quality Plan

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This Document was approved by the NC Environmental Management Commission on April 14, 2005 to be used as a guide by the NC Division of Water Quality for carrying out its Water Quality Program duties and responsibilities in the French Broad River basin. This plan is the third five-year update to the French Broad River Basinwide Water Quality Plan approved by the NC Environmental Management Commission in May 1995.

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Executive Summary

Basinwide water quality planning is a watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the NC Division of Water Quality (DWQ) for each of the 17 major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by DWQ, their implementation and the protection of water quality entail the coordinated efforts of many agencies, local governments and stakeholders throughout the state.

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to Impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters while allowing for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Evaluate cumulative effects of pollution.
- Improve public awareness and involvement.
- Regulate point and nonpoint sources of pollution where other approaches are not successful.

This 2005 document is the third five-year update of the *French Broad River Basinwide Water Quality Plan*. The first basinwide plan for the French Broad River basin was completed in 1995 and the second in 2000. The format of this plan was revised in response to comments received during the first and second planning cycles. DWQ replaced much of the general information in the first two plans with more detailed information specific to the French Broad River basin. For this plan, a greater emphasis was placed on identifying water quality concerns on the watershed level in order to facilitate protection and restoration efforts.

DWQ considered comments from four public workshops held in the basin and subsequent discussions with local resource agency staff and citizens during draft plan development. This input will help guide continuing water quality management activities throughout the river basin over the next five years.

French Broad River Basin Overview

The French Broad River basin drains to the Gulf of Mexico via the Ohio, Tennessee and Mississippi Rivers (Figure 1). The boundaries of the French Broad River basin within North Carolina contain portions or all of Avery, Buncombe, Haywood, Henderson, Madison, Mitchell, Transylvania and Yancey counties (Figure 2). DWQ subdivides all river basins into subbasins. The French Broad River basin contains seven subbasins (Figure 2). Maps of each subbasin are included in each of the subbasin chapters (Chapters 1 through 7).

The basin is composed of three major drainage areas. These include the French Broad River watershed, the Pigeon River watershed and the Nolichucky watershed. All three rivers individually flow northwest into Tennessee.

There are seven man-made lakes in the basin monitored by DWQ and include: Lake Julian; Burnett Reservoir; Beetree Reservoir; Lake Kenilworth; Lake Junaluska; Allen Creek Reservoir; and Waterville (Walters) Lake.

Major tributaries in the basin include: the East, North and West Fork French Broad Rivers; Mills River; the Mud Creek watershed; Swannanoa River; East and West Fork Pigeon Rivers; and the North and South Toe Rivers. There are several trout waters, High Quality Waters (HQW), and Outstanding Resource Waters (ORW) found throughout the basin.

Information presented in this basinwide water quality plan is based on data collected from September 1997 to August 2002 and does not include damage and/or impacts from the recent flood and hurricane events of September 2004. Samples were collected during November and December 2004 in order to evaluate the impacts from the hurricanes and will be discussed in the next basinwide cycle.

The varied nature of the topics discussed below demonstrates the wide range of stressors leading to water quality degradation in the French Broad River basin. Water quality stressors are identified when impacts have been noted to biological (fish and benthic) communities or water quality standards have been violated. Water quality decline can often be attributed to a combination of many stressors that lead to habitat and water quality degradation. In some way, every person, industry, farm and municipality in the basin impacts water quality. Therefore, every resident of the basin should play a role in management strategies designed to protect and restore the streams, lakes and rivers in the basin.

Population Growth and Urbanization

The French Broad River basin encompasses all or portions of eight counties and 24 municipalities. In 2000, the overall population of the basin (based on the percent of the county land area in the basin) was 393,795, with approximately 139 persons/square mile. The most populated areas are located in and around Asheville, Hendersonville, Waynesville and Black Mountain.

French Broad River Basin Statistics

Total Area: 2,830 sq. miles
Freshwater Stream Miles: 3,985.2 mi
Freshwater Lakes Acres: 1,736.6 ac
No. of Counties: 8
No. of Municipalities: 24
No. of Subbasins: 7
Population (1990): 357,932*
Population (2000): 393,795*
Pop. Density (2000): 139*

* Estimated based on % of county land area that is partially or entirely within the basin, not the entire county population.

Populations of counties that are wholly or partially contained within the basin increased by over 70,000 people between 1990 and 2000. Buncombe, Haywood, Madison and Henderson counties contain the fastest growing municipalities in the basin. County populations are expected to grow by more than 122,000 (25 percent) by 2020 for a total population of almost 575,000 people.

Growing populations are often accompanied by a loss of natural areas and an increase in imperious

surface. Based on the current land cover information provided by the National Resources Inventory (USDA-NRCS, June 2001), there was a 38 percent decrease (23,500 acres) in cultivated cropland in the French Broad River basin from 1982 to 1997. Uncultivated cropland and pastureland decreased by a total of 33,700 acres (45.5 and 7.7 percent, respectively). Forest cover also decreased by nearly 60,000 acres (6 percent). Urban and built-up land cover increased significantly by 90,000 acres (85.2 percent). Much of the land cover change is accounted for in the Upper French Broad River hydrologic unit, which includes rapidly growing areas in Buncombe and Henderson counties. Population growth trends and the accompanying impacts to water quality are discussed in Chapters 9 and 10.

Impacts from Stormwater Runoff

Stormwater runoff is a primary carrier of nonpoint source pollution (NPS) in both urbanized and rural areas. The impact of stormwater runoff is particularly severe in developing areas where recently graded areas are highly susceptible to erosion, and urbanized areas where stormwater runoff is rapidly channeled through curb and gutter systems into nearby streams.

There are several different stormwater programs administered by DWQ. One or more of these programs affect several communities in the French Broad River basin. The goal of DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. Those programs try to accomplish this goal by controlling the source(s) of pollution. These programs include the NPDES Phase II designations, HQW/ORW stormwater requirements and the Water Supply Watershed Program. Local governments that are or may be affected by these programs are presented in Chapter 13.

Local Involvement

Local organizations and agencies are able to combine professional expertise and local knowledge not present at the state and federal level. This allows groups to holistically understand the challenges and opportunities of local water quality concerns. Involving a wide array of people in water quality projects also brings together a range of knowledge and interests and encourages others to become involved and invested in these projects. Working in cooperation across jurisdictional boundaries and agency lines opens the door to additional funding opportunities and eases the difficulty of generating matching or leveraged funds. This could potentially allow local entities to do more work and be involved in more activities because funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of local efforts is key to water quality improvements, and DWQ applauds the foresight and proactive response by locally based organizations and agencies to potential water quality problems. There are many excellent examples of local agencies and groups using these cooperative strategies throughout the state. Several local watershed projects are highlighted throughout the subbasin chapters (Chapters 1-7). Chapter 16 also examines the local and federal initiatives underway in the French Broad River basin.

Surface Water Classifications and Use Support Assessments

Use support assessments based on surface water classifications form the foundation of this basinwide plan. Surface waters are classified according to their best-intended use. Determining

how well a waterbody supports its uses (*use support* rating) is an important method of interpreting water quality data and assessing water quality.

Use support methodology has changed significantly since the 2000 revision of the *French Broad River Basinwide Water Quality Plan*. In the previous plan, surface waters were rated fully supporting (FS), partially supporting (PS), not supporting (NS) and not rated (NR). FS was used to identify waters that were meeting their designated uses. Impaired waters were rated PS and NS, depending on the degree of degradation. NR was used to identify waters with no data or having inconclusive data. The *2002 Integrated Water Quality Monitoring and Assessment Report Guidance* issued by the U.S. Environmental Protection Agency (EPA) requested that states no longer subdivide the Impaired category. In agreement with this guidance, North Carolina no longer subdivides the Impaired category and rates waters as Supporting, Impaired, Not Rated or No Data. These ratings refer to whether the classified uses of the water (such as water supply, aquatic life and primary/ secondary recreation) are being met.

Use support methods have been developed to assess ecosystem health and human health risk through the development of use support ratings for five categories: aquatic life, fish consumption, recreation, shellfish harvesting and water supply. These categories are tied to the uses associated with the primary classifications applied to NC rivers, streams and lakes. A full description of the classifications is available in the DWQ document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina*. This document is available on-line at http://h2o.enr.state.nc.us/csu/.

Biological, chemical and physical monitoring data collected between September 1997 and August 2002 were used to assign use support ratings in this basin. The list of Impaired waters is presented in Table 1 and total monitored miles and acreage are presented below. Detailed information related to use support methodology is provided in Appendix X.

Aquatic Life

The aquatic life use support category is applied to all waters in North Carolina. Therefore, this category is applied to all 3,985.9 freshwater miles and 1,736.6 freshwater acres in the French Broad River basin. Approximately 24.4 percent of the stream miles (973.2 miles) and 56.7 percent of the freshwater acres (985.1 acres) were monitored. There were 129.2 (13.2%) Impaired stream miles and 200.0 (20.3%) Impaired freshwater acres.

Fish Consumption

Like the aquatic life use support category, the fish consumption category is also applied to all waters in the state. Fish consumption use support ratings are based on fish consumption advice or specific advisories issued by the NC Department of Health and Human Services (NCDHHS). If a limited fish consumption advice, advisory or a no consumption advisory is posted at the time of use support assessment, the water is rated Impaired.

Blue Ridge Paper Products, Inc. (BRPP) and Carolina Power and Light Company (CP&L) are required to annually monitor dioxin levels in fish tissue in the Pigeon River. This monitoring is required as part of the BRPP discharge permit issued by DWQ and as a condition of the Federal Energy Regulatory Commission (FERC) license for CP&L. In the past, there has been a limited-consumption advisory for common carp in effect for the Pigeon River from the Town of Canton to the North Carolina-Tennessee state line (approximately 26 miles, including Waterville Lake).

In 2001, however, the fish consumption advisory was revised by the NCDHHS due to declining dioxin concentrations in fish. The advisory was removed from common carp caught in the river. The limited-consumption advisory remains in effect, however, for Waterville (Walters) Lake. NCDHHS suggests that women of childbearing age and children under the age of 15 avoid eating carp caught from the lake. For all others, consumption of carp should be limited to no more than one meal per month. Swimming, boating and other recreational activities are not affected by this advisory. Visit the NCDHHS website for more information at www.epi.state.nc.us/epi/fish.

Recreation

The recreation category is also applied to all waters in the state. Approximately 8.4 percent of the freshwater stream miles (333.4 miles) were monitored for recreation; however, no freshwater acres were sampled during the assessment period. There were 22.0 stream miles (6.6 percent) Impaired in the recreation use support category.

Water Supply

Based on reports from the NC Department of Environmental Health (DEH) regional water treatment consultants, all water supply waters in the French Broad River basin are Supporting on an evaluated basis.

Impaired Waters

Impaired waters found in the French Broad River basin identified by DWQ within the last five years are presented in Table 1. The use support category for which a waterbody is Impaired is indicated in the table. Descriptions of Impaired segments, as well as problem parameters, are outlined in Appendix X. Management strategies for each waterbody are discussed in detail in the appropriate subbasin chapter. Maps showing current use support ratings for waters in the French Broad River basin are also presented in each subbasin chapter (Chapters 1 through 7).

Table 1 Impaired Waters Monitored in the French Broad River Basin (1997 to 2002)

Stream/ River Name*	Assessment Unit Number (AU#)	Subbasin	Class	Miles	Acres	Category
West Fork French Broad River	6-2-(0.5)b	04-03-01	B Tr	0.6	0.0	Aquatic Life
Peter Weaver Creek	6-10b	04-03-01	C Tr	0.8	0.0	Aquatic Life
Morgan Mill Creek	6-10-1b	04-03-01	B Tr	0.1	0.0	Aquatic Life
Mud Creek	6-55b	04-03-02	C	1.9	0.0	Aquatic Life
Mud Creek	6-55c	04-03-02	C	11.0	0.0	Aquatic Life
Mud Creek	6-55d	04-03-02	C	2.2	0.0	Aquatic Life
Bat Fork	6-55-8-1a	04-03-02	C	4.8	0.0	Aquatic Life
Bat Fork	6-55-8-1b	04-03-02	C	1.5	0.0	Aquatic Life
Devils Fork	6-55-8-2b	04-03-02	C	2.7	0.0	Aquatic Life
Clear Creek	6-55-11-(1)a	04-03-02	B Tr	2.7	0.0	Aquatic Life
Clear Creek	6-55-11-(1)c	04-03-02	B Tr	2.1	0.0	Aquatic Life
Clear Creek	6-55-11-(5)	04-03-02	C	6.5	0.0	Aquatic Life

Hominy Creek	6-76d	04-03-02	C	7.8	0.0	Aquatic Life
French Broad River	6-(54.5)b	04-03-02	B	8.2	0.0	Recreation
French Broad River	6-(54.5)d	04-03-02	B	6.4	0.0	Aquatic Life
French Broad River	6-(54.5)e	04-03-02	B	3.9	0.0	Aquatic Life
Swannanoa River	6-78a	04-03-02	C	7.0	0.0	Aquatic Life
Swannanoa River	6-78c	04-03-02	C	2.6	0.0	Aquatic Life
Newfound Creek	6-84a	04-03-02	C	3.9	0.0	Aquatic Life
Newfound Creek	6-84b	04-03-02	C	1.3	0.0	Aquatic Life
Newfound Creek	6-84c	04-03-02	C	2.3	0.0	Aquatic Life
Newfound Creek	6-84d	04-03-02	C	4.4	0.0	Aquatic Life
Ross Creek	6-78-23b	04-03-02	B	1.1	0.0	Aquatic Life
Cane Creek	6-57-(9)a	04-03-02	C	9.6	0.0	Aquatic Life
Gash Creek	6-47	04-03-02	C	3.7	0.0	Aquatic Life
Mill Pond Creek	6-51	04-03-02	WS-IV	3.1	0.0	Aquatic Life
Brandy Branch	6-54-6	04-03-03	WS-III	2.1	0.0	Aquatic Life
Little Ivy Creek (River)	6-96-10a	04-03-04	WS-II HQW	2.6	0.0	Aquatic Life
Pigeon River	5-(7)b	04-03-05	C	6.4	0.0	Aquatic Life
Waterville (Walters) Lake	5-(7)e	04-03-05	C	0.0	773.1	Fish Consumption
Richland Creek	5-16-(1)a	04-03-05	B	8.0	0.0	Recreation
Richland Creek	5-16-(1)b	04-03-05	B	2.3	0.0	Aquatic Life, Recreation
Richland Creek	5-16-(1)c	04-03-05	B	0.7	0.0	Aquatic Life, Recreation
Richland Creek	5-16-(1)d	04-03-05	B	0.9	0.0	Recreation
Richland Creek	5-16-(1)e	04-03-05	B	2.0	0.0	Aquatic Life, Recreation
Lake Junaluska (Richland Creek)	5-16-(1)f	04-03-05	B	0.0	200.0	Aquatic Life
Richland Creek	5-16-(16)a	04-03-05	B	1.6	0.0	Aquatic Life
Fines Creek	5-32	04-03-05	C	9.7	0.0	Aquatic Life
Raccoon Creek	5-16-14	04-03-05	B	4.7	0.0	Aquatic Life
Hyatt Creek	5-16-6a	04-03-05	C	0.9	0.0	Aquatic Life
Hyatt Creek	5-16-6b	04-03-05	C	2.6	0.0	Aquatic Life
Jacks Creek	7-2-63	04-03-06	C	8.5	0.0	Aquatic Life
North Toe River	7-2-(27.7)b	04-03-06	C Tr	11.3	0.0	Aquatic Life
Cane River	7-3-(13.7)b	04-03-07	C Tr	3.5	0.0	Aquatic Life

Use Support Category	Units	Total Impaired Length/Area	Percent of All Waters
Aquatic Life	Freshwater miles	129.2 mi	13.2
Fish Consumption	Freshwater acres	773.1 ac	20.3
Recreation	Freshwater miles	22.0 mi	6.6

* Refer to individual subbasin chapters for a description of the Impaired segments.

Recommended Management Strategies for Restoring Impaired Waters

The Impaired stream segments within the French Broad River basin are impacted by a combination several stressors, most of which are associated with nonpoint source pollution. Within this basinwide plan, DWQ presents management strategies and recommendations for those waters considered to be Impaired or that exhibit some notable water quality problems. Major water quality problems in the basin include habitat degradation and fecal coliform bacteria contamination (affecting primary recreation). Habitat degradation (including sedimentation, streambed scour and streambank erosion) is primarily attributed to nonpoint source pollution. Sources of nonpoint source pollution include runoff from construction sites, agricultural lands, urban areas and hydromodification.

The task of quantifying nonpoint sources of pollution and developing management strategies for these Impaired waters is very resource intensive. This task is overwhelming, given the current limited resources of DWQ, other agencies (e.g., Division of Land Resources, Division of Soil and Water Conservation, NC Cooperative Extension Service, etc.) and local governments. DWQ will collaborate with other agencies and watershed groups that deal with nonpoint source pollution issues to develop management strategies for the Impaired and notable waters within the French Broad River basin.

Impaired Waters on the State's 303(d) List

For the next several years, addressing water quality impairment in waters that are on the state's 303(d) list will be a DWQ priority. Section 303(d) of the federal Clean Water Act requires states to develop a list of waters not meeting water quality standards or which have Impaired uses. The waters in the French Broad River basin that are on this list are discussed in the individual subbasin chapters (Chapters 1 through 7). States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. EPA issued guidance in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list within 8-13 years. Information regarding 303(d) listing and reporting methodology can be found in Appendix VII.

Challenges Related to Achieving Water Quality Improvements

To achieve the goal of restoring Impaired waters throughout the basin, DWQ will need to work more closely with other state agencies and stakeholders to identify and control pollutants. The costs of restoration will be high, but several programs exist to provide funding for restoration efforts. These programs include the Clean Water Management Trust Fund (CWMTF), the NC

Agriculture Cost Share Program (NCACSP), the NC Ecosystem Enhancement Program (EEP), and the Section 319 of the EPA.

Balancing economic growth and water quality protection will be a tremendous challenge. Point source impacts on surface waters can be measured and addressed through the basinwide planning process. Nonpoint sources of pollution can be identified through the basinwide plan, but actions to address these impacts must be taken at the local level. Such actions should include: development and enforcement of local erosion control ordinances; requirement of stormwater best management practices (BMPs) for existing and new development; development and enforcement of buffer ordinances; and land use planning that assesses impacts on natural resources. This basinwide plan presents many water quality initiatives and accomplishments that are underway within the basin. These actions provide a foundation on which future initiatives can be built.

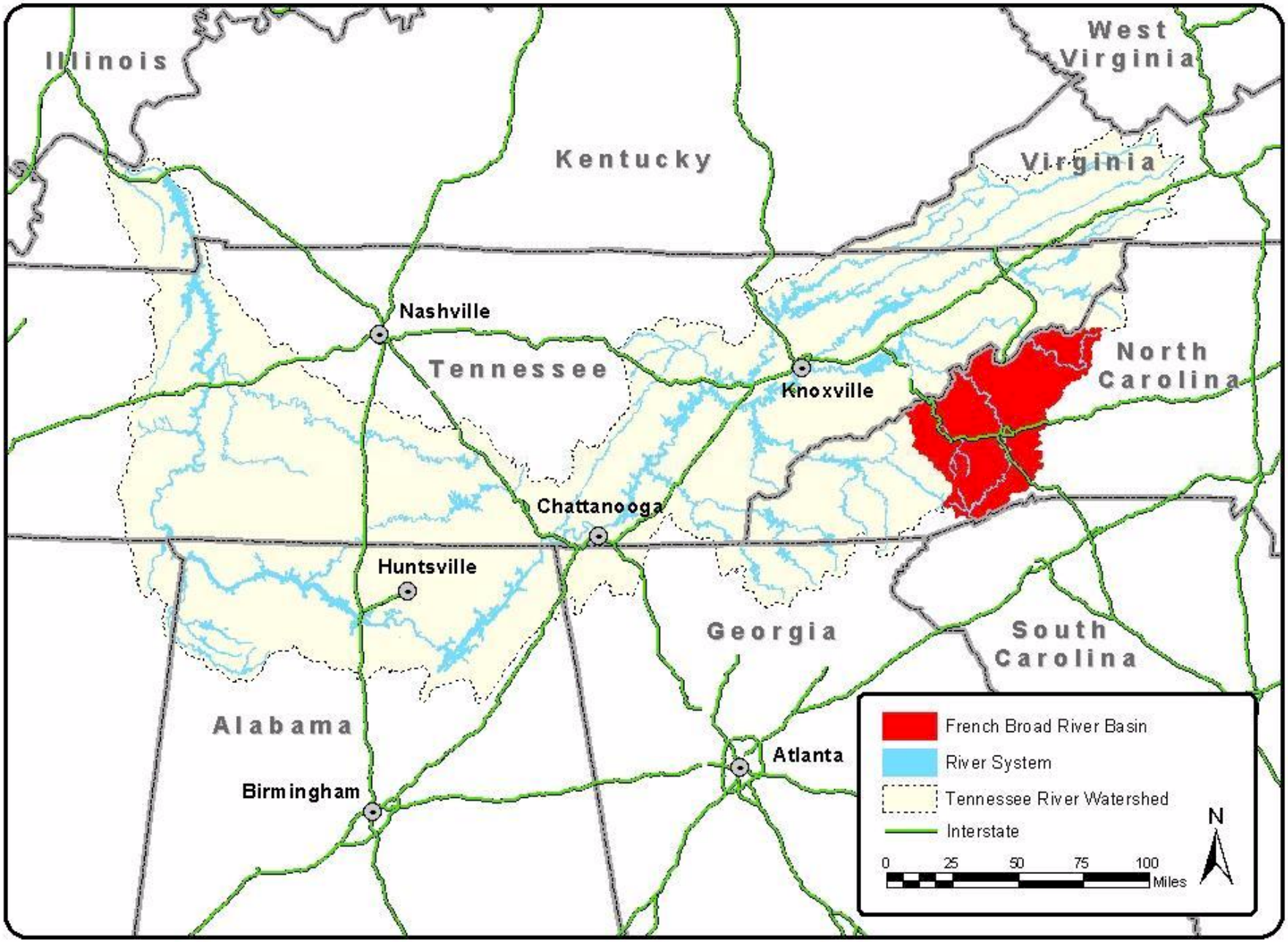
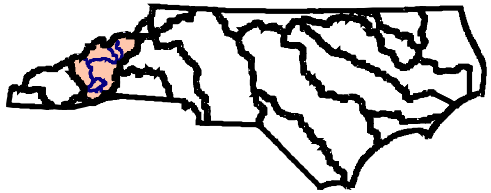


Figure 1 General Map of the Entire French Broad River Basin

Figure 2 General Map of the French Broad River Basin



NC Division of Water Quality
Basinwide Planning Program
July 25, 2005

What is Basinwide Water Quality Planning?

Basinwide water quality planning is a watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the NC Division of Water Quality (DWQ) for each of the 17 major river basins in the state (Figure 3 and Table 2). Preparation of a basinwide water quality plan is a five-year process, which is broken down into three phases (Table 3). While these plans are prepared by DWQ, their implementation and the protection of water quality entail the coordinated efforts of many agencies, local governments and stakeholder groups across the state. The first cycle of plans was completed in 1998, but each plan is updated at five-year intervals.

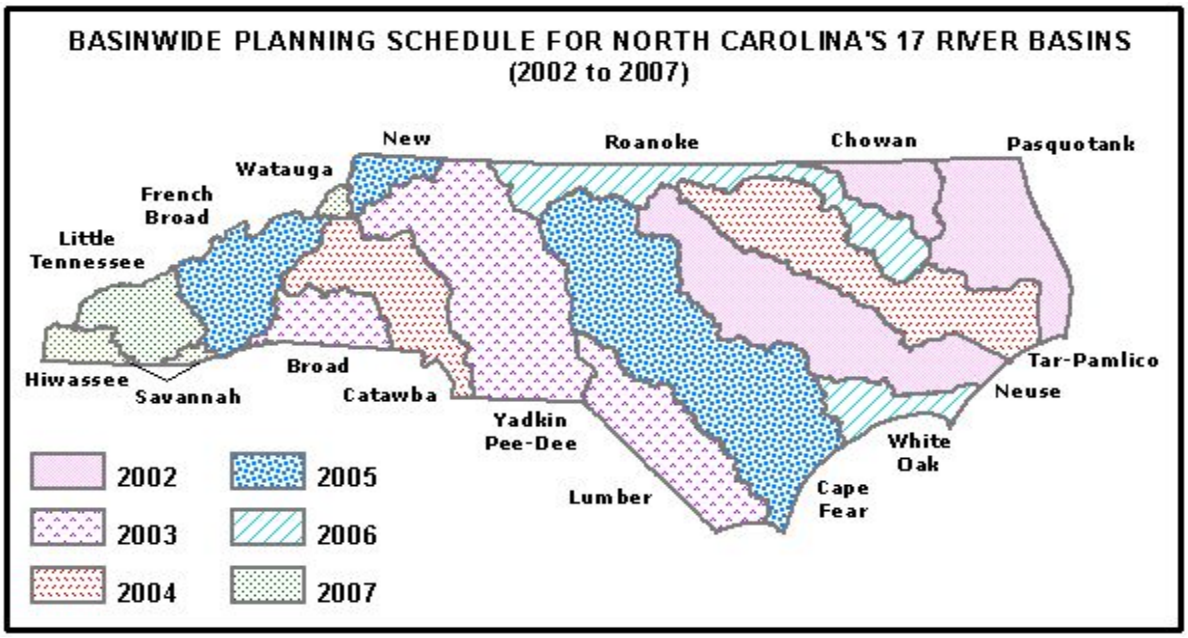


Figure 3 Basinwide Planning Schedule (2002 to 2007)

Goals of Basinwide Water Quality Planning

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to Impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters yet allow for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Evaluate cumulative effects of pollution.
- Improve public awareness and involvement.
- Regulate point and nonpoint sources of pollution where other approaches are not successful.

Table 2 Basinwide Planning Schedule (2000 to 2007)

Basin	DWQ Biological Data Collection	Draft for Public Review	Plan Receives EMC Approval	Begin NPDES Permit Issuance
Chowan	Summer 2000	5/2002	7/2002	11/2002
Pasquotank	Summer 2000	5/2002	7/2002	12/2002
Neuse	Summer 2000	5/2002	7/2002	1/2003
Broad	Summer 2000	11/2002	2/2003	7/2003
Yadkin-Pee Dee	Summer 2001	1/2003	3/2003	9/2003
Lumber	Summer 2001	9/2003	12/2003	7/2004
Tar-Pamlico	Summer 2002	12/2003	3/2004	9/2004
Catawba	Summer 2002	7/2004	9/2004	12/2004
French Broad	**Summer 2002**	**2/2005**	**4/2005**	**9/2005**
New	Summer 2003	8/2005	10/2005	3/2006
Cape Fear	Summer 2003	4/2005	8/2005	4/2006
Roanoke	Summer 2004	4/2006	8/2006	1/2007
White Oak	Summer 2004	9/2006	12/2006	6/2007
Savannah	Summer 2004	11/2006	2/2007	8/2007
Watauga	Summer 2004	12/2006	3/2007	9/2007
Hiwassee	Summer 2004	11/2006	2/2007	8/2007
Little Tennessee	Summer 2004	1/2007	4/2007	10/2007

Note: A basinwide plan was completed for all 17 basins during the first cycle (1993 to 1998). This schedule represents the second and third cycle for each.

Table 3 Five-Year Process for Development of an Individual Basinwide Plan

Years 1 through 2 **Water Quality Data Collection and Identification of Goals and Issues**	• Identify sampling needs • Conduct biological monitoring activities • Conduct special studies and other water quality sampling activities • Coordinate with local stakeholders and other agencies to continue to implement goals within current basinwide plan
Years 2 through 3 **Data Analysis and Collect Information from State and Local Agencies**	• Gather and analyze data from sampling activities • Develop use support ratings • Conduct special studies and other water quality sampling activities • Work with state and local agencies to establish goals and objectives • Identify and prioritize issues for the next basin cycle • Develop preliminary pollution control strategies • Coordinate with local stakeholders and other agencies
Years 3 through 5 **Preparation of the Draft Basinwide Plan, Public Review, Approval of Plan, Issue NPDES Permits and Begin Implementation of Plan**	• Develop draft basinwide plan based on water quality data, use support ratings, and recommended pollution control strategies • Circulate draft basinwide plan for review and present draft plan at public review • Revise plan after public review period • Submit plan to Environmental Management Commission for approval • Issue NPDES permits • Coordinate with other agencies and local interest groups to prioritize implementation actions • Conduct special studies and other water quality sampling activities

Benefits of Basinwide Water Quality Planning

Basinwide planning and management benefits water quality by:

- *Focusing resources* on one river basin at a time.
- *Using sound ecological planning and fostering comprehensive NPDES* permitting by working on a watershed scale.
- *Ensuring better consistency and equitability by* clearly defining the program's long-term goals and approaches regarding permits and water quality improvement strategies.
- *Fostering public participation* to increase involvement and awareness about water quality.
- *Integrating and coordinating programs and agencies* to improve implementation of point and nonpoint source pollution reduction strategies.

Division of Water Quality Functions and Locations

For more information on the above documents, DWQ activities or contacts, visit http://h2o.enr.state.nc.us/basinwide/ or call (919) 733-5083 and ask for the basin planner responsible for your basin of interest. Feel free to contact the appropriate Regional Office for additional information (Figure 4). For general questions about the Department of Environment and Natural Resources, contact the Customer Service Center at 1-877-623-6748.

How You Can Get Involved

To assure that basinwide plans are accurately written and effectively implemented, it is important for citizens and local stakeholders to participate in all phases of the planning process. You may contact the basinwide planner responsible for your basin anytime during the plan's development. Upon request, the basin planner can also present water quality information and basin concerns to local stakeholder groups.

To make the plan more inclusive, DWQ is coordinating with the local Soil and Water Conservation Districts (SWCD), council of governments, NC Cooperative Extension Service, the county Natural Resources Conservation Service (NRCS) and stakeholder groups to develop language and identify water quality concerns throughout the basin. Citizens can be involved during this phase of the plan by contacting the local soil and water conservation district or cooperative extension service.

During the public comment period, the draft plan is available online and by request for a period of at least 30 days. DWQ welcomes written comments and questions during this phase of the planning process and will incorporate comments when appropriate.

Some Other Reference Materials

There are several reference documents and websites that provide additional information about basinwide planning and the basin's water quality:

- *A Citizen's Guide to Water Quality Management in North Carolina* (August 2000). This document includes general information about water quality issues and programs to address these issues. It is intended to be an informational document on water quality. Visit the website at http://h2o.enr.state.nc.us/basinwide/ to download the document.
- *French Broad River Basinwide Assessment Report* (June 2003). This technical report presents physical, chemical and biological data collected in the French Broad River basin. The report is prepared by the NC Division of Water Quality (DWQ) Environmental Sciences Branch and is available on-line at http://www.esb.enr.state.nc.us/.
- *French Broad River Basinwide Water Quality Management Plan* (May 1995) and the *French Broad River Basinwide Water Quality Plan* (May 2000). These first basinwide plans for the French Broad River basin present historic water quality data, information and recommended management strategies for the first two five-year basin planning cycles.
- *North Carolina's Basinwide Approach to Water Quality Management: Program Description*. (Creager, C.S. and J.P. Baker, 1991). NCDENR DWQ, Raleigh, NC.

How to Read the Basinwide Plan

Chapters 1 - 7: Subbasin and Watershed Information

- **Summarizes information and data by subbasin, including:**
  - **Recommendations from the previous basin plan.**
  - **Achievements, current priority issues and concerns.**
  - **Impaired waters and waters with notable impacts.**
  - **Goals and recommendations for the next five years by subbasin.**

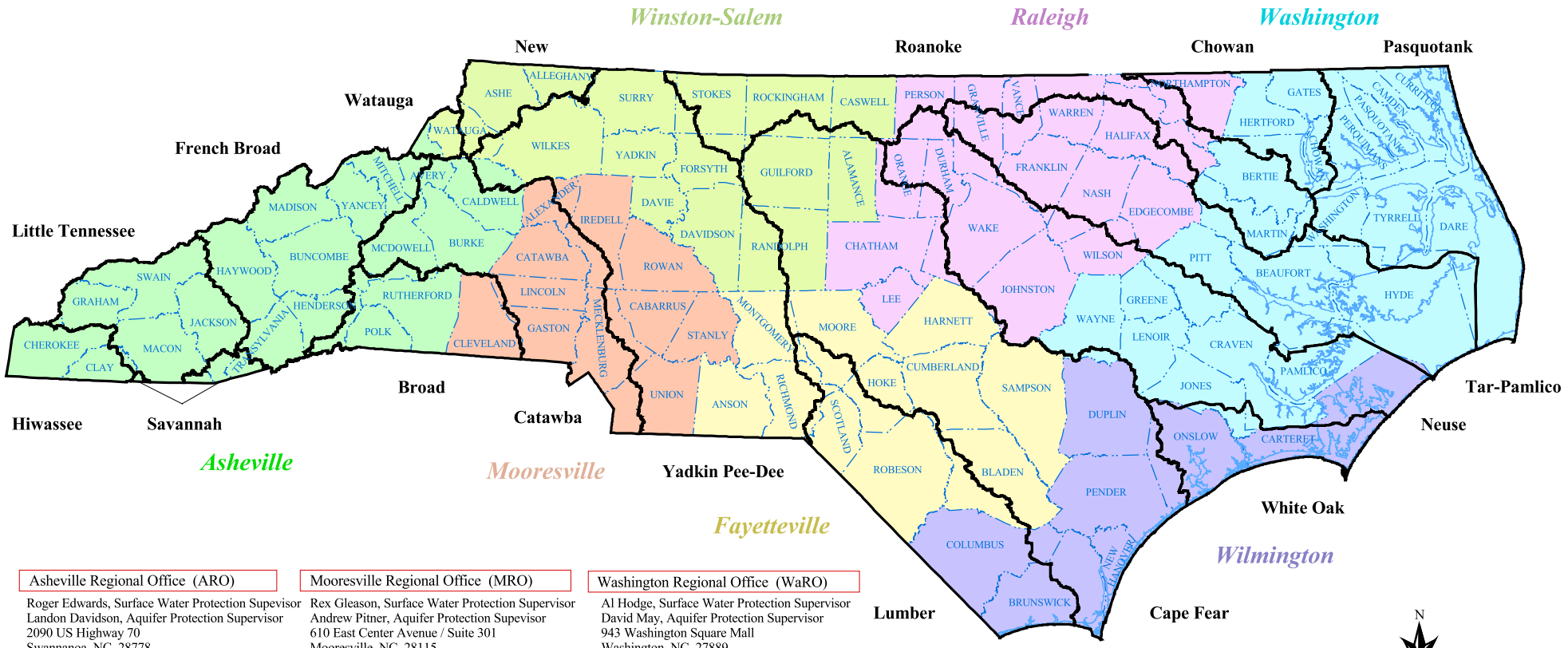
Chapter 8 - 16

- **Presents information on various topics of interest for the protection and restoration of water quality in the basin, including:**
  - **Stream classifications, population and land cover changes.**
  - **Stressors to water quality.**
  - **Agricultural, forestry and permitting activities in the basin.**
  - **Water and natural resources.**
  - **Water quality initiatives.**

Appendices

- **Population and land use changes over time, local governments in the basin.**
- **Describes water quality data collected by DWQ, use support methodology and 303(d) listing methodology.**
- **Lists NPDES dischargers and individual stormwater permits.**
- **Provides workshop summaries, points of contact, and a glossary of terms and acronyms.**

Figure 4 North Carolina Department of Environment and Natural Resources
Division of Water Quality Regional Offices



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Avery	Haywood	Polk
Buncombe	Henderson	Rutherford
Burke	Jackson	Swain
Caldwell	Macon	Transylvania
Cherokee	Madison	Yancey
Clay	McDowell	
Graham	Mitchell	

Mooresville Regional Office (MRO)

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Cabarrus	Mecklenburg
Catawba	Rowan
Cleveland	Stanly
Gaston	Union
Iredell	

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Beaufort	Gates	Pamlico
Bertie	Greene	Pasquotank
Camden	Hertford	Perquimans
Chowan	Hyde	Pitt
Craven	Jones	Tyrrell
Currituck	Lenoir	Washington
Dare	Martin	Wayne

Winston-Salem Regional Office (WSRO)

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Alamance	Forsyth	Watauga
Alleghany	Guilford	Wilkes
Ashe	Randolph	Yadkin
Caswell	Rockingham	
Davidson	Stokes	
Davie	Surry	

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Anson	Moore
Bladen	Richmond
Cumberland	Robeson
Harnett	Sampson
Hoke	Scotland
Montgomery	

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Chatham	Johnston	Vance
Durham	Lee	Wake
Edgecombe	Nash	Warren
Franklin	Northampton	Wilson
Granville	Orange	
Halifax	Person	

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Charlie Stehman, Aquifer Protection Supervisor
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Brunswick	New Hanover
Carteret	Onslow
Columbus	Pender
Duplin	

NCDENR

NC Division of Water Quality
Basinwide Planning Program
June 1, 2005

Chapter 1
French Broad River Subbasin 04-03-01

Including the: West Fork, North Fork and Middle Forks of the French Broad River, Little River, French Broad River, Peter Weaver and Morgan Mill Creeks

1.1 Subbasin Overview

Subbasin 04-03-01 at a Glance

Land and Water Area

Total area:	215 mi²
Land area:	214 mi²
Water area:	1 mi²

Population

2000 Est. Pop.:	22,079 people
Pop. Density:	89 persons/mi²

Land Cover (percent)

Forest/Wetland:	89%
Water:	<1%
Urban:	2%
Cultivated Crop:	3%
Pasture/ Managed Herbaceous:	6%

Counties

Henderson and Transylvania

Municipalities

Brevard and Rosman

Originating in Transylvania County, the headwaters of the French Broad and Little Rivers are in this subbasin. The headwater tributaries are generally high gradient streams capable of supporting viable trout populations. Most of this subbasin is forested, and half of the land area is permanently protected as part of the Pisgah National Forest. By the year 2020, population within Henderson and Transylvania counties is expected to increase by 28.7 and 14.7 percent, respectively. Of particular concern is residential and urban development occurring in the surrounding areas of Brevard and Rosman. Since 1990, Brevard alone has experienced a 26.0 percent increase in population. Consequently, streams in these areas may be negatively impacted by sediment and streambank erosion commonly associated with development activities.

There are 15 individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 32.98 MGD. The largest are RFS Ecusta, Inc. (27.5 MGD), City of Brevard WWTP (2.5 MGD), and AGFA Corporation (2.4 MGD). Refer to Appendix VI for more information on NPDES permit holders. Issues related to compliance with NPDES permit conditions are discussed below in Section 1.3 for Impaired waters and in Section 1.4 for other waters. Information regarding population growth and trends can be found in Appendix I. There are no registered animal operations in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 5. Table 4 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were 24 benthic macroinvertebrate community samples and four fish community samples (Figure 5 and Table 4) collected during this assessment period. Data were also collected from three ambient monitoring stations. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

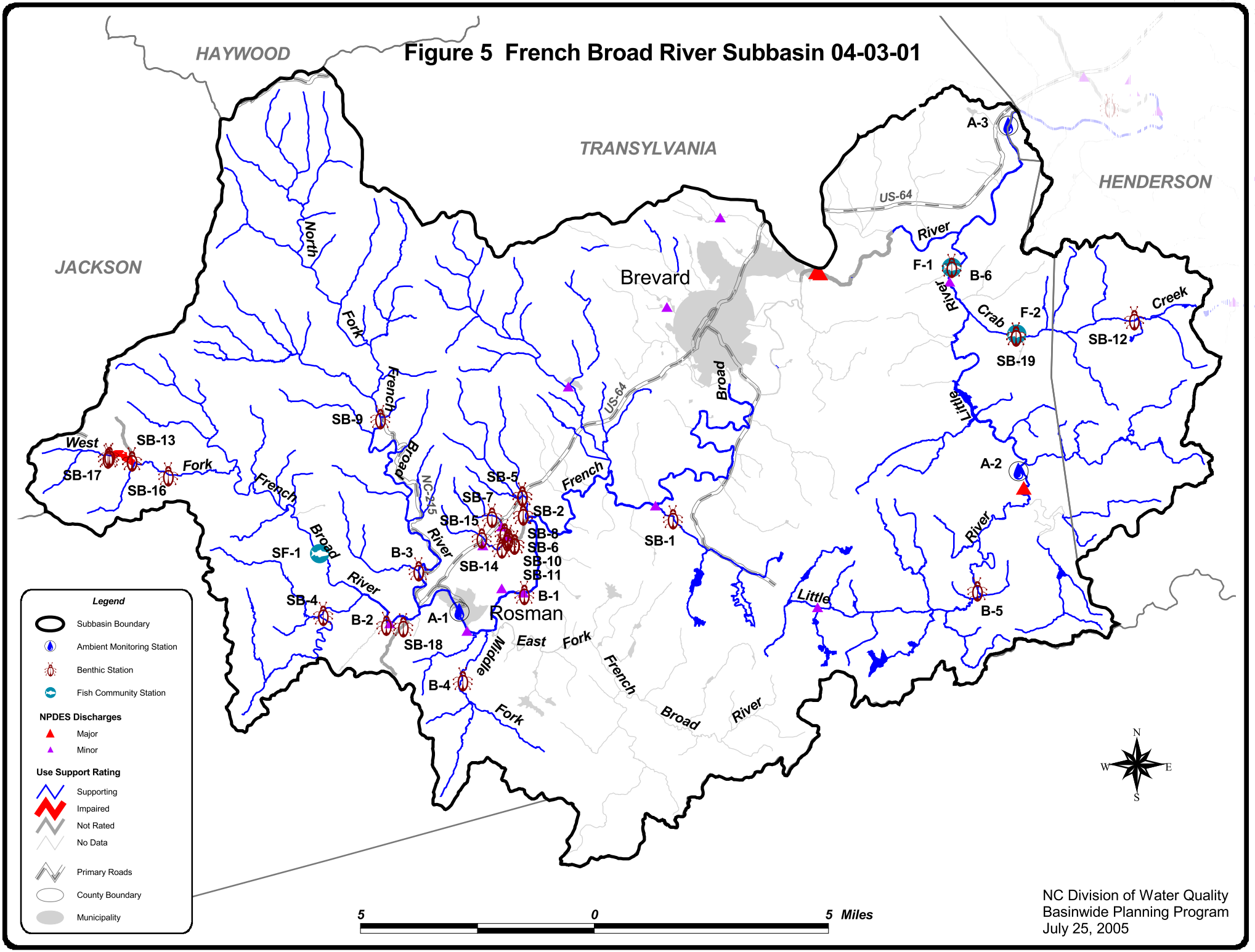


Figure 5 French Broad River Subbasin 04-03-01
HAYWOOD
TRANSYLVANIA
HENDERSON
JACKSON
Brevard
Rosman
US-64
NC-215
North Fork French Broad River
West Fork French Broad River
Middle Fork French Broad River
East Fork French Broad River
Little River
Crab Creek
Broad River
Little River
SB-9
SB-13
SB-17
SB-16
SB-5
SB-7
SB-15
SB-2
SB-8
SB-6
SB-10
SB-11
SB-14
SB-1
SB-4
SB-18
SB-12
SB-19
F-1
B-6
F-2
A-3
A-2
B-5
SF-1
B-3
B-2
A-1
B-1
B-4
Legend
Subbasin Boundary
Ambient Monitoring Station
Benthic Station
Fish Community Station
NPDES Discharges
Major
Minor
Use Support Rating
Supporting
Impaired
Not Rated
No Data
Primary Roads
County Boundary
Municipality
5 0 5 Miles
N
W
E
S
NC Division of Water Quality
Basinwide Planning Program
July 25, 2005

Table 4 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040301

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-(1)	FRENCH BROAD RIVER	19.7	Miles	S	S	B-1	E	2002				A-1	nce
6-(27)c	FRENCH BROAD RIVER	8.8	Miles	S	S							A-3	nce
6-10-1a	Morgan Mill Creek (Kaiser Lake)	1.7	Miles	S	ND	SB-7	NI	2000					
6-10-1b	Morgan Mill Creek (Kaiser Lake)	0.2	Miles	S	ND	SB-8	NI	2000					
6-10-1c	Morgan Mill Creek (Kaiser Lake)	0.1	Miles	NR	ND	SB-6	NR	2001					
6-10a	Peter Weaver Creek	2.3	Miles	S	ND	SB-14	NI	2000					
	Peter Weaver Creek	2.3	Miles	S	ND	SB-10	NI	2001					
	Peter Weaver Creek	2.3	Miles	S	ND	SB-15	NI	2001					
6-10b	Peter Weaver Creek	0.8	Miles	NR	ND	SB-11	NR	2001					
6-11	Cherryfield Creek	4.1	Miles	S	ND	SB-2	NI	2001					
6-11-3	Mason Creek	2.6	Miles	S	ND	SB-5	NI	2001					
6-2-(0.5)a	West Fork French Broad River	1.4	Miles	S	ND	SB-17	NI	2001					
6-2-(0.5)b	West Fork French Broad River	0.6	Miles	I	ND	SB-13	F	2001					
6-2-(0.5)c	West Fork French Broad River	5.0	Miles	S	ND	SB-16	G	2001					
6-2-(7.5)	West Fork French Broad River	4.8	Miles	S	ND	B-2	E	2002	SF-1	NR	1997		
6-20b	Carson Creek	2.8	Miles	S	ND	SB-1	E	2002					
6-2-10	Flat Creek	1.2	Miles	S	ND	SB-4	E	2002					
6-2-12	Woodruff Branch	1.5	Miles	NR	ND	SB-18	NR	1998					
6-3-(6.5)	North Fork French Broad River	10.1	Miles	S	ND	B-3	E	2002					
	North Fork French Broad River	10.1	Miles	S	ND	SB-9	G	2002					
6-38-(1)	Little River (Cascade Lake)	14.8	Miles	S	S	B-5	G	2002				A-2	nce
6-38-(20)	Little River	4.9	Miles	S	ND	B-6	GF	2002	F-1	GF	2002		
6-38-23	Crab Creek	5.4	Miles	S	ND	SB-12	NI	2000	F-2	G	2002		
	Crab Creek	5.4	Miles	S	ND	SB-19	G	2000	F-2	G	2002		
6-5	Middle Fork French Broad River	4.1	Miles	S	ND	B-4	E	2002					

Table 4 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040301

Assessment Unit #	Name	Length/Area	AL	REC	Benthic Community	Fish Community	Ambient Data

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:	**Monitoring data type:**	**Bioclassifcations:**	**Use Support Ratings 2004**:	**Ambient Data**
AL - Aquatic Life	F - Fish Community Survey	E - Excellent	S - Supporting	nce - no criteria
REC - Recreation	B - Benthic Community Survey	G - Good	I - Impaired	ce - criteria exce
	SF - Special Fish Community Study	GF - Good-Fair	NR - Not Rated	
	SB - Special Benthic Community Study	F - Fair	ND - No Data	
	A - Ambient Monitoring Site	P - Poor		
		NI - Not Impaired		

Waters in the following sections are identified by an assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list, and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-01 are summarized in Section 1.2. Recommendations, current status and future recommendations for previously or newly Impaired waters are discussed in Section 1.3. Waters with noted water quality impacts are discussed in Section 1.4. Water quality issues related to the entire subbasin are discussed in Section 1.5. Refer to Appendix X for a complete list of monitored waters and for more information about use support ratings.

1.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-01 in the aquatic life, recreation, fish consumption and water supply categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 96.8 stream miles (23.1 percent) monitored during this assessment period in the aquatic life category. Approximately 0.6 stream miles (<1 percent) are Impaired. Refer to Table 5 for a summary of use support ratings for waters in subbasin 04-03-01.

1.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

1.3.1 West Fork French Broad River [AU# 6-2-(0.5)b]

2000 Recommendations

The 1995 basinwide plan identified 0.5 miles of the West Fork French Broad River below the Whitewater Trout Farm as partially supporting. The plan recommended that a special study of trout farms be conducted to determine if current permit conditions are adequate to protect water quality. This site was not sampled during the 2000 basin cycle and remains on the 303(d) list of Impaired waters.

Table 5 Summary of Use Support Ratings by Category in Subbasin 04-03-01

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	93.8 mi	0.0	43.2 mi	0.0
Impaired	0.6 mi	0.0	0.0	0.0
Not Rated	2.4 mi	0.0	0.0	0.0
Total	**96.8 mi 0.0 ac**	**0.0**	**43.2 mi 0.0 ac**	**0.0**
Unmonitored Waters				
Supporting	192.3 mi 82.7 ac	0.0	0.0	29.6 mi 97.6 ac
Impaired	0.0	0.0	0.0	0.0
Not Rated	4.1 mi	0.0	0.0	0.0
No Data	125.4 mi 97.6 ac	418.6 mi 180.3 ac	375.4 mi 180.3 ac	0.0
Total	**321.8 mi 180.3 ac**	**418.6 mi 180.3 ac**	**375.3 mi 180.3 ac**	**29.6 mi 97.6 ac**
Totals				
All Waters*	**418.6 mi 180.3 ac**	**418.6 mi 180.3 ac**	**418.6 mi 180.3 ac**	**29.6 mi 97.6 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

Current Status

A 0.6-mile segment is currently Impaired due to a Fair bioclassification at site SB-13. In 2001, DWQ conducted a special study in the headwaters of the West Fork French Broad River. From this study, DWQ was able to determine that area trout farms are still having an impact on water quality despite the improvements in operations to reduce nutrient inputs by altering trout feed and capturing more solids. In addition to trout farm discharges, other factors including poor riparian habitats and livestock access to tributaries are also affecting water quality. The West Fork French Broad River has clear indicators of water quality problems, specifically nutrient enrichment evidenced by algae growth and an atypical fish community (NCDENR-DWQ, November 2003).

2005 Recommendations

DWQ will continue to work with Whitewater Trout Farm (also known as KB Farms) to reduce impacts to water quality through the NPDES general permit. It is recommended that local agencies work with landowners to install best management practices (BMPs) to improve the riparian zone and limit livestock access to streams.

1.3.2 Peter Weaver Creek [AU# 6-10a and b]

2000 Recommendations
Peter Weaver Creek, from Morgan Mill Creek to the French Broad River, was partially supporting for its use and was placed on the 303(d) list. More comprehensive benthic macroinvertebrate surveys were needed for DWQ to determine the extent of water quality problems and if the impacts were from a trout farm located on Morgan Mill Creek or other nonpoint sources. DWQ proposed to implement a water quality monitoring program in the watershed to identify which pollutants were causing the problems. Depending on the results of the intensive sampling, existing individual NPDES permit holders may be required to conduct upstream/downstream monitoring, and general NPDES permit holders may be required to obtain individual NPDES permits.

Current Status
Peter Weaver Creek, from source to Morgan Mill Creek (2.3 miles), is currently Supporting due to Not Impaired bioclassifications at sites SB-10, SB-14 and SB-15. Based on sampling criteria, the lower segment of the creek, from Morgan Mill Creek to the French Broad River (0.8 miles), is Not Rated at site SB-11. Observations made at the time of sampling, however, indicate that the biological community has degraded and may be responding to habitat and water quality problems associated with trout farm discharges and nonpoint runoff from residential areas, including a recreational vehicle park. Drought conditions may also be impacting this sampling site.

Samples at sites SB-10, SB-11, SB-14 and SB-15 were collected as part of a Watershed Assessment and Restoration Program (WARP) study on Peter Weaver and Morgan Mill (see Section 1.3.3) Creeks (NCDENR-DWQ, June 2002). This intensive survey collected the following data: benthic macroinvertebrate; stream habitat assessment; morphology and riparian zone condition; stream chemistry; and characterization of watershed land use conditions and pollution sources. The study determined that impacts in Peter Weaver Creek are due to: organic loading from a trout farm located on Morgan Mill Creek; prevention of downstream movement of aquatic invertebrates at the water intake dam of the trout farm; and habitat degradation manifested by sedimentation and substrate instability.

2005 Recommendations and Water Quality Initiatives
As part of the WARP study on Peter Weaver and Morgan Mill Creeks, management strategies were developed to restore the Impaired waters. The following are recommendations to improve water quality in both creeks:

- Local agencies should work with landowners to install BMPs focusing on livestock operations and exclusion.
- Stream restoration and streambank stabilization practices should be implemented with priority given to Peter Weaver and Morgan Mill Creeks.
- Sediment and erosion control practices should be improved. The NC Division of Land Resources (DLR) or Transylvania County should develop guidelines that better protect waters from the impacts of home and road development on steep slopes. Improved mechanisms for addressing the impacts of disturbances of less than one acre should also be developed. Staffing levels must be sufficient to support effective enforcement. Eroding bare areas along road banks and at home sites should be

stabilized with vegetation or regraded to an appropriate slope so that vegetation can be established.

- DWQ should continue monitoring to identify sources of high metal concentrations in area tributaries. Once identified, these sources should be eliminated, if possible.
- Transylvania County or the NC Division of Environmental Health (DEH) should survey residences for straight pipes and work with owners to eliminate them.
- A watershed education program should be developed and implemented with the goal of targeting homeowners in order to reduce current stream damage and prevent future degradation.

In addition to the above, DWQ in coordination with the NC Cooperative Extension Service (NCCES) has reexamined the waste management plan of the Morgan Mill Trout Farm. DWQ and NCCES made the following recommendations: reconstruct the intake structure; change the sediment flushing schedule and structure; modify the settling ponds; switch from an automatic feeding system to a manual feeding schedule with high yield food; and consider decreasing the size of the operation. DWQ and NCCES will continue to monitor the trout farm and assist in implementing the recommendations listed above.

1.3.3 Morgan Mill Creek [AU# 6-10-1a, b and c]

2000 Recommendations

Morgan Mill Creek, from the trout farm (US 64) to Peter Weaver Creek, was partially supporting for its use and was placed on the 303(d) list. Refer to Section 1.3.2 above for more information regarding Morgan Mill Creek.

Current Status

Morgan Mill Creek, from source to river mile 1.92, is currently Supporting due to Not Impaired bioclassifications at sites SB-7 and SB-8. Based on current sampling criteria, the lower segment of the creek, from river mile 1.92 to Peter Weaver Creek (0.1 mile), is currently Not Rated at site SB-6. Observations made at the time of sampling indicate that the biological community in this lower segment of Morgan Mill Creek has degraded in response to habitat and water quality problems. Drought conditions may also be impacting this sampling site.

The June 2002 WARP study for Peter Weaver Creek (see Section 1.3.2) also pertains to Morgan Mill Creek. Like Peter Weaver Creek, organic loading from Morgan Mill Trout Farm, prevention of downstream movement of aquatic invertebrates at the water intake dam, and habitat degradation, including sedimentation and substrate instability, are the limiting factors for the biological community.

2005 Recommendations and Water Quality Initiatives

DWQ will continue to monitor the water quality in Morgan Mill Creek. It is recommended that local agencies work with landowners to install the appropriat BMPs to improve the riparian zone and limit livestock access to streams. Since much of the stream is channelized with unstable streambanks, stream restoration activities are also desirable. For additional recommendations and management strategies, refer to Peter Weaver Creek (Section 1.3.2).

1.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

1.4.1 Little River [AU# 6-38-(20)]

2000 Recommendations
Little River, from Cascade Lake Dam to the French Broad River (4.8 miles), was monitored by DWQ for benthic macroinvertebrates. Samples showed impacts to the aquatic habitats and water quality, both of which are likely associated with agricultural activities. BMPs are encouraged to reduce potential nonpoint pollution impacts.

Current Status
Little River, from Cascade Lake Dam to the French Broad River (4.9 miles), is currently Supporting due to Good-Fair bioclassifications at sites B-6 and F-1. This site consistently receives a Good-Fair, but usually has the fewest numbers of fish collected during sampling. The substrate of the stream has become more embedded since this site was last monitored in 1997, making sediment a concern for this stream. This watershed could also be impacted by agricultural activities that accelerate erosion and instream habitat degradation. Agricultural BMPs are encouraged to reduce future impacts.

Cascade Lake hydroelectric dam is located approximately 4 miles upstream of the sampling sites. In July 2002, the owner, Cascade Power Company, surrendered the license to operate the facility to the Federal Energy Regulatory Commission (FERC). The facility will no longer generate electricity, and the project will operate as a "run-of-river" with all flow going into the old bypass section. For more information, see Section 14.2.

2005 Recommendations
DWQ will continue to monitor Little River. DWQ will also work with local agencies to identify sediment sources and assist agency personnel to locate monies for water quality protection funding. It is recommended that local agencies work to install BMPs and implement a sediment and erosion control program. The NC Wildlife Resources Commission (WRC) has identified Little River as an area that supports listed and otherwise rare and sensitive aquatic species. Care should be taken to protect these species and their aquatic habitats.

Water Quality Initiatives
Since 1998, over $516,000 worth of BMPs have been installed throughout Transylvania County using money from the NC Agriculture Cost Share Program (NCACSP), the NRCS Environmental Quality Improvement Program (EQIP), the Clean Water Management Trust Fund (CWMTF), and Section 319. Using funds from CWMTF, the Transylvania County Soil and

Water Conservation District (SWCD) completed a watershed assessment for the Little River watershed. The project inventoried 4.9 miles of the Little River and determined and prioritized stream restoration and BMP opportunities. Streambank stabilization and livestock exclusion projects are currently in progress.

In addition to the efforts underway by Transylvania County SWCD, the Henderson County SWCD has installed 16,166 feet of fence, 13 watering tanks and 2 stream crossings along tributaries of the Little River. NCACSP provided funding in the amount of $40,903 for these projects.

Because of the potential water quality problems noted in Little River, it has been identified by the NC Ecosystem Enhancement Program (EEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

1.5 Additional Water Quality Issues within Subbasin 04-03-01

This section identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

1.5.1 Surface Waters Identified for Potential Reclassification

French Broad River [AU# 6-(1)]
The French Broad River, from source to Nicholson Creek (19.7 miles), is Supporting due to an Excellent bioclassification at site B-1. The current DWQ classification is B Tr.

Carson Creek (AU# 6-20b)
Carson Creek, from Carson Creek dam to the French Broad River (2.8 miles), is Supporting due to an Excellent bioclassification at site SB-1. The current DWQ classification is B Tr.

Flat Creek (AU# 6-2-10)
Flat Creek, from source to the West Fork French Broad River (1.2 miles), is Supporting due to an Excellent bioclassification at site SB-4. The current DWQ classification is C Tr.

Middle Fork French Broad River (AU# 6-5)
The Middle Fork French Broad River, from source to the French Broad River (4.1 miles), is Supporting due to an Excellent bioclassification at site B-4. The current DWQ classification is B Tr.

Chapter 2
French Broad River Subbasin 04-03-02

Including the: French Broad River, Hominy and South Hominy Creeks, Mud Creek Watershed, Cane Creek, Newfound Creek, Reems Creek, Sandymush Creek, Bent Creek, Swannanoa River, Ross Creek, Lake Julian, Moore Creek, Canie Creek, Burnett Reservoir and Lake Kenilworth

2.1 Subbasin Overview

Subbasin 04-03-02 at a Glance

Land and Water Area

Total area:	806 mi²
Land area:	801 mi²
Water area:	5 mi²

Population Statistics

2000 Est. Pop.: 218,920 people
Pop. Density: 282 persons/mi²

Land Cover (percent)

Forest/Wetland:	74%
Surface Water:	1%
Urban:	3%
Cultivated Crop:	1%
Pasture/ Managed Herbaceous:	21%

Counties

Buncombe, Haywood, Henderson, Madison, and Transylvania

Municipalities

Asheville, Black Mountain, Biltmore Forest, Canton, Fletcher, Hendersonville, Laurel Park, Montreat, Weaverville and Woodfin

In this subbasin, the French Broad River is a very wide river capable of supporting many species of warmwater gamefish. Of the five counties located in this subbasin, Buncombe and Henderson counties are expected to experience the largest increase in population by the year 2020 (22.3 and 28.7 percent increase, respectively). Population growth in these counties is expected to occur around Asheville and Hendersonville, which are the largest urbanized areas in the subbasin. Since 1990, Asheville has experienced a population increase of 11.4 percent, Hendersonville an increase of 50.2 percent, and Black Mountain has increased by 35.7 percent. The French Broad River, because of its proximity to these large urban areas, is a popular water-based recreational resource, and many of the tributaries have viable populations of brook trout. For more information related to population growth and trends, refer to Appendix I.

There are 67 individual NPDES wastewater discharge permits in this subbasin with a total permitted flow of 55.4 MGD. The largest is the Metropolitan Sewerage District – Water Reclamation Facility (MSD-WRF) in Buncombe County (40.0 MGD). There are also two individual NPDES stormwater permits. Significant issues related to compliance with NPDES permit conditions are discussed in the following sections. Asheville, Biltmore Forest, Black Mountain, as well as Buncombe and Henderson counties, will be required to develop stormwater programs under Phase II. Refer to Appendix VI for more information on NPDES permit holders and to Section 13.2 for information related to the state's stormwater programs. There are seven registered animal operations in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 6. Table 6 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

Figure 6 French Broad River Subbasin 04-03-02

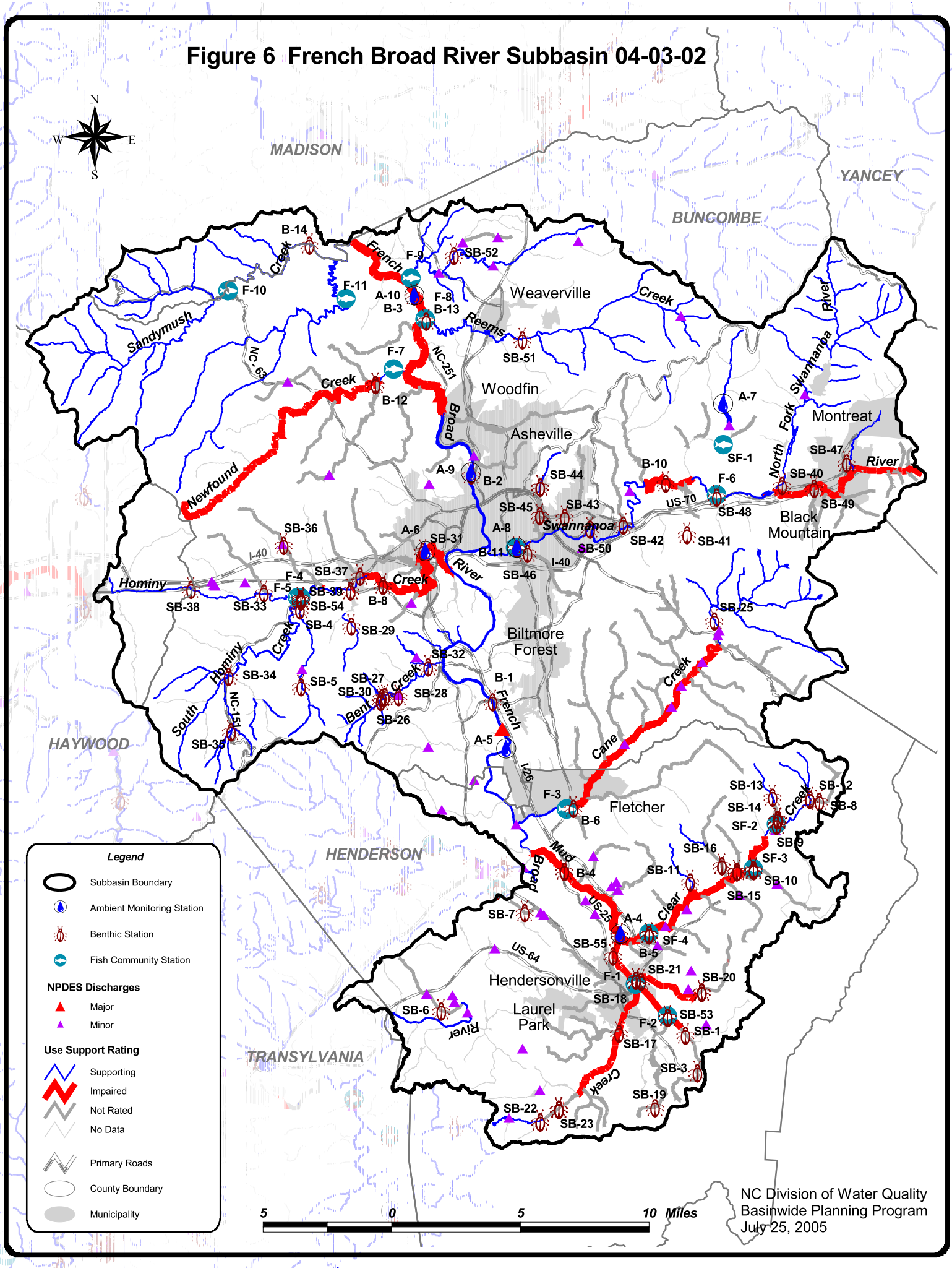


Table 6 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040302

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-(27)d	FRENCH BROAD RIVER	4.4	Miles	S	S							A-3	nce
6-(54.5)b	FRENCH BROAD RIVER	8.2	Miles	S	I	B-1	GF	2002				A-5	Bacteria
6-(54.5)c	FRENCH BROAD RIVER	18.3	Miles	S	S	B-2	G	2002				A-9	nce
6-(54.5)d	FRENCH BROAD RIVER	6.4	Miles	I	S	B-3	F	2002				A-10	nce
6-(54.5)e	FRENCH BROAD RIVER	3.9	Miles	I	S	B-3	F	2002				A-10	nce
6-47	Gash Creek	3.7	Miles	NR	ND	SB-6	NR	2002					
6-51	Mill Pond Creek	3.1	Miles	NR	ND	SB-7	NR	2002					
6-55-11-(1)a	Clear Creek	2.7	Miles	NR	ND	SB-8	NR	2000					
6-55-11-(1)b	Clear Creek	2.5	Miles	S	ND	SB-9	GF	2000	SF-2	GF	2001		
6-55-11-(1)c	Clear Creek	2.1	Miles	I	ND	SB-10	P	2001	SF-3	F	2001		
6-55-11-(5)	Clear Creek	6.5	Miles	I	ND	B-5	P	2000	SF-4	GF	2001		
6-55-11-11	Harper Creek	2.6	Miles	S	ND	SB-11	E	2000					
6-55-11-2	Laurel Fork	2.3	Miles	S	ND	SB-12	E	2000					
6-55-11-3a	Cox Creek	1.5	Miles	S	ND	SB-13	NI	2000					
6-55-11-3b	Cox Creek	1.1	Miles	NR	ND	SB-14	NR	2001					
	Cox Creek	1.1	Miles	NR	ND	SB-14	NR	2000					
6-55-11-7	Mill Creek	2.4	Miles	NR	ND	SB-15	NR	2001					
6-55-11-8	Kyles Creek	4.1	Miles	NR	ND	SB-16	NR	2001					
6-55-8-1-2-(1)	King Creek [McCabe Pond, Jordans Lake, Bonclarken Lake, Madonna Lake (Highlands Lake)]	4.8	Miles	NR	ND	SB-19	NR	2000					
6-55-8-1a	Bat Fork	4.8	Miles	NR	ND	SB-3	NR	2000					
	Bat Fork	4.8	Miles	NR	ND	SB-1	NR	2001					
6-55-8-1b	Bat Fork	1.5	Miles	I	ND	SB-53	NR	2001	F-2	P	2002		
6-55-8-2a	Devils Fork	3.4	Miles	NR	ND	SB-20	NR	2000					
6-55-8-2b	Devils Fork	2.7	Miles	I	ND	SB-21	P	2000					
6-55a	Mud Creek	2.4	Miles	S	ND	SB-22	NI	2000					
6-55b	Mud Creek	1.9	Miles	NR	ND	SB-23	NR	2000					
6-55c	Mud Creek	11.0	Miles	I	S	SB-55	F	2000	F-1	P	2002	A-4	nce

Table 6 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040302

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-55c	Mud Creek	11.0	Miles	I	S	SB-17	F	2001	F-1	P	2002	A-4	nce
	Mud Creek	11.0	Miles	I	S	SB-18	P	2001	F-1	P	2002	A-4	nce
6-55d	Mud Creek	2.2	Miles	I	ND	B-4	P	2000					
6-57-(1)	Cane Creek	7.4	Miles	S	ND	SB-25	G	1999					
6-57-(9)a	Cane Creek	9.6	Miles	I	ND	B-6	F	2002					
6-57-(9)b	Cane Creek	2.4	Miles	S	ND				F-3	G	2002		
6-67-(1)	Bent Creek	3.5	Miles	S	ND	SB-27	E	2001					
	Bent Creek	3.5	Miles	S	ND	SB-26	E	2001					
	Bent Creek	3.5	Miles	S	ND	SB-26	NI	2001					
6-67-(7)	Bent Creek	3.0	Miles	S	ND	SB-28	GF	2001					
6-67-10	Wesley Creek (Bent Creek Ranch Lake)	1.9	Miles	S	ND	SB-32	NI	2001					
6-67-6	Boyd Branch	1.3	Miles	S	ND	SB-30	E	2001					
6-76-12	Canie Creek	2.3	Miles	NR	ND	SB-31	NR	2002					
6-76-4	Webb Branch	3.8	Miles	NR	ND	SB-33	NR	2002					
6-76-5	South Hominy Creek	12.4	Miles	S	ND	SB-54	GF	2002	F-5	G	2002		
6-76-5-3	Stony Fork	4.5	Miles	S	ND	SB-35	G	2002					
6-76-5-4	Warren Creek	3.5	Miles	S	ND	SB-34	G	2002					
6-76-5-8	Beaverdam Creek	6.2	Miles	S	ND	SB-5	NI	2002					
	Beaverdam Creek	6.2	Miles	S	ND	SB-4	G	2002					
6-76-6	Pole Creek	5.3	Miles	NR	ND	SB-36	NR	2002					
6-76-7a	Bill Moore Creek (Enka Lake)	2.9	Miles	S	ND	SB-29	NI	2002					
6-76-8	Moore Creek	3.2	Miles	NR	ND	SB-37	NR	2002					
6-76a	Hominy Creek	9.7	Miles	S	ND	SB-38	G	2002					
6-76b	Hominy Creek	3.1	Miles	S	ND				F-4	GF	2002		
6-76c	Hominy Creek	3.3	Miles	S	ND	SB-39	GF	2002					
6-76d	Hominy Creek	7.8	Miles	I	S	B-8	F	2002				A-6	nce
6-78-11-(13)	North Fork Swannanoa River	5.3	Miles	S	ND	SB-40	GF	2002					
6-78-15-(1)	Beetree Creek (Beetree Reservoir)	5.0	Miles	S	S							A-7	nce

Table 6 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040302

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-78-19	Christian Creek (Davis Lake)	4.5	Miles	S	ND	SB-41	G	1999					
6-78-20	Grassy Branch	4.2	Miles	NR	ND	SB-42	NR	1999					
6-78-22	Haw Creek	4.6	Miles	NR	ND	SB-43	NR	1999					
6-78-23a	Ross Creek (Lake Kenilworth)	2.6	Miles	S	ND	SB-44	NI	2002					
6-78-23b	Ross Creek (Lake Kenilworth)	1.1	Miles	NR	ND	SB-45	NR	2002					
6-78-23c	Ross Creek (Lake Kenilworth)	12.0	Acres	NR	ND							Lake Monitoring	nce
6-78-24	Sweeten Creek (Busbee Reservoir)	3.8	Miles	NR	ND	SB-46	NR	1999					
6-78-6-(4)	Flat Creek	3.0	Miles	S	ND	SB-47	GF	1999					
6-78a	Swannanoa River	7.0	Miles	I	ND	SB-49	F	2002					
6-78b	Swannanoa River	4.6	Miles	S	ND	SB-48	GF	2002	F-6	G	2002		
6-78c	Swannanoa River	2.6	Miles	I	ND	B-10	F	2002					
6-78d	Swannanoa River	11.5	Miles	S	S	SB-50	GF	2002				A-8	nce
	Swannanoa River	11.5	Miles	S	S	B-11	GF	2002				A-8	nce
6-84a	Newfound Creek	3.9	Miles	I	ND	B-12	F	2002					
6-84b	Newfound Creek	1.3	Miles	I	ND	B-12	F	2002					
6-84c	Newfound Creek	2.3	Miles	I	ND	B-12	F	2002					
6-84d	Newfound Creek	4.4	Miles	I	ND	B-12	F	2002					
6-84e	Newfound Creek	1.7	Miles	S	ND				F-7	G	2002		
6-87-(1)	Reems Creek	10.2	Miles	S	ND	SB-51	E	2002					
6-87-(10)	Reems Creek	4.5	Miles	S	ND	B-13	GF	2002	F-8	G	2002		
6-88	Flat Creek	11.1	Miles	S	ND	SB-52	GF	2002	F-9	G	2002		
6-92-(1)	Sandymush Creek	9.8	Miles	S	ND	B-14	G	2002					
6-92-(9)	Sandymush Creek	10.7	Miles	S	ND	B-14	G	2002	F-10	G	2002		
6-92-13	Turkey Creek	9.1	Miles	S	ND				F-11	G	2002		

Table 6 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040302

Assessment Unit #	Name	Length/Area	AL	REC	Benthic Community	Fish Community	Ambient Data

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:	**Monitoring data type:**	**Bioclassifcations:**	**Use Support Ratings 2004**:	**Ambient Data**
AL - Aquatic Life	F - Fish Community Survey	E - Excellent	S - Supporting	nce - no criteria
REC - Recreation	B - Benthic Community Survey	G - Good	I - Impaired	ce - criteria exce
	SF - Special Fish Community Study	GF - Good-Fair	NR - Not Rated	
	SB - Special Benthic Community Study	F - Fair	ND - No Data	
	A - Ambient Monitoring Site	P - Poor		
		NI - Not Impaired		

There were 63 benthic macroinvertebrate community samples and 16 fish community samples (Figure 6 and Table 6) collected during this assessment period. Data were also collected from eight ambient monitoring stations and two lakes. Many of these observations are corroborated by data collected by the VWIN program (see Appendix V). Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-02 are summarized in Section 2.2. Recommendations, current status and future recommendations for waters that were previously or newly Impaired are discussed in Section 2.3. Waters with noted water quality impacts are discussed in Section 2.4. Water quality issues related to the entire subbasin are discussed in Section 2.5. Refer to Appendix X for a complete list of monitored waters and more information on use support ratings.

2.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-02 in the aquatic life, fish consumption, recreation and water supply categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 336.7 stream miles (35.7 percent) and 12.0 freshwater acres (2.7 percent) monitored during this assessment period in the aquatic life category. In the recreation category, 76.5 stream miles (8.1 percent) were monitored. A total of 83.8 stream miles (8.9 percent) are Impaired. This includes 8.2 miles Impaired for recreational use. Refer to Table 7 for a summary of use support ratings for waters in subbasin 04-03-02.

2.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

Table 7 Summary of Use Support Ratings by Category in Subbasin 04-03-02

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	201.5 mi	0.0	68.3 mi	0.0
Impaired	74.6 mi	0.0	8.2 mi	0.0
Not Rated	60.6 mi 12.0 ac	0.0	0.0	0.0
Total	**336.7 mi 12.0 ac**	**0.0**	**76.5 mi 0.0 ac**	0.0
Unmonitored Waters				
Supporting	150.7 mi	0.0	0.0	68.6 mi 325.9 ac
Impaired	0.0	0.0	0.0	0.0
Not Rated	181.9 mi 30.8 ac	0.0	0.0	0.0
No Data	274.3 mi 397.6 ac	943.6 mi 440.4 ac	867.1 mi 440.4 ac	0.0
Total	**606.9 mi 428.4 mi**	**943.6 mi 440.4 ac**	**867.1 mi 440.4 ac**	**68.6 mi 325.9 ac**
Totals				
All Waters*	**943.6 mi 440.4 ac**	**943.6 mi 440.4 ac**	**943.6 mi 440.4 ac**	**68.6 mi 325.9 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

2.3.1 Mud Creek Watershed

Mud Creek [AU# 6-55c and d]

2000 Recommendations

Mud Creek was Impaired due to habitat degradation from point and nonpoint sources of pollution. Nonpoint sources included urban and stormwater runoff as well as agricultural land use. The Hendersonville Wastewater Treatment Plant (WWTP) was operating under a Special Order of Consent (SOC) during the 2000 basin plan. The facility was under construction to increase its flow capacity and was meeting the effluent limits of the SOC. Local agencies were to assist in providing technical assistance and financial support for best management practices (BMPs) associated with a local dairy operation. Land-of-Sky Regional Council of Governments was to form a stakeholder group that was to develop an implementation plan to improve the water quality throughout the watershed.

Current Status

Mud Creek, from Little Mud Creek to the French Broad River (13.2 miles), is currently Impaired because of Poor or Fair bioclassification at sites B-4, SB-17, SB-18, SB-55, and F-1. Additional

sites at SB-22 and SB-23 are Not Rated (1.9 miles) and Not Impaired (2.7 miles) because data from these sites were inconclusive or too small to rate.

Most of the data collected in this watershed during the assessment period was part of the DWQ Watershed Assessment and Restoration Program (WARP) funded by the Clean Water Management Trust Fund (CWMTF). This intensive survey collected the following data: benthic macroinvertebrate; stream habitat assessment; morphology and riparian zone condition; water quality sampling to evaluate stream chemistry and toxicity; and characterization of watershed land use, conditions and pollution sources (NCDENR-DWQ, October 2002b). The study area included the Mud Creek watershed and its major tributary streams (discussed below).

The study found that aquatic organisms in the creek are impacted by toxicity, habitat degradation, storm flow scour from urban areas, and widespread stream degradation. Pesticides and urban toxicants are thought to be the cause of toxicity. Channelization, lack of riparian vegetation, and upland sedimentation are all potential causes of habitat degradation. Nutrient overloading is also widespread. The biological community may also have been adversely impacted by a four-year drought (1998 to 2002), although nonpoint source runoff impacts may have been minimized during this time.

A group of local stakeholders have organized as the Mud Creek Watershed Restoration Council. This group has developed a watershed plan and is moving into the implementation phase with the support of a full-time watershed coordinator housed at the Henderson County Cooperative Extension Service Center (NCCES). Working with the council, the NC Ecosystem Enhancement Program (EEP) helped develop a local watershed plan. The plan identifies sources of habitat and water quality impacts and makes recommendations to address these issues. Refer to *Current Water Quality Initiatives* for more information.

Hendersonville WWTP completed construction activities in March 2002. The newly constructed aeration facility is producing high quality effluent. The SOC has been removed and the facility is currently meeting its operating limits.

2005 Recommendations

DWQ will continue to monitor water quality in the Mud Creek watershed to study the causes of toxicity. Management strategies were developed as part of the WARP study, and DWQ recommends that the following strategies be implemented:

- Feasible and cost-effective stormwater retrofit projects should be implemented throughout the developed portions of the watershed.
- A program to address toxic inputs from developed areas should be created and implemented including source reduction and stormwater treatment methods.
- Stream channel restoration activities.
- BMPs to prevent pesticides from entering streams, including practices applicable to apple orchards.
- BMPs to minimize livestock access to streams.
- Post-construction stormwater management strategies, especially in rapidly developing areas, should be developed by Henderson County or the local municipality.

- Henderson County should develop local sediment and erosion control programs or NC Division of Land Resources (DLR) should refine its present program, with specific provisions to address smaller sites and road and site development on steep slopes.
- A watershed education program should be developed.

DWQ encourages the efforts of the Mud Creek Watershed Restoration Council and will partner with them as they implement management strategies in the watershed.

Water Quality Initiatives

Several water quality initiatives are underway throughout the Mud Creek watershed. Henderson County Soil and Water Conservation District (SWCD) in conjunction with the NRCS has closed three abandoned animal waste systems; installed 19 agrichemical handling facilities; converted 70 acres of conventional till vegetables to no-till farmland; purchased two precision sprayers to reduce pesticide over spray; installed 2,663 feet of fence to exclude livestock; and installed five watering tanks. Over $600,000 of funds from EQIP and the NC Agriculture Cost Share Program (NCACSP) was spent to install the BMPs. The district is currently seeking additional funds to purchase more precision sprayers and to examine the use of pheromone mediating mating disruptors.

In addition to the local SWCD, the Mud Creek Watershed Restoration Council was formed and consists of a diverse group that strives to improve and protect water quality throughout the Mud Creek watershed. The council has developed management strategies grouped into the following four categories: 1) stormwater; 2) nonpoint source pollution from agricultural activities; 3) habitat degradation; and 4) upland sources of sediment (Mud Creek Watershed Restoration Council, April 2003). Goals and objectives for each of these categories are listed below.

(1) *Stormwater*: Strategies are listed to address the volume, velocity and quality of post-construction runoff from existing and future roads and commercial and residential development.

- Educate citizens and businesses on stormwater issues and BMPs; create an awards program.
- Develop or refine stormwater management and floodplain development ordinances.
- Reduce impervious surfaces that create stormwater runoff and pollution; review building codes for low impact development opportunities.

(2) *Nonpoint Source Pollution from Agricultural Activities*: Strategies are listed to reduce pesticides, nutrients, sediment, and bacteria and other agriculture related nonpoint source pollution.

- Promote innovative pest management practices to minimize pesticide drift.
- Work with willing landowners to stabilize streams, establish vegetative buffers, and implement animal waste practices.

(3) *Habitat Degradation*: Strategies include those that improve aquatic habitat needed by aquatic organisms to survive and reproduce in a stream. The recommendations address the causes of habitat degradation including sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of riffles or pools, loss of woody habitat, and streambed scour (i.e., flow that washes away habitat).

- Restore the most critically eroding streams and restore native vegetation along all streams.
- Educate landowners about the importance of riparian buffers.
- Protect high priority wetlands and riparian buffers in the watershed.

(4) *Upland Sources of Sedimentation*: Strategies also include those that reduce sediment pollution from construction activities and unpaved roads and driveways.

- Consider the benefits of a local sediment and erosion control program.
- Educate excavators and the public about how to control erosion.
- Reduce sediment pollution from unpaved roads, eroding roadbanks and roadside ditches.

Land use/cover information for the watershed was determined using 2001 aerial photography with an Integrated Pollution Source Identification (IPSI) system developed by the Tennessee Valley Authority (TVA). IPSI is a geographical information database that utilizes a number of physical factors to aid in identifying and prioritizing issues affecting water quality. From IPSI, it was determined that 45 percent of the land area is forest; 25 percent is used for residential, commercial or industrial purposes, and 23 percent consists of agricultural use including row crops, orchards, and cattle and horse pastures. Significant channelization and floodplain alteration has occurred throughout the watershed during the last 150 years. Woody debris is sparse, and the aquatic habitat is generally poor throughout the watershed. Without appropriate water quality protection, increasing urbanization in the watershed will likely exacerbate existing water quality problems. For additional information on local water quality initiatives in the Mud Creek watershed and contact information, refer to Chapter 16.

Because of the water quality problems noted throughout the Mud Creek watershed, it has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. A local watershed plan was completed in 2003 and incorporated into the management strategies listed above. NCEEP is initiating two wetland restoration projects (totaling 15 acres) and one 2,000 linear foot stream restoration project in the Mud Creek watershed. Construction will begin in 2005. For a copy of the local watershed plan, visit www.nceep.net/services/lwps/Mud_Creek/mudcreek.htm.

Bat Fork [AU# 6-55-8-1b]

2000 Recommendations

Bat Fork was Impaired due to habitat degradation from nonpoint source inputs including agriculture as well as urban and nonurban development. Bat Fork could benefit from local initiatives that might include the formation of a citizens group to conduct stream cleanup efforts, assess the watershed for specific pollution sources, and identify possible solutions to nonpoint sources of pollution. Local agencies could pursue funding opportunities to reduce nonpoint

source pollution and to implement a watershed-wide education effort. DWQ will work with these various agencies to conduct further monitoring and assist with locating sources of funding.

Current Status
Bat Fork, from SR 1779 to Johnson Drainage Ditch (1.5 miles), is currently Impaired due to a Poor bioclassification at site F-2. Upstream sites, from source to SR 1779 (4.8 miles), are Not Rated due to the small stream size at sites SB-1 and SB-3. Bat Fork was sampled as part of the Mud Creek WARP study. A number of stressors impact Bat Fork, including toxicants, severe habitat degradation, and widespread stream degradation. Habitat degradation was the most severe and likely due to channelization, removal of riparian vegetation, upland sediment sources, and livestock access to the stream. In 2002, the lower Bat Fork monitoring site had the lowest scoring habitat in the basin.

Since March 2000, the General Electric (GE) Lighting Plant has been sending remediated groundwater and process waters to Hendersonville's WWTP. This change in operations has reduced impacts to Bat Fork, although the plant still discharges permitted stormwater to the creek. A local initiative is underway (the Mud Creek Watershed Restoration Project) which should address water quality concerns throughout the entire Mud Creek watershed and include Bat Fork.

2005 Recommendations
DWQ will continue to monitor the water quality in Bat Fork. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone and limit livestock access to streams. Since much of the stream is channelized with unstable streambanks, stream restoration activities are also desirable. For additional recommendations and water quality initiatives, refer to the Mud Creek recommendations listed above.

Devils Fork [AU# 6-55-8-2b]

Current Status and 2005 Recommendations
Devils Fork is Impaired, from the first unnamed tributary west of SR 1006 to Johnson Drainage Ditch (2.7 miles), due to a Poor bioclassification at site SB-21. This segment is located in a commercial/industrial section of Hendersonville where channelization has impacted water quality and riparian habitats. Upstream, Devils Fork, from source to the first tributary west of SR 1006 (3.4 miles), is currently Not Rated because of a Not Rated bioclassification. Although the monitoring site (SB-20) in this upstream segment is classified Not Rated, it was characterized by a degraded aquatic community.

Devils Fork was sampled as part of the Mud Creek WARP study. The study determined that Devils Fork suffers from exposure to toxicants, habitat degradation and nutrient enrichment. Upstream toxicants are likely pesticides from orchards and/or row crops, and downstream toxicants are from these same agricultural activities as well as urban areas. As with Bat Fork, habitat degradation was caused by channelization, removal of riparian vegetation, and upland sediment sources. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone and complete stream restoration activities. As Devils Fork is part of the Mud Creek watershed, refer to the Mud Creek recommendations and water quality initiatives listed above.

Clear Creek [AU# 6-55-11-(1)c and 6-55-11-(5)]

2000 Recommendations
Clear Creek is a large tributary of Mud Creek and consists of forested and agricultural land use. Special studies revealed that pesticide runoff from apple orchards were impacting the aquatic organisms in the stream. Local agencies should pursue funding opportunities to reduce nonpoint source pollution and implement BMPs. DWQ will work with the various agencies to conduct further monitoring and assist with locating sources of funding.

Current Status
Clear Creek, from Puncheon Camp Creek to Mud Creek (8.6 miles), is currently Impaired because of Poor bioclassification at sites B-5 and SB-10 and a Fair bioclassification at site SF-3. Although characterized by impacted aquatic communities, upper segments of Clear Creek, from source to Puncheon Camp Creek (5.2 miles), are Not Rated due to the small stream size at SB-8 and Supporting due to Good-Fair bioclassification at SB-9 and SF-2.

Clear Creek was sampled as part of the Mud Creek WARP study. The study determined that the primary cause of impairment in the lower segment is exposure to toxicants most likely associated with farming activities. Habitat degradation and elevated nutrients are secondary issues for the biological community. In addition, two tributaries leading to Clear Creek (Cox Creek and Mill Creek) were identified and characterized by degraded biological communities similar to those identified in lower Clear Creek.

NCEEP helped develop a local watershed plan in concert with the Mud Creek Watershed Restoration Council. These plans identify sources of water quality impacts and make recommendations to address these impacts. In the Clear Creek watershed, 1,300 feet of stream restoration has been completed, and 6.4 acres of buffers have been installed as a result of the work of the council.

2005 Recommendations
DWQ will continue to monitor the water quality in Clear Creek. High concentrations of metals were found during storm events, and further study is needed to identify the source of these metals and their impact on water quality. It is recommended that local agencies work with landowners to install BMPs on apple orchards and tomato farms to reduce the amount of pesticides entering the stream. For additional recommendations and water quality initiatives, refer to Mud Creek *2005 Recommendations*.

2.3.2 Hominy Creek [AU# 6-76d]

2000 Recommendations
Hominy Creek was Impaired due to nonpoint source pollution most likely associated with urban and nonurban development and agricultural activities. Funding and implementation of agricultural BMPs, including chemical handling facilities, is needed in order to reduce habitat degradation and impacts to water quality from nonpoint sources. DWQ will work with the various agencies to conduct additional monitoring and assist agency staff with locating sources of water quality protection funding.

Current Status

Hominy Creek, from the source to Moore Creek (16.1 miles), is Supporting due to a Good-Fair bioclassification at SB-39 and F-4 and a Good bioclassification at site SB-38. Hominy Creek, from Moore Creek to the French Broad River (7.8 miles), however, is currently Impaired due to a Fair bioclassification at site B-8. This site is near the community of Enka, downstream of the BASF discharge. Conductivity was much higher below the discharge, and there were many pollution tolerant macroinvertebrates collected, which suggests that this portion of Hominy Creek may be impacted by toxicity. The stream also has showed evidence of severe habitat degradation including bank erosion and poor riparian buffers. The downstream portion of Hominy Creek is urbanized. A special study found that many of the problems facing Hominy Creek may be attributed to development directly next to the stream (NCDENR-DWQ, 2002a).

2005 Recommendations

DWQ will continue to monitor water quality in Hominy Creek and work with other local agencies to study the toxic impacts affecting this stream. BASF is no longer discharging to Hominy Creek, which may result in a higher bioclassification rating during the next sampling cycle. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone and complete stream restoration activities. These practices will improve habitat and stabilize eroding banks. In addition, care should be taken during development to minimize erosion and sedimentation of the stream, and an area of natural vegetation should be maintained adjacent to the stream. It is recommended that local efforts work together and focus on this watershed for water quality improvement.

Water Quality Initiatives

Through the NC Agriculture Cost Share Program (NCACSP) and Agriculture Sediment Initiative, the Buncombe County Soil and Water Conservation District (BCSWCD) was provided $35,000 in cost share funding for BMPs in the Hominy Creek watershed. Implementation of several BMPs is currently underway. For more information on either of these programs, refer to Chapter 11.

Because of the water quality impairment noted above, Hominy Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

2.3.3 French Broad River [AU# 6-(54.5)b, d and e]

Current Status

The French Broad River [AU# 6-(54.5)b], from Mud Creek to NC 146 (8.2 miles), is Supporting in the aquatic life category due to a Good-Fair bioclassification at site B-1. This same segment, however, is Impaired in the recreation category due to a standards violation for fecal coliform bacteria. During annual screening in 2002, the ambient monitoring station (A-5) at Glenn Bridge Road (SR 3495) near Skyland exceeded the water quality screening criteria for fecal coliform bacteria. Subsequent monitoring of five samples in 30 days is required by DWQ assessment methodology to confirm the fecal coliform levels and determine if it exceeds the state standard. This additional monitoring reported fecal coliform bacteria levels above the standard. Excessive rainfall in the two years of monitoring (Fall 2002 through 2003) caused extremely high flows in

the French Broad River. The associated nonpoint runoff from the precipitation events may have caused the higher than normal bacteria levels.

Regional DWQ staff and the Buncombe County Metropolitan Sewerage District – Water Reclamation Facility (MSD-WRF) are working to identify possible sources of the elevated fecal coliform bacteria. The specific source has not been identified; however, the regional staff and MSD-WRF were able to eliminate an MSD-WRF pump station as a potential source. This pump station force main crosses the French Broad River, and no leaks or damage was found in the line. Given that land use in this segment of the river is dominated by agricultural pastureland, it is likely that the potential source of fecal coliform bacteria is associated with nonpoint source runoff during heavy rain events.

From NC 146 to Craggy Dam (17.9 miles), the French Broad River [AU# 6-(54.5)c] is Supporting in the aquatic life category due to a Good bioclassification at site B-2. No standards violations were reported for fecal coliform bacteria at the ambient monitoring station A-9; therefore, this segment is also Supporting in the recreation category. This site has been sampled seven times since 1983 and has steadily increased from Fair (1983 and 1985) to Good-Fair (1987, 1992 and 1997) to the most recent Good (2002) bioclassification. Like much of the French Broad River, this section receives runoff from both point and nonpoint sources including the City of Asheville and surrounding agricultural land. Substrate was a good mix of boulders and rubble, and the macroinvertebrate community has been fairly stable since 1992.

The French Broad River [AU# 6-(54.5)d and e], from Craggy Dam to Sandymush Creek (10.3 miles), is Impaired in the aquatic life category due to a Fair bioclassification at site B-3. Craggy Dam (Section 14.2) is a "run-of-river" dam that could potentially slow the flow of the river during drought conditions, consequently impacting the benthic community downstream. Specific conductivity was slightly higher at this site than at the upstream site B-2 (~90 μmhos/cm compared to ~50 μmhos/cm). The stream substrate was a good mix of boulders and rubble.

Like much of the river, this section is impacted by runoff from both point and nonpoint sources (i.e., agriculture, stormwater, etc.) and has historically received Fair (1990 and 1992) and/or Good-Fair (1997) bioclassifications. The improvement to Good-Fair in 1997 was most likely associated with treatment and operation upgrades at MSD-WRF. No violations of the discharge permit were reported from 2000 to 2002, and information provided by MSD-WRF shows that instream waste concentration of the discharge was less than 5% of the river's flow during July 2002. This section of the river also receives water from Newfound Creek and Reems Creek. Both of these watersheds have historically been impacted by both urban and agricultural runoff. For more information on either of these watersheds, refer to Sections 2.3.5 and 2.4.1, respectively.

Overall, the aquatic community in this stretch of the river has historically received low (Fair) and/or marginal (Good-Fair) bioclassifications. Based on these low and marginal bioclassifications, this segment is considered Impaired based on the most recent sampling data. DWQ will continue to monitor this segment of the French Broad River and continue to work with the City of Asheville as they develop a Phase II stormwater program to minimize impacts from both point and nonpoint sources.

2005 Recommendations

A total maximum daily load (TMDL) should be developed to identify and address the elevated fecal coliform bacteria levels found in the river from Mud Creek to NC 146 (8.2 miles). It is recommended that the adjacent segments of the French Broad River be included in this TMDL so that the source of the fecal coliform can be identified and targeted for reduction. Prior to scheduling and developing a TMDL, DWQ staff will continue to work with other agencies and organizations to attempt to track and remedy sources of bacteria. Continued follow-up monitoring is being conducted in this more normal flow year of 2004 to assess the persistence of fecal coliform bacteria.

DWQ will also continue to monitor benthic macroinvertebrates along the entire mainstem of the French Broad River and work with local agencies to identify impacts from point and nonpoint sources.

Water Quality Initiatives

MSD-WRF is continually investing funds into its aggressive sewer rehabilitation program and has completed several projects throughout the county. The results have reduced the amount of sanitary sewer overflows, and no permit violations were reported from 2000 to 2002. For more information about MSD-WRF, visit their website at www.msdbc.org.

2.3.4 Swannanoa River [AU# 6-78a and c]

2000 Recommendations

Swannanoa River was not Impaired, but impacts to water quality are evident along the entire length of the river. DWQ recommends a strategy of monitoring the river to identify sources of sediment. Sediment controls should be enhanced and in accordance with regulations or ordinances to prevent further impacts to habitat and water quality along the Swannanoa River.

Current Status

The Swannanoa River, from source to the North Fork Swannanoa River (7.0 miles), is currently Impaired because of Fair bioclassification at site SB-49. The river is also Impaired from Beetree Creek to Bull Creek (2.6 miles) due to a Fair bioclassification at site B-10.

Segments of the Swannanoa River, from the North Fork of the Swannanoa River to Beetree Creek (4.6 miles) and from Bull Creek to the French Broad River (11.5 miles), are currently Supporting because of Good-Fair bioclassification at sites B-11, SB-48 and SB-50 and a Good bioclassification at site F-6.

Much of the data collected in this watershed during the assessment period was part of special study to prioritize projects for conservation and restoration (NCDENR-DWQ, January 2003). All of the sample sites on the Swannanoa River indicate water quality problems. These include: habitat degradation; poor riparian buffer zones; nutrient enrichment; sedimentation; channelization; and toxicity. Many of these problems may be attributed to urban/residential runoff and development. The lower portion of the river (near Biltmore Forest) has improved over time, progressing from Poor or Fair in the 1980s to Good-Fair in the 1990s. The middle section, however, still has a Fair bioclassification, and there are indications of water quality decline over time.

2005 Recommendations

DWQ will continue to monitor water quality in the Swannanoa River watershed. It is recommended that additional monitoring sites be included in the next cycle of basin sampling to determine the quality of headwater streams. Evaluating these type of streams will require the development of a headwater stream sampling protocol and criteria (see Appendix IV). Once data have been compiled on these headwater streams, it is recommended that the headwaters be prioritized and targeted for conservation easements.

It is also recommended that the municipalities along the river develop local stormwater plans to address problems generated due to the changing land use in this watershed. Local planning efforts, including zoning ordinances, should be considered to protect natural resources and guide development. In addition, local governments and organizations should work to demonstrate innovative BMPs on new developments. These pilot projects would be useful tools in trying new practices and learning what works for developments in Western North Carolina. All of these projects could be incorporated into Buncombe County's NDPES Phase II stormwater program. The projects could be very effective if Black Mountain, Swannanoa and other communities joined in this effort to create a regional initiative.

Water Quality Initiatives

Throughout the Swannanoa River watershed, there are a variety of county and local initiatives underway. On the county level, Buncombe County has an agreement in place with many of the municipalities along the river to handle erosion control plans associated with new construction activities. Working with the Buncombe County Soil and Water Conservation District (BCSWCD), amendments were added to the county erosion control and subdivision ordinances to limit the density of development on steep slopes (scale related to percent slope). These efforts should help control nonpoint runoff from new development sites along the river.

Two other major funding initiatives are underway in the Swannanoa River watershed and include projects under Section 319 and CWMTF for the Swannanoa Watershed Urban Cost Share Program and the Azalea Park-Blue Ridge Parkway Restoration Project, respectively. These projects are both being managed by a full-time watershed coordinator with RiverLink, who has also been tasked with assessing nonpoint source activities and water quality impacts throughout the entire Swannanoa River watershed.

As part of the Swannanoa Watershed Urban Cost Share Program, a watershed assessment was completed using the Integrated Pollution Source Index (IPSI) developed by the Tennessee Valley Authority (TVA). IPSI is a geographical information database that utilizes a number of physical factors to aid in identifying and prioritizing issues affecting water quality. With this information, RiverLink was able to identify nonpoint source pollution problems within urbanized areas of the Swannanoa River watershed and determine which areas are best suited for restoration and preservation activities.

Besides the IPSI, funding provided for the Swannanoa Watershed Urban Cost Share Program was used for two projects in the Town of Black Mountain and three projects in the Haw Creek watershed (AU# 6-78-22). These projects are described below.

Near the headwaters in the Town of Black Mountain, RiverWalk Park was constructed to address nonpoint source pollution, particularly runoff associated with impervious surfaces and rooftops

from the Bi-Lo shopping complex. The park treats runoff from approximately 1.5-acres of impervious surfaces. One wetland and one bio-retention pond (rain garden) were constructed and were designed to hold water for 24 hours. Besides runoff treatment, the park will also serve as an educational BMP site for local schools, government officials and local citizens. The park was constructed with $37,000 of Section 319 grant money and involved the help of the Town of Black Mountain, the Urban Forestry Division, Quality Forward, Montreat College, Warren Wilson College, and numerous local volunteers.

The second project in Black Mountain is located behind the Black Mountain Center for the Arts. This project is located in the downtown area and catches runoff from three rooftops and the surrounding parking areas. Two rain gardens and one vegetated swale were constructed. Rain barrels have also been incorporated into the project. The project is being used as an urban stormwater BMP demonstration project and was constructed with $47,200 of Section 319 grant money.

The projects in the Haw Creek watershed are also demonstration projects and include both public and private property. At the Evergreen Community Charter School, two rain gardens, two vegetated swales, and one stormwater wetland are being constructed. The rain gardens and stormwater wetland will capture the majority of the runoff from the rooftop and parking areas during storm and rain events. In addition, the rain gardens and wetland are being incorporated into an environmental curriculum in the charter school and will include subjects such as water quality and aquatic habitats. This project was constructed using $60,000 of Section 319 grant money.

At the Charlie Bullman Athletic Field, invasive species will be removed and the native habitat will be restored. The athletic field is located in a residential area, adjacent to elementary schools, and is a part of the local parks system. Instream structures will be used to address 90-degree bends in the creek and eroding streambanks will be stabilized. Riffles and pools will also be added to improve the aquatic habitat. Each season 6 to 8 dump truck loads of clay are needed to maintain the fields. Vegetated swales and bio-retention cells (ponds) will be used to catch sediment runoff from the athletic fields. Sediment caught in the cells can be used again to maintain the fields. This project was funded using $40,000 of Section 319 grant money.

The third project in the watershed is located on private property and is located at the confluence of the mainstem of Haw Creek and a smaller tributary. Both streams receive runoff from local roads. Invasive plant species will be removed and native species will be planted to stabilize streambanks. A small wetland currently located on the site will be expanded and used to facilitate treatment of road runoff. Conservation easements will also be marked to protect the newly installed BMPs. This project is designed to demonstrate how homeowners can improve water quality in their own backyards. This project was constructed using $23,800 of Section 319 grant money.

Grant money from the CWMTF was used for the Azalea Park-Blue Ridge Parkway Restoration Project. Located in the area of Azalea Road, the Swannanoa River in this stretch is suffering from eroding streambanks and severe aquatic habitat decline. The goal of the project was to stabilize eroding banks, replant the riparian zone with native vegetation, modify the floodplain, and improve the stream habitat with the use of instream structural devices such as crossvanes and j-hooks to recreate pools and riffles throughout the project site. As a result, the project will

restore 1.3 miles of the mainstem of the Swannanoa River. This project should be completed in 2006 and will improve water quality by reducing sediment loading into the river system. It will also enhance recreational fishing opportunities.

Riverlink is also working with different groups and landowners to protect additional headwaters near the Town of Black Mountain and identifying potential BMP sites along private lands in the City of Asheville.

Because of the water quality impairments noted above, the Swannanoa River has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

2.3.5 Newfound Creek [AU# 6-84a, b, c and d]

2000 Recommendations

Newfound Creek, although not considered Impaired based on 1997 data, remains on the state's 303(d) list. Sedimentation, turbidity, fecal coliform bacteria, and bank destabilization continue to be a concern for Newfound Creek. DWQ is proceeding with the development of a TMDL for fecal coliform bacteria.

Current Status

Newfound Creek, from source to Dix Creek (11.9 miles), is currently Impaired because of a Fair bioclassification at site B-12. The lower segment of Newfound Creek, from Dix Creek to the French Broad River (1.7 miles), is Supporting based on a Good bioclassification at site F-7.

The creek suffers from severe habitat degradation including streambank erosion, embedded substrate and poor riparian buffers. Samples collected in Newfound Creek show that the creek still has nutrient and organic enrichment problems, both of which are likely associated with agricultural land use (primarily dairy and beef cattle operations). Dairy waste management in the watershed has been effective in reducing the amount of organic particulates and increasing dissolved oxygen concentrations. The biological community may also have been adversely impacted by urban and residential development, as well as a four-year drought (1998 to 2002).

In February 2005, the U.S. Environmental Protection Agency (EPA) approved a TMDL for fecal coliform bacteria in Newfound Creek. The TMDL recommends a 92.8% reduction in fecal coliform bacteria loading to Newfound Creek. BMPs for animal operations, riparian buffers, and identification and repair of aging and/or failing septic systems should achieve the reduction goal. For more information on TMDL reports or to review a copy of the Newfound Creek TMDL, visit http://h2o.enr.state.nc.us/tmdl/.

2005 Recommendations

DWQ will continue to monitor water quality and fecal coliform bacteria levels in Newfound Creek. DWQ encourages the implementation of the Newfound Creek nonpoint source strategy plan and will assist agency personnel in locating sources of water quality protection funding. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone and limit livestock access to streams. Stream restoration activities are also desirable along the creek as the banks are eroding and unstable. As this watershed continues to

develop, a local sediment and erosion control program should be developed and implemented. This will likely require additional staffing at the local level.

Water Quality Initiatives

Many efforts by citizens and local agencies have been undertaken to improve water quality in the Newfound Creek watershed. Several dairies and dischargers have ceased operation; sedimentation and erosion control efforts are ongoing; and efforts are underway to improve on-site wastewater systems.

The Buncombe County Soil and Water Conservation District (BCSWCD) has developed a Newfound Creek watershed program and has a full-time watershed coordinator working in this area. A nonpoint source strategy plan was completed in 2000 through a CWMTF grant of $118,865. Activities underway include: watershed education and outreach; water quality monitoring; and BMP installation. Over $100,000 from the NC Agriculture Cost Share Program (NCASCP) has been spent in the watershed for BMPs. The Pigeon River Fund has also contributed $23,900 towards this project for workshops, water quality monitoring equipment, watershed signs, newsletters, and brochures.

A grant through EPA Section 319 ($416,250) provided funding for staff and equipment, helped gain a new USGS gauge on Jenkins Valley Road, provided funding for an Integrated Pollution Source Inventory (IPSI) by TVA, and funding for the installation of several BMPs. Under the grant, BCSWCD installed 31 BMPs on a total of 10 acres of land. Total annual soil loss before the BMPs were installed was 2,606.1 tons/site. After installation, 89.9 tons/site were reported. As a direct result of the district's efforts in the watershed, an estimated 2,156 tons/year of soil was eliminated from Newfound Creek and its tributaries. Projects included a variety of urban and agricultural BMPs such as septic system repairs, critical area treatments, and direct streambank stabilization along the mainstem of Newfound Creek.

In 2003, BCSWCD received a $415,000 CWMTF grant for additional BMPs and continued funding for a watershed coordinator. This existing grant allows for BMPs to be installed through May 2006. Through IPSI, BCSWCD identified severely eroded perennial streams, and the watershed coordinator is working with targeted community members to install BMPs along these streambanks.

Current water quality monitoring (November 2004) through the BCSWCD indicates Newfound Creek is still impacted by nonpoint sources including fecal coliform bacteria and sediment loss from urban development. Water quality monitoring stations are located at eight different sites throughout the Newfound Creek watershed where BMPs were or have the potential to be installed. BCSWCD is diligently encouraging landowners to improve water quality through conservation easements, cost share assistance and community outreach funded through the CWMTF. Education outreach in the form of Erosion Control Workshops, parent meetings at local schools, newsletter distributions, and site visits have increased the visibility of the watershed. For more information, refer to the *Newfound Creek Watershed Non-Point Source Strategy Plan: Preliminary Plan* (BCSWCD, December 2000) or visit http://www.buncombecounty.org/governing/depts/Soil/watershed.htm.

Because of the water quality impairment noted above, Newfound Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for

stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

2.3.6 Ross Creek [AU#6-78-23b and c]

2000 Recommendations
A management strategy or TMDL approach will be used under the 303(d) process to address urban runoff, sediment and nutrient loads in Ross Creek. DWQ will coordinate and collaborate with local agencies over the next basinwide cycle to make progress towards this end.

Current Status
From I-240 to the backwaters of Lake Kenilworth (1.1 miles), Ross Creek is Not Rated due to a Not Rated bioclassification at site SB-45. This Not Rated segment of Ross Creek is located near Tunnel Road, a heavily urbanized area in the City of Asheville. In this area, potential impacts include urban stormwater runoff from a high percentage of impervious surfaces draining to the creek. DWQ noted evidence of habitat degradation including poor riparian zones, steep and eroding banks, and embedded substrate. Conductivity is also high, double that of the upstream monitoring site. Ross Creek was sampled as part of a special study to evaluate water quality concerns throughout the Swannanoa River watershed (NCDENR-DWQ, March 2003).

Ross Creek (Lake Kenilworth) is currently Not Rated (12.0 acres) due to lack of adequate number of samples. Potential problems associated with eutrophication were noted.

2005 Recommendations
DWQ will continue to monitor Ross Creek and will work with local agencies to identify the source of the high conductivity found in the downstream site. DWQ encourages the implementation of the Ross Creek Watershed Initiative developed by the Land-of-Sky Regional Council of Governments. DWQ will assist local personnel in locating sources of water quality protection funding for this watershed. It is also recommended that local agencies work to improve the riparian zone and design stream restoration activities to stabilize the eroding banks. This urban watershed would benefit from a local stormwater program including retrofitting sites with BMPs to improve water quality. Asheville is required to develop a Phase II stormwater program, and the Ross Creek watershed should be considered a priority for retrofit opportunities.

Water Quality Initiatives
Land-of-Sky Regional Council of Governments obtained funding from several sources, including the Pigeon River Fund and a Federal 205(j) grant, to address stakeholder awareness of this stream's urban characteristics and to develop a restoration plan for Ross Creek. Since initial funding of this project, the following activities have been conducted: intensive stream monitoring; a stream cleanup day; curb markings along Ross Creek storm drains; three stakeholder meetings; and preliminary identification of locations for stream restoration projects (Land-of-Sky Regional Council of Governments, 2001).

Because of the water quality impairment noted above, Ross Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

2.3.7 Cane Creek [AU#6-57-(9)a]

Current Status
Cane Creek, from Ashworth Creek to Cushion Branch (9.6 miles), is currently Impaired because of a Fair bioclassification at site B-6. This site declined significantly from the last sampling in 1997. Cane Creek is located in an area undergoing significant urban development and land use changes, particularly around the Town of Fletcher. DWQ will work with others to continue monitoring this stream to determine the stressors in this watershed.

Cane Creek, from Cushion Branch to the French Broad River (2.4 miles), is Supporting due to a Good bioclassification at site F-3. However, the recent widening of US 25 and the construction of a new bridge across the stream seems to have contributed large amounts of sediment to the stream.

2005 Recommendations
DWQ will work with the Town of Fletcher as it begins to develop its Phase II stormwater program and assist local agencies in identifying sources of water quality protection funding. In addition, a local sedimentation and erosion control plan should be developed. The expanding urban communities may also benefit from urban BMPs, watershed signs, newsletters and brochures geared toward water quality awareness.

Water Quality Initiatives
RiverLink is evaluating the existing and historic environmental conditions in the Cane Creek watershed. This evaluation will focus on ecological, hydrological and water quality changes in Cane Creek and provide a baseline in order to address ecosystem restoration and maintenance. RiverLink will develop a model to identify and prioritize protection and restoration projects. For more information, contact RiverLink or visit to www.riverlink.org.

Because of the water quality impairment noted above, Cane Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

2.3.8 Gash Creek [AU #6-47]

2000 Recommendations
Gash Creek was listed as Impaired due to nonurban development resulting in habitat degradation. Additional information needs to be obtained for this creek in order to develop appropriate management strategies for restoration. Golf and construction activities seem to be the primary concern within this watershed and should be the focus of a nonpoint source inventory.

Current Status and 2005 Recommendations
Gash Creek, from source to the French Broad River (3.7 miles), is currently Not Rated because of a Not Rated bioclassification at site SB-6. This stream could not be rated due to the small stream size at the time of sampling. Gash Creek drains agricultural and residential land, as well as a golf course. Water quality problems at this site include habitat degradation and organic enrichment. The Etowah Sewer Company has moved its discharge to the French Broad River since Gash Creek was last sampled in 1996. Unfortunately, the stream has not improved since

the removal of this discharge. The decline in water quality in 2002 may be attributed to a combination of poor habitat, low flows due to drought conditions during the time of sampling, upstream land practices, and an urbanizing landscape. Gash Creek remains on the 303(d) list of Impaired waters. It is recommended that local entities work with landowners to improve riparian buffers and habitat of Gash Creek.

2.3.9 Mill Pond Creek [AU #6-51]

2000 Recommendations

Mill Pond Creek was listed as Impaired due to nonpoint source pollution. Possible sources of contamination include a closed landfill (Henderson County Stony Mountain Road Landfill), a NC Department of Transportation (NCDOT) storage site, and/or upstream dischargers. The Volunteer Water Information Network (VWIN) consistently notes high levels of conductivity in Mill Pond Creek. DWQ will investigate and monitor this creek in order to develop appropriate management strategies.

Current Status and 2005 Recommendations

Mill Pond Creek, from source to the French Broad River (3.1 miles), is currently Not Rated because of a Not Rated bioclassification at site SB-7. This stream could not be rated due to its small size during the time of sampling. This small stream is located downstream from the Henderson County landfill and two wastewater dischargers. Residential development and on-going dam construction may also be impacting the creek. DWQ observations and monitoring indicate that this creek suffers from poor habitat conditions and high conductivity. The biological community was sparse indicating a toxic impact. DWQ will continue to monitor this stream and work with local agencies to identify and address the source of conductivity and toxicants. DWQ will also assist local personnel in locating sources of water quality protection funding for this watershed. It is recommended that local agencies work to improve the riparian zone and complete stream restoration activities to improve habitat.

2.3.10 South Hominy Creek [AU# 6-76-5]

2000 Recommendations

South Hominy Creek was listed as Impaired due to nonpoint source runoff associated with urban stormwater runoff, non-urban development activities, and agricultural runoff. The water quality in South Hominy Creek declined significantly from the first basinwide sampling period going from a Good-Fair to a Poor bioclassification. DWQ will work with various local and county agencies to conduct further monitoring and assist in locating sources of water quality protection funding.

Current Status and 2005 Recommendations

South Hominy Creek, from source to Hominy Creek (12.4 miles), is currently Supporting because of a Good-Fair bioclassification at site SB-54 and a Good bioclassification at site F-5. South Hominy Creek is located in the Hominy watershed. Overall, the creek contains good aquatic habitats; however, there is evidence of streambank erosion, nutrient loading, livestock access, and partially embedded substrate. Many of these issues are being addressed at the local level by the BCSWCD.

Due to the current bioclassification and continuing local initiatives, DWQ recommends that South Hominy Creek be removed from the 2006 303(d) list of Impaired waters. In addition, DWQ will continue to monitor this watershed and be involved in the NCEEP project described below.

Water Quality Initiatives

In 2003, NCEEP began a local watershed planning project in the South Hominy Creek watershed. Its goals were to assess the function of watershed resources, determine mechanisms to improve stream and wetland integrity, and identify areas needing restoration, enhancement or preservation. NCEEP identified 13 sites where opportunities exist to improve watershed functions and water quality. The local watershed plan reviewed historical land use data and concluded that impacts to the watershed are most likely associated with adjacent land use, clearing of riparian buffers, and excess sediment due to bank erosion, land development, and/or unpaved road runoff. Four general types of projects were identified and include: preservation of watershed-riparian function; restoration of riparian corridors; enhancement of riparian corridors; and BMP installation and landowner education. The plan also recommends that additional data be collected to better characterize and prioritize management strategies (NCDENR-NCEEP, February 2004a). For more information, refer to the technical findings report available on-line at www.nceep.net/services/lwps/south_hominy_creek/southhominycreek.htm. The final local watershed plan should be available in the summer of 2005.

2.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

2.4.1 Reems Creek [AU# 6-87-(10)]

Current Status and 2005 Recommendations

Reems Creek, from the bridge at US Highway 23 to the French Broad River (4.5 miles), is currently Supporting because of a Good-Fair bioclassification at site B-13 and a Good bioclassification at site F-8. Upstream, from source to the bridge at US Highway 23 (10.2 miles), Reems Creek received an Excellent bioclassification at site SB-51.

While the stream supports aquatic life, it contains elevated fecal coliform bacteria levels. In 2002, DWQ received a request to reclassify Reems Creek to Class B waters for primary recreational use. DWQ staff conducted the necessary sampling for this request in 2003 and found that the state standard for fecal coliform bacteria was exceeded. In this plan, the data window used to make use support assessments is 1997 to 2002. In the next basinwide plan, this stream will likely be Impaired for primary recreation due to fecal coliform bacteria. It is recommended that local entities study the watershed to identify sources of fecal coliform bacteria

and implement measures to reduce the bacteria levels. DWQ will assist in locating sources of water quality protection funding to address the issue of fecal coliform bacteria.

2.4.2 Gill Branch [AU# 6-76-12]

Current Status and 2005 Recommendations

DWQ did not have water quality data available during the plan's data window of 1997 to 2002; therefore, Gill Branch is currently rated No Data. Gill Branch is a tributary of Reems Creek; and in 2002, DWQ received a request to reclassify Gill Branch to Class B waters for primary recreational purposes. Recent sampling by DWQ (2003) indicates that Gill Branch has elevated levels of fecal coliform bacteria. The sampling found that the state standard for fecal coliform bacteria was exceeded. In the next basinwide plan, this stream will likely be Impaired for primary recreation due to fecal coliform bacteria. It is recommended that local entities study the watershed to identify sources of fecal coliform bacteria and implement measures to reduce this problem. DWQ will assist in locating sources of water quality protection funding to address fecal coliform bacteria.

2.4.3 Bent Creek [AU #6-67-(7)]

Current Status and 2005 Recommendations

Bent Creek, from the Powhatan Dam to the French Broad River (3.0 miles), is Supporting due to a Good-Fair bioclassification at site SB-28. This monitoring site is located below the Powhatan dam and a campground sewage disposal facility (Powhatan Recreational Area). The bioclassification may have been affected by low flow due to drought conditions during the time of sampling. This segment of the stream showed signs of habitat degradation compared to upstream sites, which received an Excellent bioclassification at sites SB-26 and SB-27. Bent Creek also exhibited signs of nutrient enrichment (NCDENR-DWQ, January 2002).

Since the dam and the campground sewage disposal facility are in close proximity to each other, DWQ could not separate out these impacts on water quality. Currently, there are no minimum flow requirements along the dam, and the campground is constructing a new sewage collection system. DWQ will work with the Powhatan Recreational Area to ensure that the sewage disposal facility is operating according to its permit.

2.4.4 North Fork Swannanoa River [AU #6-78-11-(13)]

Current Status and 2005 Recommendations

The North Fork Swannanoa River, from the Asheville Water Supply Dam to the Swannanoa River (5.3 miles), is Supporting due to a Good-Fair bioclassification at SB-40. Drought related conditions experienced throughout the basin from 1998 to 2002 may have impacted the benthic community along the North Fork creating habitat and water quality stress. Currently, there are no minimum flow requirements for the water supply dam. This also may have contributed to the Good-Fair bioclassification observed at this site. DWQ will continue to monitor water quality throughout the Swannanoa watershed and rely on local initiatives to address potential sources of nonpoint source pollution.

2.4.5 Flat Creek [AU #6-78-6-(4)]

Current Status and 2005 Recommendations

Flat Creek, from Big Piney Branch to the Swannanoa River (3.0 miles), is Supporting due to a Good-Fair bioclassification at site SB-47. Flat Creek is located in a residential area and flows through the Town of Montreat. As with many other streams throughout the Swannanoa watershed, impacts to Flat Creek may be associated with habitat and water quality stress due to drought conditions during the time of sampling. DWQ will continue to monitor water quality throughout the Swannanoa watershed and rely on local initiatives to address potential impacts from nonpoint source pollution.

2.4.6 Flat Creek [AU #6-88]

Current Status and 2005 Recommendations

Flat Creek, from source to the French Broad River (11.1 miles), is Supporting due to a Good-Fair bioclassification at SB-52 and a Good bioclassification at F-9. This watershed is located adjacent to and north of the Reems Creek watershed and drains the extreme northwest corner of Buncombe County where rolling pastures and hills characterize the landscape. Although the Good bioclassification for site F-9 was also found to be Good in 1997, DWQ observed an increase in more tolerant fish species and a less diverse community. Five NPDES facilities are currently located in this watershed for a combined discharge of 0.13 MGD. DWQ will continue to monitor the fish community and aquatic habitat in this area. DWQ will also work to identify potential nonpoint source impacts.

2.4.7 Moore Creek [AU# 6-76-8]

Current Status and 2005 Recommendations

Moore Creek, from source to Hominy Creek (3.2 miles), is currently Not Rated due to a Not Rated bioclassification at site SB-37. This stream drains a residential area in Candler and suffers from habitat degradation including bank erosion and poor riparian buffers. It is recommended that local agencies work with landowners to improve the riparian zone adjacent to the stream. Stream restoration activities are also desirable along Moore Creek as the banks are eroding and unstable. Additional information and a more comprehensive watershed assessment are needed to determine the stressors contributing to the water quality conditions in Moore Creek.

2.4.8 Canie Creek [AU# 6-76-12]

Current Status and 2005 Recommendations

Canie Creek, from the source to Hominy Creek (2.3 miles), is currently Not Rated because of a Not Rated bioclassification at site SB-31. This creek drains a mixture of residential and commercial land and was found to have the lowest water quality in the Hominy Creek watershed. The creek suffers from severe bank erosion, and rip-rap was used to stabilize portions of the bank. Canie Creek also had high conductivity and a narrow riparian area. It is recommended that local agencies work with landowners to improve the riparian zone adjacent to the stream. Using bioengineering solutions, stream restoration activities are also recommended to prevent any further impacts associated with erosion.

2.5 Additional Water Quality Issues within Subbasin 04-03-02

This section identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

2.5.1 Surface Waters Identified for Potential Reclassification

Harper Creek (AU# 6-55-11-11)
Harper Creek, from source to Clear Creek (2.6 miles), is Supporting due to an Excellent bioclassification at site SB-11. The current DWQ classification is B Tr.

Laurel Fork (AU# 6-55-11-2)
Laurel Fork, from source to Clear Creek (2.3 miles), is Supporting due to an Excellent bioclassification at site SB-12. The current DWQ classification is C Tr.

Bent Creek [AU# 6-67-(1)]
Bent Creek, from source to the Powhatan Dam (3.5 miles), is Supporting due to an Excellent bioclassification at site SB-26 and SB-27. The current DWQ classification is B Tr.

Boyd Branch (AU# 6-67-6)
Boyd Branch, from source to Bent Creek (1.3 miles), is Supporting due to an Excellent bioclassification at site SB-30. The current DWQ classification is C.

Reems Creek [AU# 6-87-(1)]
Reems Creek, from source to US Highway 23 (10.2 miles), is Supporting due to an Excellent bioclassification at site SB-51. The current DWQ classification is C Tr.

Chapter 3
French Broad River Subbasin 04-03-03
Including the: Davidson River, Boylston Creek, Mills River and North Fork Mills River

3.1 Subbasin Overview

Subbasin 04-03-03 at a Glance

Land and Water Area

Total area:	141 mi²
Land area:	141 mi²
Water area:	0 mi²

Population Statistics

2000 Est. Pop.: 20,009 people
Pop. Density: 145 persons/mi²

Land Cover (percent)

Forest/Wetland:	89%
Surface Water:	<1%
Urban:	<1%
Cultivated Crop:	2%
Pasture/ Managed Herbaceous:	8%

Counties
Henderson and Transylvania

Municipalities
Brevard and Mills River

Much of the land in this subbasin lies within the Pisgah National Forest or Pisgah Game Lands. Much of the subbasin outside the national forest is agricultural, consisting primarily of dairy farms and row crops. There are no large urban areas within this subbasin, although some development exists along the major highway corridors (NC 280 and NC 191). By the year 2020, overall county population is expected to increase by 28.7 and 14.7 percent in Henderson and Transylvania counties, respectively.

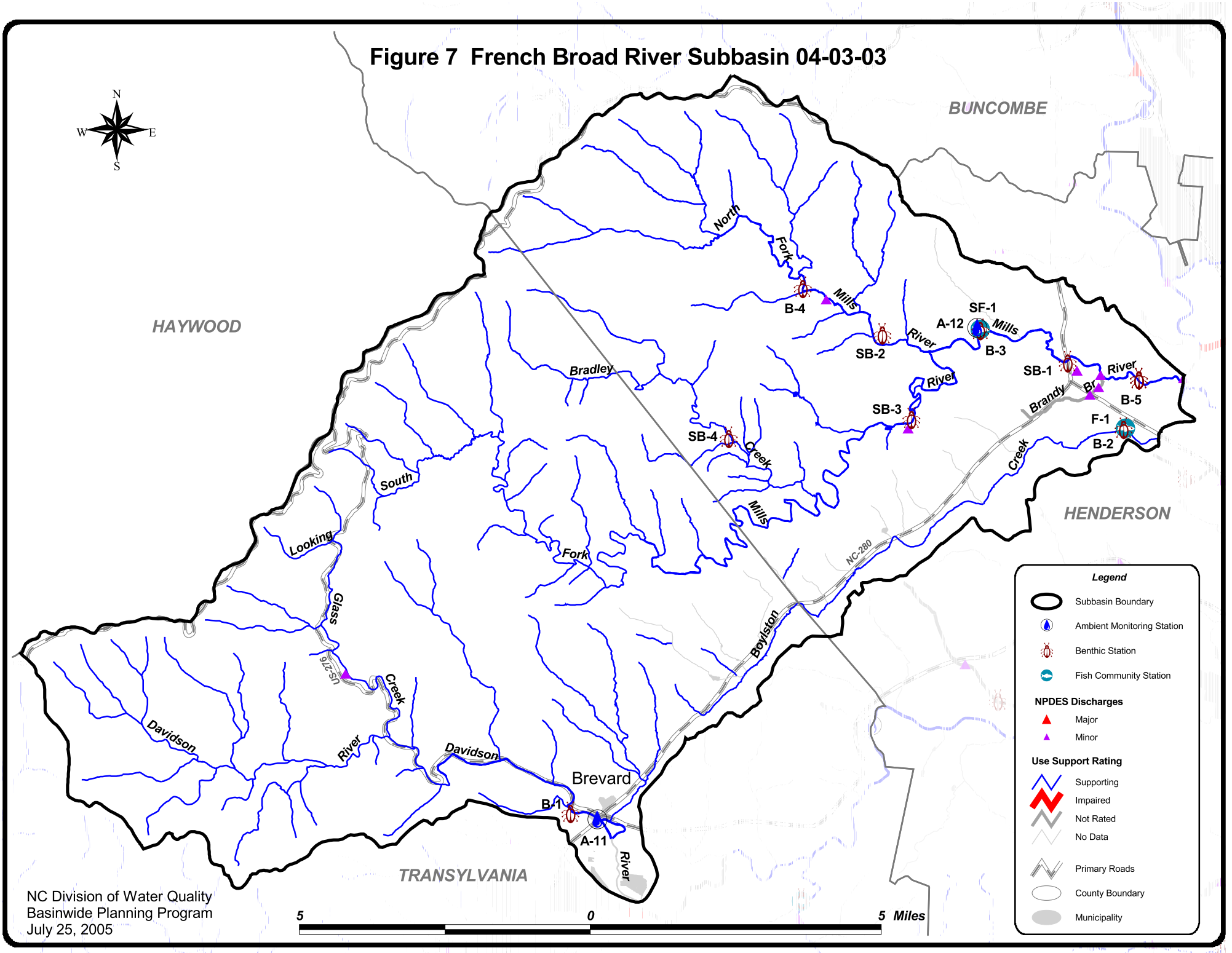
Since the previous plan, the Town of Mills River has incorporated several areas and new sewer lines were installed along sections of Mills River. This extension will likely spur development throughout the area; therefore, special care should be given to site design to minimize the impacts of sedimentation and erosion on water quality. Managing growth is particularly important because most of the South Fork Mills River watershed is classified as outstanding resource waters (ORW), and most of the Davidson River watershed is classified as high quality waters (HQW). Refer to Appendix I for more information regarding population growth and trends and to Chapter 8 for water classifications and standards.

There are eight NPDES wastewater discharge permits in this subbasin; none are major dischargers. Refer to Appendix VI for identification and more information on individual NPDES permit holders. There are two registered animal operations in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 7. Table 8 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were nine benthic macroinvertebrate community samples and two fish community samples (Figure 7 and Table 8) collected during this assessment period. Data were also collected from two ambient monitoring stations. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Figure 7 French Broad River Subbasin 04-03-03



NC Division of Water Quality
Basinwide Planning Program
July 25, 2005

Table 8 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040303

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-34-(1)	Davidson River	5.4	Miles	S	ND	B-1	E	2002					
6-34-(15.5)	Davidson River	0.2	Miles	S	ND	B-1	E	2002					
6-34-(17)	Davidson River	3.3	Miles	S	S	B-1	E	2002				A-11	nce
6-52-(6.5)	Boylston Creek	6.1	Miles	S	ND	B-2	GF	2002	F-1	G	2002		
6-54-(1)a	Mills River	1.0	Miles	S	ND	B-3	G	2002					
6-54-(1)b	Mills River	1.8	Miles	S	S	B-3	G	2002	SF-1	E	1997	A-12	nce
6-54-(4.5)	Mills River	0.7	Miles	S	ND	SB-1	GF	2002					
6-54-(5)	Mills River	1.8	Miles	S	ND	B-5	GF	2002					
6-54-(6.5)	Mills River	0.7	Miles	S	ND	B-5	GF	2002					
6-54-2-(4)	North Fork Mills River	2.9	Miles	S	ND	B-4	E	2002					
6-54-2-(9)	North Fork Mills River	2.5	Miles	S	ND	SB-2	G	2002					
6-54-3-(17.5)	South Fork Mills River	4.2	Miles	S	ND	SB-3	G	2002					
6-54-3-17-(4.5)	Bradley Creek	2.5	Miles	S	ND	SB-4	E	1997					

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired

Use Support Ratings 2004:
S - Supporting
I - Impaired
NR - Not Rated
ND - No Data

Ambient Data
nce - no criteria
ce - criteria exce

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-03 are summarized in Section 3.2. Recommendations, current status and future recommendations for previously or newly Impaired waters are discussed in Section 3.3. Waters with noted water quality impacts are discussed in Section 3.4. Water quality issues related to the entire subbasin are discussed in Section 3.5. Refer to Appendix X for a complete list of monitored waters and more information on use support ratings.

3.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-03 in the aquatic life, recreation, fish consumption and water supply categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 30.6 stream miles (13.7 percent) monitored during this assessment period in the aquatic life category; none of which are Impaired. Refer to Table 9 for a summary of use support ratings by use category for waters in subbasin 04-03-03.

3.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

3.3.1 Mills River [AU# 6-54-(1)a and b, 6-54-(4.5), 6-54-(5) and 6-54-(6.5)]

2000 Recommendations

Mills River, from SR 1337 to the French Broad River (4.6 miles), was Impaired due to a noted impact to benthic macroinvertebrates. The impact was likely associated with agricultural nonpoint sources of pollution, particularly those associated with pesticides applied on tomato farms. DWQ will rely on local initiatives to address pesticide and nonpoint source pollution.

Table 9 Summary of Use Support Ratings by Category in Subbasin 04-03-03

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	30.6 mi	0.0	5.1 mi	0.0
Impaired	0.0	0.0	0.0	0.0
Not Rated	0.0	0.0	0.0	0.0
Total	**30.6 mi 0.0 ac**	**0.0**	**5.1 mi 0.0 ac**	**0.0**
Unmonitored Waters				
Supporting	172.3 mi	0.0	0.0	160.4 mi
Impaired	0.0	0.0	0.0	0.0
Not Rated	1.8 mi	0.0	0.0	0.0
No Data	18.4 mi	223.1 mi	218.0 mi	0.0
Total	**192.5 mi 0.0 ac**	**223.1 mi 0.0 ac**	**218.0 mi 0.0 ac**	**160.4 mi 0.0 ac**
Totals				
All Waters*	**223.1 mi 0.0 ac**	**223.1 mi 0.0 ac**	**223.1 mi 0.0 ac**	**160.4 mi 0.0 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

Current Status

The entire Mills River (6.0 miles) is currently Supporting for its designated uses due to Good and Good-Fair bioclassification ratings at sites B-3, SB-1 and B-5. Site SF-1 received an Excellent bioclassification. Despite the overall Good and Good-Fair bioclassification, however, DWQ noted an increase in sedimentation during a special study in 2002. Increases in sediment can lead to degraded instream habitats. Probable sources for this sediment increase include development and agricultural activities along NC 280 and NC 191 (NCDENR-DWQ, April 2003).

In addition to DWQ data, a ten-year report by VWIN concludes that the Mills River watershed exhibits the most consistent water quality (Good bioclassification and VWIN monitored sites) (Section 3.3.2). VWIN notes, however, that past biological monitoring by DWQ has shown significant degradation in the lower section and that this degradation was most likely associated with pesticide use (Maas et *al*., April 2003). One agrichemical handling facility was constructed in a central location along the river through a Clean Water Management Trust Fund (CWMTF) grant. The use of these buildings can reduce the amount of pesticides reaching the river, and this may account for the observed water quality improvements in Mills River during 2002. Refer to *Water Quality Initiatives* below for more information.

Due to the current bioclassification and continual efforts by local initiatives to improve water quality in the Mills River watershed, DWQ will recommend to the U.S. Environmental

Protection Agency (EPA) that the Mills River be removed from the next 303(d) Impaired waters list for 2006.

2005 Recommendations

DWQ will continue to monitor water quality in the Mills River watershed and work with the Mills River Partnership Planning Committee and Land-of-Sky Regional Council of Governments to implement the following recommendations and achieve the water quality goals listed below. It is recommended that an Integrated Pollution Source Index (IPSI) be developed through the Tennessee Valley Authority (TVA) for this watershed. This watershed assessment tool is a geographical information database that utilizes a number of physical factors to aid in identifying and prioritizing issues affecting water quality. An IPSI will help prioritize the following recommendations, which are included in the Mills River Watershed Management Strategy (2002).

(1) *Land Conversion*: Implement appropriate measures to encourage and assist landowners to retain forestland, farmland, riparian areas, wetlands, and other open spaces in the watershed.

- Strengthen Henderson County's Farmland Preservation Program.
- Enhance state and federal forest management programs to help retain private forestland.
- Market available farmland and forestland to farmers and foresters.
- Find new markets or tourism niches for farmers.
- Allow and encourage agricultural uses within all zoning districts.
- Coordinate planning efforts to redirect activities to outside of the water supply watershed.
- Adopt sustainable development policies.
- Identify targeted areas for land conversion and focus protection efforts on these areas.
- Encourage conservation easements through a coordinated conservation plan.
- Limit impervious surface to 10% of the watershed (4,695 acres).
- Recommendations to protect water quality should be part of the development design and approval process.

(2) *Hazardous Material Spill Control*: Enhance programs to prevent and/or respond effectively to hazardous material incidents and prevent the shutdown of water supplies and services to thousands of customers.

- Develop a detailed inventory of hazardous materials in the watershed.
- Use the inventory to update the county's emergency response plan. Provide necessary training and equipment.
- Ask NC Department of Transportation (NCDOT) to consider constructing an effective spill containment catch basins along NC 191/280.
- Ask Duke Power Company to consider alternatives for controlling vegetation within transmission line right-of-ways.
- Educate landowners and business operators about hazardous materials, spill prevention, and proper application and disposal techniques.
- Establish programs for the collection of hazardous materials.

- Develop educational material and brochures for homeowners on the proper handling and containment of hazardous household materials (i.e., propane, gasoline, heating oil tanks, etc.).

(3) *Erosion and Sedimentation Control*: Implement a variety of programs to reduce sediment loading to watershed streams from all sources.

- Develop a joint project with NCDOT to pave eroding dirt and gravel roads, stabilize eroding road banks and drainage ditches, and install sediment catch basins at the end of drainage ditches.
- Provide technical and financial assistance to landowners to address erosion problems on their land.
- Use a checklist for permitting development projects to enhance compliance with state regulations and distribute educational materials.
- Educate homeowners about their responsibilities under the sediment control rules and develop educational materials.
- Host Clear Water Contractor trainings in Henderson County.
- Conduct an environmental education training for elected officials.
- Work with Henderson County to consider hiring a full-time sedimentation control specialist.
- Complete all necessary erosion control projects on US Forest Service lands.
- Conduct sediment monitoring.
- Develop a countywide sediment and erosion control plan.

(4) *Stormwater Quality and Quantity Control*: Implement appropriate measures to prevent or mitigate the water quantity and quality impacts of stormwater runoff in the watershed.

- Conduct training sessions for developers, design professionals, and local government officials on stormwater management principles and practices.
- Work with NCDOT to improve stormwater management on existing and new roads. Fund demonstration projects and encourage additional training for staff and contractors.
- Use calcium chloride for road and driveway de-icing.
- Secure funding for stormwater BMP demonstration projects.
- Educate landowners and residents regarding stormwater impacts and BMPs.

(5) *Riparian Buffer Preservation and Restoration*: Work with willing landowners to restore and preserve effective riparian buffers along all waterbodies in the watershed.

- Buffers should be at least 50 feet wide on the mainstem of the Mills River and North/South Forks and should be 20 to 50 feet in width on the tributaries.
- Continue landowner outreach program.
- Offer free or low cost trees and recruit volunteers to plant them.

(6) *Agricultural Nonpoint Source Control*: Expand existing programs to address agricultural NPS pollution, especially programs to eliminate problems associated with pesticide use.

(7) *Wastewater Management*: Manage existing and future wastewaters to prevent or mitigate impacts on water quality and public health.

(8) *Groundwater*: Expand the current level of knowledge of groundwater resources and contamination in the watershed and take appropriate protective measures.

(9) *Landowner Education and Participation*: Inform landowners of watershed protection issues, best management practices and seek their assistance in protecting water quality.

For more detailed information regarding the above recommendations, refer to the Mills River Watershed Management Strategy (Mills River Partnership Planning Committee and Land-of-Sky Regional Council of Governments, 2002).

Water Quality Initiatives

The mission of the Mills River Watershed Protection Project is to improve the water quality in the Mills River in a way that also benefits landowners. The project began with two grants that were approved by the CWMTF in 1999 to protect land adjacent to the mainstem and two forks of the Mills River. The first grant, awarded to the Carolina Mountain Land Conservancy, covered the acquisition of conservation easements. The second grant was for buffer plantings, streambank stabilization, and agrichemical handling facilities. In this project, over 13,000 feet of stream were protected with buffers and easements; five streambank reaches were stabilized, and one agrochemical handling facility was built. The agrochemical facility is located in a central location for easy access and old "spray" areas are no longer in use. Additional money not used for the agrichemical handling facilities was used to stabilize over 10 miles of logging roads, as well as build two feed-waste barns, four watering tanks, two stock trails, and 4,000 feet of fencing for cattle. Representatives from the Natural Resources Conservation Service (NRCS) and the Henderson County Soil and Water Conservation District (SWCD) continually provide additional agricultural cost share assistance to landowners in the Mills River watershed.

During the end of 2002, an EPA Source Water Protection grant was acquired by the Land-of-Sky Regional Council of Governments to implement workshops, meetings and inventories related to the following issues: land conversion, hazardous spills, erosion, stormwater and general watershed education in the Mills River area. In 2003, a Section 319 grant was approved for Henderson County to do additional work in the watershed. A stormwater monitoring program was implemented with 16 suspended sediment sampling stations. Two are located on Brandy Branch and four on Foster Creek with the remaining stations strategically placed in Mills River. In addition, two stormwater wetlands have been built and four riparian buffers have been planted.

Many other best management practices (BMPs) are in various stages of development including additional wetlands, a rain garden, water supply road signs, streambank stabilization, and stormwater brochures. For more information on the Mills River Watershed Protection Project, visit http://www.hendersoncountync.org/soil/millsriverweb1.html.

3.3.2 Brandy Branch [AU # 6-54-6]

2000 Recommendations
Brandy Branch was listed as Impaired due to nonpoint sources of pollution likely associated with agricultural and residential land use. DWQ will notify local agencies of water quality concerns for this creek and work with these various agencies to conduct further monitoring and assist agency personnel with locating sources of water quality protection funding. A more in-depth water quality study is needed to identify land use activities or streambank problems causing degradation.

Current Status and 2005 Recommendations
Brandy Branch was included in the Mills River TMDL study but could not be monitored due to lack of flow due to drought conditions during the time of sampling. DWQ will monitor this stream during the next basinwide cycle. Brandy Branch will remain on the 303(d) of Impaired waters.

Water Quality Initiatives
Brandy Branch is part of the Mills River watershed and is being addressed through the Mills River Partnership. Refer to Mills River *2005 Recommendations* and *Water Quality Initiatives* listed above.

3.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

3.4.1 Davidson River [AU # 6-34-(1), 6-34-(15.5), 6-34-(17), 6-34-(21)]

2000 Recommendations
Processing from the lower Davidson River, RFS Ecusta, a division of P.H. Glatfelter Inc., was withdrawing 20.5 MGD. The river, under 7Q10 conditions, could be impacted from this withdrawal. Ecusta initiated a recycling effort to significantly reduce water withdrawals during the last planning cycle. DWQ will continue to monitor the Davidson River for improvements.

Current Status
The Davidson River, from source to the Olin Corporation Water Supply Dam (11.5 miles), received a bioclassification of Excellent at site B-1. The lower segment, from the Water Supply Dam to the French Broad River (1.4 miles), was not monitored. The river has historically received Excellent bioclassification ratings; however, there was a slight decline in the aquatic community during the last sampling period due to reduced flow likely associated with drought

conditions during the time of sampling. Davidson River drains Pisgah National Forest, as well as areas known for their heavy recreational use.

During this planning cycle, the Ecusta paper mill closed (2002), and the property was sold to New Tech Environmental Incorporated (2003). There was a concern over the continuance of environmental systems (i.e., wastewater and landfill leachate treatment) during the ownership lapse, but all systems are in good condition and running. The facility is now operated by the Ecusta Development Business Corporation (EDBC) and includes an industrial park. EDBC produces raw pulp material, and the company is in the process of securing permits for operation and sludge disposal. During operation, EDBC withdraws approximately 3 to 7 MGD from the Davidson River, and they do not anticipate the need to significantly increase water use at this time. EDBC will have a minimal impact on the Davidson River, as their wastewater is discharged to the French Broad River.

VWIN data collected along Davidson River corroborates DWQ ratings with an upstream rating of Excellent and a downstream rating of Good. Conductivity levels were higher downstream and the highest of all sampling sites in Transylvania County, but levels did not exceed the regional average (Maas et *al*., June 2003).

2005 Recommendations

DWQ will continue to monitor water quality in the Davidson River watershed and work with EDBC to ensure that they are operating according to their permit. It is recommended that local planning efforts be undertaken to manage growth and protect water quality in this watershed, particularly adjacent to the national forest. It is recommended that Transylvania County and/or Brevard develop local stormwater and sediment and erosion control programs to address concerns generated due to changing land use. It is recommended that a public request be made so DWQ can pursue a reclassification of the Davidson River [AU# 6-34-(17)] to HQW based on the Excellent bioclassification.

3.4.2 Boylston Creek [AU#6-52-(6.5)]

Current Status and 2005 Recommendations

Boylston Creek, from 0.3 miles upstream of Murray Branch to the French Broad River (6.1 miles), received a bioclassification of Good-Fair at site B-2 and a Good at site F-1. Land use in the surrounding watershed is predominantly agricultural and includes row crops and feedlots. This site has historically received a Good-Fair bioclassification (1992, 1997 and 2002) and impacts are likely associated with nonpoint source runoff. Drought conditions during the time of sampling likely reduced the effects of nonpoint source pollution, but severely eroded streambanks were observed and the substrate consists mostly of sand and gravel (both of which affect aquatic habitats). It is recommended that local agencies work with landowners to assess the need for and prioritize the installation of BMPs to improve the riparian zones and restore the streambanks along Boylston Creek.

3.5 Additional Water Quality Issues within Subbasin 04-03-03

This section identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

3.5.1 Surface Waters Identified for Potential Reclassification

Davidson River [AU# 6-34-(15.5) and 6-34-(17)]

The current DWQ classification for AU# 6-34-(15.5) and 6-34-(17) is WS-V, B Tr. This is a 2.7-mile stretch from Avery Creek to the Olin Corporation water supply dam. The headwaters of the Davison River flow through the Pisgah National Forest and sampling in 1997 and 2002 indicate excellent water quality. The upstream segment [AU # 6-34-(1)] is classified as WS-V, B Tr HQW. Refer to section 3.41 for more information.

Chapter 4
French Broad River Subbasin 04-03-04

Including the: French Broad River, Little Ivy Creek (River), Ivy Creek, California Creek and Bull Creek

4.1 Subbasin Overview

Subbasin 04-03-04 at a Glance

Land and Water Area

Total area:	496 mi²
Land area:	494 mi²
Water area:	2 mi²

Population Statistics

2000 Est. Pop.: 40,490 people
Pop. Density: 81 persons/mi²

Land Cover (percent)

Forest/Wetland:	85%
Surface Water:	<1%
Urban:	<1%
Cultivated Cropland:	<1%
Pasture/ Managed Herbaceous:	14%

Counties

Buncombe and Madison

Municipalities

Hot Springs, Mars Hill and Marshall

The north and western portions of this subbasin are located in Pisgah National Forest and consistently have good or excellent water quality. The rest of the subbasin is rural and includes the municipalities of Hot Springs, Mars Hill and Marshall. The impacts of nonpoint source pollution are evident in many of the streams outside of the National Forest. Local efforts are underway to address these water quality concerns. By the year 2020, population in Buncombe and Madison counties is expected to increase by 22.3 and 19.3 percent, respectively.

Currently, there are 11 NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.98 MGD; none are major dischargers. Refer to Appendix VI for identification and more information on individual NPDES permit holders. Refer to Appendix I for more information regarding population growth and trends. There are no animal operations listed in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 8. Table 10 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were 19 benthic macroinvertebrate community samples and four fish community samples (Figure 8 and Table 10) collected during this assessment period. Data were also collected from one ambient monitoring station. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the

Figure 8 French Broad River Subbasin 04-03-04

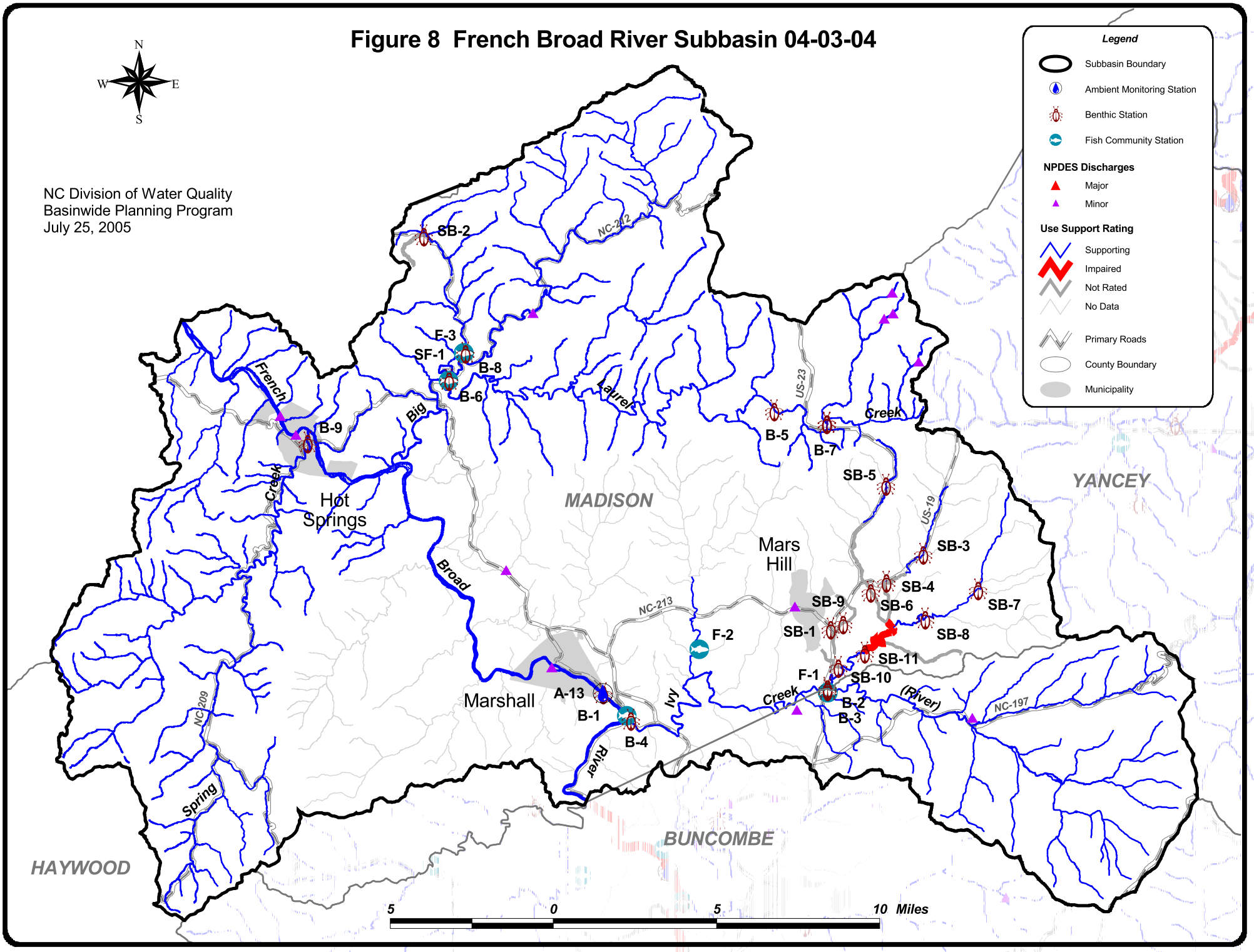


Table 10 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040304

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
6-(54.5)f	FRENCH BROAD RIVER	33.1	Miles	S	S	B-1	GF	2002				A-13	nce
6-112	Big Laurel Creek	30.8	Miles	S	ND	B-5	E	2002	SF-1	GF	1997		
	Big Laurel Creek	30.8	Miles	S	ND	B-6	G	2002	SF-1	GF	1997		
6-112-26	Shelton Laurel Creek	14.8	Miles	S	ND	B-8	G	2002	F-3	E	2002		
6-112-26-13-1-1	Cold Spring Branch	1.4	Miles	NR	ND	SB-2	NR	2002					
6-112-5	Puncheon Fork	5.2	Miles	S	ND	B-7	E	2002					
6-118-(1)	Spring Creek	20.3	Miles	S	ND	B-9	E	2002					
6-118-(27)	Spring Creek	1.7	Miles	S	ND	B-9	E	2002					
6-96-(0.5)	Ivy Creek (River)	7.4	Miles	S	ND	B-2	G	2002	F-1	E	2002		
6-96-(11.3)	Ivy Creek (River)	0.5	Miles	S	ND	B-4	GF	2002					
6-96-(11.7)	Ivy Creek (River)	10.5	Miles	S	ND	B-4	GF	2002					
6-96-10-1a	Middle Fork Little Ivy Creek	3.5	Miles	S	ND	SB-3	NI	2002					
6-96-10-1b	Middle Fork Little Ivy Creek	2.1	Miles	NR	ND	SB-4	NR	2002					
6-96-10-2a	California Creek	3.6	Miles	S	ND	SB-5	NI	2002					
6-96-10-2b	California Creek	3.8	Miles	NR	ND	SB-6	NR	2002					
6-96-10-3	Paint Fork	7.1	Miles	S	ND	SB-8	NI	2002					
	Paint Fork	7.1	Miles	S	ND	SB-7	NI	2002					
6-96-10-5	Big Branch	2.9	Miles	NR	ND	SB-10	NR	2002					
	Big Branch	2.9	Miles	NR	ND	SB-9	NR	2002					
6-96-10a	Little Ivy Creek (River)	2.6	Miles	I	ND	SB-11	F	2002					
6-96-10b	Little Ivy Creek (River)	2.1	Miles	S	ND	B-3	GF	2002					
6-96-16	Bull Creek	3.8	Miles	S	ND				F-2	GF	2002		

Table 10 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040304

Assessment Unit #	Name	Length/Area	AL	REC	Benthic Community	Fish Community	Ambient Data

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:	**Monitoring data type:**	**Bioclassifcations:**	**Use Support Ratings 2004**:	**Ambient Data**
AL - Aquatic Life	F - Fish Community Survey	E - Excellent	S - Supporting	nce - no criteria
REC - Recreation	B - Benthic Community Survey	G - Good	I - Impaired	ce - criteria exce
	SF - Special Fish Community Study	GF - Good-Fair	NR - Not Rated	
	SB - Special Benthic Community Study	F - Fair	ND - No Data	
	A - Ambient Monitoring Site	P - Poor		
		NI - Not Impaired		

AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-04 are summarized in Section 4.2. Recommendations, current status and future recommendations for previously and newly Impaired waters are discussed in Section 4.3. Waters with noted water quality impacts are discussed in Section 4.4. Water quality issues related to the entire subbasin are discussed in Section 4.5. Refer to Appendix III for a complete list of monitored waters and more information on use support ratings.

4.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-04 in the aquatic life, recreation, fish consumption and water supply categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 157.3 stream miles (20.8 percent) monitored during this assessment period in the aquatic life category. Of these, 2.6 miles (<0.5 percent) are Impaired. Refer to Table 11 for a summary of use support rating by category for waters in subbasin 04-03-04.

4.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

4.3.1 Little Ivy Creek (River) [AU # 6-96-10a]

2000 Recommendations
Little Ivy Creek, from SR 1547 to Ivy Creek (2.6 miles), was Impaired due to nonpoint source pollution associated with agricultural and residential land use. Several projects are underway to address fecal coliform bacteria and erosion in the watershed. DWQ will continue to monitor the creek to better identify sources of pollution.

Current Status
Little Ivy Creek, from California Creek to SR 1547 (2.6 miles), is Impaired due to a Fair bioclassification at site SB-11. Downstream, from SR 1547 to Ivy Creek (2.1 miles), Little Ivy Creek is Supporting due to a Good-Fair bioclassification at B-3.

Table 11 Summary of Use Support Ratings by Category in Subbasin 04-03-04

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	144.4 mi	0.0	33.1 mi	0.0
Impaired	2.6 mi	0.0	0.0	0.0
Not Rated	10.3 mi	0.0	0.0	0.0
Total	**157.3mi 0.0 ac**	**0.0**	**33.1 mi**	**0.0**
Unmonitored Waters				
Supporting	370.1 mi	0.0	0.0	157.5 mi
Impaired	0.0	0.0	0.0	0.0
Not Rated	2.7 mi	0.0	0.0	0.0
No Data	225.9 mi	756.0 mi	722.9 mi	0.0
Total	**598.7 mi 0.0 ac**	**756.0 mi 0.0 ac**	**722.9 mi 0.0 ac**	**157.5 mi 0.0 ac**
Totals				
All Waters*	**756.0 mi 0.0 ac**	**756.0 mi 0.0 ac**	**756.0 mi 0.0 ac**	**157.5 mi 0.0 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

An intense monitoring effort was undertaken in the Little Ivy Creek watershed as part of a special study. The study found that the biological impairment of the creek is likely attributed to nutrient loading, sediment and non-urban development (NCDENR-DWQ, May 2003). Eleven sites were monitored throughout the watershed in May 2002; however, only two of these sites (B-3 and SB-11 on Figure 8) were large enough to receive a bioclassification. Several of the other sites could not be rated due to low stream flows as a result of drought conditions during the time of sampling. Sedimentation and narrow riparian zones are widespread concerns throughout the entire watershed, and many of the problem areas are located near roadways and residential land.

The monthly chemistry data from the Volunteer Water Information Network (VWIN) corroborated many of the DWQ benthic data conclusions in the Ivy Creek and Little Ivy Creek watersheds (Maas et *al*., June 2002; Maas et *al*., May 2003). The Ivy Creek watershed exhibited the highest pH and alkalinity values of any watershed in the seven county VWIN program; conductivity and nutrient levels were also elevated. Water quality deteriorated below the confluence of Ivy Creek and Little Ivy Creek, indicating that Little Ivy Creek and its tributaries were significant contributors of pollutants to Ivy Creek (River). Since 1992, DWQ data indicate overall declining benthic communities in the Ivy Creek watershed.

2005 Recommendations

DWQ will continue to monitor the Little Ivy Creek watershed to document the effects of land use changes and development in the surrounding area. It is recommended that local governments develop programs to reduce water quality impacts due to construction activities to reduce the amount of sediment that is entering the watershed. BMPs need to be installed and monitored during and post-construction activities. Implementation of both urban and agricultural best management practices (BMPs) are also encouraged.

Water Quality Initiatives

Madison County Soil and Water Conservation District (SWCD), the Natural Resources Conservation Service (NRCS), the Madison County Health Department, and the NCDENR Division of Environmental Health (DEH) are participating in the Little Ivy River Watershed BMP Implementation Project. The project identified fecal coliform bacteria, nutrients and sediment as potential water quality concerns throughout the watershed. Nonpoint sources include runoff from agricultural areas, including cropland and small animal operations, and straight pipes (wastewater discharged directly into streams without treatment). Using CWMTF grant money, the county identified several straight pipes and failing septic systems in need of repair. CWMTF and Section 319 grant money has also been used to establish a series of controlled grazing demonstrations, accompanied with an educational program. Controlled grazing allows for alternative watering systems and better distribution of livestock away from the streams. Vegetative areas have also been installed or improved and have included the establishment of riparian buffers, easements, livestock exclusion, cropland conversion, critical area stabilization, and livestock facilities. In the last five years, 123 watering tanks have been installed, 21 feed and waste structures were built, and 32,280 feet of streambank were protected from livestock. Total funding for these projects was $470,000 and the county has an additional $300,000 to continue installing BMPs.

Madison County SWCD also received $75,000 from the CWMTF to conduct an Integrated Pollutant Source Identification (IPSI) survey through the Tennessee Valley Authority (TVA) for the entire Madison County area. Information obtained from this project will assist in identifying nonpoint source locations and priority areas for restoration. Data analysis should be complete by December 2004. In addition, grant proposals are being reviewed by the U.S. Environmental Protection Agency (EPA) to address sedimentation and erosion problems. The district also hopes to encourage the county to adopt sedimentation and erosion control ordinances. For more information on the BMP Implementation Project in the Ivy Creek watershed, contact the Madison County SWCD.

Because of the water quality impairment noted above, Little Ivy Creek has been identified by the NC Ecosystem Enhancement Program (EEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

4.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

4.4.1 California Creek [AU# 6-96-2a and b]

Current Status and 2005 Recommendations

California Creek, from source to Little Ivy Creek (7.4 miles), was sampled by DWQ pre- and post-construction of I-26 in Madison County. The sample taken prior to construction was used as a baseline of water quality in the creek. California Creek, from Sprinkle Creek to Little Ivy Creek (3.8 miles), is currently Not Rated in the aquatic life category at site SB-6. This segment was too small to rate according to DWQ sampling methodologies. The upstream site (SB-5), from source to Sprinkle Creek (3.6 miles), however, supported a good, diverse biological community. Sedimentation is a concern for the entire creek, and riparian habitat should to be monitored at the downstream site (SB-6). The VWIN program also monitors California Creek, and their findings corroborate DWQ data (see Appendix V). California Creek is part of the Little Ivy Creek watershed. For more information, refer to the Little Ivy Creek *2005 Recommendations* listed above.

4.4.2 French Broad River [AU# 6-(54.5)f]

Current Status and 2005 Recommendations

This portion of the French Broad River, from Sandymush Creek to the NC/TN state line (33.1 miles), flows through the Town of Marshall and is directly downstream of Progress Energy's Hydroelectric Plant in Marshall. This segment is Supporting in the aquatic life category due to a Good-Fair bioclassification at site B-1. This site has consistently received a Good-Fair bioclassification. In 2002, the aquatic plants were abundant, and algae were observed.

DWQ will continue to monitor water quality in this segment of the river. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zones along this portion of the French Broad River.

4.4.3 Ivy Creek (River) [AU# 6-96-(11.3) and 6-96-(11.7)]

Current Status and 2005 Recommendations

Ivy Creek, from source to the French Broad River (18.4 miles), is currently Supporting because of a Good bioclassification at site B-2 and a Good-Fair bioclassification at site B-4. It also received an Excellent bioclassification at site F-1. Site B-4 is in close proximity to the confluence with the French Broad River and has a wider riparian zone. This portion of Ivy Creek consistently receives a Good-Fair bioclassification. However, it is important to note that

the 2002 monitoring found fewer species and a less diverse biological community. Turbidity was also a noted concern. Ivy Creek has the potential to continue to degrade in the next monitoring cycle if these downward trends continue. It is important that the recommendations outlined in the Little Ivy Creek watershed be implemented here as well (refer to Little Ivy Creek *2005 Recommendations* listed above). The development and implementation of a local sediment and erosion control program should help protect water quality at this site.

4.4.4 Bull Creek [AU# 6-96-16]

Current Status and 2005 Recommendations

Bull Creek, from source to Ivy Creek (3.8 miles), is currently Supporting because of a Good-Fair bioclassification at site F-2. This site was sampled for the first time in 2002, and while the greatest number of fish in the basin was collected at this site, the diversity was only moderate. There were indications of excess periphyton communities due to an elevated pH, and conductivity was relatively high. VWIN also monitors this creek and their information corroborates with DWQ data (see Appendix V). DWQ will continue to monitor this site and work with others to determine the source of the high conductivity. It is recommended that local agencies work with landowners to install BMPs to improve the riparian area along Bull Creek.

4.5 Additional Water Quality Issues within Subbasin 04-03-04

The following section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

This section also identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

4.5.1 Subbasin Concerns and Priorities

In addition to the Little Ivy and Ivy Creek (River) watersheds, several other initiatives are underway by the Madison County SWCD and NRCS to control and reduce the impacts from agricultural activities. Over the last basinwide cycle (1998 to 2003), the county has installed 76 watering tanks, built one feed and waste structure, constructed 1,300 feet of stock trails, and excluded livestock along several tributaries using 20,000 feet of fence. These projects were funded by grants from the NC Agriculture Cost Share Program (NCASCP). In addition, 30 acres have been converted from cropland to pasture, and crops are being rotated on two acres of land to reduce the amount of pesticide and fertilizer use. Thirty-one watering tanks, four feed and waste structures, and one stream crossing have also been constructed using EQIP grant money totaling $150,000. The Madison County SWCD and NRCS are also working to promote community awareness, stewardship and involvement in protecting the local watersheds.

Within this subbasin, Madison County is expected to increase in population by 19.3% over the next 15 years. Increases in population often lead to new construction sites and additional sources of NPS from impervious surfaces. Local officials are currently working to establish sedimentation and erosion control ordinances throughout the county and identifying those areas most susceptible to growth and development activities. DWQ will work with the county SWCD and NRCS staff to identify new biological monitoring sites to assess impacts to additional watersheds within this subbasin.

4.5.2 Surface Waters Identified for Potential Reclassification

Big Laurel Creek (AU# 6-112)
Big Laurel Creek, from source to the French Broad River (30.8 miles), is Supporting due to an Excellent bioclassification at site B-5 and a Good-Fair bioclassification at site SF-1. The current DWQ classification is C Tr. Big Laurel Creek is located in a forested area of the subbasin, and there is little development opportunity due to steep gradient slopes.

Shelton Laurel Creek (AU# 6-112-26)
Shelton Laurel Creek, from source to Big Laurel Creek (14.8 miles), is Supporting due to an Excellent bioclassification at site F-3 and a Good bioclassification at site B-8. The current DWQ classification is C Tr.

Puncheon Fork (AU# 6-112-5)
Puncheon Fork, from source to Big Laurel Creek (5.2 miles), is Supporting due to an Excellent bioclassification at site B-7. The current DWQ classification is C Tr.

Spring Creek [AU# 6-118-(1) and 6-118-(27)]
Spring Creek, from source to the French Broad River (22.0 miles), is Supporting due to an Excellent bioclassification at site B-9 and a Good-Fair bioclassification at site SF-1. The current DWQ classification for AU# 6-118-(1) is C Tr. The current DWQ classification for AU# 6-118-(27) is C.

Chapter 5
French Broad River Subbasin 04-03-05

Including the: Pigeon River, West and East Fork Pigeon River, Richland Creek, Fines Creek, Crabtree Creek, Hyatt Creek, Plott Creek, Raccoon Branch, Hurricane Creek, Lake Junaluska and Walters Lake

5.1 Subbasin Overview

Subbasin 04-03-05 at a Glance

Land and Water Area

Total area:	532 mi²
Land area:	531 mi²
Water area:	1 mi²

Population Statistics

2000 Est. Pop.: 52,212 people
Pop. Density: 98 persons/mi²

Land Cover (percent)

Forest/Wetland:	84%
Surface Water:	<1%
Urban:	1%
Cultivated Crop:	<1%
Pasture/ Managed Herbaceous:	14%

Counties

Haywood

Municipalities

Canton, Clyde, Maggie Valley and Waynesville

This subbasin includes undeveloped land within the Great Smoky Mountains National Park, Pisgah National Forest, Pisgah Game Lands and the Shining Rock Wilderness Area. The largest urban areas are Waynesville, Lake Junaluska, Clyde, Maggie Valley and Canton. By the year 2020, population throughout Haywood County is expected to increase by 15.9%. For more information regarding population growth and trends, refer to Appendix I.

There are 16 NPDES wastewater discharge permits in this subbasin with a total permitted flow of 37.1 MGD. The largest are Blue Ridge Paper Products, Inc. (BRPP) (29.9 MGD), the Town of Waynesville WWTP (6.0 MGD), and the Town of Maggie Valley WWTP (1.0 MGD). Significant issues related to compliance with NPDES permit conditions are discussed below. Currently, there are two individual NPDES stormwater permits in this subbasin. Canton, Clyde, Waynesville, as well as Haywood County, will be required to develop stormwater programs under Phase II. Refer to Appendix VI for identification and more information on individual NPDES permit holders and to Section 13.2 for information related to stormwater programs. There are eight registered animal operations in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 9. Table 12 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were 19 benthic macroinvertebrate community samples and 19 fish community samples (Figure 9 and Table 12) collected during this assessment period. Data were collected from eight ambient monitoring stations and two lakes assessments. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Figure 9 French Broad River Subbasin 04-03-05

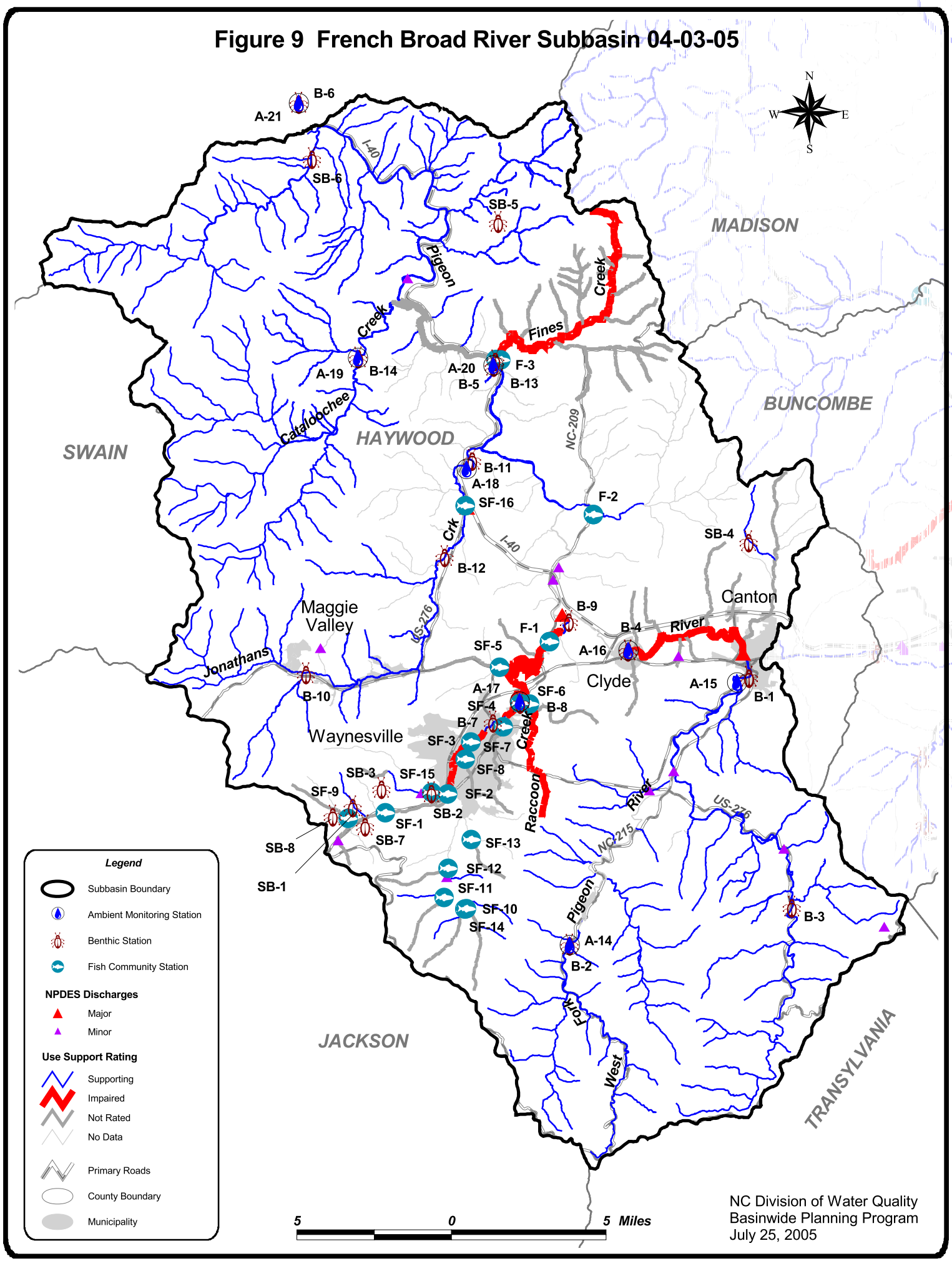


Table 12 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040305

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
5-(1)	PIGEON RIVER	4.8	Miles	S	S							A-15	nce
5-(6.5)	PIGEON RIVER	0.8	Miles	S	S	B-1	GF	2002				A-15	nce
5-(7)a	PIGEON RIVER (Waterville Lake below elevation 2258)	0.5	Miles	S	ND	B-1	GF	2002					
5-(7)b	PIGEON RIVER (Waterville Lake below elevation 2258)	6.4	Miles	I	S	B-4	P	2002				A-16	nce
5-(7)d	PIGEON RIVER (Waterville Lake below elevation 2258)	7.2	Miles	S	S	B-5	GF	2002				A-20	nce
5-(7)e	PIGEON RIVER (Waterville Lake below elevation 2258)	773.1	Acres	NR	ND							Lake Monitoring	nce
5-(7)f	PIGEON RIVER (Waterville Lake below elevation 2258)	12.0	Miles	S	S	B-6	G	2002				A-21	nce
5-16-(1)a	Richland Creek (Lake Junaluska)	8.0	Miles	NR	I				SF-1	NR	2001	A-17	Bacteria
	Richland Creek (Lake Junaluska)	8.0	Miles	NR	I				SF-2	NR	2001	A-17	Bacteria
5-16-(1)b	Richland Creek (Lake Junaluska)	2.3	Miles	I	I				SF-3	P	2001	A-17	Bacteria
5-16-(1)c	Richland Creek (Lake Junaluska)	0.7	Miles	I	I				SF-3	P	2001	A-17	Bacteria
5-16-(1)d	Richland Creek (Lake Junaluska)	0.9	Miles	S	I	B-7	G	2002				A-17	Bacteria
5-16-(1)e	Richland Creek (Lake Junaluska)	2.0	Miles	I	I	B-8	F	2002	SF-4	P	2001	A-17	Bacteria
5-16-(1)f	Richland Creek (Lake Junaluska)	200.0	Acres	I	ND							Lake Monitoring	pH
5-16-(16)a	Richland Creek	1.6	Miles	I	ND				F-1	P	2002		
5-16-(16)b	Richland Creek	0.7	Miles	S	ND	B-9	GF	2002					
5-16-11	Farmer Branch	2.9	Miles	NR	ND				SF-8	NR	2001		
5-16-13	Shelton Branch	2.7	Miles	NR	ND				SF-7	NR	2001		
5-16-14	Raccoon Creek	4.7	Miles	I	ND				SF-6	F	2001		
5-16-15	Factory Branch	2.4	Miles	NR	ND				SF-5	NR	2001		
5-16-3	Winchester Creek	2.5	Miles	NR	ND				SF-9	NR	2001		
5-16-4	Nolen Creek	1.8	Miles	S	ND	SB-1	NI	2002					
5-16-6a	Hyatt Creek	0.9	Miles	NR	ND	SB-3	NR	2002					
5-16-6b	Hyatt Creek	2.6	Miles	S	ND	SB-2	NI	2002	SF-15	NR	2001		
5-16-7-2	Cherry Cove Creek	2.5	Miles	NR	ND				SF-10	NR	2001		

Table 12 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040305

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
5-16-7-3	Shiny Creek	2.9	Miles	NR	ND				SF-14	NR	2001		
5-16-7-6	Old Bald Creek	2.4	Miles	NR	ND				SF-11	NR	2001		
5-16-7-9-(1)	Rocky Branch	2.2	Miles	NR	ND				SF-12	NR	2001		
5-16-7-9-(2)	Rocky Branch	0.2	Miles	NR	ND				SF-12	NR	2001		
5-16-8-1	Medford Branch	1.8	Miles	NR	ND				SF-13	NR	2001		
5-22	Crabtree Creek	3.3	Miles	S	ND				F-2	GF	2002		
5-26-(7)	Jonathans Creek	14.6	Miles	S	S	B-11	G	2002	SF-16	GF	1997	A-18	nce
	Jonathans Creek	14.6	Miles	S	S	B-12	E	2002	SF-16	GF	1997	A-18	nce
	Jonathans Creek	14.6	Miles	S	S	B-10	E	2002	SF-16	GF	1997	A-18	nce
5-2a	West Fork Pigeon River (Lake Logan)	7.8	Miles	S	S	B-2	E	2002				A-14	nce
5-3-(6.5)	East Fork Pigeon River	13.0	Miles	S	ND	B-3	E	2002					
5-32	Fines Creek	9.7	Miles	I	ND	B-13	GF	2002	F-3	F	2002		
5-41	Cataloochee Creek	8.1	Miles	S	S	B-14	E	2002				A-19	nce
5-44	Hurricane Creek	5.4	Miles	S	ND	SB-5	G	2002					
5-59-22	Chestnut Branch	3.3	Miles	S	ND	SB-6	E	2002					
5-8-4-(2)	Rough Creek	1.2	Miles	S	ND	SB-4	E	1997					

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired

Use Support Ratings 2004:
S - Supporting
I - Impaired
NR - Not Rated
ND - No Data

Ambient Data
nce - no criteria
ce - criteria exce

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list, and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-05 are summarized in Section 5.2. Recommendations, current status and future recommendations for previously or newly Impaired waters are discussed in Section 5.3. Waters with noted water quality impacts are discussed in Section 5.4. Water quality issues related to the entire subbasin are discussed in Section 5.5. Refer to Appendix X for a complete list of monitored waters and more information on Supporting monitored waters.

5.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-05 in the aquatic life, recreation, fish consumption and water supply categories. A fish consumption advisory is in effect for Waterville (Walters) Lake. Women of childbearing age and children under the age of 15 are advised not to eat common carp caught in the lake. For all others, a limited-consumption advisory applies and advises that common carp be limited to one meal per month. No other fish advisories have been issued. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 146.8 stream miles (19.9 percent) and 973.1 acres (87.2 percent) monitored during this assessment period in the aquatic life category. There are 27.4 stream miles (3.7 percent) Impaired in this same category. In addition, nearly 14 stream miles (2.0 percent) are Impaired for recreational use. Refer to Table 13 for a summary of use support ratings for waters in subbasin 04-03-05.

5.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

Table 13 Summary of Use Support Ratings by Category in Subbasin 04-03-05

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	88.0 mi	0.0	61.6 mi	0.0
Impaired	27.4 mi 200.0 ac	773.1 ac	13.8 mi	0.0
Not Rated	31.4 mi 773.1 ac	0.0	0.0	0.0
Total	**146.8 mi 973.1 ac**	**0.0 mi 773.1 ac**	**75.4mi 0.0 ac**	**0.0**
Unmonitored Waters				
Supporting	393.5 mi	0.0	0.0	264.5 mi 91.9 ac
Impaired	0.0	0.0	0.0	0.0
Not Rated	53.8 mi	0.0	0.0	0.0
No Data	143.3 mi 142.8 ac	737.4 mi 342.8 ac	662.0 mi 1,115.9 ac	0.0
Total	**590.6 mi 142.8 ac**	**737.8 mi 342.8 ac**	**662.0 mi 1,115.9 ac**	**264.5 mi 91.9 ac**
Totals				
All Waters*	**737.4 mi 1,115.9 ac**	**737.4 mi 1,115.9 ac**	**737.4 mi 1,115.9 ac**	**264.5 mi 91.9 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

5.3.1 Pigeon River [AU# 5-(7)b]

2000 Recommendations

Seven miles of the Pigeon River was Impaired due to point and nonpoint source pollution. Blue Ridge Paper Products (BRPP) had improved its manufacturing process to eliminate the release of the chemical dioxin, a by-product of the paper making process. DWQ will participate in a Joint Watershed Advisory Group and continue to monitor the river as additional improvements are made. Local initiatives are needed to address the nonpoint source impacts to the river from the towns of Canton and Clyde and outlying nonurban areas.

Current Status

Pigeon River [AU# 5-(1), 5-(6.5) and 5-(7)a], from source to 0.15 miles downstream of West Park Street in Canton (6.1 miles), is Supporting due to a Good-Fair bioclassification at site B-1. This site has been sampled 13 times since 1983, and the bioclassification has varied between Good-Fair and Excellent due to year-to-year differences in flow and habitat. Much of the nearby land is used for agricultural purposes, but an increasing number of vacation homes are being built in the upper reaches of the watershed.

Pigeon River [AU# 5-(7)b], from 0.15 miles downstream of West Park Street in Canton to SR 1642 (Main Street in Clyde) (6.4 miles), is currently Impaired in the aquatic life category due to a Poor bioclassification at site B-4. The sampling site is located approximately 5 miles downstream of Blue Ridge Paper Products, Inc. (BRPP) and has been sampled 12 times since 1984. Historically, this site has received Fair and Poor bioclassifications, but improvements in BRPP's processes were evident in samples collected in 1992 (improvement from Poor to Fair) and 1997 (improvement from Fair to Good-Fair). In 2002, however, the bioclassification decreased to Poor. This decrease is likely associated with drought conditions during the time of sampling. Pools were absent; riffles were minimal, and aquatic weeds were abundant. These factors, along with low flow conditions and the subsequent lack of dilution of the BRPP effluent likely impacted the benthic community. Conductivity was also high at the time of sampling. A review of data from the DWQ ambient monitoring station (A-16) showed that the mean conductivity has been steadily increasing at the site since 1998. This site also receives nonpoint urban and stormwater runoff from the towns of Canton and Clyde. This nonpoint runoff could also impact the benthic community in this stretch of the river.

In addition to DWQ sampling, EA Engineering, Science and Technology, Inc. (EA) collected fish and macroinvertebrate samples along the Pigeon River and three major tributaries (Jonathan Creek, Fines Creek and Richland Creek) in the summer of 2000. The study was prepared for BRPP following NCDENR protocols and examined the overall fish and macroinvertebrate communities in the watershed. The EA survey was compared to a 1995 survey and found that: 1) the number of smallmouth bass had increased 10 fold; 2) darters were found where they were absent in 1995; and 3) species richness had improved downstream of the BRPP discharge. Macroinvertebrate communities ranged from Fair, Good-Fair, and Good with a Good bioclassification on both Jonathan Creek and Fines Creek and a Fair bioclassification on Richland Creek (EA, May 2001). DWQ sampling and use support ratings for Jonathan Creek, Fines Creek and Richland Creek are presented below.

A Settlement Agreement was reached in 1997 on a modified color variance and NPDES permit for BRPP. The following agencies participated in the agreement: the U.S. Environmental Protection Agency (EPA); the states of North Carolina and Tennessee; Cocke County and the City of Newport, TN; the Tennessee Environmental Council; the American Canoe Association; and BRPP. The intent of the agreement was to address the Pigeon River color issue without litigation. The goal was to reach an annual average color loading of 48,000-52,000 lbs/day by May 1, 2001. This goal was met. All of the BMP projects as required in the agreement are complete and operational. Additional color reduction measures were completed and others are ongoing. Contingency plans for low flow periods were in place and operational.

Pursuant to the agreement, North Carolina and Tennessee were required to establish a Joint Watershed Advisory Group to foster joint planning and public input on decisions affecting the Pigeon River. This group has been meeting since 2000. BRPP has also been working with a Community Advisory Committee composed of community leaders in Haywood County (North Carolina), Cocke County (Tennessee), and the State of North Carolina.

Overall, the water quality in the Pigeon River has improved dramatically over the last 15 years. Annual fish tissue monitoring for dioxin in the Pigeon River is conducted by BRPP and Carolina Power and Light Company (CP&L). This monitoring is required as part of the BRPP discharge

permit issued by DWQ and as a condition of the Federal Energy Regulatory Commission (FERC) license for CP&L. In the past, there has been a limited-consumption advisory for common carp in effect for the Pigeon River from the Town of Canton to the North Carolina-Tennessee state line (approximately 26 miles, including Waterville Lake). In 2001, the NC Department of Health and Human Services (NCDHHS) revised this advisory due to declining dioxin concentrations in fish. The advisory was removed from common carp caught in the river, but remains in effect for Waterville (Walters) Lake. NCDHHS suggests that women of childbearing age and children under the age of 15 avoid eating carp caught from the lake. For all others, consumption of carp should be limited to no more than one meal per month. Swimming, boating and other recreational activities are not affected by this advisory. Visit the NCDHHS website for more information at www.epi.state.nc.us/epi/fish.

In addition, the State of Tennessee had a historical limited-consumption advisory for common carp, catfish species, and redbreast sunfish in effect for the Pigeon River within the State of Tennessee downstream to the confluence with the French Broad River. Due to monitoring conducted from 1996 to 2002, the Tennessee Department of Environment and Conservation (TDEC), Division of Water Pollution Control (DWPC) recommended that the Fish Consumption Advisory be removed (TDEC-DWPC, October 2002). This advisory has been lifted; however, the Pigeon River (5 miles) remains on the Tennessee 303(d) list for color.

2005 Recommendations

DWQ will continue to monitor the Pigeon River to study the sources and impact of increasing conductivity. DWQ will continue to work closely with BRPP to minimize the impact of its discharge and continue its involvement in the Joint Watershed Advisory Group. Additional provisions during times of drought should be reviewed and perhaps revised in the next permit cycle for BRPP to protect water quality in Pigeon River. In addition, DWQ recommends erosion and sedimentation control measures be taken in areas of the watershed that are under development.

Water Quality Initiatives

Haywood Waterways Association (HWA) is a nonprofit organization dedicated to maintaining and improving the water quality of the Pigeon River. It focuses on reducing nonpoint source pollution by offering education and outreach programs and working through a variety of voluntary initiatives, concentrating on individual landowners. HWA partnered with TVA to conduct a nonpoint source inventory (IPSI) of Haywood County using low-elevation infrared photography and interpretation. TVA digitized multiple layers of GIS information obtained from the photo interpretation. Nonpoint sources such as septic systems, illegal dumps sites, eroding roads and streambanks, pastureland and animal access to streams were identified. This information was used by TVA to apply a nutrient loading model to calculate a nutrient budget for the Haywood County portion of the Pigeon River watershed. HWA and the Haywood County Soil and Water Conservation District (SWCD) then used the TVA model and IPSI data to develop and implement strategies for water quality improvements. A Watershed Action Plan (HWA, 2002) was written detailing the inventory results and 19 strategies were recommended to improve water quality in the watershed.

Using the IPSI data, TVA and HWA were able to identify the most heavily impacted subwatersheds, identify and rank the nonpoint sources, and identify landowners where the nonpoint sources were located. EPA 319 and Clean Water Management Trust Fund (CWMTF)

grants were secured for sediment and water quality monitoring, educational publications, and a variety of best management practices (BMPs) projects on lands with participating landowners. BMP projects include: fencing livestock from streams; improving high-use areas and stock trails adjacent to the streams; streambank stabilization; improving riparian buffers; and a stormwater management project in a rural subdivision. Financial incentives in the form of reduced cost or no-cost BMP work are offered to the landowners in return for long-term management agreements or conservation easements. For more information on HWA and to review the Watershed Action Plan, visit www.haywoodwaterways.org.

5.3.2 Waterville (Walters) Lake [AU # 5-(7)e]

2000 Recommendations

Waterville (Walters) Lake was Impaired due to eutrophic conditions (i.e., algal blooms, chlorophyll *a*, dissolved oxygen violations, and nutrients). Support methodology changed since the 303(d) listing for Waterville Lake, and based on previous results, the lake is Supporting for its uses. Despite this change, however, a fish advisory remains in effect for catfish and carp, and the lake remains on the 303(d) list of Impaired waters.

Current Status

Waterville (Walters) Lake, from White Oak Road to Waterville Reservoir Dam (773.1 acres), is currently Not Rated in the aquatic life category. Waterville Lake receives runoff from urban and agricultural areas, which includes the Richland Creek, Jonathans Creek and Fines Creek watersheds. Samples collected from Waterville Lake showed evidence of eutrophication. Parameters of concern include chlorophyll *a*, elevated surface dissolved oxygen, and pH. There was also increased algae growth, specifically blue-green algae in the reservoir, during the summer of 2002. The elevated levels of chlorophyll *a*, conductivity and dissolved gasses may be attributed to drought conditions during the time of sampling. Low flow combined with limited dilution of upstream discharge effluents and nonpoint sources may also be contributing to the eutrophic conditions.

Waterville Lake remains under a fish consumption advisory for common carp. NCDHHS revised the advisory in 2001 and suggests that women of childbearing age and children under the age of 15 avoid eating carp caught from the lake. For all others, consumption of carp should be limited to no more than one meal per month. Swimming, boating and other recreational activities are not affected by this advisory. Sampling by DWQ and CP&L shows that dioxin concentrations in all species of fish collected from the lake have decreased since the early 1990s. Dioxin levels in common carp, however, remain above the North Carolina limit. Waterville Lake is on the state's 303(d) list of Impaired waters due to the fish consumption advisory. See Section 5.3.1 for more information.

2005 Recommendations

DWQ will continue to monitor water quality in Waterville (Walters) Lake. In addition, DWQ will work with Progress Energy (CP&L) and BRPP to develop a Quality Assurance and Project Plan (QAPP) so that their data can be used by DWQ in determining use support ratings in the future.

Water Quality Initiatives

Local efforts to reduce nonpoint source pollution are being led through a partnership between Haywood County SWCD, the Southwestern NC Resource Conservation & Development (RC&D) Council, and HWA. Since 2000, BMPs have been installed throughout the Pigeon River watershed including areas around Waterville (Walters) Lake. In addition, the Pigeon River Fund has also been a major contributor to water quality projects since 1996. Progress Energy provides capital for the fund, which was created during the relicensing of the Waterville (Walters) Lake Dam. The fund provides grants for projects that improve water quality, restore fish and wildlife habitat, create public access, and promote water quality awareness.

5.3.3 Richland Creek [AU # 5-16-(1)a, b, c, d and e; 5-16-(16)a]

2000 Recommendations

Richland Creek, from below the Lake Junaluska Dam to the Pigeon River (2.4 miles), was Impaired in the aquatic life category due to a Fair bioclassification. Impacts were associated with both point and nonpoint sources, including runoff from urban and agricultural areas, road development, and eroding streambanks. Biological impairment and habitat degradation continue to be primary concerns throughout the Richland Creek watershed. DWQ will continue to monitor the creek and Lake Junaluska and work with local initiatives to restore water quality.

Current Status

Richland Creek, from source to the backwaters of Lake Junaluska (13.9 miles), is currently Impaired in the recreation category based on elevated fecal coliform bacteria levels. Richland Creek, from US Route 23 to Depot Street (3.0 miles) and from Shelton Branch to the backwaters of Lake Junaluska (2.0 miles), is also Impaired in the aquatic life category due to a Poor bioclassification at site SF-3 and SF-4 and a Fair bioclassification at site B-8, respectively. The segment of Richland Creek from Lake Junaluska Dam to Jones Cove Branch (1.6 miles) is also Impaired in the aquatic life category because of a Poor bioclassification at site F-1. DWQ monitoring data and information presented in a special study indicates that there are long-term water quality impacts from nonpoint source pollution associated with urbanization, sedimentation, and erosion (NCDENR-DWQ, September 2001). Richland Creek is located in one of the most heavily developed areas of Haywood County and the Pigeon River watershed.

2005 Recommendations

DWQ will continue to monitor Richland Creek. DWQ will also work with the DWQ regional staff, the Town of Waynesville, and Haywood County to identify the source of the elevated fecal coliform bacteria levels. DWQ also encourages the Town of Waynesville to complete source tracking and sewer system mapping to identify damaged or leaking sewer lines.

Water Quality Initiatives

HWA has developed five-year goals for the Richland Creek subwatershed of the Pigeon River as part of their Watershed Action Plan (2002). These include: stabilizing 23,000 feet of eroding streambank and 26 miles of eroding road banks; improving 921 acres of pasture thus removing 10 animal access points to streams; and improving 10 miles of riparian corridors. These goals would theoretically result in a 37 percent reduction of sediment entering Richland Creek and eventually Lake Junaluska. The Haywood County SWCD, the Southwestern NC RC&D Council, and HWA have secured CWMTF grant money to implement the watershed action plan in Richland Creek. DWQ encourages the efforts of HWA and will partner with them as they

implement management strategies throughout the watershed. Refer to Section 5.3.1 for more information regarding HWA.

Because of the water quality impairment noted above, Richland Creek has been identified by the NC Ecosystem Enhancement Program (EEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

5.3.4 Lake Junaluska [AU # 5-16-(1)f]

2000 Recommendations

A progressive program to implement nonpoint source pollution controls was recommended to reduce the nutrient and sediment loading and the need for future dredging. An initiative by the HWA was underway to inventory nonpoint source pollution in the watershed. Local support of the recommendations produced by this study is critical to correcting the water quality of Lake Junaluska.

Current Status and 2005 Recommendations

Lake Junaluska (200 acres) has had chronic problems with sediment inputs from the surrounding watershed and is considered Impaired in the aquatic life category due to eutrophication (pH standards violation). As a result of the sediment inputs, significant funds have been spent periodically dredging the lake. DWQ assessed an enforcement action against the Lake Junaluska Assembly in November 1998 after the lake was mistakenly drained lower than was intended. A plume of sediment from the lake bottom flowed down the entire length of lower Richland Creek to the Pigeon River, burying fish and habitat. The reservoir continues to suffer from sedimentation problems.

Lake Junaluska also had elevated surface dissolved oxygen and pH values. Both of these may have contributed to increased algae growth in 2002. The local Watershed Action Plan by HWA (2002) suggests reducing the sediment loading to a rate that can be managed over time. It is recommended those BMPs that emphasis sediment and erosion control be installed in this watershed. As Lake Junaluska is part of the Richland Creek watershed, refer to Richland Creek *2005 Recommendations* and *Water Quality Initiatives* (Section 5.3.3) for more information.

5.3.5 Fines Creek [AU # 5-32]

2000 Recommendations

Fines Creek was experiencing notable impacts from agricultural activities, as well as runoff from nonurban development. The Volunteer Water Information Network (VWIN) has also noted sediment and nutrient impacts (Maas et *al*., November 1999). This watershed could benefit from implementation of BMPs directed towards these inputs. DWQ will notify local agencies of water quality concerns in Fines Creek. DWQ will also work with local agencies to conduct additional monitoring and assist agency personnel with locating sources of water quality protection funding.

Current Status

Fines Creek, from the source to the Pigeon River (9.7 miles), is currently Impaired in the aquatic life category because of a Fair bioclassification at site F-3. This site also received a Good-Fair bioclassification at site B-13. This creek has some high quality aquatic habitat, but the fish community suffers from chronic impairment. Fines Creek drains primarily agricultural land (much of which is used for pasture) and exhibits nutrient enrichment and high conductivity.

VWIN monthly chemistry data corroborated many of the DWQ biological data conclusions (Maas et *al*., January 2004). This watershed has very high nutrient and turbidity values, some of the highest in a seven-county VWIN monitoring area. VWIN and HWA identified habitat degradation and sedimentation as major concerns for Fines Creek. According to the Watershed Action Plan (HWA, 2002), many of the streams in the watershed have been channelized and have little to no riparian vegetation.

2005 Recommendations

DWQ will continue to monitor water quality in Fines Creek and potentially add a monitoring site in Rush Fork Creek during the next sampling cycle. DWQ will work with local agencies, including HWA and VWIN, to address the nutrient and turbidity issues in this watershed and assist in identifying additional funding sources for water quality protection. In addition, DWQ recommends that local agencies work with landowners to install BMPs to improve the riparian zone and limit livestock access to streams.

Water Quality Initiatives

HWA, Haywood County SWCD, and the Southwestern NC RC&D Council have secured EPA 319 grant money for BMP projects along Fines Creek. HWA has set a goal of reducing nonpoint source pollution by 35 percent over the next five years throughout the Fines Creek watershed. These funds will also be used to restore streambanks, improve pasture conditions, and address animal access points. Fines Creek is part of the Watershed Action Plan (2002) developed by HWA. Refer to Section 5.3.1 for more information.

Because of the water quality impairments noted above, Fines Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

5.3.6 Raccoon Creek [AU # 5-16-14]

Current Status and 2005 Recommendations

Raccoon Creek, from source to Richland Creek (4.7 miles), is currently Impaired in the aquatic life category because of a Fair bioclassification at site SF-6. This stream drains an area of suburban and commercially developed land, as well as some agricultural lands. Raccoon Branch suffers from habitat degradation, which includes steep, eroding banks. HWA has been continually monitoring sedimentation rates in Raccoon Creek for the last two years; however, the results are inconclusive. It is recommended that local agencies and HWA work with landowners to install BMPs to improve the riparian zone and conduct stream restoration activities.

5.3.7 Hyatt Creek [AU # 5-16-6a and b]

2000 Recommendations
Hyatt Creek was previously Impaired and placed on the 303(d) list based on evaluated information. Use support methodology has been improved, and only monitored data are now used in use support determinations (see Appendix X). However, this stream was required to remain on the 303(d) list until sampling was conducted to assess current water quality conditions. Refer to Appendix IV for more information on the state's 303(d) methodology and listing requirements.

Current Status and 2005 Recommendations
Hyatt Creek, from source to Richland Creek (3.5 miles), is currently Not Rated in the aquatic life category because of a Not Rated bioclassification at sites SB-3 and SF-15. Another site (SB-2) received a Not Impaired bioclassification. Due to its small size, Hyatt Creek did not receive a use support rating. The small size of the stream is likely due to drought conditions during the time of sampling. Several impacts were noted, however, and include lack of pools and instream habitat, high sediment loadings, and minimal riparian vegetation. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone and limit livestock access to streams.

Water Quality Initiatives
HWA, Haywood County SWCD, and the Southwestern NC RC&D Council have secured CWMTF grant money for BMP projects along Hyatt Creek. Since Hyatt Creek is part of the Richland Creek watershed, refer to the Richland Creek *Water Quality Initiatives* (Section 5.3.3) for more information.

Because of the water quality impairment noted above, Hyatt Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

5.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

5.4.1 Plott Creek [AU # 5-16-9]

Current Status and 2005 Recommendations
Plott Creek, from source to Richland Creek (4.7 miles), has not been monitored by DWQ. However, HWA believes that Plott Creek may encounter problems associated with planned

development activities in the surrounding area (HWA, 2002). Currently, 76 percent of this watershed is forested; however, road data indicate that 60 percent of the land will be developed as low density residential in the coming years. This change in the amount of impervious surface could have potential negative water quality impacts. It is recommended that Haywood County continue programs to minimize water quality impacts during development activities in order to reduce the amount of sediment that is entering the watershed. In addition, the existing forested areas adjacent to Plott Creek and its tributaries should remain for water quality protection.

Water Quality Initiatives

Because of the potential water quality problems noted above, Plott Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects. NCEEP will partner with the Haywood Waterways Association when working in this watershed.

5.4.2 Jonathan Creek [AU # 5-26-(7)]

Current Status and 2005 Recommendations

Jonathan Creek, from 0.4 miles downstream of Fines Creek to the Pigeon River (14.6 miles), is currently Supporting in the aquatic life category due to Excellent bioclassifications at sites B-10 and B-12, a Good bioclassification at site B-11, and a Good-Fair bioclassification at SF-16. This creek has been sampled since 1992, and monitoring data continually indicate excellent water quality. The site assigned the Good bioclassification receives the discharge of the Maggie Valley Wastewater Treatment Plant (WWTP). The discharge may have had an effect on water quality during this assessment period due to the low flow conditions caused by a four-year drought (1998 to 2002).

Jonathan Creek drains through the Town of Maggie Valley, which includes both commercial and residential areas, as well as agricultural land. It is recommended that local agencies work with landowners to install BMPs to improve the riparian zone, targeting the residential areas of the watershed, as well as the agricultural areas. Protecting the riparian corridor and minimizing the impact of development in this watershed are other recommendations discussed in the local Watershed Action Plan (HWA, 2002).

Water Quality Initiatives

Because of the excellent water quality noted above, Jonathan Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration projects in order to protect the existing ecosystem. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

5.4.3 Crabtree Creek [AU# 5-22]

Current Status and 2005 Recommendations

Crabtree Creek, from the source to the Pigeon River (3.3 miles), is currently Supporting in the aquatic life category because of a Good-Fair bioclassification at site F-2. During the time of sampling, a few habitat concerns were noted in Crabtree Creek, including narrow riparian zones and eroding banks. There are also places where cattle have direct access to the stream. It is

recommended that local agencies continue to work with landowners on the importance of water quality protection and continue assisting with BMP installation to improve the riparian zone and limit livestock access to streams.

5.5 Additional Water Quality Issues within Subbasin 04-03-05

This section identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

5.5.1 Surface Waters Identified for Potential Reclassification

Jonathan Creek [AU# 5-26-(7)]
Jonathan Creek, from 0.4 miles downstream of Fines Creek to the Pigeon River (14.6miles) is currently Supporting due to Excellent and Good bioclassifications at sites B-10, B12, and B-11. The current DWQ classification is C Tr. Refer to section 5.4.2 for more information.

West Fork Pigeon River (AU# 5-2a)
The West Fork Pigeon River, from source to the backwaters of Lake Logan (7.8 miles), is Supporting due to an Excellent bioclassification at site B-2. The current DWQ classification is WS-III, Tr.

East Fork Pigeon River [AU# 5-3-(6.5)]
The East Fork Pigeon River, from a point 0.5 miles upstream of Bee Branch to the Pigeon River (13.0 miles), is Supporting due to an Excellent bioclassification at site B-3. The current DWQ classification is WS-III, Tr.

Chapter 6
French Broad River Subbasin 04-03-06

Including the: Nolichucky River, North and South Toe River, Big Rock Creek, Jacks Creek and Right Fork Cane Creek

6.1 Subbasin Overview

Subbasin 04-03-06 at a Glance

Land and Water Area

Total area:	466 mi²
Land area:	465 mi²
Water area:	1 mi²

Population Statistics

2000 Est. Pop.:	31,122 people
Pop. Density:	66 persons/mi²

Land Cover (percent)

Forest/Wetland:	87%
Surface Water:	<1%
Urban:	<1%
Cultivated Crop:	<1%
Pasture/ Managed Herbaceous:	11%

Counties

Avery, Mitchell and Yancey

Municipalities

Bakersville, Burnsville, Newland, Spruce Pine, and Sugar Mountain

Much of the land in this subbasin is within the Pisgah National Forest, although there are scattered agricultural and industrial lands throughout the subbasin. The largest community is the Town of Spruce Pine, near the Blue Ridge Parkway. There has been little population growth in this subbasin, and the subbasin is expected to remain mostly rural with only a slight increase in population by the year 2020. Population increases of 14.1, 9.4 and 16.7 percent are projected for Avery, Mitchell and Yancey counties, respectively. For more information regarding population growth and trends, refer to Appendix I.

There are seven NPDES discharge permits in this subbasin with a total permitted flow of 14.5 MGD. The largest are Unimin Corporation/Quartz Operation (3.6 MGD), Feldspar Corporation (3.5 MGD), Unimin Corporation/Schoolhouse Quartz Facility (2.16 MGD), and K-T Feldspar Corporation (1.73 MGD). There are two individual NPDES stormwater permits in the subbasin. Refer to Appendix VI for identification and more information on individual NPDES permit holders. Significant issues related to compliance with NPDES permit conditions are discussed below. There are no registered animal operations in this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 10. Table 14 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were 10 benthic macroinvertebrate community samples and five fish community samples (Figure 10 and Table 14) collected during this assessment period. Data were collected from four ambient monitoring stations as well. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Figure 10 French Broad River Subbasin 04-03-06

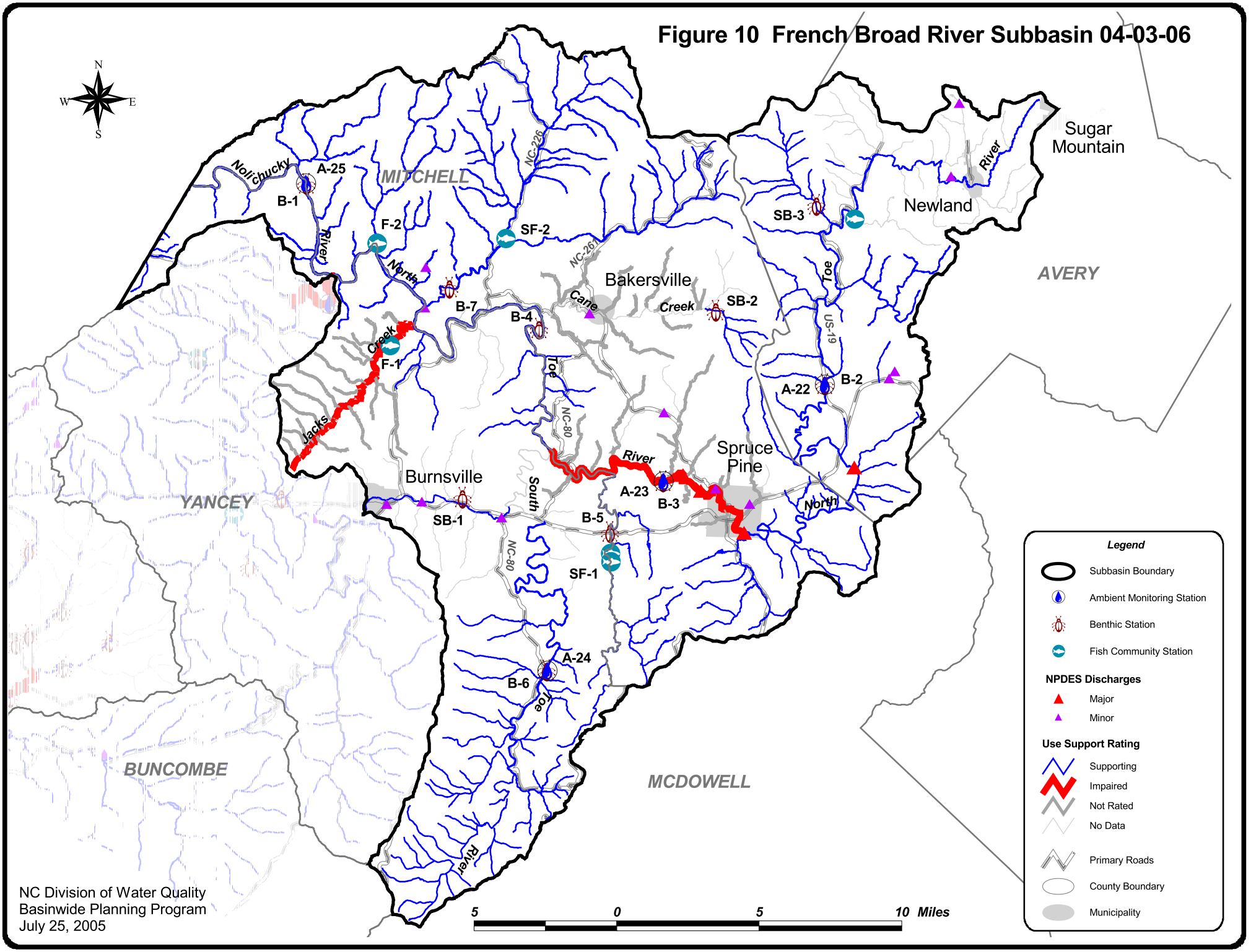


Table 14 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040306

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
7	NOLICHUCKY RIVER	10.0	Miles	S	S	B-1	G	2002				A-25	nce
7-2-(0.5)	North Toe River	22.0	Miles	S	S	B-2	G	2002				A-22	nce
7-2-(21.5)	North Toe River	9.4	Miles	S	S	B-2	G	2002				A-22	nce
7-2-(27.7)b	North Toe River	11.3	Miles	I	S	B-3	F	2002				A-23	turbidity 14%
7-2-(27.7)c	North Toe River	24.8	Miles	S	ND	B-4	G	2002					
7-2-15	Roaring Creek	4.9	Miles	S	ND	SB-3	E	2002					
7-2-48	Big Crabtree Creek (Crabtree Creek)	14.6	Miles	S	ND	B-5	E	2002	SF-1	E	1999		
7-2-52-(1)	South Toe River	25.9	Miles	S	S	B-6	E	2002				A-24	nce
7-2-52-33	Little Crabtree Creek	6.3	Miles	S	ND	SB-1	GF	2002					
7-2-59-1	Right Fork Cane Creek	1.2	Miles	S	ND	SB-2	E	2002					
7-2-63	Jacks Creek	8.5	Miles	I	ND				F-1	F	2002		
7-2-64	Big Rock Creek	13.9	Miles	S	ND	B-7	E	2002	SF-2	G	1998		
7-2-69	Pigeonroost Creek	7.1	Miles	S	ND				F-2	E	2002		

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired

Use Support Ratings 2004:
S - Supporting
I - Impaired
NR - Not Rated
ND - No Data

Ambient Data
nce - no criteria
ce - criteria exce

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support rating for all waters in subbasin 04-03-06 are summarized in Section 6.2. Recommendations, current status and future recommendations for previously and newly Impaired waters are discussed in Section 6.3. Waters with noted water quality impacts are discussed in Section 6.4. Water quality issues related to the entire subbasin are discussed in Section 6.5. Refer to Appendix X for a complete list of monitored waters and more information on use support ratings.

6.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-06 in the aquatic life, recreation and fish consumption categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 159.8 stream miles (23.2 percent) monitored during this assessment period in the aquatic life category. Of these, 19.8 stream miles (3.0 percent) are Impaired. Refer to Table 15 for a summary of use support ratings by category for waters in the subbasin 04-03-06.

6.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

6.3.1 Right Fork Cane Creek (AU#7-2-59-1)

2000 Recommendations

Right Fork Cane Creek (1.1 miles) was previously Impaired and placed on the 303(d) list based on evaluated information. Use support methodology has been improved, and only monitored data are now used in use support determinations (see Appendix X). However, this stream was required to remain on the 303(d) list until sampling was conducted to assess current water quality conditions. Refer to Appendix VII for more information on the state's 303(d) methodology and listing requirements.

Table 15 Summary of Use Support Ratings by Category in Subbasin 04-03-06

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	140.0 mi	0.0	78.5 mi	0.0
Impaired	19.8 mi	0.0	0.0	0.0
Not Rated	0.0	0.0	0.0	0.0
Total	**159.8 mi 0.0 ac**	**0.0**	**78.5 mi 0.0 ac**	**0.0**
Unmonitored Waters				
Supporting	354.5 mi	0.0	0.0	25.4 mi
Impaired	0.0	0.0	0.0	0.0
Not Rated	75.3 mi	0.0	0.0	0.0
No Data	100.0 mi	689.6 mi	611.1 mi	0.0
Total	**529.8 mi 0.0 ac**	**689.6 mi 0.0 ac**	**611.1 mi 0.0 ac**	**25.4 mi 0.0 ac**
Totals				
All Waters*	**689.6 mi 0.0 ac**	**689.6 mi 0.0 ac**	**689.6 mi 0.0 ac**	**25.4 mi 0.0 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

Current Status and 2005 Recommendations

Right Fork Cane Creek, from the source to Cane Creek (1.2 miles), is currently Supporting based on an Excellent bioclassification at site SB-2. The benthic community was diverse and reflected no water quality problems. There were a few habitat concerns noted, such as bank erosion and riparian zone width, that should be addressed to protect this excellent water quality. It is recommended that local agencies work with landowners to install best management practices (BMPs) to improve the riparian zones and restore streambanks. Based on this sampling data, DWQ recommends that Right Fork Cane Creek be removed from the 2006 303(d) list.

6.3.2 Jacks Creek [AU# 7-2-63]

Current Status and 2005 Recommendations

Jacks Creek, from the source to the North Toe River (8.5 miles), is currently Impaired based on a Fair bioclassification at site F-1. The fish community species diversity was low and conductivity values were elevated. The stream had a narrow riparian zone and abundant instream algal growth. DWQ will continue to monitor this site, and a more in-depth study should be conducted to identify the source of high conductivity. It is recommended that local agencies work with landowners to install BMPs to improve riparian zones and the overall water quality in this stream.

Water Quality Initiatives

Because of the water quality impairment noted above, Jacks Creek has been identified by the NC Ecosystem Enhancement Program (EEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

6.3.3 North Toe River [AU#7-2-(27.7)b]

2000 Recommendations

Habitat degradation and turbidity were noted problems in a 32.5-mile segment of the river from Grassy Creek to the South Toe River. DWQ will continue to monitor the river to assess possible impacts from mine processors and the WWTP located in the Town of Spruce Pine. The implementation of BMPs is recommended to protect the river from future impacts from urban runoff. DWQ will notify local agencies of water quality concerns for this creek and work with these various agencies to conduct further monitoring and assist agency personnel with locating sources of water quality protection funding.

Current Status and 2005 Recommendations

The North Toe River, from Grassy Creek to the South Toe River (11.3 miles), is currently Impaired based on a Fair bioclassification at site B-3. This same segment is also Impaired due to a turbidity water quality standards violation at site A-23. The ambient monitoring station (A-23) exceeded the state standard for turbidity in 14% of the samples collected during this assessment period. This site receives runoff from the Town of Spruce Pine and several dischargers in the watershed, which may have impacted the benthic community. The North Toe River may also be impacted by road construction activities associated with the expansion of NC 19 from Burnsville to Spruce Pine. Narrow riparian zones were also noted.

Several days before DWQ monitoring, a 1,500-gallon spill of #2 fuel oil in the river was reported to local authorities. The U.S. Environmental Protection Agency (EPA) was the primary responder and coordinated clean up efforts. Prior to the spill, the North Toe River water quality was improving (Good-Fair in 1992 and Good in 1997). DWQ will continue to monitor the water quality at this site and work with local agencies to find the source of turbidity. It is recommended that local agencies work with landowners to install BMPs to improve riparian zones and the overall water quality in the river.

Water Quality Initiatives

Because of the water quality impairment noted above, the North Toe River has been identified by the NC Ecosystem Enhancement Program (EEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

6.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

6.4.1 Big Rock Creek [AU#7-2-64]

Current Status and 2005 Recommendations
Big Rock Creek, from source to the North Toe River (13.9 miles), is currently Supporting based on an Excellent bioclassification at site B-7 and a Good fish community at site SF-2. Like many other streams throughout the basin, drought conditions likely affected this stream. In 1997, the stream was 20 meters (66 feet) wide, but in 2002, it was reduced to 9 meters (30 feet). Big Rock drains primarily agriculture and forestland. Narrow riparian zones and eroding streambanks were noted during sampling. It is recommended that local agencies work with landowners to install BMPs to improve riparian zones and the overall water quality in Big Rock.

Water Quality Initiatives
Because of the poor riparian zones noted above, Big Rock Creek has been identified by NCEEP as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

6.5 Additional Water Quality Issues within Subbasin 04-03-06

This section identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

6.5.1 Surface Waters Identified for Potential Reclassification

Roaring Creek (AU# 7-2-15)
Roaring Creek, from source to the North Toe River (4.9 miles), is Supporting due to an Excellent bioclassification at site SB-3. The current DWQ classification is WS-IV, Tr.

Big Crabtree Creek (Crabtree Creek) (AU# 7-2-48)
Big Crabtree Creek (Crabtree Creek), from source to the North Toe River (14.6 miles), is Supporting due to an Excellent bioclassification at site B-5 and SF-1. The current DWQ classification is C Tr.

Right Fork Cane River (AU# 7-2-59-1)

Right Fork Cane Creek, from the source to Cane Creek (1.2 miles), is currently Supporting based on an Excellent bioclassification at site SB-2. The current DWQ classification is C Tr. DWQ is recommending that the Right Fork Cane Creek be removed from the 2006 state's 303(d) list. Refer to Section 6.3.1 for more information.

Big Rock Creek (AU#7-2-64)

Big Rock Creek, from source to the North Toe River (13.9 miles), is currently Supporting based on an Excellent bioclassification at site B-7. The current DWQ classification is C Tr. Refer to Section 6.4.1 for more information.

Pigeonroost Creek (AU# 7-2-69)

Pigeonroost Creek, from source to the North Toe River (7.1 miles), is Supporting due to an Excellent bioclassification at site F-2. The current DWQ classification is C Tr.

Chapter 7
French Broad River Subbasin 04-03-07
Including the: Little Creek, Bald Mountain Creek, Cane River and Price Creek

7.1 Subbasin Overview

Subbasin 04-03-07 at a Glance

Land and Water Area

Total area:	153 mi²
Land area:	153 mi²
Water area:	0 mi²

Population Statistics

2000 Est. Pop.:	8,964 people
Pop. Density:	57 persons/mi²

Land Cover (percent)

Forest/Wetland:	87%
Surface Water:	<1%
Urban:	<1%
Cultivated Crop:	<1%
Pasture/ Managed Herbaceous:	12%

Counties
Yancey

Municipalities
Burnsville

The southern portion of this subbasin lies within the Pisgah National Forest, and the Town of Burnsville is the largest municipality. By the year 2020, the overall population of Yancey County is projected to increase by 16.7 percent. Refer to Appendix I for more information regarding population growth and trends.

There is one NPDES wastewater discharge permit holder in this subbasin. It is held by the Town of Burnsville WWTP with a total permitted flow of 0.8 MGD. Refer to Appendix VI for identification and more information on individual NPDES permit holders. There are no registered animal operations listed for this subbasin.

A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure 11. Table 16 contains a summary of assessment units and lengths, streams monitored, monitoring data types, locations and results, along with use support ratings for waters in this subbasin. Refer to Appendix X for a complete listing of monitored waters and more information about use support ratings.

There were four benthic macroinvertebrate and three fish community samples (Figure 11 and Table 16) collected during this assessment period. Data were also collected from one ambient monitoring station. Refer to the *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html and Appendix IV for more information on monitoring.

Waters in the following sections are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database, 303(d) Impaired waters list and the various tables in this basin plan. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Use support ratings for all waters in subbasin 04-03-07 are summarized in Section 7.2. Recommendations, current status and future recommendations for previously or newly Impaired waters are discussed in Section 7.3. Waters with noted water quality impacts are discussed in Section 7.4. Water quality issues related to the entire subbasin are discussed in Section 7.5.

Figure 11 French Broad River Subbasin 04-03-07

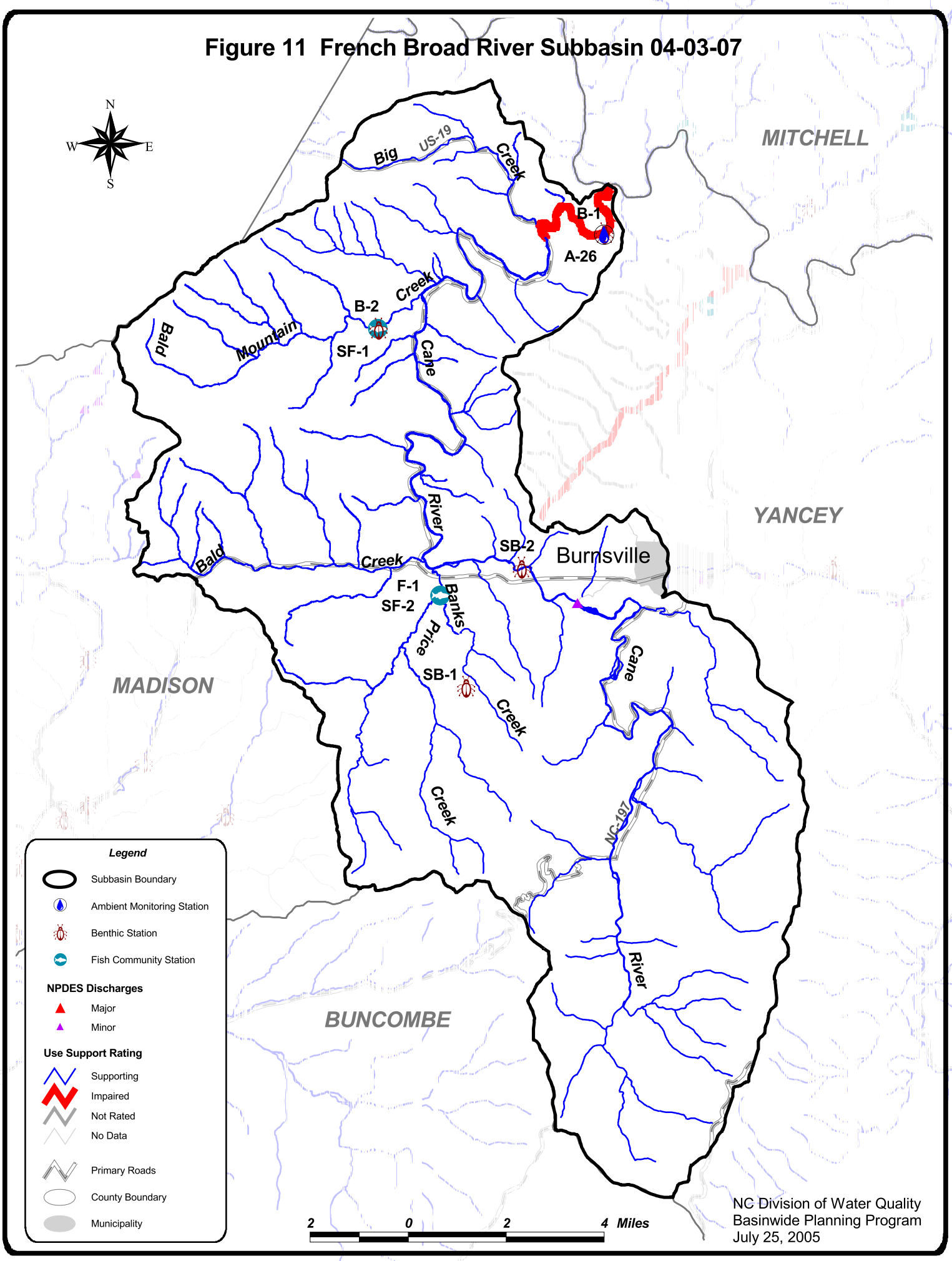


Table 16 DWQ Assessment and Use Support Ratings Summary for Monitored Waters in Subbasin 040307

Assessment Unit #	Name	Length/Area		AL	REC	Benthic Community			Fish Community			Ambient Data	
7-3-(13.7)a	Cane River	21.6	Miles	S	S	SB-2	E	2002					
7-3-(13.7)b	Cane River	3.5	Miles	I	ND	B-1	E	2002				A-26	turbidity 20%
7-3-21	Price Creek	8.0	Miles	S	ND				F-1	G	2002		
	Price Creek	8.0	Miles	S	ND				SF-2	GF	1997		
7-3-21-4	Banks Creek	4.2	Miles	S	ND	SB-1	NI	2002					
7-3-32	Bald Mountain Creek	8.0	Miles	S	ND	B-2	E	2002	SF-1	NR	1997		

Assessment Unit # - Portion of DWQ Classified Index where monitoring is applied to assign a use support rating.

Use Categories:
AL - Aquatic Life
REC - Recreation

Monitoring data type:
F - Fish Community Survey
B - Benthic Community Survey
SF - Special Fish Community Study
SB - Special Benthic Community Study
A - Ambient Monitoring Site

Bioclassifcations:
E - Excellent
G - Good
GF - Good-Fair
F - Fair
P - Poor
NI - Not Impaired

Use Support Ratings 2004:
S - Supporting
I - Impaired
NR - Not Rated
ND - No Data

Ambient Data
nce - no criteria
ce - criteria exce

Table 17 Summary of Use Support Ratings by Use Category in Subbasin 04-03-07

Use Support Rating	Aquatic Life	Fish Consumption	Recreation	Water Supply
Monitored Waters				
Supporting	41.7 mi	0.0	21.6 mi	0.0
Impaired	3.5 mi	0.0	0.0	0.0
Not Rated	0.0	0.0	0.0	0.0
Total	**45.2 mi 0.0 ac**	**0.0**	**21.6 mi 0.0 ac**	**0.0**
Unmonitored Waters				
Supporting	168.7 mi	0.0	0.0	55.9 mi
Impaired	0.0	0.0	0.0	0.0
Not Rated	0.0	0.0	0.0	0.0
No Data	3.7 mi	217.6 mi	196.0 mi	0.0
Total	**172.4 mi 0.0 ac**	**217.6 mi**	**196.0 mi**	**55.9 mi**
Totals				
All Waters*	**217.6 mi 0.0 ac**	**217.6 mi 0.0 ac**	**217.6 mi 0.0 ac**	**55.9 mi 0.0 ac**

* Total Monitored + Total Unmonitored = Total All Waters.

Refer to Appendix X for a complete list of monitored waters and more information on use support ratings.

7.2 Use Support Assessment Summary

Use support ratings were assigned for waters in subbasin 04-03-07 in the aquatic life, recreation, fish consumption and water supply categories. There are no fish consumption advisories in this subbasin; therefore, all waters are No Data in the fish consumption category. In the water supply category, all waters are Supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 45.2 stream miles (20.8 percent) monitored during this assessment period in the aquatic life category. Of these, 3.5 stream miles (<2 percent) are Impaired. Refer to Table 17 for a summary of use support ratings for waters in subbasin 04-03-07.

7.3 Status and Recommendations of Previously and Newly Impaired Waters

The following waters were either identified as Impaired in the previous basin plan (2000) or are newly Impaired based on recent data. If previously identified as Impaired, the water will either remain on the state's 303(d) list or will be delisted based on recent data showing water quality improvements. If the water is newly Impaired, it will likely be placed on the 2006 303(d) list. The current status and recommendations for addressing these waters are presented below, and each is identified by an assessment unit number (AU#). Information regarding 303(d) listing and reporting methodology is presented in Appendix VII.

7.3.1 Little Creek (AU# 7-3-33)

2000 Recommendations
Little Creek was listed on the 2000 (not yet approved) 303(d). Use support methodology has been improved, and only monitored data are now used in use support determinations (see Appendix X). However, this stream was required to remain on the 303(d) list until sampling was conducted to assess current water quality conditions. Refer to Appendix VII for more information on the state's 303(d) methodology and listing requirements.

Current Status and 2005 Recommendations
Little Creek was delisted from the state's 2000 303(d) Impaired waters list. Refer to Appendix VII for more information on the state's 303(d) methodology and listing requirements. Little Creek was previously rated for sediment based on erroneously evaluated information. Using updated use support methodology, Little Creek was removed from the 303(d) list and is no longer considered Impaired.

7.3.2 Cane River [AU#7-3-(13.7)b]

Current Status and 2005 Recommendations
Although the benthic macroinvertebrate data from Cane River near Sioux received an Excellent bioclassification at site B-1, the ambient station at site A-26 found high turbidity levels. Therefore, this section of Cane River, from Big Creek to the North Toe River (3.5 miles), is Impaired due to exceeded turbidity criteria. Cane River is classified as a trout stream and has a turbidity standard of 10 NTU. No more than 10 percent of the monthly samples collected during this assessment period should exceed the standard. At site A-26, 20.4 percent of the samples exceeded the turbidity standard.

DWQ will continue to monitor Cane River and work with local agencies to identify the source(s) of turbidity. During land-disturbing/construction activities, water quality should be considered, and BMPs should be installed to minimize or prevent future impacts to water quality in the Cane River watershed. A TMDL management strategy should be developed in the future for the turbidity violation. The NC Wildlife Resources Commission (WRC) has identified Cane River as an area that supports listed and otherwise rare and sensitive aquatic species. Care should be taken to protect these species and their aquatic habitat.

7.4 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are not Impaired. However, notable water quality problems and concerns were documented for these waters during this assessment. Attention and resources should be focused on these waters to prevent additional degradation and facilitate water quality improvements. DWQ will notify local agencies of these water quality concerns and work with them to conduct further assessments and to locate sources of water quality protection funding. Additionally, education on local water quality issues and voluntary actions are useful tools to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VIII.

7.4.1 Price Creek (AU# 7-3-21)

Current Status and 2005 Recommendations
Price Creek, from source to Cane River (8.0 miles), is Supporting based on a Good bioclassification at site F-1. Compared to the samples collected in 1997 (SF-2), the fish community was more diverse, but ten species were represented by only one or two individuals, reducing the percentage of species with multiple age classes to the second lowest site in the basin. DWQ will continue to monitor water quality in the Price Creek watershed and work with local agencies to maintain the fish population.

Water Quality Initiatives
Because of the potential water quality problem noted above, Price Creek has been identified by the NC Ecosystem Enhancement Program (NCEEP) as one of 28 local watersheds in the basin with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for implementation of NCEEP restoration projects.

7.4.2 Bald Mountain Creek (AU# 7-3-32)

Current Status and 2005 Recommendations
Bald Mountain Creek, from source to Cane River (8.0 miles), is Supporting due to an Excellent bioclassification at site B-2 and a Not Rated bioclassification at site SF-1. Bald Mountain Creek has been sampled three times for benthic macroinvertebrates and has continually improved from Good-Fair (1992) to Good (1997) to the most recent Excellent (2002) bioclassification. Water quality and habitat conditions are likely influenced by nonpoint source runoff from agriculture, forest and rural residential properties. The stream is also receiving runoff from SR 1408, which parallels the creek for most of its length. DWQ will continue to monitor water quality in Bald Mountain Creek.

7.5 Additional Water Quality Issues within Subbasin 04-03-07

The following section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

This section also identifies those surface waters given an Excellent bioclassification, and therefore, may be eligible for reclassification to a High Quality Water (HQW) or an Outstanding Resource Water (ORW). It should be noted that these are streams that were sampled by DWQ during this basinwide cycle. There may be other tributaries eligible for reclassification in addition to the ones listed below. For more information regarding water quality standards and classifications, refer to Chapter 8.

7.5.1 Bald Creek (AU#7-3-22)

The NC Department of Transportation (NCDOT) plans to widen US 19/19E to a multilane highway from future I-26 (existing US 19/23) in Madison County to SR 1186 west of Micaville in Yancey County. The total project length is 21 miles. In order to assess existing water quality concerns, Equinox Environmental Consultation and Design, Inc. (Equinox) completed a preliminary watershed characterization assessment for NCEEP during the winter of 2004. The characterization assessment identified inadequate wastewater treatment, habitat degradation, and poor riparian and stream habitats as the primary water quality concerns in this watershed (NCDENR-NCEEP, February 2004b).

Bald Creek is a small rural watershed (approximately 18 square miles) in an area of steep ridges and valleys. Many of the stream valleys have been cleared for homes, gardens and small farms. Streams in the watershed often have very little woody riparian vegetation and course through fields or a landowner's yard. Almost all of the streams in this watershed are designated trout waters. Fish monitoring by Equinox revealed very limited trout populations in many of these streams, and noted that instream habitats have been degraded by channelization, removal of riparian vegetation, and sedimentation. For a copy of the preliminary watershed characterization assessment, visit www.nceep.net/services/lwps/Bald_Creek/bald_creek_phase_I_doc_final.pdf. A more detailed assessment is scheduled for completion in late 2005.

In 1999, the NC Department of Environmental Health (NCDEH) Wastewater Discharge Elimination (WaDE) Program surveyed household waste systems in the Bald Creek watershed. Thirty-two (32) percent of households had waste systems that were inadequate because the systems were associated with straight piped waste, failing septic systems, and/or unpermitted pit privys. Eighteen (18) percent of households had blackwater straight pipes. Often, noncompliant systems had grey water and blackwater pipes, but NCDEH only recorded what was seen as the worst problems on site. To date, 15 repairs have been completed and were funded through grants from the Clean Water Management Trust Fund (CWMTF). Repairs have also been made in many of the subwatersheds, but there are still many more that need to be fixed (NCDENR-NCEEP, February 2004b). It is recommended that additional funds be made available to improve wastewater treatment in this watershed. For more information on this survey and the impacts of straight piping on water quality, see Section 7.5.2.

New residential development is occurring in this watershed and will likely continue with the completion of the new highway project. Sedimentation could pose a significant water quality problem. It is recommended that construction activities follow any existing sedimentation and erosion control programs, and developers adequately design their sites to minimize stormwater runoff (NCDENR-NCEEP, February 2004b). Many of the tributaries to Bald Creek (including Possumtrot and Elk Wallow Creek) are designated Trout (Tr) waters by DWQ. Under the NC Sedimentation and Pollution Control Act (SPCA), development along trout waters must maintain

either an undisturbed zone of 25 feet or of sufficient width to confine visible siltation within 25 percent of the buffer zone nearest the development/construction activities. Refer to Section 8.1.2 for more information. It is also recommended that education efforts be undertaken to make sure that local governments and citizens are aware of this regulation and follow it during construction activities. It is also recommended that Yancey County develop a local sediment and erosion control program to minimize the impact of development on water quality.

7.5.2 Straight Pipes

In this subbasin, wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits. The wastewater from these households is treated on the property through the use of septic systems. Older or improperly maintained septic systems can fail to properly treat waste and "bubble" or leak to the surface. Wastewater from some homes in this area illegally discharge directly to streams through what is known as a "straight pipe". Wastewater from these failing or illegal systems can make its way to streams or contaminate groundwater. The discharge of untreated or partially treated sewage can be extremely harmful to humans and the aquatic environment.

According to a 1999 household survey of 313 homes in this Bald Creek watershed, the Toe River Health District, as part of the Toe River Clean Water Project, obtained the following data (NCDENR-NCEEP, February 2004b):

- 163 Properly functioning systems
- 76 Malfunctioning systems
- 42 Blackwater pipes
- 29 Grey water pipes
- 3 Failing Septic Systems
- 2 Unpermitted Pit Privies

For more information on straight pipes, wastewater and/or failing septic systems, see Chapter 13. Information is also available by contacting the environmental health section of the county health department (Appendix VIII) or the NCDEH On-Site Wastewater Section (OSWW) WaDE Program by calling 1-866-223-5718 or by visiting http://www.deh.enr.state.nc.us/oww/Wade/wade.htm.

7.5.3 Surface Waters Identified for Potential Reclassification

Cane River [AU# 7-3-(13.7)a]
Cane River, from the Town of Burnsville Water Supply Intake to Big Creek (21.6 miles), is Supporting due to an Excellent bioclassification at site SB-2. The current DWQ classification is C Tr.

Bald Mountain Creek [AU# 7-3-32]
Bald Mountain Creek, from source to Cane River (8.0 miles), is Supporting due to an Excellent bioclassification at site B-2. The current DWQ classification is C Tr. Refer to Section 7.4.2 for more information.

Chapter 8
North Carolina Water Quality Standards and Classifications

8.1 Description of Surface Water Classifications and Standards

North Carolina's Water Quality Standards Program adopted classifications and water quality standards for all the state's river basins by 1963. The program remains consistent with the Federal Clean Water Act and its amendments. Water quality classifications and standards have also been modified to promote protection of surface water supply watersheds, high quality waters, and the protection of unique and special pristine waters with outstanding resource values.

8.1.1 Statewide Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Most supplemental classifications have been developed to provide special protection to sensitive or highly valued resource waters. Table 18 briefly describes the best uses of each classification. A full description is available in the document titled Classifications *and Water Quality Standards Applicable to Surface Waters of North Carolina* (NCDENR-DWQ, August 2004). Information on this subject is also available at DWQ's website http://h2o.enr.state.nc.us/csu.

Table 18 Primary and Supplemental Surface Water Classifications

PRIMARY FRESHWATER AND SALTWATER CLASSIFICATIONS*	
Class	**Best Uses**
C and SC	Aquatic life propagation/protection and secondary recreation.
B and SB	Primary recreation and Class C uses.
SA	Waters classified for commercial shellfish harvesting.
WS	*Water Supply watershed*. There are five WS classes ranging from WS-I through WS-V. WS classifications are assigned to watersheds based on land use characteristics of the area. Each water supply classification has a set of management strategies to protect the surface water supply. WS-I provides the highest level of protection and WS-V provides the least protection. A Critical Area (CA) designation is also listed for watershed areas within a half-mile and draining to the water supply intake or reservoir where an intake is located.
SUPPLEMENTAL CLASSIFICATIONS	
Class	**Best Uses**
Sw	*Swamp Waters*: Recognizes waters that will naturally be more acidic (have lower pH values) and have lower levels of dissolved oxygen.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.
HQW	*High Quality Waters*: Waters possessing special qualities including excellent water quality, Native or Special Native Trout Waters, Critical Habitat areas, or WS-I and WS-II water supplies.
ORW	*Outstanding Resource Waters*: Unique and special surface waters which are unimpacted by pollution and have some outstanding resource values.
NSW	*Nutrient Sensitive Waters*: Areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.

* Primary classifications beginning with a "S" are assigned to saltwaters.

8.1.2 Statewide Water Quality Standards

Each primary and supplemental classification is assigned a set of water quality *standards* that establish the level of water quality that must be maintained in the waterbody to support the uses associated with each classification. Some of the standards, particularly for HQW and ORW waters, outline protective management strategies aimed at controlling point and nonpoint source pollution. These strategies are discussed briefly below. The standards for C and SC waters establish the basic protection level for all state surface waters. The other primary and supplemental classifications have more stringent standards than for C and SC, and therefore, require higher levels of protection.

Some of North Carolina's surface waters are relatively unaffected by pollution sources and have water quality higher than the standards that are applied to the majority of the waters of the state. In addition, some waters provide habitat for sensitive biota such as trout, juvenile fish, or rare and endangered aquatic species.

High Quality Waters (Class HQW)

There are 273.6 stream miles of HQW waters in the French Broad River basin (Figure 12). Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

Criteria for HQW Classification

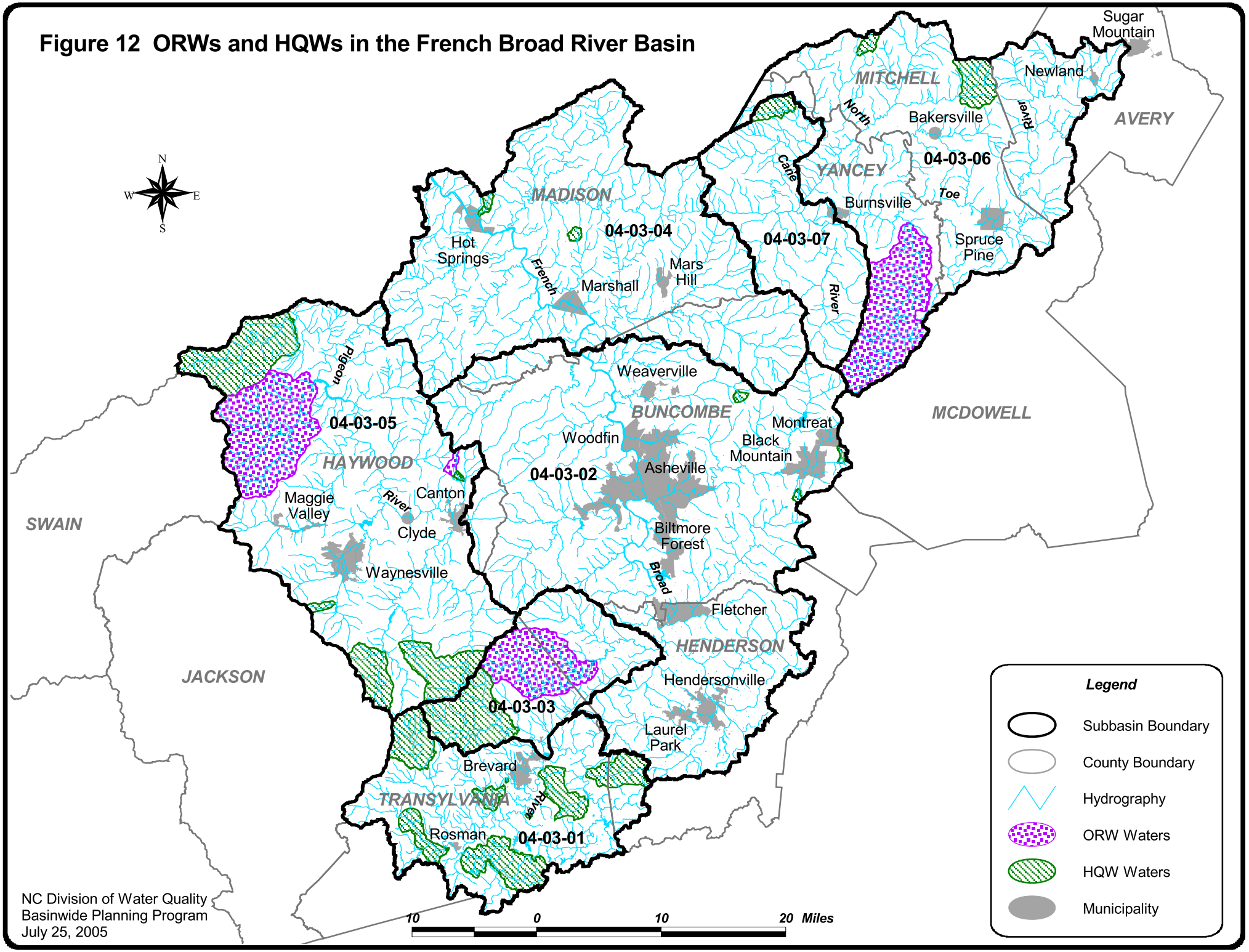
- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native or special native trout waters by the Wildlife Resources Commission.
- Waters designated as primary nursery areas or other functional nursery areas by the Division of Marine Fisheries.
- Waters classified by DWQ as WS-I, WS-II or SA.

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. The low density option requires a 30-foot setback between development activities and the stream; whereas, the high density option requires structural stormwater controls. In addition, the Division of Land Resources (DLR) requires more stringent erosion controls for land-disturbing projects within one mile of and draining to HQWs.

Outstanding Resource Waters (Class ORW)

There are 263.0 stream miles of ORW waters in the French Broad River basin (Figure 12). These waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource.

Figure 12 ORWs and HQWs in the French Broad River Basin



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The ORW rule defines outstanding resource values as including one or more of the following:

- an outstanding fisheries resource;
- a high level of water-based recreation;
- a special designation such as National Wild and Scenic River or a National Wildlife Refuge;
- within a state or national park or forest; or
- a special ecological or scientific significance.

The requirements for ORW waters are more stringent than those for HQWs. Special protection measures that apply to North Carolina ORWs are set forth in 15A NCAC 2B .0225. At a minimum, no new discharges or expansions are permitted, and a 30-foot setback or stormwater controls for new developments are required. In some circumstances, the unique characteristics of the waters and resources that are to be protected require that a specialized (or customized) ORW management strategy be developed.

Primary Recreation (Class B)

There are 294.7 freshwater acres and 185.0 stream miles classified for primary recreation in the French Broad River basin. Waters classified as Class B are protected for primary recreation, include frequent and/or organized swimming, and must meet water quality standards for fecal coliform bacteria. Sewage and all discharged wastes into Class B waters much be treated to avoid potential impacts to the existing water quality.

Trout Waters

There are 272.2 freshwater acres and 2,132.5 stream miles classified as Trout (Tr) waters in the French Broad River basin. Different water quality standards for some parameters, such as dissolved oxygen, temperature and turbidity, have been developed to protect freshwaters for natural trout propagation and survival of stocked trout. These water quality standards result in more restrictive limits for wastewater discharges to trout water streams. There are no watershed development restrictions associated with the Tr classification; however, the NC Division of Land Resources (DLR), under the NC Sedimentation and Pollution Control Act (SPCA), has requirements for protecting trout streams from land-disturbing activities. The SPCA states that "waters that have been classified as trout waters by the Environmental Management Commission (EMC) shall have an undisturbed zone either 25 feet wide or of sufficient width to confine visible siltation within the twenty-five percent (25%) of buffer zone nearest the land-disturbing activity, whichever is greater" [G.S. 113A-57(1)]. This rule applies to all named and unnamed tributaries flowing to the affected trout water stream. For more information regarding land-disturbing activities along designated trout streams, refer to the DLR website at www.dlr.enr.state.nc.us/.

The NC Wildlife Resources Commission (WRC) administers a state fishery management classification known as the Designated Public Mountain Trout Waters. It provides for public access to streams for fishing and regulates fishing activities (seasons, size limits, creel limits, and bait and lure restrictions). Although many of these waters are also classified Tr by DWQ, this is not the same classification.

Water Supply Watersheds (Class WS)

There are 710.9 freshwater stream miles and 566.4 freshwater acres currently classified for water supply in the French Broad River basin (Figure 13). The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local governments administer the program based on state minimum requirements. There are restrictions on wastewater discharges, development, landfills and

residual application sites to control the impacts of point and nonpoint sources of pollution to water supplies.

There are five water supply classifications (WS-I to WS-V) that are defined according to the land use characteristics of the watershed. The WS-I classification carries the greatest protection for water supplies. No development is allowed in these watersheds. Generally, WS-I lands are publicly owned. WS-V watersheds have the least amount of protection and do not require development restrictions. These are either former water supply sources or sources used by industry. WS-I and WS-II classifications are also HQW by definition because requirements for these levels of water supply protection are at least as stringent as those for HQWs. Those watersheds classified as WS-II through WS-IV require local governments having jurisdiction within the watersheds to adopt and implement land use ordinances for development that are at least as stringent as the state's minimum requirements. A minimum 30-foot setback is required on perennial streams in those watersheds in low density areas; a minimum 100 feet setback is required in high density areas. The French Broad River basin currently contains WS-I, WS-II, WS-III and WS-IV water supply watersheds.

8.2 Reclassification of Surface Waters

The classification of a surface water may be changed if a request is submitted by a local government, watershed group, or a local citizen. DWQ reviews each request for reclassification and conducts an assessment of the surface water to determine if the reclassification is appropriate. If it is determined that a reclassification is justified, the request must proceed through the state rule-making process. To initiate a reclassification, the "Application to Request Reclassification of NC Surface Waters" must be completed and submitted to DWQ's Classification and Standards Unit. For more information on requests for reclassification and contact information, visit http://h2o.enr.state.nc.us/csu/.

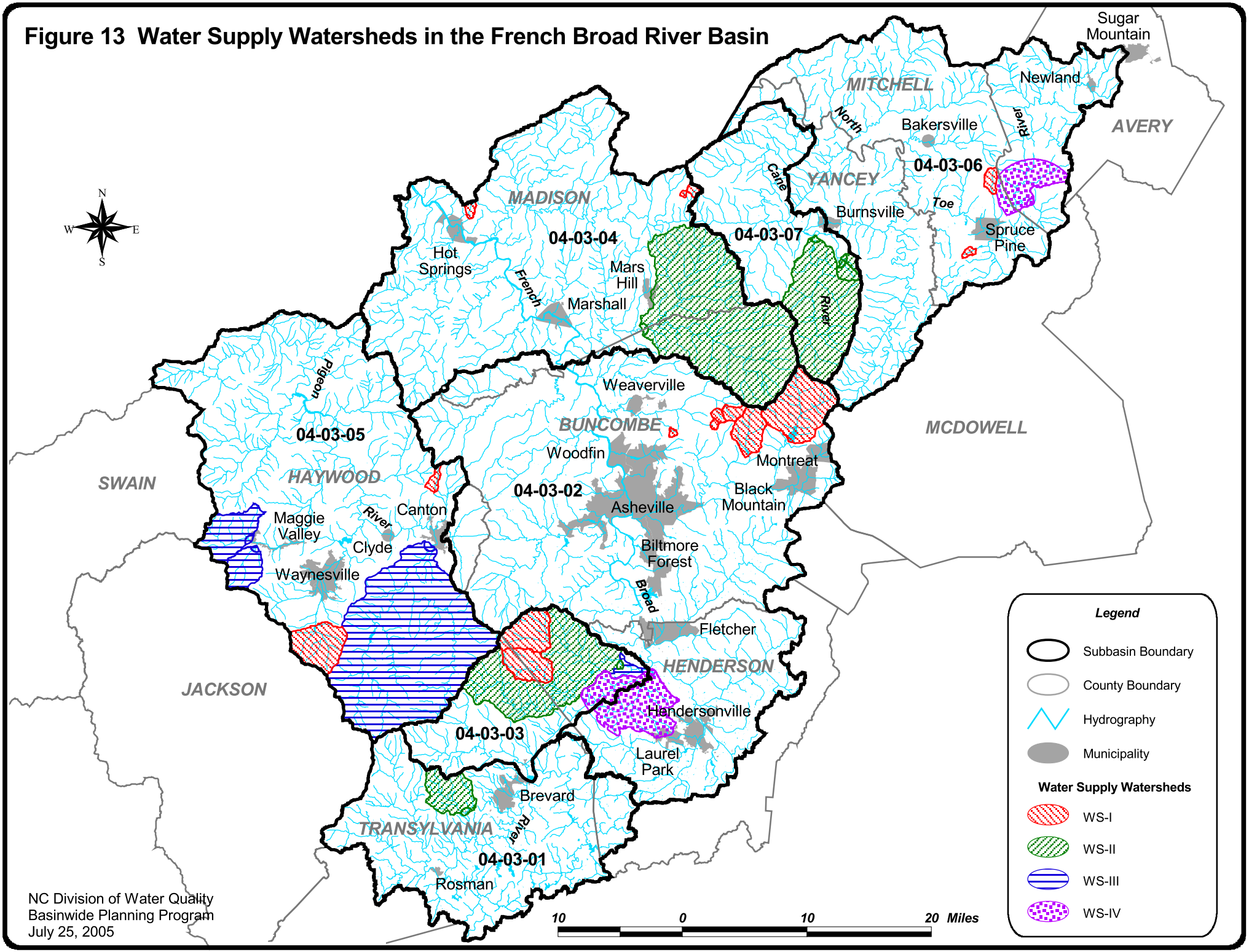
8.2.1 Pending and Recent Reclassifications in the French Broad River Basin

In Chapters 1 through 7, DWQ identified those surface waters as having Excellent bioclassification, and therefore, may be eligible for reclassification. There may also be many other surface waters eligible for reclassification that were not identified with the subbasin chapters. Both private and public stakeholders play an important role in the reclassification process and are responsible for filing formal requests with DWQ for reclass consideration. The following waters have been reclassified or have been identified by the NC Wildlife Resources Commission (WRC) as potential areas for reclassification.

Richland Creek [AU# 5-16-(1)] and several of the tributaries in the upper watershed were reclassified and given the supplemental classification of Tr. Rules associated with the Tr classification became effective September 1, 2004. Refer to Section 5.3.3 for more information related to Richland Creek in the Pigeon River watershed.

Although the biological indices may not support reclassification at this time, the WRC believes that portions of the Little River (AU# 6-38) will be eligible for reclassification to HQW in the future. Little River supports listed and otherwise rare and sensitive aquatic species.

Figure 13 Water Supply Watersheds in the French Broad River Basin



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Chapter 9
Population Growth, Land Cover Changes and Water Quality

9.1 General Sources of Pollution

Human activities can negatively impact surface water quality, even when the activity is far removed from the waterbody. With proper management of wastes and land use activities, these impacts can be minimized. Pollutants that enter waters fall into two general categories: *point sources* and *nonpoint sources*.

Point Sources

Piped discharges from:
- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state.

Nonpoint sources are from a broad range of land use activities. Nonpoint source pollutants are typically carried to waters by rainfall, runoff or snowmelt. Sediment and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Nonpoint Sources

- Construction activities
- Roads, parking lots and rooftops
- Agriculture
- Failing septic systems and straight pipes
- Timber harvesting
- Hydrologic modifications

Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given these characteristics, it is difficult and resource intensive to quantify nonpoint contributions to water quality degradation in a given watershed. While nonpoint source pollution control often relies on voluntary actions, the state has many programs designed to reduce nonpoint source pollution.

Every person living in or visiting a watershed contributes to impacts on water quality. Therefore, each individual should be aware of these contributions and take actions to reduce them.

Cumulative Effects

While any one activity may not have a dramatic effect on water quality, the cumulative effect of land use activities in a watershed can have a severe and long-lasting impact.

9.2 Managing the Impacts of Growth, Development, and Stormwater Runoff

9.2.1 Introduction

Urban growth poses one of the greatest threats to aquatic resources more than any other human activity. The impacts on rivers, lakes and streams as development surrounding metropolitan areas consumes neighboring forests and fields can be significant and permanent if stormwater runoff is not controlled. Greater numbers of homes, stores and businesses require greater quantities of water. Growing populations not only require more water, but they also lead to the discharge and runoff of greater quantities of waste and pollutants into the state's streams and groundwater. Thus, just as demand and use increase, some of the potential water supply is lost (Orr and Stuart, 2000).

In addition, as watershed vegetation is replaced with impervious surfaces in the form of paved roads, buildings, parking lots, and residential homes and driveways, the ability of the environment to absorb and diffuse the effects of natural rainfall is diminished. Urbanization results in increased surface runoff and correspondingly earlier and higher peak streamflows after rainfall. Flooding frequency is also increased. These effects are compounded when small streams are channelized (straightened) or piped and storm sewer systems are installed to increase transport of drainage waters downstream. Bank scour from these frequent high flow events tends to enlarge urban streams and increase suspended sediment. Scouring also destroys the variety of habitat in streams, leading to degradation of benthic macroinvertebrate populations and loss of fisheries (EPA, 1999).

Most of the impacts result in habitat degradation (Chapter 10), but urban runoff also carries a potentially toxic cocktail including oil and grease from roads and parking lots, street litter and pollutants from the atmosphere. Cumulative impacts from developing and urban areas can cause severe impairment to urban streams.

9.2.2 Effects of Growth and Development in the French Broad River Basin

Although the French Broad River basin is not one of the fastest developing basins in the state, the effects of development are impacting water quality. Seven of the eight counties in the basin experienced growth rates in excess of 13 percent in the last decade of the 20th century. The sparsely developed watersheds of the northern portion of the basin generally contain streams with high water quality, excellent aquatic species populations, and Supporting use support ratings. Water quality declines dramatically in streams in the central watersheds, where urbanization is focused around urban centers and interstate corridors. It is no surprise that the greatest concentration of Impaired streams lies in the areas of Asheville and Hendersonville, including the urbanizing corridors along interstate highways.

Populations of counties that are wholly or partly contained within the basin increased by over 70,000 people between 1990 and 2000. Appendix I presents projected population growth by county for the French Broad River basin from 2000 to 2020. Buncombe, Haywood and Henderson counties are growing the fastest in the basin. The county populations are expected to grow by more than 122,000 to almost 575,000 people by 2020. Flat Rock, Fletcher and

Hendersonville had very high growth rates. Black Mountain also increased population substantially in the last ten years. Although the French Broad River basin population is growing slower than some other river basins, there will be increased drinking water demands and wastewater discharges. There will also be loss of natural areas and increases in impervious surfaces associated with construction of new homes and businesses.

The overall population of the basin based on 2000 Census data is 393,795, with approximately 139 persons/square mile. Population density estimated by subbasin is presented in Appendix I.

Refer to Appendix II for local governments' listing and Appendix III for land cover changes related to urbanization.

In the past, the French Broad River basin was blessed with an abundance of surface water that supported the industrial expansion of the mid-20th century and the current domestic expansion. Even today, there is sufficient water to serve its diverse domestic, agricultural, industrial, energy production and recreational needs except in periods of severe drought. But, it is those periods of drought that point to the impending threats to the availability of good quality water. Clean water can likely be provided in sufficient quantity to supply the future needs of the basin, but only with inspired foresight, planning and management.

9.2.3 The Role of Local Governments

A summary of necessary management actions needed by local authorities is provided here, followed by discussions on large, watershed management issues. These actions are necessary to address current sources of impairment and to prevent future degradation in all streams. The intent of these recommendations is to describe the types of actions necessary to improve stream conditions, not to specify particular administrative or institutional mechanisms for implementing remedial practices. Those types of decisions must be made at the local level.

Because of uncertainties regarding how individual remedial actions cumulatively impact stream conditions and how aquatic organisms will respond to improvements, the intensity of management efforts necessary to bring about a particular degree of biological improvement cannot be established in advance. The types of actions needed to improve biological conditions can be identified, but the mix of activities that will be necessary – and the extent of improvement that will be attainable – will only become apparent over time as an adaptive management approach is implemented. Management actions are suggested below to address individual problems, but many of these actions are interrelated (NCDENR-DWQ, June 2003a).

Actions one through five are important to restoring and sustaining aquatic communities in the watershed, with the first three recommendations being the most important.

(1) **Feasible and cost-effective stormwater retrofit projects should be implemented throughout the watershed to mitigate the hydrologic effects of development** (increased stormwater volumes and increased frequency and duration of erosive and scouring flows). This should be viewed as a long-term process. Although there are many uncertainties, costs in the range of $1 million per square mile can probably be anticipated.
   - Over the short-term, currently feasible retrofit projects should be identified and implemented.

- In the longer term, additional retrofit opportunities should be implemented in conjunction with infrastructure improvements and redevelopment of existing developed areas.
- Grant funds for these retrofit projects may be available from EPA initiatives, such as Section 319 funds, or the North Carolina Clean Water Management Trust Fund.

(2) **A watershed scale strategy to address toxic inputs should be developed and implemented, including a variety of source reduction and stormwater treatment methods.** As an initial framework for planning toxicity reduction efforts, the following general approach is proposed:
- Implementation of available BMP opportunities for control of stormwater volume and velocities. As recommended above to improve aquatic habitat potential, these BMPs will also remove toxics from stormwater.
- Development of a stormwater and dry weather sampling strategy in order to facilitate the targeting of pollutant removal and source reduction practices.
- Implementation of stormwater treatment BMPs, aimed primarily at pollutant removal, at appropriate locations.
- Development and implementation of a broad set of source reduction activities focused on: reducing non-storm inputs of toxics; reducing pollutants available for runoff during storms; and managing water to reduce storm runoff.

(3) **Stream channel restoration activities should be implemented in target areas, in conjunction with stormwater retrofit BMPs, in order to improve aquatic habitat.** Before beginning stream channel restoration, a geomorphologic survey should be conducted to determine the best areas for stream channel restoration. Additionally, it would probably be advantageous to implement retrofit BMPs before embarking on stream channel restoration, as restoration is probably best designed for flows driven by reduced stormwater runoff. Costs of approximately $200 per foot of channel should be anticipated (Haupt et *al*., 2002 and Weinkam et *al*., October 2001). Grant funds for these retrofit projects may be available from federal sources, such as EPA's Section 319 funds, or state sources including North Carolina Clean Water Management Trust Fund (CWMTF).

(4) Actions recommended above (e.g., stormwater quantity and quality retrofit BMPs) are likely to reduce nutrient/organic loading and associated impacts to some extent. Activities recommended to address this loading include the identification and elimination of illicit discharges; education of homeowners, commercial applicators, and others regarding proper fertilizer use; street sweeping; catch basin clean-out practices; and the installation of additional BMPs targeting BOD and nutrient removal at appropriate sites.

(5) Prevention of further channel erosion and habitat degradation will require effective post-construction stormwater management for all new development in the study area.

(6) Effective enforcement of sediment and erosion control regulations will be essential to the prevention of additional sediment inputs from construction activities. Development of improved erosion and sediment control practices may be beneficial.

(7) Watershed education programs should be implemented and continued by local governments with the goal of reducing current stream damage and preventing future degradation. At a minimum, the program should include elements to address the following issues:
    - Redirecting downspouts to pervious areas rather than routing these flows to driveways or gutters;
    - Protecting existing woody riparian areas on all streams;
    - Replanting native riparian vegetation on stream channels where such vegetation is absent; and
    - Reducing and properly managing pesticide and fertilizer use.

9.2.4 Maintain and Develop Riparian Buffers

The presence of intact riparian buffers and/or wetlands in urban areas can reduce the impacts of urban development. Establishment and protection of buffers should be considered where feasible, and the amount of impervious cover should be limited as much as possible. Wide streets, large cul-de-sacs, and long driveways and sidewalks lining both sides of the street are all features of urban development that create excess impervious cover and consume natural areas.

Preserving the natural streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. Forested buffers in particular provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife (NCDENR-DWQ, February 2004). To obtain a free copy of DWQ's *Buffers for Clean Water* brochure, call (919) 733-5083, ext. 558.

9.2.5 Protecting Headwaters

Many streams in a given river basin are only small trickles of water that emerge from the ground. A larger stream is formed at the confluence of these trickles. This constant merging eventually forms a large stream or river. Most monitoring of fresh surface waters evaluates these larger streams. The many miles of small trickles, collectively known as headwaters, are not directly monitored and in many instances are not even indicated on maps. These streams account for approximately 80 percent of the stream network and provide many valuable services for quality and quantity of water delivered downstream (Meyer et *al*., September 2003). However, degradation of headwater streams can (and does) impact the larger stream or river.

There are three types of headwater streams: perennial (flow year-round), intermittent (flow during wet seasons), and ephemeral (flow only after precipitation events). All types of headwater streams provide benefits to larger streams and rivers. Headwater streams control flooding, recharge groundwater, maintain water quality, reduce downstream sedimentation, recycle nutrients, and create habitat for plants and animals (Meyer et *al*., September 2003).

In smaller headwater streams, fish communities are not well developed and benthic macroinvertebrates dominate aquatic life. Benthic macroinvertebrates are often thought of as "fish food" and, in mid-sized streams and rivers, they are critical to a healthy fish community. However, these insects, both in larval and adult stages, are also food for small mammals, such as river otter and raccoons, birds and amphibians (Erman, 1996). Benthic macroinvertebrates in

Figure 14 Diagram of Headwater Streams within a Watershed Boundary

headwater streams also perform the important function of breaking down coarse organic matter, such as leaves and twigs, and releasing fine organic matter. In larger rivers, where coarse organic matter is not as abundant, this fine organic matter is a primary food source for benthic macroinvertebrates and other organisms in the system (CALFED, 1999). When the benthic macroinvertebrate community is changed or extinguished in an area, even temporarily, as occurs during land use changes, it can have repercussions in many parts of both the terrestrial and aquatic food web.

Headwater streams also provide a source of insects for repopulating downstream waters where benthic macroinvertebrate communities have been eliminated due to human alterations and pollution. Adult insects have short life spans and generally live in the riparian areas surrounding the streams from which they emerge (Erman, 1996). Because there is little upstream or stream-to-stream migration of benthic macroinvertebrates, once headwater populations are eliminated, there is little hope for restoring a functioning aquatic community. In addition to macroinvertebrates, these streams support diverse populations of plants and animals that face similar problems if streams are disturbed. Headwater streams are able to provide these important ecosystem services due to their unique locations, distinctive flow patterns, and small drainage areas.

Because of the small size of headwater streams, they are often overlooked during land use activities that impact water quality. All landowners can participate in the protection of headwaters by keeping small tributaries in mind when making land use management decisions on the areas they control. This includes activities such as retaining vegetated stream buffers, minimizing stream channel alterations, and excluding cattle from streams. Local rural and urban planning initiatives should also consider impacts to headwater streams when land is being developed. For a more detailed description of watershed hydrology and watershed management, refer to EPA's Watershed Academy website at http://www.epa.gov/OWOW/watershed/wacademy/acad2000/watershedmgt/principle1.html.

9.2.6 Reduce Impacts of Future Development

Proactive planning efforts at the local level are needed to assure that development is done in a manner that maintains water quality. These planning efforts will need to find a balance between water quality protection, natural resource management and economic growth. Growth management requires planning for the needs of future population increases, as well as developing and enforcing environmental protection measures. These actions are critical to water quality management and the quality of life for the residents of the basin.

Areas adjacent to the high growth areas of the basin are at risk of having Impaired biological communities. These biological communities are important to maintaining the ecological integrity in the French Broad River basin. These streams will be important as sources of benthic macroinvertebrates and fishes for reestablishment of biological communities in nearby streams that are recovering from past impacts or are being restored.

To prevent further impairment to aquatic life in streams in urbanizing watersheds local governments should:

(1) Identify waters that are threatened by development.
(2) Protect existing riparian habitat along streams.
(3) Implement stormwater BMPs during and after development.
(4) Develop land use plans that minimize disturbance in sensitive areas of watersheds.
(5) Minimize impervious surfaces including roads and parking lots.
(6) Develop public outreach programs to educate citizens about stormwater runoff.

Action should be taken at the local level to plan for new development in urban and rural areas.

For more detailed information regarding recommendations for new development found in the text box (right), refer to EPA's website at www.epa.gov/owow/watershed/wacademy/acad2000/protection, the Center for Watershed Protection website at www.cwp.org, and the Low Impact Development Center website at www.lowimpactdevelopment.org. Additional public education is also needed in the French Broad River basin in order for citizens to understand the value of urban planning and stormwater management. DWQ recently developed a booklet that discusses actions individuals can take to reduce stormwater runoff and improve stormwater quality entitled *Improving Water Quality In Your Own Backyard*. To obtain a free copy, call (919) 733-5083, ext. 558. For an example of local community planning, visit the website at http://www.charmeck.org/Home.htm.

Planning Recommendations for New Development

- Minimize number and width of residential streets.
- Minimize size of parking areas (angled parking & narrower slots).
- Place sidewalks on only one side of residential streets.
- Minimize culvert pipe and hardened stormwater conveyances.
- Vegetate road right-of-ways, parking lot islands and highway dividers to increase infiltration.
- Plant and protect natural buffer zones along streams and tributaries.

Chapter 10
Water Quality Stressors

10.1 Stressor Identification

10.1.1 Introduction and Overview

Water quality stressors are identified when impacts have been noted to biological (fish and benthic) communities or water quality standards have been violated. Stressors apply to one or more use support category and may be identified for Impaired, as well as Supporting but impacted/noted waters. In many cases, identifying stressors is challenging because direct measurements of the stressor may be difficult or prohibitively expensive. DWQ staff use field observations from sample sites, special studies, and data from ambient monitoring stations to identify stressors. It is important to identify stressors and potential sources of stressors so that water quality programs can target limited resources to address these issues.

Most stressors to the biological community are a complex grouping of many different stressors. Individually, they may not degrade water quality or aquatic habitat, but together they can severely degrade both water quality and aquatic habitat. During naturally severe conditions, such as droughts or floods, any individual stressor or group of stressors may have more severe impacts to aquatic life than during normal climatic conditions. The most common source of stressors is from altered watershed hydrology.

10.1.2 Stressor Sources

Sources of stressors are most often associated with land use in a watershed, as well as the quality and quantity of any treated wastewater that may be entering a stream. Sources of stressors most often come from a watershed where the hydrology is altered enough to allow the stressor to be easily delivered to a stream during a rain event along with unnaturally large amounts of water. DWQ identifies the source of a stressor as specifically as possible depending on the amount of information available in a watershed. Most often, the source is based on the predominant land use in a watershed.

Stressors sources identified in the French Broad River basin during this assessment period include urban or impervious surface areas, construction sites, road building, agriculture, and forestry. Point source discharges are also considered a water quality stressor source.

10.2 Habitat Degradation

Instream habitat degradation is identified in the use support summary (Appendix X) where there is a notable reduction in habitat diversity or a negative change in habitat. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour. Good instream habitat is necessary for aquatic life to survive and reproduce. Streams that typically show signs of habitat degradation are in watersheds that have a large amount of land-disturbing activities (construction, mining, timber

harvest and agricultural activities) or a large percentage of impervious surfaces. A watershed in which most of the riparian vegetation has been removed from streams or channelization has occurred also exhibits instream habitat degradation. Streams that receive a discharge quantity that is much greater than the natural flow in the stream often have degraded habitat as well.

Determining the cause and quantifying amounts of habitat degradation is very difficult in most cases. To assess instream habitat degradation in most streams would require extensive technical and monetary resources and perhaps even more resources to restore the stream. Although DWQ and other agencies are starting to address this issue, local efforts are needed to prevent further instream habitat degradation and to restore streams that have been Impaired by activities that cause habitat degradation. As point sources become less of a source of water quality impairment, nonpoint sources that pollute water and cause habitat degradation need to be addressed to further improve water quality in North Carolina's streams and rivers.

Some Best Management Practices

Agriculture

- No till or conservation tillage practices
- Strip cropping and contour farming
- Leaving natural buffer areas around small streams and rivers

Construction

- Using phased grading/seeding plans
- Limiting time of exposure
- Planting temporary ground cover
- Using sediment basins and traps

Forestry

- Controlling runoff from logging roads
- Replanting vegetation on disturbed areas
- Leaving natural buffer areas around small streams and rivers

10.2.1 Sedimentation

Introduction

Soil erosion, transport and redeposition are among the most essential natural processes occurring in watersheds. However, land-disturbing activities such as the construction of roads and buildings, crop production, livestock grazing and timber harvesting can accelerate erosion rates by causing more soil than usual to be detached and moved by water. If best management practices (BMPs) are not used effectively, accelerated erosion can strip the land of its topsoil, decreasing soil productivity and causing sedimentation in streams and rivers (NCDEHNR-DLR, 1998). Sedimentation is the process by which eroded soil is deposited into waters. Sediment that accumulates on the bottom of streams and rivers smothers aquatic insects that fish feed upon and buries fish habitat that is vital to reproduction. Sediment filling rivers and streams decreases their storage volume and increases the frequency of floods (NCDEHNR-DLR, 1998).

Suspended sediment can decrease primary productivity (photosynthesis) by shading sunlight from aquatic plants, affecting the overall productivity of a stream system. Suspended sediment also has several effects on various fish species including avoidance and redistribution, reduced feeding efficiency, and therefore, reduced growth by some species, respiratory impairment, reduced tolerance to diseases and toxicants, and increased physiological stress (Roell, June 1999). Suspended sediment also increases the cost of treating municipal drinking water.

One of the most commonly noted types of habitat degradation in the French Broad River basin was a result of sediment entering streams from adjacent land uses. During 2002 basinwide monitoring, DWQ aquatic biologists reported streambank erosion and sedimentation throughout the French Broad River basin. Lower bioclassification ratings were assigned because of sedimentation; bottom substrate was embedded by silt and/or pools were partially filled with

sediment. Unstable and/or undercut (eroding) streambanks were also noted in explanation of lower ratings (NCDENR-DWQ, June 2003b).

Land Clearing Activities

Erosion and sedimentation can be controlled during most land-disturbing activities by using appropriate BMPs. In fact, substantial amounts of erosion can be prevented by planning to minimize the (1) amount and (2) time the land is exposed. DWQ's role in sediment control is to work cooperatively with those agencies that administer sediment control programs in order to maximize the effectiveness of the programs and to protect water quality. Where programs are not effective, as evidenced by a violation of instream water quality standards, and where DWQ can identify a source, then appropriate enforcement action can be taken. Generally, this entails requiring the landowner or responsible party to install acceptable BMPs.

As a result of new stormwater rules enacted by EPA in 1999, construction or land development activities that disturb one acre or more are required to obtain a NPDES stormwater permit. An erosion and sediment control plan must also be developed and approved for these sites under the state's Sedimentation Pollution Control Act (SPCA) administered by the NC Division of Land Resources. Site disturbances of less than one acre are required to use BMPs, but an approved plan is not required.

Forestry operations in North Carolina are subject to regulation under the Sedimentation Pollution Control Act of 1973 (G.S. Chapter 113A, Article 4 referred to as "SPCA"). However, forestry operations may be exempted from the permit requirements in the SPCA, if the operations meet compliance standards outlined in the *Forest Practices Guidelines Related to Water Quality* (15A NCAC 1I .0101-.0209, referred to as "FPGs") and General Statutes regarding stream obstruction (G.S. 77-13 and G.S. 77-14). More information on forestry in the French Broad River basin is available in Chapter 12 and on the Water Quality Section of the Division of Forest Resources (DFR) website at http://www.dfr.state.nc.us.

For agricultural activities that are not subject to the SPCA, sediment controls are carried out on a voluntary basis through programs administered by several different agencies (see Appendix VIII for further information).

Stronger Rules for Sediment Control

The Division of Land Resources (DLR) has the primary responsibility for assuring that erosion is minimized and sedimentation is reduced during construction activities. In February 1999, the NC Sedimentation Control Commission adopted significant changes for strengthening the Erosion and Sedimentation Control Program (NCDEHNR-DLR, July-September 1999) as follows:

- Allows state and local erosion and sediment control programs to require a pre-construction conference when one is deemed necessary.
- Reduces the number of days allowed for establishment of ground cover from 30 working days to 15 working days and from 120 calendar days to 90 calendar days. (Stabilization must now be complete in 15 working days or 90 calendar days, whichever period is shorter.)
- Provides that no person may initiate a land-disturbing activity until notifying the agency that issued the plan approval of the date the activity will begin.

- Allows assessment penalties for significant violations upon initial issuance of a Notice of Violation (NOV).

Additionally, during its 1999 session, the NC General Assembly passed House Bill 1098 to strengthen the Sediment Pollution Control Act of 1973 (SPCA). The bill made the following changes to the Act (NCDEHNR-DLR, July-September 1999):

- Increases the maximum civil penalty for violating the SPCA from $500 to $5000 per day.
- Provides that a person may be assessed a civil penalty from the date a violation is detected if the deadline stated in the Notice of Violation is not met.
- Provides that approval of an erosion control plan is conditioned on compliance with federal and state water quality laws, regulations and rules.
- Provides that any erosion control plan that involves using ditches for the purpose of dewatering or lowering the water table must be forwarded to the Director of DWQ.
- Amends the General Statutes governing licensing of general contractors to provide that the State Licensing Board for General Contractors shall test applicants' knowledge of requirements of the SPCA and rules adopted pursuant to the Act.
- Removes a cap on the percentage of administrative costs that may be recovered through plan review fees.

For information on North Carolina's Erosion and Sedimentation Control Program or to report erosion and sedimentation problems, visit the new website at http://www.dlr.enr.state.nc.us/ or you may call the NC Division of Land Resources, Land Quality Section at (919) 733-4574.

Recent Review of Sediment Control Research

The two most popular sediment control devices are silt fences and sediment basins. In 2001, DWQ staff conducted a review of peer-reviewed research publications and consulted with experts at NC State University (NCSU) to investigate the effectiveness of current sediment and erosion control practices. In addition, engineering calculations have been conducted to obtain theoretical effectiveness of sediment basins and silt fences. Research conducted in North Carolina showed that construction sites in North Carolina produce 10 to 188 tons per acre per year of sediment. Such wide variation might be attributed to the significant spatial and temporal differences in rainfall intensity and duration, soil characteristics, slope, and the type of soil cover. DLR currently uses the assumption that (on average) construction sites produce 84 tons/acre-year. For comparison, erosion in undisturbed natural systems is only 0.1-0.2 tons/acre-year.

Currently, sediment basins are designed to have 1,800 cubic feet of storage space for each acre of disturbed land and a surface area based on the flow from all areas draining to the sediment basin. Based on the reference review and consultation, DWQ has concluded that these basins have numerous deficiencies, including:

- Insufficient volume.
- Inadequate cleaning frequency. (In many cases, effectiveness of the basins is significantly reduced because they are not maintained.)
- Short-circuiting. (In many cases, inlet and outlet in basins are constructed in very close proximity, which results in a shorter than predicted retention time.)

- Water to be drained from the surface where concentration of the sediment is the lowest.
- Basins need to be designed with consideration of total drainage area. Water from undisturbed areas should be diverted around the basins. (In many cases, basins are treating runoff from the entire drainage area, which is significantly larger than that of cleared land.)

New research indicates that use of new technologies such as installation of baffles in the sediment basins, application of flocculents, and use of skimmers can significantly increase efficiency of sedimentation basins. Research funded by the Sedimentation Control Commission (SCC) and the NC Department of Transportation (NCDOT) at NCSU demonstrated that turbidity levels can approach the current turbidity standard of 50 NTU (for waters not classified Tr) in runoff if these devices are used. However, the most important factor in reducing sedimentation is timely cover of cleared land with mulches that are adequately tacked. It has been conclusively proven that use of ground cover (temporary or permanent) dramatically reduces erosion rates.

10.2.2 Loss of Riparian Vegetation

During 2002 basinwide sampling, DWQ biologists reported degradation of aquatic communities at numerous sites throughout the French Broad River basin in association with narrow or nonexistent zones of native riparian vegetation. Riparian vegetation loss was common in rural and residential areas as well as in urban areas (NCDENR-DWQ, June 2003b).

Removing trees, shrubs and other vegetation to plant grass or place rock (also known as riprap) along the bank of a river or stream degrades water quality. Removing riparian vegetation eliminates habitat for aquatic macroinvertebrates that are food for trout and other fish. Rocks lining a bank absorb the sun's heat and warm the water. Some fish require cooler water temperatures as well as the higher levels of dissolved oxygen cooler water provides. Trees, shrubs and other native vegetation cool the water by shading it. Straightening a stream, clearing streambank vegetation, and lining the banks with grass or rock severely impact the habitat that aquatic insects and fish need to survive.

Livestock grazing with unlimited access to the stream channel and banks can cause severe streambank erosion resulting in degraded water quality. Although they often make up a small percentage of grazing areas by surface area, riparian zones (vegetated stream corridors) are particularly attractive to cattle that prefer the cooler environment and lush vegetation found beside rivers and streams. This concentration of livestock can result in increased sedimentation of streams due to "hoof shear", trampling of bank vegetation, and entrenchment by the destabilized stream. Despite livestock's preference for frequent water access, farm veterinarians have reported that cows are healthier when stream access is limited (EPA, 1999).

Establishing, conserving and managing streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. Forested buffers in particular provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife (NCDENR-DWQ, February 2004). To obtain a free copy of DWQ's *Buffers for Clean Water* brochure, call (919) 733-5083, ext. 558.

10.2.3 Loss of Instream Organic Microhabitats

> ***Typical Channel Modifications***
>
> - Removal of any obstructions, natural or artificial, that inhibit a stream's capacity to convey water (clearing and snagging).
> - Widening, deepening or straightening of the channel to maximize conveyance of water.
> - Lining the bed or banks with rock or other resistant materials.

Organic microhabitat (leafpacks, sticks and large wood) and edge habitat (root banks and undercut banks) play very important roles in a stream ecosystem. Organic matter in the form of leaves, sticks and other materials serve as the base of the food web for small streams. Additionally, these microhabitats serve as special niches for different species of benthic macroinvertebrates, providing food and/or habitat. For example, many stoneflies are found almost exclusively in leafpacks and on small sticks. Some beetle species prefer edge habitat, such as undercut banks. If these microhabitat types are not present, there is no place for these specialized macroinvertebrates to live and feed. The absence of these microhabitats in some streams in the French Broad River basin is directly related to the absence of riparian vegetation. Organic microhabitats are critical to headwater streams, the health of which is linked to the health of the entire downstream watershed.

10.2.4 Channelization

Channelization refers to the physical alteration of naturally occurring streams and riverbeds. Typical modifications are described in the text box. Although increased flooding, bank erosion and channel instability often occur in downstream areas after channelization has occurred, flood control, reduced erosion, increased usable land area, greater navigability and more efficient drainage are frequently cited as the objectives of channelization projects (McGarvey, 1996).

Direct or immediate biological effects of channelization include injury and mortality of benthic macroinvertebrates, fish, shellfish/mussels and other wildlife populations, as well as habitat loss. Indirect biological effects include changes in benthic macroinvertebrate, fish and wildlife community structures, favoring species that are more tolerant of or better adapted to the altered habitat (McGarvey, 1996).

Restoration or recovery of channelized streams may occur through processes, both naturally and artificially induced. In general, streams that have not been excessively stressed by the channelization process can be expected to return to their original forms. However, streams that have been extensively altered may establish a new, artificial equilibrium (especially when the channelized streambed has been hardened). In such cases, the stream may become locked in an endless cycle of erosion and entrenchment. Once the benefits of channelization are outweighed by the costs, both in money and environmental integrity, channel restoration efforts are likely to be taken (McGarvey, 1996).

Channelization of streams within the continental United States is extensive and promises to become even more so as urban development continues. Overall estimates of lost or altered riparian habitats within US streams are as high as 70 percent. Unfortunately, the dynamic nature of stream ecosystems makes it difficult (if not impossible) to quantitatively predict the effects of channelization (McGarvey, 1996). Channelization has occurred historically in parts of the

French Broad River basin and continues to occur in some watersheds, especially in small headwater streams.

10.2.5 Recommendations for Reducing Habitat Degradation

In March 2002, the Environmental Management Commission (EMC) sent a letter to the Sedimentation Control Commission (SCC) outlining seven recommendations for improving erosion and sedimentation control, based on a comprehensive performance review of the turbidity standard conducted in 2001 by DWQ staff. Specifically, the recommendations are that the EMC and SCC:

(1) Evaluate, in consultation with the Attorney General's Office, whether statutory authority is adequate to mandate temporary ground cover over a percentage of the uncovered area at a construction site within a specific time after the initial disturbance of the area. If it is found that statutory authority does not exist, then the EMC and SCC should prepare resolutions for the General Assembly supporting new legislation to this effect.

(2) Prepare resolutions supporting new legislation to increase the maximum penalty allowed in the Sedimentation Pollution Control Act from $5,000 to $25,000 for the initial response to a noncompliant site.

(3) Jointly support a review of the existing Erosion and Sediment Control Planning and Design Manual by DLR. This review should include, but not be limited to, a redesign of the minimum specifications for sedimentation basins.

(4) Evaluate, in consultation with the Attorney General's Office, whether the statutory authority is adequate for effective use of the "Stop Work Order" tool and, if found not to be adequate, to prepare resolutions for the General Assembly supporting new legislation that will enable staff to more effectively use the "Stop Work Order" tool.

(5) Support increased research into and experimentation with the use of polyacrylamides (PAMs) and other innovative soil stabilization and turbidity reduction techniques.

(6) Jointly support and encourage the awarding of significant monetary penalties for all activities found to be in violation of their Stormwater Construction General Permit, their Erosion and Sediment Control Plan, or the turbidity standard.

(7) Hold those individuals who cause serious degradation of the environment through excessive turbidity and sedimentation ultimately responsible for restoration of the area.

DWQ will continue to work cooperatively with DLR and local programs that administer sediment control in order to maximize the effectiveness of the programs and to take appropriate enforcement action when necessary to protect or restore water quality. However, more voluntary implementation of BMPs is needed for activities that are not subject to these rules in order to substantially reduce the amount of widespread sedimentation present in the French Broad River basin. Additionally, more public education is needed basinwide to educate landowners about the value of riparian vegetation along small tributaries and the impacts of sedimentation to aquatic life.

Funding is available through numerous federal and state programs for landowners to restore and/or protect riparian buffer zones along fields or pastures, develop alternative watering sources for livestock, and fence animals out of streams (refer to Chapters 11 and 16). EPA's *Catalog of Federal Funding Sources for Watershed Protection* (Document 841-B-99-003) outlines some of these and other programs aimed at protecting water quality. A copy may be obtained by calling the National Center for Environmental Publications and Information at (800) 490-9198 or by visiting the website at http://www.epa.gov/OWOW/watershed/wacademy/fund.html. Local contacts for various state and local agencies are listed in Appendix VIII.

10.3 Fecal Coliform Bacteria

Fecal coliform bacteria live in the digestive tract of warm-blooded animals (humans, as well as other mammals) and are excreted in their waste. Fecal coliform bacteria do not actually pose a danger to people or animals; however, where fecal coliform are present, other disease-causing bacteria may also be present. Water that is polluted by human or animal waste can harbor other pathogens that may threaten human health.

Fecal coliform bacteria, and other potential pathogens associated with waste from warm-blooded animals, are not necessarily harmful to fish and aquatic insects; however, they can potentially impact human health. High levels of fecal coliform bacteria can indicate high levels of sewage or animal wastes that could make water unsafe for human contact (e.g., swimming). Pathogens associated with fecal coliform bacteria can cause diarrhea, dysentery, cholera and typhoid fever in humans. Some pathogens can also cause infection in open wounds. High levels of fecal coliform bacteria may indicate contamination that increases the risk of contact with other harmful pathogens in surface waters. In the French Broad River basin, data from DWQ's ambient monitoring stations in subbasins 04-03-02 and 04-03-05 (Chapters 1 and 5) show high levels of fecal coliform bacteria in portions of the French Broad River mainstem and Richland Creek. Both are Impaired in the recreation use support category.

Throughout the state, there are many waters that have high levels of fecal coliform bacteria associated mostly with stormwater runoff in urban areas. Under favorable conditions, fecal coliform bacteria can survive in bottom sediments for an extended period of time (Howell et *al*., 1996; Sherer et *al*., 1992; Schillinger and Gannon, 1985). Therefore, concentrations of bacteria measured in the water column can reflect both recent inputs, as well as the resuspension of older inputs.

Reducing fecal coliform bacteria in wastewater requires a disinfection process, which typically involves the use of chlorine and other disinfectants. Although these materials may kill the fecal coliform bacteria and other pathogenic disease-causing bacteria, they also kill bacteria essential to the proper balance of the aquatic environment, and thereby, endanger the survival of species dependent on those bacteria.

Water quality standards for fecal coliform bacteria are intended to ensure safe use of waters for recreation and shellfish harvesting (refer to Administrative Code Section 15A NCAC 2B .0200). The North Carolina fecal coliform standard for freshwater is 200 colonies/100ml based on the

geometric mean of at least five consecutive samples taken during a 30-day period and not to exceed 400 colonies/100ml in more than 20 percent of the samples during the same period.

Sources of Fecal Coliform in Surface Waters

- Urban stormwater
- Wild animals and domestic pets
- Improperly designed or managed animal waste facilities
- Livestock with direct access to streams
- Improperly treated discharges of domestic wastewater, including leaking or failing septic systems and straight pipes

A number of factors beyond the control of any state regulatory agency contribute to elevated levels of disease-causing bacteria. Therefore, the state does not encourage swimming in surface waters. To assure that waters are safe for swimming indicates a need to test waters for pathogenic bacteria. Although fecal coliform standards have been used to indicate the microbiological quality of surface waters for swimming and shellfish harvesting for more than 50 years, the value of this indicator is often questioned. Evidence collected during the past several decades suggests that the coliform group may not adequately indicate the presence of pathogenic viruses or parasites in water.

The detection and identification of specific pathogenic bacteria, viruses and parasites such as *Giardia*, *Cryptosporidium* and *Shigella* are expensive, and results are generally difficult to reproduce quantitatively. Also, to ensure the water is safe for swimming would require a whole suite of tests for many organisms, as the presence/absence of one organism would not document the presence/absence of another. This type of testing program is not possible due to resource constraints.

Chapter 11
Agriculture and Water Quality

11.1 Animal Operations

In 1992, the Environmental Management Commission (EMC) adopted a rule modification (15A NCAC 2H.0217) establishing procedures for managing and reusing animal wastes from intensive livestock operations. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following size: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system.

Key Animal Operation Legislation (1995-2003)

1995 Senate Bill 974 requires owners of swine facilities with 250 or more animals to hire a certified operator. Operators are required to attend a six-hour training course and pass an examination for certification. Senate Bill 1080 established buffer requirements for swine houses, lagoons and land application areas for farms sited after October 1, 1995.

1996 Senate Bill 1217 required all facilities (above threshold populations) to obtain coverage under a general permit, beginning in January 1997, for all new and expanding facilities. DWQ was directed to conduct annual inspections of all animal waste management facilities. Poultry facilities with 30,000+ birds and a liquid waste management system were required to hire a certified operator by January 1997 and facilities with dry litter animal waste management systems were required to develop an animal waste management plan by January 1998. The plan must address three specific items: 1) periodic testing of soils where waste is applied; 2) development of waste utilization plans; and 3) completion and maintenance of records on-site for three years. Additionally, anyone wishing to construct a new or expand an existing swine farm must notify all adjoining property owners.

1997 House Bill 515 placed a moratorium on new or existing swine farm operations and allows counties to adopt zoning ordinances for swine farms with a design capacity of 600,000 pounds (SSLW) or more. In addition, owners of potential new and expanding operations are required to notify the county (manager or chair of commission) and local health department, as well as adjoining landowners. NCDENR was required to develop and adopt economically feasible odor control standards by March 1, 1999.

1998 House Bill 1480 extended the moratorium on construction or expansion of swine farms. The bill also requires owners of swine operations to register with DWQ any contractual relationship with an integrator.

1999 House Bill 1160 extended (again) the moratorium on new construction or expansion of swine farms, required NCDENR to develop an inventory of inactive lagoons. The Bill requires owners/operators of an animal waste treatment system to notify the public in the event of a discharge to surface waters of the state of 1,000 gallons or more of untreated wastewater.

2000 Attorney General Easley reached a landmark agreement with Smithfield Foods, Inc. to phase out hog lagoons and implement new technologies that will substantially reduce pollutants from hog farms. The agreement commits Smith field to phase out all anaerobic lagoon systems on 276 company-owned farms. Legislation will be required to phase out the remaining systems statewide within a 5-year period (State of Environment Report 2000).

2001 House Bill 1216 extended (again) the moratorium on new construction or expansion of swine farms.

Table 19 summarizes, by subbasin, the number of registered livestock operations, total number of animals, number of facilities, and total steady state live weight (SSLW) as of September 2003. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in each subbasin.

Overall the majority of registered animal operations are found in the upper portion of the basin. Registered animal operations where recent data show problems are discussed in the appropriate subbasin chapter.

Table 19 Registered Animal Operations in the French Broad River Basin (September 2003)

Subbasin	Cattle			Poultry			Swine		
	No. of Facilities	No. of Animals	Total Steady State Live Weight*	No. of Facilities	No. of Animals	Total Steady State Live Weight*	No. of Facilities	No. of Animals	Total Steady State Live Weight*
04-03-01	0	0	0	0	0	0	0	0	0
04-03-02	7	2,810	3,886,000	0	0	0	1	2,000	283,400
04-03-03	2	425	595,000	0	0	0	0	0	0
04-03-04	0	0	0	0	0	0	0	0	0
04-03-05	8	1,215	1,701,000	0	0	0	0	0	0
04-03-06	0	0	0	0	0	0	0	0	0
04-03-07	0	0	0	0	0	0	0	0	0
Totals	**17**	**4,450**	**6,182,000**	**0**	**0**	**0**	**1**	**2,000**	**283,400**

* Steady State Live Weight (SSLW) is in pounds, after a conversion factor has been applied to the number of swine, cattle or poultry on a farm. Conversion factors come from the US Department of Agriculture, Natural Resource Conservation Service guidelines. Since the amount of waste produced varies by hog size, this is the best way to compare the sizes of the farms.

11.2 Impacted Streams in Agricultural Areas

In the French Broad River basin, the majority of agricultural land is in pasture use. There are also a variety of specialty crop farms in this river basin including tomatoes, peppers and apple orchards. Impacts to streams from agricultural activities can include excessive nutrient loading, pesticide and herbicide contamination, bacterial contamination, and sedimentation. In several watersheds, water quality data are indicating toxicity impacts to the aquatic biological community attributable to the use of pesticides on these specialty operations. For more information, refer to the discussion related to Mud Creek (Chapter 2) and the Mills River (Chapter 3).

Overall, there has been a decrease in agricultural land use throughout the watershed. From 1982 to 1997, pasture use has decreased by 7.7% (18,000 acres). Cultivated and uncultivated crop areas decreased by 28.0% and 45.5% (23,500 and 15,700 acres), respectively (USDA-NRCS, June 2001). Impacts to water quality from agricultural sources may decrease over the next basin cycle. It should be noted, however, that there has been an increase in urban/built-up areas in many municipalities throughout the river basin. Refer to Appendix III for more information regarding land use changes.

2005 Recommendations

DWQ will identify streams where agricultural land use may be impacting water quality and aquatic habitat. This information will be related to local Division of Soil and Water Conservation and NRCS staff to investigate the agricultural impacts in these watersheds and to recommend BMPs to reduce impacts. DWQ recommends that funding and technical support for agricultural BMPs continue and increase. Refer to Appendix VIII for agricultural nonpoint source agency contact information.

11.3 Agricultural Best Management Practices Funding Opportunities

11.3.1 USDA – NRCS Environmental Quality Improvement Program (EQIP)

The Environmental Quality Improvement Program (EQIP) provides technical, educational and financial assistance to eligible farmers to address soil, water and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers in complying with federal and state environmental laws and encourages environmental enhancement. The purposes of the program are achieved through the implementation of a conservation plan that includes structural, vegetative and land management practices on eligible land. Five to ten-year contracts are made with eligible producers. Cost share payments may be made to implement one or more eligible structural or vegetative practice, such as animal waste management facilities, terraces, filter strips, tree planting and permanent wildlife habitat. Incentive payments can be made to implement one or more land management practices, such as nutrient management, pest management and grazing land management.

Fifty percent of the funding available for this program will be targeted at natural resource concerns relating to livestock production. The program is carried out primarily in priority areas that may be watersheds, regions or multistate areas and for significant statewide natural resource concerns that are outside of geographic priority areas. EQIP's authorized budget of $1.3 billion is prorated at $200 million per year through the year 2002.

NRCS district contacts for the French Broad River basin are provided in Appendix VIII or visit the website at http://www.nrcs.usda.gov/programs/eqip/ for more information.

11.3.2 NC Agriculture Cost Share Program

The North Carolina Agriculture Cost Share Program was established in 1984 to help reduce the sources of agricultural nonpoint source pollution to the state's waters. The program helps owners and renters of established agricultural operations improve their on-farm management by using BMPs. These BMPs include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential for surface and groundwater pollution. The Agriculture Cost Share Program is a voluntary program that reimburses farmers up to 75 percent of the cost of installing an approved BMP. The Division of Soil and Water Conservation (DSWC) implements the program. The cost share funds are paid to the farmer once the planned control measures and technical specifications are completed. The annual statewide budget for BMP cost sharing is approximately $6.9 million. From 1999 to

2003, $1,562,128 was provided for projects in counties wholly or partially in the French Broad River basin. Soil and Water Conservation District (SWCD) contacts for the French Broad River basin are included in Appendix VIII or visit the website at http://www.enr.state.nc.us/DSWC/pages/agcostshareprogram.html for more information.

11.3.3 Agricultural Sediment Initiative

In 2000, the NC Association of Soil and Water Conservation Districts and the NC Soil and Water Conservation Commission initiated an effort to assess stream channels and watersheds of streams on the state's 2000 303(d) list due to sediment where agriculture was included as a potential source. The primary objective of the Agricultural Sediment Initiative was to evaluate 303(d) listed waters in order to assess the severity of sedimentation associated with agricultural activities within the watershed and to develop local strategies for addressing sedimentation. The initiative involved 47 Impaired stream segments in 34 counties and 11 river basins.

In 2001, the Soil and Water Conservation Commission allocated additional Agriculture Cost Share Funds to districts to address agricultural sediment. In 2002, the districts in the French Broad River basin received an additional $110,000 to implement agricultural BMPs in selected watersheds, and an additional $30,000 was allocated in 2003.

Table 20 summarizes the results of the completed Agricultural Sediment Surveys for five watersheds in three counties in the French Broad River basin. District staff requested approximately $2,840,000 for restoration and protection work in four of the watersheds.

Table 20 Summary of Agricultural Sediment Initiative Surveys

Stream	County	Problems Identified	Funds Requested by District
Richland Creek	Haywood	Cropland erosion, pasture/hayland overuse, urban development, road construction, streambank erosion	$100,000
Hyatt Creek	Haywood	Streambank erosion, road construction, urban development, livestock in stream	$385,000
Mud Creek	Henderson	New development, road construction, streambank erosion	$725,000
Right Fork Cane Creek	Henderson	New development, streambank erosion in urban areas, small amount of mining	$765,000
Hominy Creek	Buncombe	Streambank erosion, urban development, road construction, large stone quarry	$865,000

Chapter 12
Forestry in the French Broad River Basin

12.1 Forestland Ownership

Controlling 72 percent of the approximately one million acres of forestland, North Carolina's non-industrial, private forest landowners own a majority of the forests found in the French Broad River basin (Figure 15). Less than 1 percent of the forestland is actually owned by the forest industry. The remaining 27 percent is under public ownership (Brown, January 2004). Publicly owned forestland primarily consists of the Pisgah National Forest, Nantahala National Forest, and the Great Smokey Mountains National Park. For more information about forestland ownership or a copy of the most recent statistics for North Carolina, visit the USDA Forest Service Southern Research Station webpage at http://www.srs.fs.usda.gov/.

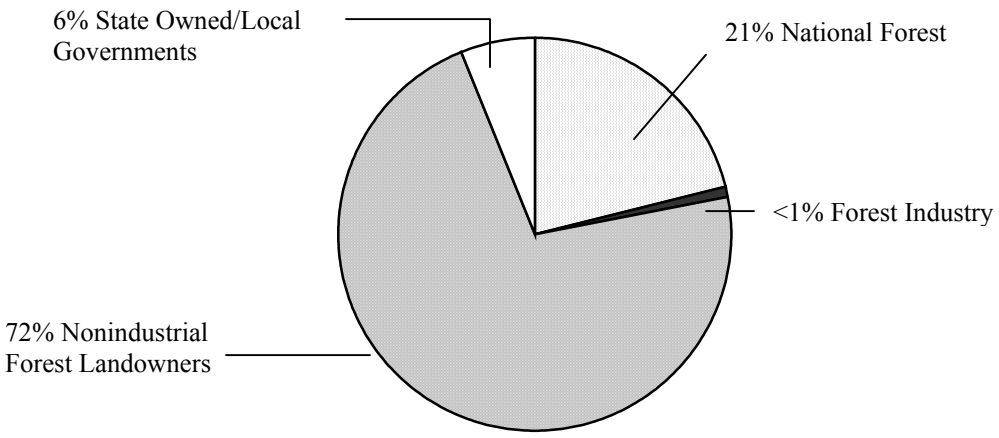


Figure 15 Ownership of Forestland in the French Broad River Basin

12.1.1 Forest Management

Forest management is an economic driver within the French Broad River basin. For the period of September 1997 through August 2002, nearly 2,850 acres of privately-owned forestland in the basin were planted in trees, with a majority of these acres utilizing cost shared funding through various North Carolina or federal programs. Over 900 forest management plans were developed to support sustainable forests on 43,600 acres of forestland owned by non-industrial, private landowners within this same time period. Currently, there are 23 tracts, containing nearly 3,500 acres certified as Forest Stewardship Forests within the basin. Furthermore, the Forest Legacy Program has invested close to $500,000 in the French Broad River basin to purchase easements and property to maintain sustainable forestland and protect water quality. For more information on forest management, visit the website at www.dfr.state.nc.us.

12.1.2 Urban Forestry

The City of Asheville and Town of Brevard have been certified as Tree City USA communities for well over 20 years. Since 1997, The Urban Forestry and Community Development Grant Program has invested nearly $200,000 into 21 community-based urban forestry projects in the basin. These projects include urban forestry education, teacher training, forest inventories, tree planting, and urban forest management. Urban forestry is a vital component in reducing runoff by promoting green space and integrating trees into traditional cityscapes.

12.1.3 Forest Utilization

From the most recent wood product utilization data available (September 2003), 14 different businesses reside in the French Broad River basin that are considered "Primary Processors" of forestry-related raw material (i.e., sawmill, veneer mill, oriented strand board mill, chip mill, paper mill, etc.). Twenty-nine primary processor businesses purchase forestry-related raw material from the basin, which represents fewer than 10 percent of the primary processors located in North Carolina.

12.2 State Forests (SFs)/Educational State Forests (ESFs)

North Carolina's ESFs are designed to teach the public, especially school children, about the forest environment. Each ESF features self-guided trails that include information kiosks, exhibits, tree identification signs, a forest education center, forestry BMP demonstration areas, and a talking tree trail. Specially trained rangers are available to conduct classes for school and other youth groups. Teachers or group leaders choose from a selection of 30-minute programs that cover all aspects of the forest environment - from soil, water and wildlife to timber and forest management. More information on the Division of Forest Resources (DFR) SFs and ESFs can be found on the website at www.dfr.state.nc.us.

In Henderson County, DFR manages over 10,000 acres at Dupont State Forest. This forest is managed for many benefits including protection of unique natural communities, forestry demonstration and research, watershed protection, wildlife, hunting and fishing, and protection of cultural resources. Over 120,000 visit Dupont State Forest annually for its waterfalls, trails, fishing, restricted hunting and scheduled programs.

Also in Henderson County, DFR manages approximately 235 acres at Holmes Educational State Forest, thus, providing buffer protection to Crab Creek. The forest is managed as an outdoor classroom for school groups and the general public, as well as for sustainable forestry and group camping.

12.3 Forestry Water Quality Regulations in North Carolina

12.3.1 Forest Practices Guidelines for Water Quality (FPGs)

Forestry operations in North Carolina are subject to regulation under the Sedimentation Pollution Control Act of 1973 (G.S. Ch.113A Art.4 referred to as "SPCA") and amendments thereof. However, forestry operations are exempt from the permit requirements of the SPCA, if the

operations comply with performance standards outlined in the *Forest Practices Guidelines Related to Water Quality* (15A NCAC 1I .0101 - .0209, referred to as "FPG's") and North Carolina General Statutes that address stream obstruction (G.S.77-13 and G.S.77-14). Detailed information on maintaining compliance with the FPGs is available on the *Water Quality Section* of the DFR website at www.dfr.state.nc.us.

DFR is delegated the authority, by the Division of Land Resources (DLR), to monitor and evaluate forestry operations for compliance with these aforementioned laws. In addition, DFR works to resolve FPG compliance questions brought to its attention through citizen complaints. Violations of the FPG performance standards that cannot be resolved by DFR are referred to DLR for enforcement action. During a five-year period beginning September 1997, DFR conducted 434 FPG inspections of forestry and/or timber harvesting activities in the basin; approximately 72 percent of the sites inspected were in compliance with the FPGs. Six sites were later referred to DLR for noncompliance enforcement.

12.3.2 Other Forestry Related Water Quality Regulations

In addition to the FPGs, DFR monitors the implementation and compliance of the following in this basin:

- The US Army Corps of Engineers' (USACE) Section 404 Dredge and Fill exemption for forestry activities.
- The USACE's 15 Best Management Practices to satisfy the exemption related to forest road construction in wetlands.
- The USACE's six (6) Best Management Practices for mechanical site preparation in support of pine plantation silviculture in southeastern wetlands.

12.3.3 Water Quality Foresters

One Water Quality Forester covers a large portion of the French Broad River basin. Created in 1999, Water Quality Forester positions are assigned to seven of the DFR's 13 districts across the state. The Water Quality Foresters conduct FPG inspections, develop pre-harvest plans, and provide training opportunities for landowners, loggers and the public regarding soil conservation and water quality protection practices related to forestry. Service foresters and county rangers also handle water quality issues in the remainder of the basin, along with their other forest management and fire control responsibilities. Contact information for each district and/or county can be found on DFR's website at www.dfr.state.nc.us.

12.3.4 Forestry Best Management Practices (BMPs)

Implementing forestry BMPs is strongly encouraged by the DFR in order to efficiently and effectively protect the water resources of North Carolina. The *Forestry Best Management Practices Manual* (NCDENR-DFR, September 1989) describes recommended techniques that should be used to help comply with the state's forestry laws and help protect water quality. Also known as the "Blue Book", this manual is currently undergoing its first revision since adoption in 1989. Revisions to the manual are led by the DENR appointed Technical Advisory

Committee (TAC). The second edition of the manual will be printed in a condensed pocket-sized version, as well as a comprehensive desktop text. The pocket-sized, condensed version will allow for greater distribution and on-site use by loggers and equipment operators. More information on forestry BMPs can be found at DFR's website at www.dfr.state.nc.us.

Among the BMP's promoted for timber harvesting is the use of bridgemats for establishing temporary stream crossings. DFR provides bridgemats for short-term loan to loggers for use in a major portion of French Broad River basin. DFR's Bridgemat Loan and Education Program is an educational and protection project which promotes the benefits of using portable bridges for stream crossings, in lieu of using other techniques such as culverts or hard-surface crossings, both which have a greater potential to result in stream sedimentation. Grant awards from the EPA Nonpoint Source Pollution Management Program have funded all bridgemat purchases for this loan program. It is recommended that additional bridgemats be made available for forestry activities in the French Broad River basin. Further information on DFR's Bridgemat Loan Program can be found on the DFR website at www.dfr.state.nc.us.

Since the last basin plan was issued, DFR has implemented the following in an ongoing effort to improve compliance with forest regulations and, in turn, minimize nonpoint source pollution from forestry operations:

(1) Established one Water Quality Forester position in the French Broad River basin.
(2) Implemented internal and external water quality training programs specific to FPG and BMP performance.
(3) Established the Forestry Nonpoint Source Unit at the Raleigh Central Office.
(4) Completed North Carolina's Forestry BMP Implementation Survey (2000-2003) field data collection and Interim Report. Final Report development is ongoing.
(5) Expanded the Bridgemat Loan and Education Program and completed a three-year summary report.
(6) Encouraged the use of Forestry BMPs through the ProLogger education and water quality programs offered by the North Carolina Forestry Association.
(7) Undertaking revision of the North Carolina's Forestry BMP Manual (2nd Edition).
(8) Established a new water quality website for the forestry community and North Carolina citizens.

DFR continues its efforts to protect water quality through education and training programs, demonstrations and research projects. Projects that address forestry NPS pollution prevention can be found on the website at http://h2o.enr.state.nc.us/nps/What_is_NPS/forestry.htm. Progress reports on these projects will be made available at the DFR website (www.dfr.state.nc.us).

Chapter 13
Wastewater and Stormwater Programs

13.1 NPDES Wastewater Discharge Permit Summary

The primary pollutants associated with point source discharges are:

* oxygen-consuming wastes,
* nutrients,
* color, and
* toxic substances including chlorine, ammonia and metals.

Discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge are broadly referred to as 'point sources'. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems serving schools, commercial offices, residential subdivisions and individual homes. Stormwater point source discharges include stormwater collection systems for municipalities that serve populations greater than 100,000 and stormwater discharges associated with certain industrial activities. Point source dischargers in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit. Discharge permits are issued under the NPDES program, which is delegated to DWQ by the Environmental Protection Agency.

Types of Wastewater Discharges

Major Facilities: Wastewater Treatment Plants with flows ≥1 MGD (million gallons per day); and some industrial facilities (depending on flow and potential impacts to public health and water quality).

Minor Facilities: Facilities not defined as Major.

100% Domestic Waste: Facilities that only treat domestic-type waste (from toilets, sinks, washers).

Municipal Facilities: Public facilities that serve a municipality. Can treat waste from homes and industries.

Nonmunicipal Facilities: Non-public facilities that provide treatment for domestic, industrial or commercial wastewater. This category includes wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation, and other facilities such as schools, subdivisions, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

Currently, there are 137 permitted wastewater discharges in the French Broad River basin. Table 21 provides summary information (by type and subbasin) about the discharges. Various types of dischargers listed in the table are described in the inset box. Facilities are mapped in each subbasin chapter. For a complete listing of permitted facilities in the basin, refer to Appendix VI.

The majority of NPDES permitted wastewater flow into the waters of the French Broad River basin are from major municipal wastewater treatment plants (WWTP). Nonmunicipal discharges also contribute substantial wastewater flow into the French Broad River basin. Facilities, large or small, where recent data show problems with a discharge are discussed in each subbasin chapter.

Table 21 Summary of NPDES Dischargers and Permitted Flows for the French Broad River Basin (September 2003)

	French Broad River Subbasin							
Facility Categories	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**Total**
Total Facilities	15	67	8	11	16	19	1	137
Total Permitted Flow (MGD)	32.976	55.423	0.245	0.984	37.132	14.493	0.80	142.05
Major Discharges	3	3	0	0	3	4	0	13
Total Permitted Flow (MGD)	32.4	49.6	0.0	0.0	36.9	10.99	0.0	129.89
Minor Discharges	12	64	8	11	13	15	1	124
Total Permitted Flow (MGD)	0.576	5.823	0.245	0.984	0.232	3.503	0.80	12.16
100% Domestic Waste	8	54	7	5	11	6	0	91
Total Permitted Flow (MGD)	0.441	1.339	0.065	0.066	0.232	0.056	0.0	2.20
Municipal Facilities	2	2	0	4	2	3	1	14
Total Permitted Flow (MGD)	2.59	44.8	0.0	0.915	7.0	2.395	0.80	58.50
Nonmunicipal Facilities	13	65	8	7	14	16	0	123
Total Permitted Flow (MGD)	30.386	10.623	0.245	0.069	30.132	12.098	0.0	83.55

13.2 DWQ Stormwater Programs

There are many different stormwater programs administered by DWQ. One or more of these programs affects many communities in the French Broad River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include NPDES Phase I and II, HQW/ORW stormwater requirements, and requirements associated with the Water Supply Watershed Program. Local governments that are or may be affected by these programs are presented in Table 22.

13.2.1 NPDES Phase I

Phase I of the EPA stormwater program started with Amendments to the Clean Water Act (CWA) in 1990. Phase I required NPDES permit coverage to address stormwater runoff from medium and large stormwater sewer systems serving populations of 100,000 or more. There are no NPDES Phase I stormwater permits issued to communities in the basin.

Phase I also had requirements for ten categories of industrial sources to be covered under stormwater permits. Industrial activities which require permitting are defined in categories ranging from sawmills and landfills to manufacturing plants and hazardous waste treatment, storage or disposal facilities. Construction sites disturbing greater than five acres are also

required to obtain an NPDES stormwater permit under Phase I of the EPA stormwater program. Excluding construction stormwater general permits, there are 139 general stormwater permits and 6 individual stormwater permits. Refer to the subbasin chapters for more information on stormwater programs and permits and a complete listing of individual permits in Appendix VI.

13.2.2 NPDES Phase II

The Phase II stormwater program is an extension of the Phase I program that will include permit coverage for smaller municipalities and cover construction activities down to one acre. The local governments permitted under Phase II will be required to develop and implement a comprehensive stormwater management program that includes six minimum measures.

(1) Public education and outreach on stormwater impacts.
(2) Public involvement/participation.
(3) Illicit discharge detection and elimination.
(4) Construction site stormwater runoff control.
(5) Post-construction stormwater management for new development and redevelopment.
(6) Pollution prevention/good housekeeping for municipal operations.

Construction sites greater than one acre will also be required to obtain an NPDES stormwater permit under Phase II of the EPA stormwater program in addition to erosion and sedimentation control approvals.

Twelve municipalities and one county (Table 22) in the basin are automatically required (based on 1990 US Census Designated Urban Areas and results of the 2000 US Census) to obtain a NPDES stormwater permit under the Phase II rules. These local governments were required to submit applications for NPDES stormwater permits by March 2003. DWQ is currently developing criteria that will be used to determine whether other municipalities should be required to obtain a NPDES permit and how the program will be implemented. DWQ is also working to finalize state rules to implement the Phase II stormwater rules as required by the EPA.

2004 Recommendations
DWQ recommends that the local governments that will be permitted under Phase II proceed with permit applications and develop programs that can go beyond the six minimum measures. Implementation of Phase II, as well as the other stormwater programs, should help to reduce future impacts to streams in the basin. Local governments, to the extent possible, should identify sites for preservation or restoration. DWQ and other NCDENR agencies will continue to provide information on funding sources and technical assistance to support local government stormwater programs.

13.2.3 State Stormwater Program

The State Stormwater Management Program was established in the late 1980s under the authority of the North Carolina Environmental Management Commission (EMC) and North Carolina General Statute 143-214.7. This program, codified in 15A NCAC 2H .1000, affects development activities that require either an Erosion and Sediment Control Plan (for disturbances

of one or more acres) or a CAMA major permit within one of the 20 coastal counties and/or development draining to Outstanding Resource Waters (ORW) or High Quality Waters (HQW). The State Stormwater Management Program requires developments to protect these sensitive waters by maintaining a low density of impervious surfaces, maintaining vegetative setbacks, and transporting runoff through vegetative conveyances. Low density development thresholds vary from 12-30 percent built-upon area (impervious surface) depending on the classification of the receiving stream. If low density design criteria cannot be met, then high density development requires the installation of structural best management practices (BMPs) to collect and treat stormwater runoff from the project. High density BMPs must control the runoff from the 1 or 1.5-inch storm event (depending on the receiving stream classification) and remove 85 percent of the total suspended solids.

Table 22 shows the seven counties in the French Broad River basin where permits may be required under the state stormwater management program. All development requiring an Erosion and Sediment Control Plan (for disturbances of one or more acres) must obtain a stormwater permit.

2005 Recommendations

DWQ will continue implementing the state stormwater program with the other NCDENR agencies and local governments. Local governments should develop local land use plans that minimize impervious surfaces in sensitive areas. Communities should integrate state stormwater program requirements, to the extent possible, with other stormwater programs in order to be more efficient and gain the most water quality benefits for protection of public health and aquatic life.

13.3 Water Supply Watershed Stormwater Rules

Current Status

The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local governments administer the program based on state minimum requirements. There are restrictions on wastewater discharges, development, landfills and residual application sites to control the impacts of point and nonpoint sources of pollution. The program attempts to minimize the impacts of stormwater runoff by utilizing low density development or stormwater treatment in high density areas.

All communities in the French Broad River basin in water supply watersheds have EMC approved water supply watershed protection ordinances (Table 22).

2005 Recommendations

DWQ recommends continued implementation of local water supply protection ordinances to ensure safe and economical treatment of drinking water. Communities should also integrate water supply protection ordinances with other stormwater programs, to the extent possible, in order to be more efficient and gain the most water quality benefits for both drinking water and aquatic life.

Table 22 Communities in the French Broad River Subject to Stormwater Requirements

	NPDES		State Stormwater Program	Water Supply Watershed Stormwater Requirements
Local Government	Phase I	Phase II		
Municipalities				
Newland				**X**
Sugar Mountain				**X**
Asheville		**X**		**X**
Biltmore Forest		**X**		
Black Mountain		**X**		
Montreat		**X**	**X**	
Weaverville		**X**		
Woodfin		**X**		
Canton		**X**		**X**
Clyde		**X**		
Hazelwood				
Maggie Valley				**X**
Waynesville		**X**		**X**
Flat Rock				
Fletcher		**X**		
Hendersonville		**X**		
Laurel Park		**X**		**X**
Hot Springs			**X**	
Mars Hill				**X**
Marshall				
Bakersville				
Brevard			**X**	
Spruce Pine				
Burnsville				
Rosman				
Mills River				**X**
Counties				
Avery				**X**
Buncombe			**X**	**X**
Haywood		**X**	**X**	**X**
Henderson			**X**	**X**
Madison			**X**	**X**
Mitchell			**X**	**X**
Transylvania			**X**	**X**
Yancey			**X**	**X**

13.4 Septic Systems and Straight Piping

In the French Broad River basin, wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits, but is treated on the property through the use of permitted septic systems. Wastewater from some of these homes illegally discharges directly to streams through what is known as a "straight pipe". In other cases, wastewater from failing septic systems makes its way to streams or contaminates groundwater. Straight piping and failing septic systems are illegal discharges of wastewater into waters of the state.

With on-site septic systems, the septic tank unit treats some wastes, and the drainfield associated with the septic tank provides further treatment and filtration of the pollutants and pathogens found in wastewater. A septic system that is operating properly does not discharge untreated wastewater to streams and lakes or to the ground's surface where it can run into nearby surface waters. Septic systems are a safe and effective long-term method for treating wastewater if they are sited, sized and maintained properly. If the tank or drainfield are improperly located or constructed, or the systems are not maintained, nearby wells and surface waters may become contaminated, causing potential risks to human health. Septic tanks must be properly installed and maintained to ensure they function properly over the life of the system. Information about the proper installation and maintenance of septic tanks can be obtained by calling the environmental health sections of the local county health departments (Appendix VIII contains contact information).

The discharge of untreated or partially treated sewage can be extremely harmful to humans and the aquatic environment. Pollutants from illegally discharged household wastewater contain chemical nutrients, disease pathogens and endocrine disrupting chemicals. Although DWQ ambient monitoring of the waters in the French Broad River basin show a relatively small percentage of fecal coliform bacteria samples exceeding state standards for primary recreation, smaller streams may contain a higher concentration of bacteria and other pollutants. The economies of the counties in this basin are highly dependent upon river recreation, especially for tourists and seasonal residents. Concerns were expressed at public workshops for the French Broad River basin about the possibility of failing septic systems and straight pipes, as well as the number of septic systems that are currently being permitted each year.

In order to protect human health and maintain water quality, straight pipes must be eliminated and failing septic systems must be repaired. The Wastewater Discharge Elimination (WaDE) Program is actively helping to identify and remove straight pipes (and failing septic systems) in the western portion of North Carolina. This program uses door-to-door surveys to locate straight pipes and failing septic systems, and offers deferred loans or grants to homeowners who have to eliminate the straight pipes by installing a septic system. The program also offers deferred loans and grants to repair malfunctioning septic systems. Buncombe County, Henderson County, Madison County, Transylvania County and the Toe River Health Departments have obtained grant money to conduct similar surveys. The results of the recent surveys are presented in Table 23.

Table 23 Results of Recent WaDE Surveys in the French Broad River Basin

Lead Agency	WaDE/ Buncombe County Health Department	Madison County Health Department	Toe River Health District	WaDE/ CWMTF/EPA Initiative
Project Dates	01/00-03/02	03/98-05/03	04/99-12/03	06/02-04/04
Terms of Funding	1 year	2 years	3 years	3 years
Homes Visited	2,027	~10,000	~1,100	3,351
Inspections Completed	1,844	5,360	707	2,098
Violations Found	265	996	213	268
Corrections with Assistance	12	143	127	15
Total Corrections	151	446	194	96

2005 Recommendations

Efforts to create a permanent statewide septic maintenance and repair program similar to the straight pipe and failing septic system initiative currently active in western NC should be pursued. The WaDE Program in collaboration with the Local Health Departments should request additional funding from the CWMTF (Section 16.3.2) and Section 319 Program (Section 16.2.1) to continue the straight pipe elimination program for the French Broad River basin. Additional monitoring of fecal coliform throughout tributary watersheds where straight pipes and failing septic systems are a potential problem should be conducted in order to narrow the focus of the surveys. For more information on the WaDE Program, contact the DENR On-Site Wastewater Section, NC Division of Environmental Health, toll free at 1-866-223-5718 or visit their website at http://www.deh.enr.state.nc.us/oww/Wade/wade.htm.

Additionally, precautions should be taken by local septic system permitting authorities to ensure that new systems are sited and constructed properly and that an adequate repair area is also available. Educational information should also be provided to new septic system owners regarding the maintenance of these systems over time. DWQ has developed a booklet that discusses actions individuals can take to reduce stormwater runoff and improve stormwater quality entitled *Improving Water Quality In Your Own Backyard*. The publication includes a discussion about septic system maintenance and offers other sources of information. To obtain a free copy, call (919) 733-5083, ext. 558.

The following website also offers good information in three easy to follow steps:
http://www.wsg.washington.edu/outreach/mas/water_quality/septicsense/septicmain.html.

Chapter 14
Water Resources

14.1 River Basin Hydrologic Units

Under the federal system, the French Broad River basin is made up of hydrologic areas referred to as cataloging units (USGS 8-digit hydrologic units). The French Broad River basin is made up of three whole cataloging units: the Upper French Broad River, Pigeon River and Nolichucky River. Cataloging units are further divided into smaller watershed units (14-digit hydrologic units or local watersheds) that are used for smaller scale planning like that done by NCEEP (Section 16.3). There are 89 local watershed units in the basin. Table 24 compares the three systems. A map identifying the hydrologic units and subbasins can be found in Appendix I.

Table 24 Hydrologic Subdivisions in the French Broad River Basin

Watershed Name and Major Tributaries	DWQ Subbasin 6-Digit Codes	USGS 8-Digit Hydrologic Units	USGS 14-Digit Hydrologic Units Local Watersheds*
Upper French Broad River East Fork French Broad River North Fork French Broad River West Fork French Broad River Little River Cane Creek Hominy Creek Mud Creek Sandymush Creek Swannanoa River Davidson River Mills River Big Ivy Creek (River) Big Laurel Creek Spring Creek	04-03-01 04-03-02 04-03-03 04-03-04	06010105	070010, 010010, 010020, 010030, 010040, 010050, 010055, 010060, 010080, 020010, 030010, 030020, 030030, 030040, 040010, 040020, 050010, 060010, 060020, 060030, 070020, 070030, 070040, 080010, 080020, 080030, 090010, 090020, 090030, 090040, 010070, 020015, 020020, 020030, 080040, 100010, 100020, 100030, 100040, 110010, 110020, 110030, 110040, 110050, 120010, 120020, 120030, 120040, 130010, 130020, 130030, 130040, 140010
Pigeon River East Fork Pigeon River West Fork Pigeon River Big Creek Cataloochee Creek Jonathan Creek Richland Creek	04-03-05	06010106	010010, 010020, 010030, 010040, 020010, 020020, 020030, 020040, 020050, 020060, 020070, 030010, 030020, 030030, 030040
Nolichucky River Big Rock Creek North Toe River South Toe River Cane River	04-03-06 04-03-07	06010108	010010, 010020, 010030, 010040, 020010, 020020, 020030, 030010, 040010, 050010, 060010, 060020, 100010, 100020, 100030, 120010, 070010, 080010, 080020, 080030, 080040

* Numbers from the 8-digit and 14-digit column make the full 14-digit HU. Example: 06010105070010 is one 14-digit HU.

14.2 Minimum Streamflow

One of the purposes of the Dam Safety Law is to ensure maintenance of minimum streamflows below dams. Conditions may be placed on dam operations specifying mandatory minimum releases in order to maintain adequate quantity and quality of water in the length of a stream affected by an impoundment. The Division of Water Resources (DWR), in conjunction with the Wildlife Resources Commission (WRC), recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The Division of Land Resources (DLR) issues the permits. The Federal Energy Regulatory Commission (FERC) licenses all dams associated with hydropower.

Hydroelectric Dams

There are five operational dams in the French Broad River basin, including three on the French Broad River, one on Ivy Creek, and one on the Pigeon River. Information on each of these dams is presented below.

Craggy Dam is required by FERC to provide a tiered release of 460 cfs from July through January, and 860 cfs the remainder of the year. This dam operates in a run-of-river (non-peaking) mode and bypasses 3,200 feet of natural channel. It is located just downstream of the Beaverdam Creek confluence, and the facility is owned and operated by Buncombe County Metropolitan Sewer District.

Capitola Dam has no minimum release requirement according to their FERC license. This dam operates in a run-of-river (non-peaking) mode and bypasses 1,000 feet of natural channel. It is located just upstream of Marshall, and the facility is owned and operated by the French Broad Electric Membership Corporation.

Redmon Dam has no minimum release requirement according to their FERC license. The dam is operates in a run-of-river (non-peaking) mode and has no bypass stream channel. It is located just downstream of Marshall and the facility is owned and operated by Progress Energy.

Ivy River (Creek) Dam is located in AU# 6-96-(11.7). This facility is required by FERC to provide a 7Q10 flow of 16 cfs. A calibrated gage is required to monitor downstream flows. This dam operates in a run-of-river (non-peaking) mode and has no bypass channel. It is located 2.2 miles upstream of the mouth of Ivy Creek and is owned by Sithe Energies, Inc.

The *Walters* hydroelectric facility is located in AU# 5-(7) and is operated by Progress Energy. This facility is required by FERC to provide a minimum flow of 100 cfs one mile below the powerhouse at Brown's Bridge in Tennessee. A gage is required at Brown's Bridge to monitor flows. From the dam to the powerhouse, the facility bypasses 12 miles of natural channel. The powerhouse is located at the Pigeon River confluence with Big Creek on the North Carolina-Tennessee border.

Scheduled recreational releases are also required at Walters. The Schedule One recreational release is 1,200 cfs from 1:00 pm to 6:00 pm on two weekdays during each week, and 12:00 pm to 6:00 pm on Saturdays between the Saturday of the Memorial Day weekend and the Saturday of the Labor Day weekend. The Schedule Two recreational release is 1,200 cfs from 2:00 pm to

6:00 pm on not less than three weekdays per week during the two weeks prior to the Memorial Day weekend and the two weeks after the Labor Day weekend. The release schedule may be modified based on recreational use. The utility is to provide a toll-free phone number to provide information on the recreational flow releases.

No minimum release will be required in the bypassed natural channel until water quality and biological criteria are met. In lieu of a minimum flow, the utility will contribute funds to the Pigeon River Fund (www.pigeonriverfund.org) that will be administered by the Pigeon River Committee. In exchange for contributions to the fund, the Secretary of DENR will not seek a minimum release from the dam for ten years. When water quality and biological criteria are met, the established minimum release into the bypassed channel will be 30 cfs during May and June, and 20 cfs during the remainder of the year.

The Cascade Power Company surrendered the license to operate the *Cascade* hydroelectric facility on the Little River [AU# 6-38-(1)]. During operation, the facility was required to provide a 7Q10 flow of 23 cfs below the dam. A calibrated gage was established to monitor the flow requirement. The dam release was required to provide water in a run-of-river mode, and it bypassed 1,016 feet of natural stream channel when in operation.

Lake Junaluska located on Richland Creek [AU# 5-16-(16)] previously was a hydroelectric dam. In 1995, The Lake Junaluska Assembly surrendered its license exemption to produce power to FERC. The Assembly is still required to release water from the dam in a run-of-river mode. The Assembly agreed to a lake management plan with the NC Wildlife Resources Commission that allows the lake to be drawn down beginning on November 15 to a level not to exceed 2,448 feet mean sea level and return to full pool by April 15. A 7Q10 flow of 27.7 cfs or inflow, whichever is less, should be maintained below the dam during refill.

Water Supply Impoundments, Withdrawals and/or Miscellaneous Dams

There are additional impoundments that are not licensed hydroelectric dams in this basin. The following are water supply impoundments, withdrawals and/or miscellaneous dams.

- The *Town of Waynesville's* water supply reservoir is located on Allen Creek [AU# 5-16-7-(8.5)]. The dam has a 7Q10 release requirement of 3.5 cfs. A calibrated flume is used to make the release.
- On the *Little East Fork Pigeon River* [AU# 5-2-12-(5.5)] a trout hatchery is permitted to withdraw water only when 6.5 cfs is maintained downstream of the point of withdrawal. A calibrated gage is required to monitor flows.
- A trout hatchery diversion on *Shope Creek* (AU# 6-78-3) was permitted with an installed orifice sized for a 7Q10 release of 0.28 cfs.
- *Long Valley Lake on Long Valley Branch* (AU# 6-75) has a flow requirement of 0.36 cfs.
- *Eagle Lake Dam on Phillips Creek* (AU# 6-26-1) has a flow requirement of 0.5 cfs.
- *Cove Dam* on an unnamed tributary of Swannanoa River near Oteen has a flow requirement of 0.2 cfs.

Instream Flow Studies

The Division of Water Resources (DWR) participated in several instream flow studies during this cycle in the French Broad River basin. The studies and their findings are described below.

DWR conducted an instream flow study on *Jonathan Creek* [AU# 5-26-(5.5) and 5-26-(7)]. DWR along with the NC Wildlife Resources Commission (WRC) and the Maggie Valley Sanitary District reviewed a proposal for an expansion of the water treatment plant from 1.5 MGD to 3.0 MGD. The withdrawal from Jonathan Creek could increase to 3.0 MGD if an 8 cfs flow is maintained downstream of the intake. The installation of a calibrated gage will be required with this expansion, and withdrawal from Campbell Creek [AU# 5-26-8-(2.5)] would remain unchanged.

DWR, the WRC, and the City of Hendersonville participated in an instream flow study for *Mills River* [AU# 6-54-(4.5) and 6-54-(5)]. The study was the result of a proposal to relocate the city's water intake upstream of Highway 191/280. The study found that the city could withdraw 12 MGD without restriction, but withdrawals up to a maximum of 24 MGD would require a minimum flow of 30 cfs.

Further analysis examining the net habitat benefits was conducted for the city's proposal for a plant capacity of 18 MGD. This study indicated that the city could withdraw up to 18 MGD without restrictions in January through June, with an 8 cfs release from the upstream impoundments on North Fork Mills River and Bradley Creek. If there were no withdrawals from the upstream impoundments, then up to 14.2 MGD could be withdrawn in July through December without restrictions. In July through December, withdrawals up to 18 MGD were permissible if North Fork Mills River and Bradley Creek ran free, and the following targets were met below the downstream intake: 30 cfs (July and December); 40 cfs (August, October and November); and 42 cfs (September). Hendersonville must establish a gage downstream of their intake to monitor flows when their maximum daily withdrawal equals or exceeds 14 MGD.

Anticipating events that may temporarily prevent the use of the downstream source, such as in the event of a spill, the upstream impoundments may be used at any time. Conservation efforts or interconnection purchases should be used to maintain the 8 cfs downstream requirement. During storms, if nonpoint contaminants prevent use of the downstream source, the upstream impoundments may be used as long as the 8 cfs downstream flow can be maintained and more than 160 cfs (mean annual flow) is maintained at the US Geological Survey gage (#03446000).

The City of Hendersonville uses impoundments on *North Fork Mills River* [AU# 6-54-2-(1)] and *Bradley Creek* [AU# 6-54-3-17-(0.5)] as water supply sources. The city withdraws a combined volume of 5.5 MGD on average. The DWR participated in a study on these waters with the NC WRC, the US Department of Agriculture-Forest Service, and the City of Hendersonville. The study was used, in part, to issue a special use permit for Hendersonville from the U.S. Forest Service. All parties agreed upon an 8 cfs release below each of the water supply impoundments with gages to monitor the releases.

14.3 Interbasin Transfers

In addition to water withdrawals (discussed above), water users in North Carolina are also required to register surface water transfers with the Division of Water Resources (DWR) if the amount is 100,000 gallons per day or more. In addition, persons wishing to transfer two million gallons per day (MGD) or more, or increase an existing transfer by 25 percent or more, must first obtain a certificate from the Environmental Management Commission (G.S. 143-215.22I). The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolina*, on file in the Office of the Secretary of State. These boundaries differ from the 17 major river basins delineated by DWQ. Table 25 summarizes interbasin transfers within the French Broad River basin.

In determining whether a certificate should be issued, the state must determine that the overall benefits of a transfer outweigh the potential impacts. Factors used to determine whether a certificate should be issued include:

- The necessity, reasonableness and beneficial effects of the transfer;
- The detrimental effects on the source and receiving basins, including effects on water supply needs, wastewater assimilation, water quality, fish and wildlife habitat, hydroelectric power generation, navigation and recreation;
- The cumulative effect of existing transfers or water uses in the source basin;
- Reasonable alternatives to the proposed transfer; and
- Any other facts and circumstances necessary to evaluate the transfer request.

A provision of the interbasin transfer law requires that an environmental assessment or environmental impact statement be prepared in accordance with the State Environmental Policy Act as supporting documentation for a transfer petition. For more information on interbasin transfers, visit the website at http://www.ncwater.org or call DWR at (919) 733-4064.

Table 25 Estimated Interbasin Transfers in the French Broad River Basin (1997)

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Estimated Transfer (MGD)
Hendersonville	Hendersonville	French Broad River	Broad River	<0.1
Hendersonville	Saluda	French Broad River	Broad River	0.151

14.4 Water Quality Issues Related to Drought

Water quality problems associated with rainfall events usually involve degradation of aquatic habitats because the high flows may carry increased loadings of substances like metals, oils, herbicides, pesticides, sand, clay, organic material, bacteria and nutrients. These substances can be toxic to aquatic life (fish and insects) or may result in oxygen depletion or sedimentation. During drought conditions, these pollutants become more concentrated in streams due to reduced flow. Summer months are generally the most critical months for water quality. Dissolved oxygen is naturally lower due to higher temperatures, algae grow more due to longer periods of sunlight, and streamflows are reduced. In a long-term drought, these problems can be greatly

exacerbated, and the potential for water quality problems to become catastrophic is increased. This section discusses water quality problems that can be expected during low flow conditions.

The frequency of acute impacts due to nonpoint source pollution (runoff) is actually minimized during drought conditions. However, when rain events do occur, pollutants that have been collecting on the land surface are quickly delivered to streams. When streamflows are well below normal, this polluted runoff becomes a larger percentage of the water flowing in the stream. Point sources may also have water quality impacts during drought conditions even though permit limits are being met. Facilities that discharge wastewater have permit limits that are based on the historic low flow conditions. During droughts, these wastewater discharges may make up a larger percentage of the water flowing in a stream than during normal climatic and streamflow conditions. These discharges may also contribute to lowered dissolved oxygen concentrations and increased levels of other pollutants during drought conditions.

As streamflows decrease, there is less habitat available for aquatic insects and fish, particularly around lake shorelines. There is also less water available for irrigation and for water supplies. The dry conditions and increased removal of water for these uses further increases strain on the resource. With lesshabitat, naturally lower dissolved oxygen levels and higher water temperatures, the potential for large kills of fish and aquatic insects is very high. These conditions may stress the fish to the point where they become more susceptible to disease and where stresses that normally would not harm them result in mortality.

These are also areas where longer retention times due to decreased flows allow algae to take full advantage of the nutrients present resulting in algal blooms. During the daylight hours, algae greatly increase the amount dissolved oxygen in the water, but at night algal respiration and die off can cause dissolved oxygen levels to drop low enough to cause fish kills. Besides increasing the frequency of fish kills, algae blooms can also cause difficulty in water treatment resulting in taste and odor problems in finished drinking water.

Chapter 15
Natural Resources

15.1 Ecological Significance of the French Broad River Basin

The French Broad River basin once had one of the most diverse aquatic faunas in the state; now it is one of the most heavily altered basins in western North Carolina. Flat, low elevation areas such as floodplains and other wetlands have been especially affected. Because of these impacts, many aquatic animals are no longer found in the basin, including several freshwater mussels, such as the oyster mussel, Cumberland mocassinshell, and purple lilliput. Fish likely to be absent from the basin include longhead darter, wounded darter, and spotfin chub. In addition to fish thought to be extirpated, many species of fish have not been seen in more than 20 years, including river carpsucker, lake sturgeon, blueside darter, longear sunfish, mountain madtom, and dusky darter. Despite these impacts, many of the aquatic and wetland communities of the French Broad River basin are nationally significant and a number of significant remnants persist.

15.2 Rare Aquatic and Wetland-Dwelling Animal Species

For information on any of the species listed in Table 26, visit the NC Natural Heritage Program website at www.ncnhp.org.

Table 26 List of Rare Animals Associated with Aquatic and Wetland Habitats in the French Broad River Basin (September 2003)

Scientific Name	Common Name	Major Group	State Status	Federal Status
Cryptobranchus alleganiensis	Hellbender	Amphibian	SC	FSC
Necturus maculosus	Common mudpuppy	Amphibian	SC	
Stygobromus carolinensis	Yancey sideswimmer	Crustacean	SR	FSC
Percina macrocephala	Longhead darter	Fish	SC	FSC
Aplodinotus grunniens	Freshwater drum	Fish	T	
Hiodon tergisus	Mooneye	Fish	SC	
Carpiodes carpio	River carpsucker	Fish	SC	
Percina burtoni	Blotchside darter	Fish	E	
Noturus flavus	Stonecat	Fish	E	
Erimystax insignis	Blotched chub	Fish	SR	FSC
Etheostoma vulneratum	Wounded darter	Fish	SC	
Percina caprodes	Logperch	Fish	T	
Cottus carolinae	Banded sculpin	Fish	T	
Polyodon spathula	Paddlefish	Fish	E	FSC
Acipenser fulvescens	Lake sturgeon	Fish	SC	FSC
Cyprinella monacha	Spotfin chub	Fish	T	T
Etheostoma jessiae	Blueside darter	Fish	SC	
Ichthyomyzon bdellium	Ohio lamprey	Fish	SR	

Lepomis megalotis	Longear sunfish	Fish	SR	
Stizostedion canadense	Sauger	Fish	SR	
Noturus eleutherus	Mountain madtom	Fish	SC	
Luxilus chrysocephalus	Striped shiner	Fish	T	
Percina sciera	Dusky darter	Fish	E	
Percina squamata	Olive darter	Fish	SC	FSC
Etheostoma acuticeps	Sharphead darter	Fish	T	
Lampetra appendix	American brook lamprey	Fish	T	
Matrioptila jeanae	A caddisfly	Insect	SR	
Ephemerella berneri	A mayfly	Insect	SR	
Barbaetis benfieldi	Benfield's bearded small minnow mayfly	Insect	SR	
Attaneuria ruralis	A stonefly	Insect	SR	
Macdunnoa brunnea	A mayfly	Insect	SR	
Isoperla frisoni	A stonefly	Insect	SR	
Bolotoperla rossi	A stonefly	Insect	SR	
Micrasema burksi	A caddisfly	Insect	SR	
Drunella longicornis	A mayfly	Insect	SR	
Heterocloeon petersi	A mayfly	Insect	SR	
Micrasema sprulesi	A caddisfly	Insect	SR	
Macromia margarita	Mountain river cruiser	Insect	SR	FSC
Rhyacophila mainensis	A caddisfly	Insect	SR	
Fusconaia subrotunda	Long-solid	Mollusk	SR	
Alasmidonta viridis	Slippershell mussel	Mollusk	E	
Lasmigona holstonia	Tennessee heelsplitter	Mollusk	E	FSC
Lampsilis fasciola	Wavy-rayed lampmussel	Mollusk	SC	
Pleurobema oviforme	Tennessee clubshell	Mollusk	E	FSC
Alasmidonta raveneliana	Appalachian elktoe	Mollusk	E	E
Epioblasma capsaeformis	Oyster mussel	Mollusk	EX	E
Medionidus conradicus	Cumberland mocassinshell	Mollusk	EX	
Toxolasma lividus	Purple lilliput	Mollusk	EX	FSC
Villosa iris	Rainbow	Mollusk	SC	
Hemidactylium scutatum	Four-toed salamander	Amphibian	SC	
Eurycea longicauda	Longtail salamander	Amphibian	SC	
Ambystoma talpoideum	Mole salamander	Amphibian	SC	
Glyptemys (Clemmys) muhlenbergii	Bog turtle	Reptile	T	T(S/A)

Rare Species Listing Criteria

E =	Endangered (those species in danger of becoming extinct)
T =	Threatened (considered likely to become endangered within the foreseeable future)
SR =	Significantly Rare (those whose numbers are small and whose populations need monitoring)
SC =	Species of Special Concern
FSC =	Federal Species of Concern (those under consideration for listing under the Federal Endangered Species Act)
T(S/A) =	Threatened due to similarity of appearance
EX =	Extirpated

15.3 Significant Natural Heritage Areas in the French Broad River Basin

The North Carolina Natural Heritage Program (NHP) of the Office of Conservation and Community Affairs compiles a list of Significant Natural Heritage Areas as required by the Nature Preserves Act. The list is based on the program's inventory of natural diversity in the state. Natural areas are evaluated based on the number and quality occurrences of rare plant and animal species, rare or high quality natural communities, and special animal habitats. The global and statewide rarity of these elements and their quality at a site is compared with other occurrences to determine a site's significance. Sites included on this list are the best representatives of the natural diversity of the state, and therefore, have priority for protection. Inclusion on the list does not imply that any protection or public access to the site exists.

Sites that directly contribute to the maintenance of water quality in the French Broad River basin are highlighted on the map and in the following text. The NHP has identified more than 180 individual natural areas in the French Broad River basin. Some of the more important sites are discussed below, and the locations of several are shown in Figure 16.

Black and Craggy Mountains
This extensive region of high mountains includes Mount Mitchell and several other peaks over 6,000 feet. It is one of the largest NHP areas in the basin and contains many rare plant and animal species associated with high elevations. Much of the site is in public ownership, and many of the identified natural areas are contiguous and of high quality. The Craggy Mountains, in particular, include large stands of old-growth forest.

Roan Mountain Massif
The Roan Mountain Massif is one of the biologically richest areas in the southern Appalachians. The eastern part of the site contains a series of grassy balds that is collectively the largest and best example remaining in the Southern Appalachians. Numerous rare plant and animal species are found in the balds and associated communities, such as high elevation seeps. The western part of the site contains one of the few large remnants of southern Appalachian spruce-fir forest. Also present are numerous high elevation rocky summits, which supports a large number of rare plants. High quality northern hardwood forests, boulderfield forests, beech gaps, and other forest communities are present lower on the slopes.

Nolichucky/Toe/Cane Rivers
The Nolichucky and its three main tributaries are home to many rare aquatic animals. For example, the wavy-rayed lamp mussel is only found in the Nolichucky and Little Tennessee River watersheds. The Cane River contains several rare animals, most notably, almost the entire North Carolina population of sharphead darter. The South Toe River supports the only extant North Carolina population of the blotchside darter. Several nearby bogs and marshes in the Celo area contain rare plants. The lower stretches of the North Toe and Nolichucky Rivers provide habitat for the olive darter, logperch, and tangerine darter, as well as the federally endangered Appalachian elktoe mussel.

Great Balsam Mountains/Pisgah Ridge
This area includes sites in the higher parts of the Great Balsam Mountains and Pisgah Ridge. Many high quality, though common, natural communities are found in the area, as well as rarer communities such as bogs and granitic domes. A large number of regional endemic and northern disjunct species are present, along with several globally rare species.

Southern Appalachian Bogs
This basin contains a number of Southern Appalachian bogs and swamp forest-bog complexes, many of them nationally significant. Examples of these wetlands include: Bat Fork Bog, East Flat Rock Bog Remnant, Franklin Bog, King Creek Bog, McClures Bog, Sevenmile Ridge Swamp Forest-Bog Complex, and Sugar Mountain Natural Area. Before the Hendersonville area was extensively developed, this area was probably the largest expanse of mountain wetlands in North Carolina. Although most of the remaining sites are now just remnants, very significant wetlands still exist at Buck Forest and Pink Beds. Many of the rare, federally listed plants in the French Broad River basin are associated with these wetlands.

Buck Forest
Much of Buck Forest is protected by DuPont State Forest. Buck Forest includes a large collection of rare natural communities. Significant features include Southern Appalachian bogs, swamp forest-bog complexes, and several swamp pink populations. Many of the rare plants in Buck Forest are associated with the wetland communities.

Pigeon River Gorge
The Pigeon River Gorge contains a number of rare species. Here, cove forests support a population of the globally imperiled pirate bush and the mock orange and yellowwood. This area was heavily impacted by construction of Interstate 40 through the length of the gorge.

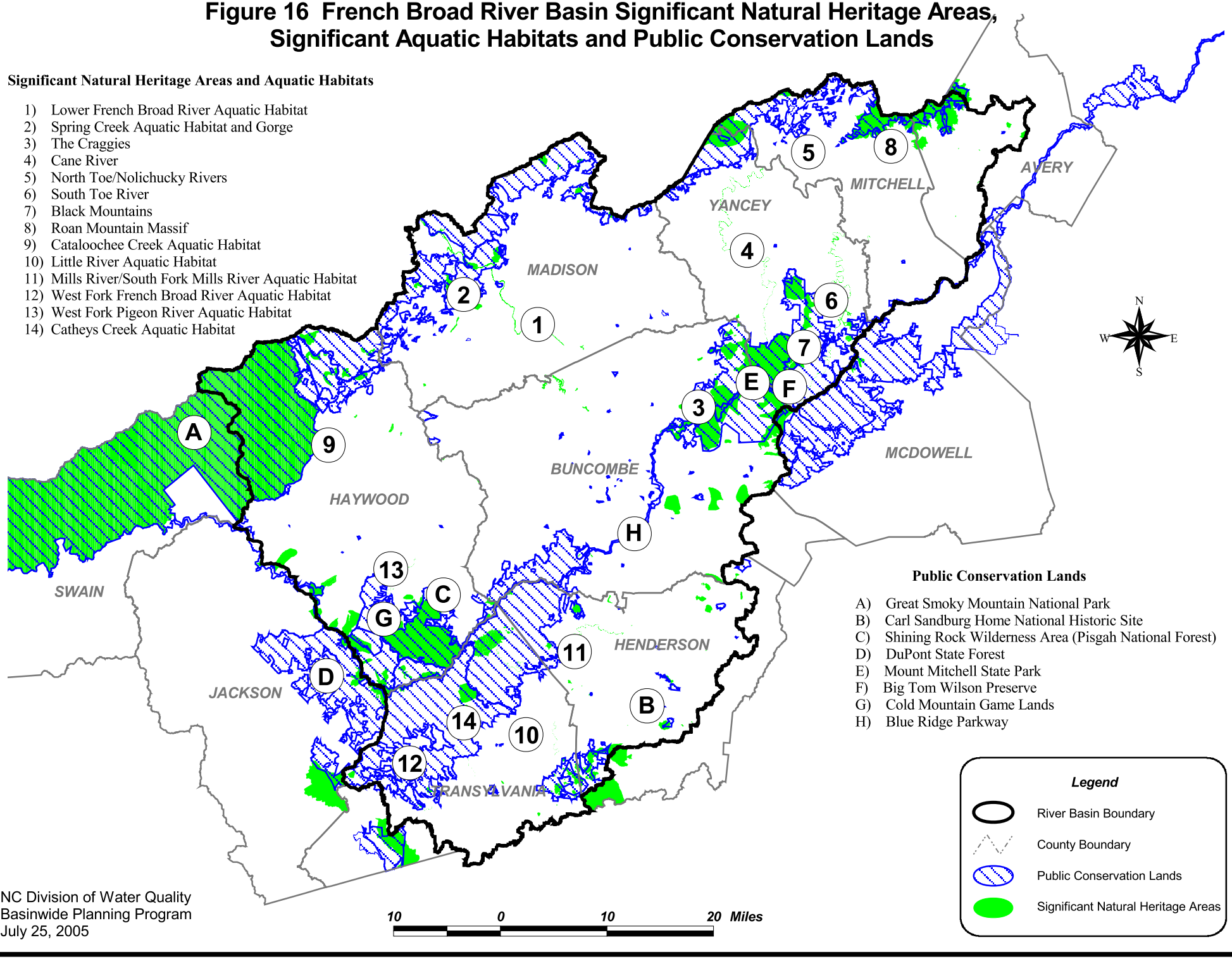
Hot Springs Window
The French Broad River flows through the Hot Springs Window, a geologic "window" through which two rock types unusual for the state, dolomites and mudstones, are exposed. Associated with the unusual rock types are many plants and natural communities rare in North Carolina.

15.4 Significant Aquatic Habitats in French Broad River Basin

The NHP also collaborates with other agencies and organizations to identify Significant Aquatic Habitats in North Carolina. They are stream segments or other bodies of water that contain significant natural resources, such as a high diversity of rare aquatic animal species. The impact from lands adjacent to and upstream of these reaches determines their water quality and the viability of their aquatic species. The identification of a natural area conveys no protection; these lands are the responsibility of the landowner. The Significant Aquatic Habitats of the French Broad River basin include the following; several of which are shown on Figure 16.

South Toe River Aquatic Habitat
The state significant South Toe River drains the east slopes of the Black Mountains and west slopes of the Blue Ridge. Rare animals found include: Appalachian elktoe; blotchside darter; olive darter; hellbender; and two caddisflies. This is the location for the only extant blotchside darter population known in North Carolina.

Figure 16 French Broad River Basin Significant Natural Heritage Areas, Significant Aquatic Habitats and Public Conservation Lands



NC Division of Water Quality
Basinwide Planning Program
July 25, 2005

North Toe River/Nolichucky River Aquatic Habitat
This segment of the river is nationally significant, providing habitat for several rare fish including: the sharphead darter, olive darter, blotched chub, logperch; and two mussels, the Appalachian elktoe and wavy-rayed lampmussel.

Cane River Aquatic Habitat
This state significant river contains several rare fish, most notably essentially the entire North Carolina population of sharphead darter. Other rare fish found here are striped shiner, blotched chub, stonecat, and olive darter. The hellbender has also been found in the Cane River, as well as Appalachian elktoe.

Cataloochee Creek Aquatic Habitat and Catheys Creek Aquatic Habitat
These habitat areas are regionally significant waterways, important for their assemblages of rare stream insects. Cataloochee Creek is in the Great Smoky Mountains National Park, while Catheys Creek is in Transylvania County.

Little River Aquatic Habitat
Little River Aquatic Habitat in Transylvania County is significant because the area supports a population of the federally endangered Appalachian elktoe mussel. The Little River is also one of only two sites in the state for Tennessee clubshell, which is also federally endangered. The rare mountain river cruiser (a dragonfly species) is also known from this river.

Mills River/South Fork Mills River Aquatic Habitat
This state significant site provides habitat for a number of rare aquatic animals, fish, mollusks and insects including: the hellbender; the blotched chub and blueside darter; and the Appalachian elktoe, slippershell mussel, and Tennessee heelsplitter. This site supports the only known population of the Tennessee heelsplitter in the state. An aquatic amphibian, the mudpuppy, was reported in this site in 1950s, but has not been seen recently. Its current status is unknown.

West Fork French Broad River Aquatic Habitat
This state significant river segment provides habitat for a number of rare aquatic species including hellbenders, two stoneflies, and two caddisflies.

West Fork Pigeon River Aquatic Habitat
This state significant site contains a good population of the federally endangered Appalachian elktoe mussel, as well as hellbenders.

Spring Creek Aquatic Habitat
The state significant Spring Creek and its tributaries drain most of western Madison County before emptying into the French Broad River at Hot Springs. A number of rare fish species are known in this creek, including the American brook lamprey, Ohio lamprey, banded sculpin, spotfin chub, wounded darter, logperch, dusky darter, olive darter, and freshwater drum. Several are now extirpated from Spring Creek, and many are found nowhere else in North Carolina.

Lower French Broad River Aquatic Habitat
This regionally significant site extends from the confluence of Ivy Creek downstream to the Tennessee border. Historically, it provided habitat for a variety of aquatic animals, including

hellbenders, banded sculpin, lake sturgeon, paddlefish (last observed 1983), mooneye, river carpsucker, mountain madtom, logperch, olive darter, sauger, freshwater drum (last observed 1987), loggerhead musk turtle, and eastern spiny softshell. As part of the Tennessee Valley river system, the French Broad provides habitat for numerous fish species found in no other river systems in North Carolina. Some of these fish have been extirpated (e.g., native muskellunge, longhead darter, lake sturgeon, Tennessee snubnose darter, and mountain madtom).

15.5 Public Conservation Lands

Figure 16 also shows public conservation lands within the French Broad River basin. The basin contains significant public lands, both in terms of area and ecological value. The National Park Service manages Great Smoky Mountains National Park and the Blue Ridge Parkway, both of which have substantial acreage in the French Broad River basin. The Carl Sandburg Home National Historic Site accounts for another 271 acres of National Park Service land in the French Broad River basin. The US Forest Service oversees the Pisgah National Forest, which include the 7,500-acre Middle Prong and 18,600-acre Shining Rock Wilderness Areas.

State-owned lands include the Division of Forest Resources' 10,200-acre DuPont State Forest, an area very popular with naturalists and recreational users. The Division of Parks and Recreation manages the 1,575-acre Mount Mitchell State Park, and the Wildlife Resources Commission manages the 3,307-acre Cold Mountain Game Land. Two other state agencies, the Department of Transportation and the Department of Agriculture, have been working to preserve wetlands in the basin, such as Southern Appalachian bogs. The Department of Agriculture owns portions of Bat Fork Bog and Ochlawaha Bog, while DOT has been working on Franklin Bog, Mud Creek and many other sites. Mountain wetlands are often small, so it is significant that between these two agencies, more than 200 acres have been permanently protected.

Key partners in future protection efforts will be private, nonprofit land trusts, such as the Southern Appalachian Highlands Conservancy, the Carolina Mountain Land Conservancy, and the Nature Conservancy. Although not shown on the map, these organizations have protected significant areas in the French Broad River basin. Using innovative tools such as conservation easements, these organizations work with landowners in a number of ways to protect important natural areas and the "open space" of agricultural lands.

A prime example of the use of conservation easements is the Asheville Watershed Easement, where the Conservation Trust for North Carolina helped the city protect its water supply in perpetuity. Not too long ago, the American Farmland Trust helped protect the Big Tom Wilson Preserve, an area of 8,517 acres encompassing the upper part of the Cane River watershed. Land trusts also purchase and hold land as preserves. The Nature Conservancy owns and manages much of McClure’s Bog, and the Carolina Mountain Lands Conservancy owns and manages part of the Ochlawaha Bog. In 2002, the Southern Appalachian Highlands Conservancy, with help from the CWMTF, protected important riparian areas along Rough Creek and other tributary streams that are part of the Canton watershed. The work that these private organizations do is helping to improve quality of life for residents of the French Broad River basin. Conservation organizations will continue to work with landowners in a number of ways to protect important natural areas, as well as the "open space" of the mountains.

Chapter 16
Water Quality Initiatives

16.1 The Importance of Local Initiatives

As the Basinwide Planning Program completes its third cycle of plan development, there are many efforts being undertaken at the local level to improve water quality. Information about local efforts particular to a watershed or subbasin is included in Chapters 1-7. DWQ encourages local agencies and organizations to learn about and become active in their watersheds.

In an effort to provide water quality information and gain public input, DWQ held public workshops in Asheville, Hendersonville, Burnsville and Waynesville during November 2003. The purpose of the workshops was to inform people of the 2005 update plan and to seek input prior to finalizing the plan. Participants provided comments on specific waters in the French Broad River basin and generalized issues related to urbanization and land use changes, water supply quantity and protection, enforcement, permitting, monitoring, and funding sources. Refer to Appendix IX for specific comments received during the public workshops.

An important benefit of local initiatives is that local people make decisions that affect change in their own communities. There are a variety of limitations local initiatives can overcome including: state government budgets, staff resources, lack of regulations for nonpoint sources, the rule-making process, and many others.

These local organizations and agencies are able to combine professional expertise in a watershed. This allows groups to holistically understand the challenges and opportunities of different water quality efforts. Involving a wide array of people in water quality projects also brings together a range of knowledge and interests, and encourages others to become involved and invested in these projects. By working in coordination across jurisdictions and agency lines, more funding opportunities are available, and it is easier to generate necessary matching or leveraging funds. This will potentially allow local entities to do more work and be involved in more activities because their funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of these local efforts is key to water quality improvements. There are good examples of local agencies and groups using these cooperative strategies throughout the state. The following local organizations and agencies (Table 27) are highlighted to share their efforts towards water quality improvement. Specific projects are described in the subbasin chapters (Chapters 1–7).

DWQ applauds the foresight and proactive response to potential water quality problems acted upon by these local efforts. Federal and state government agencies are interested in assisting local governments and citizen groups in developing their water quality management programs. The distribution of several grantors is discussed in the following sections.

Table 27 Local Water Quality Initiatives

Land-of-Sky Regional Council of Governments
Office Location: Asheville, North Carolina

A multi-county, local government planning and development organization, LOS is one of 18 such organizations in the state and serves Region B (Buncombe, Henderson, Madison and Transylvania counties). The mission of LOS is to work with local, state and federal agencies, regional leaders, and the community to foster desirable economic, social and ecological conditions in the region. For more information, contact:

Bill Eaker	Phone: (828) 251-6622 x118	http://www.landofsky.org/
Director, Environmental Programs	Email: bill@landofsky.org	

Current and Continuing Projects:

- Participation and supporting member of the French Broad Voluntary Buffer Partnership, the Mills River Partnership, the Mud Creek Restoration Project, and the Ross Creek Urban Restoration Project.
- Using EPA Section 205(j) grant money, published a guide to stormwater management for local officials and contractors.
- Participating in Phase II Stormwater Management planning, education, and training.

Haywood Waterways Association (HWA)
Office Location: Waynesville, North Carolina

A nonprofit association dedicated to maintaining and improving the water quality of the Pigeon River, HWA focuses on reducing nonpoint pollution in the Pigeon River watershed. HWA works through a variety of voluntary initiatives including educational programs, greenways, information and work sessions, erosion control workshops, and obtaining grants and other resources to address nonpoint pollution. HWA is funded by contributions from members, grants and donations. HWA is guided by a Technical Advisory Committee (TAC) with representatives from federal, state and local agencies as well as many volunteers from a variety of backgrounds and expertise. HWA and its partner organizations (the SWCD, NRCS, and the Southwestern RC&D) have collaborated on 35 successful grant applications, providing almost $2.4 million for water quality projects in Haywood County. For more information, contact:

Ron Moser	Office Phone: (828) 452-9077	www.haywoodwaterways.org
HWA Director	Home Phone: (828) 456-5195	
	Email: ronmoser@charter.net	

Current and Continuing Projects:

- Water quality and sediment monitoring, publications and BMP projects along Hyatt Creek, Fines Creek and Richland Creek (subbasin 04-03-05). Grant money provided by EPA Section 319 and CWMTF.
- Educational activities related to soil erosion. Printed brochure entitled "It's Not Just Dirt" using funding provided by the Pigeon River Fund. Also publishing a brochure entitled "Stewardship Begins in Our Own Backyards: A Landowner's Guide to Protecting Land and Streams" using EPA Section 319 and CWMTF grant monies.
- Continually publish and distribute newspaper inserts related to the Pigeon River watershed and water quality issues throughout the watershed.
- Sponsors of several local activities including Kids-in-the-Creek, VWIN, the Haywood Environmental Initiative, and Summer Camps.
- Assisting municipalities in the implementation of their Phase II Storm Water Management Programs.

RiverLink, Inc.
Office Location: Asheville, North Carolina

A regional, nonprofit organization, RiverLink focuses on the economic and environmental revitalization of the French Broad River and its tributaries as a place to live, work and play. RiverLink's activities are governed by a Board of Directors recruited from Buncombe, Henderson, Transylvania and Madison counties, and it is continually seeking grant opportunities to fund various water quality initiatives along the French Broad River and its tributaries. For more information, contact:

RiverLink, Inc. Phone: (828) 252-8474 www.riverlink.org

Current and Continuing Projects:

- Supports greenway development throughout the basin and encourages private development along the riverfront based on open space design guidelines. Where allowed, these areas will be used for educational and demonstration purposes.
- Continually looking for opportunities to partner with private landowners to restore and conserve "degraded" mountain wetland sites within Buncombe and Henderson counties.
- Publishes a bimonthly newsletter about water quality issues throughout the French Broad River basin.
- Serves a supporting member and partner with the French Broad River Voluntary Buffer Partnership and raises funds for the UNCA VWIN program.
- Providing information, education and training to local developers (Clean Water Contractors). Geared toward businesses engaged in earth moving and construction activities, the program has provided information on erosion and sediment control.

Pigeon River Fund
Office Location: Asheville, North Carolina

The Pigeon River Fund exists to improve the streams and rivers of Haywood, Buncombe and Madison counties. The fund supports activities that improve surface water quality, enhance fish and wildlife management areas, expand public access, and increase citizen awareness of their roles in protecting water resources. Since 1996, the fund has awarded $1.7 million, which has leveraged more than $6 million in additional state and federal grants to help the citizens of the regions of Western North Carolina. For more information and grant guidelines, contact:

Bob Wagner Phone: (828) 254-4960 www.pigeonriverfund.org
Pigeon River Fund info@pigeonriverfund.org

Volunteer Water Information Network Program (VWIN)
Participants: Environmental Quality Institute (EQI) of University of North Carolina at Asheville (UNCA), HWA, RiverLink, ECO, Brevard College (Transylvania County), Haywood Community College, Madison SWCD

Funding: Pigeon River Fund, Henderson County, Metropolitan Sewerage District, Dornick Foundation, Volunteers

VWIN is a water quality monitoring program where trained volunteers collect water from 224 sites throughout Buncombe, Henderson, Madison and Transylvania counties; 139 of these sites are in the French Broad River basin. Samples are analyzed in a state certified lab at UNCA for parameters such as turbidity, suspended solids, pH, alkalinity, conductivity and heavy metals such as zinc, copper and lead. For more information, contact:

Marilyn Westphal Phone: (828) 251-6823 http://www.unca.edu/eqi/vwin.htm
VWIN Program Coordinator mjwestphal@unca.edu

Environmental and Conservation Organization (ECO)
Office Location: Hendersonville, North Carolina

ECO is a nonprofit organization devoted to conserving and preserving the natural heritage of the mountain region. Seeking to think globally and act locally, ECO works to preserve and protect streams and wetlands, wildlife and natural habitats. ECO addresses environmental community concerns through educational program development, recreational programs, environmental service projects for the community, and encourages civic responsibility in economic and democratic processes. For more information, contact:

Mary Jo Padgett Executive Director	Phone: (828) 692-0385 eco@main.nc.us	www.main.nc.us/eco/about.html

Current and Continuing Projects:

- Coordinates the Henderson County VWIN stream monitoring program and participates by bio-monitoring 28 VWIN sites semi-annually.
- Participates in the Mud Creek Watershed Restoration Council, Mills River Partnership, and the French Broad River Voluntary Buffer Partnership.
- Coordinates the Big Sweep and Adopt-A-Stream programs in Henderson County.

Quality Forward
Office Location: Asheville, North Carolina

Quality Forward is a volunteer-based organization working to enhance the environment and quality of life for the citizens of Asheville and Buncombe County through awareness building, community activities and partnership. Planting over 5,000 trees in Buncombe County. Quality Forward coordinated the Swannanoa River Riparian Greenway Project (Biltmore Village) and is also involved in many river improvement projects. For more information, contact:

Quality Forward	Phone: (828) 254-1776 info@qualityforward.org	www.qualityforward.org/

Current and Continuing Projects:

- Programs include adopt-a-stream, the annual Big Sweep river cleanup and Clean Streams Days in Buncombe County.
- Environmental education programs that teach school and youth groups about water quality monitoring and benthic macroinvertebrate sampling.
- Newsletters and publications about the natural heritage and beauty of Buncombe County and the surrounding areas.

French Broad River Voluntary Buffer Partnership
Participants: LOS, Land Trusts, Tennessee Valley Authority (TVA), Local Governments, Landowners, State/Federal Resource Management Agencies including NCDENR

Funding: CWMTF, NCDENR, TVA

Under grants from the CWMTF and TVA, LOS initiated the Voluntary Buffer Partnership to develop a comprehensive plan for protecting and restoring riparian buffers along the mainstem of the French Broad River in four counties. The partnership has developed a "toolbox" of possible buffer protection/restoration options and is continually working with landowners to stabilize streambanks and preserve buffers using conservation easements. For more information, contact:

Bill Eaker Land-of-Sky Regional Council of Governments	Phone: (828) 251-6622 bill@landofsky.org	http://www.landofsky.org/

Current and Continuing Projects:

- Distributes water quality issues and project newsletters to over 800 landowners along the river.
- Conducting an assessment of the buffer conditions in Buncombe and Madison counties. Seventy-five sites have already been identified in Transylvania and Henderson counties as being affected by active streambank erosion.

Mills River Partnership
Participants: Henderson County SWCD, NRCS, LOS, USDA Forest Service, Regional Water Authority, City of Hendersonville, Carolina Mountain Land Conservancy, UNCA VWIN, City of Asheville, Town of Mills River, ECO

Funding: CWMTF, USDA Forest Service, Regional Water Authority, City of Hendersonville, Cross Creek Foundation, EPA, Trout Unlimited, Mountain Valley RC&D Council, City of Asheville

The Mills River Partnership is comprised of various stakeholders who have partnered to improve water quality in the lower Mills River and Wash Creek while maintaining the outstanding quality of the other streams in the watershed. The Partnership is a nonregulatory organization devoted to working with landowners in the watershed. Each project is designed with the individual needs of the landowner in mind. All projects are voluntary and are paid for through grants awarded to the Mills River Project. For more information, contact:

Shaun Moore Henderson County Soil and Water Conservation District (SWCD)	Phone: (828) 697-7979 shaun.moore@nc.ncadnet.net	http://www.henderson.lib.nc.us/county/soil/millsriverweb1.html

Mud Creek Watershed Restoration Council
Participants: LOS, DWQ, EEP, TVA, City of Hendersonville, Henderson County Cooperative Extension, VWIN, Carolina Mountain Land Conservancy

Funding: CWMTF and DENR

The Mud Creek Watershed Restoration Council was established in 2000 to provide a forum for local stakeholder participation in the development of the Watershed Protection Plan for Mud Creek. The council's mission is to improve and protect water quality throughout the Mud Creek watershed. To do this, the council has developed a restoration plan and implementation strategy to improve water quality, increase public awareness and appreciation of the watershed, promote farmland conservation and the restoration of wetlands, and set water quality priorities. For more information on the Restoration Council and the Mud Creek Project, contact:

Diane Silver NC Cooperative Extension Service Henderson County Center	Phone: (828) 697-4891 diane_silver@ncsu.edu	www.ces.ncsu.edu/henderson/mudcreek

16.2 Federal Initiatives

16.2.1 Clean Water Act – Section 319 Program

Section 319 of the Clean Water Act provides grant money for nonpoint source demonstration and restoration projects. Approximately $1 million is available annually through base funding for demonstration and education projects across the state. An additional $2 million is available annually through incremental funding for restoration projects. All projects must provide non-federal matching funds of at least 40 percent of the project's total costs. Project proposals are reviewed and selected by the North Carolina Nonpoint Source Workgroup, made up of state and federal agencies involved in regulation or research associated with nonpoint source pollution.

Information on the North Carolina Section 319 Grant Program application process is available online at http://h2o.enr.state.nc.us/nps/application_process.htm.

There are 12 projects in the French Broad River basin that have been funded through the Section 319 Program between 1997 and 2002, many of which have basinwide applications (Table 28). Many are demonstration projects and educational programs that allow for the dissemination of information to the public through established programs at NC State University and the NC Cooperative Extension Service. Other projects fund stream restoration activities that improve water quality.

Descriptions of projects and general Section 319 Program information are available at http://h2o.enr.state.nc.us/nps/Section_319_Grant_Program.htm.

Table 28 Projects Funded Through Clean Water Act Section 319

FY	Project Name	Agency	Description
1999	Mountain Nurseries	Transylvania CES	Innovative BMP Demonstration
1999	Nature Trail Revitalization	Transylvania County	Educational
1999	Upper French Broad BMPs	NCSU Water Quality Group (WQG)	BMP Implementation
1999	Newfound Creek	Buncombe SWCD	BMP Implementation
1999	Minimizing Water Quality Impacts of Mountain Construction Projects	NCSU Soil Science	BMP Demonstration
2000	French Broad River Watershed Education Training Center	NCSU WQG, Transylvania CES	Education and BMP installation
2000	BMP Implementation of Impaired Streams of the Swannanoa River Watershed	RiverLink	Education and BMP installation
2000	Haywood County NPS Pollution Inventory / Watershed Improvement Project	Southwestern RC&D Council	Education and BMP installation
2001	Mills River Watershed Protection	Henderson County – Mills River Partnership	Whole watershed protection project
2002	Clyde and Junaluska Elementary Outdoor Classroom	Haywood SWCD	Educational
2002	Stormwater Wetlands in Asheville	NCSU WQG	Innovative BMP Demonstration
2002	Bent Creek Stream Restoration and Stormwater Best Management Practices	NCSU WQG	Stream Restoration

16.3 State Initiatives

16.3.1 North Carolina Ecosystem Enhancement Program

The North Carolina Ecosystem Enhancement Program (NCEEP) (formerly the North Carolina Wetlands Restoration Program) is a non-regulatory program responsible for implementing wetland and stream restoration projects throughout the state. The focus of the program is to improve watershed functions in the 17 river basins across the state by restoring wetlands, streams and riparian buffers within selected local watersheds. These vital watershed functions include water quality protection, floodwater retention, fisheries and wildlife habitat, and recreational opportunities. The NCEEP is not a grant program. Instead, the program funds local restoration projects directly through a combination of NC Department of Transportation (NCDOT) and non-NCDOT in-lieu fee programs.

Restoration sites are targeted through the development and use of Watershed Restoration Plans (formerly called "Basinwide Wetland and Riparian Restoration Plans"). The restoration plans are developed, in part, using information compiled in DWQ's Basinwide Water Quality Plans and Basinwide Assessment Reports. The NCEEP Plans evaluate resource data and existing water quality initiatives within local watersheds in order to select "Targeted Local Watersheds". Targeted Local Watersheds (TLWs) are areas with the greatest need and opportunity for stream and wetland restoration efforts, and where NCEEP resources can be most efficiently focused for maximum restoration benefit. The NCEEP Watershed Restoration Plans are updated every five years on the same timeline as DWQ's Basinwide Water Quality Plans.

The selection of TLWs (at the scale of NRCS 14-digit Hydrologic Units, or HUs) does not necessarily restrict the location of NCEEP restoration project sites. However, these targeted HUs are given higher priority than nontargeted HUs in considering the selection of NCEEP candidate restoration project sites. TLWs are simply local watersheds where stream, wetland and riparian buffer restoration projects will make the most sense in the context of overall watershed and wetlands protection.

The NCEEP can perform restoration projects cooperatively with other state or federal programs or environmental groups. For example, the NCEEP's efforts can complement projects funded through the Section 319 Program. Integrating wetlands or riparian area restoration components with Section 319-funded or proposed projects will often improve the overall water quality and habitat benefits of the project. The NCEEP actively seeks landowners within the French Broad River basin that have restorable wetland, riparian and stream sites.

For more information about the NCEEP and its Watershed Restoration Plans, contact Hal Bryson at (919) 715-7452 or visit the NCEEP website at http://www.nceep.net/.

Table 29 lists the NCEEP's TLWs (stream names and 14-digit HU codes) in the French Broad River basin. This table also indicates the pertinent factors that led to the selection of each TLW. The TLWs are selected on the basis of available data indicating the need and opportunity for local stream and wetlands restoration projects. Factors such as water quality problems, degraded aquatic habitat, cleared riparian buffers, significant natural areas or species, and increasing development pressures in the watershed are weighted heavily in determining these priority

watersheds. Also, the presence of existing or planned water quality or habitat restoration projects in the same local watershed can be a significant factor in the choice of these watersheds. In some cases, NCEEP has used the water quality information alone (e.g., use impairment, potential increases in nonpoint source pollution) to support the selection of a specific TLW. Targeted local watersheds are mapped in Figure 17.

The NCEEP is also working to develop comprehensive Local Watershed Plans. These locally-based plans develop comprehensive watershed assessments to identify causes and sources of nonpoint source impairment. They also identify and prioritize wetland areas, stream reaches, riparian buffer areas and BMPs that will provide significant water quality and habitat improvements and other environmental benefits to local watersheds. The NCEEP will coordinate with local community groups, local governments and others to develop and implement these plans.

Selection of a watershed as a TLW does not mean that a Local Watershed Plan will be initiated in that area. Local Watershed Plans are developed in areas that have extensive future mitigation needs, while TLWs are selected as part of the NCEEP planning process for the Basinwide Watershed Restoration Plans. There are currently three local watershed-planning efforts underway in the French Broad River Basin and they are described below (NCDENR-NCEEP, April 2005).

French Broad Local Watershed Plans

Local watershed planning was initiated in the Mud Creek watershed to identify watershed functional deficits and assets with an emphasis on water quality, aquatic and terrestrial habitat, and hydrology. The local watershed plan (LWP) was finished in 2003 and is included in the work plan and management strategies of the Mud Creek Watershed Restoration Council. NCEEP is scheduled to construct two wetlands and restore 2,000 linear feet of streambank in 2005. For more information about the Mud Creek watershed, refer to Section 2.3.1.

Two other watersheds targeted for LWP development are South Hominy Creek and Bald Creek. Preliminary watershed characterization studies (Phase I assessments) have been completed for both watersheds and are moving into Phase II of the planning effort. The end result will yield wetland, stream and riparian buffer enhancement and restoration projects, BMP projects, as well as policy and protection recommendations. The technical assessment for these efforts will be completed in 2005. See Sections 2.3.10 and 7.5.1, respectively, for more information on either of these watersheds.

16.3.2 Clean Water Management Trust Fund

The CWMTF offers approximately $40 million annually in grants for projects within the broadly focused areas of restoring and protecting state surface waters and establishing a network of riparian buffers and greenways. In the French Broad River basin, 38 projects have been funded for a total of $44,679,794 (Table 30). For more information on the CWMTF or these grants, call (252) 830-3222 or visit the website at www.cwmtf.net.

Table 29 NCEEP Targeted Local Watersheds (2004)

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	ORW or HQW	Aquatic NHP Elements	Existing, Projects	Muncipality(ies) Phase I or II	Resource Professional Comments
04-03-01	French Broad, Kings Creek 06010105010050	Yes	No	No	No	Yes	EEP DWQ WARP	Brevard	DWQ Biological Assessment Narrow riparian zones
04-03-01	East Fork French Broad River 06010105010040	No	No	No	Yes	Yes	SWCD	No	DWQ Biological Assessment Increasing development along Highway 276 corridor, poor quality riparian zone
04-03-02	Lower Mud Creek 06010105030030	Yes	No	No	No	No	EEP LWP	Hendersonville Phase II	
04-03-02	Clear Creek 06010105030040	Yes	Yes	No	No	No	EEP LWP	Hendersonville Phase II	
04-03-02	Upper Mud Creek 06010105030020	Yes	No	No	No	Yes	EEP LWP	Hendersonville Phase II	DWQ Biological Assessment Bat Fork (Mud Creek tributary) has 45% of streams channelized and only 15% have adequate buffer on both sides of the stream.
04-03-02	Avery Creek County Line Creek 06010105050010	No	No	No	No	Yes	EEP	Biltmore Forest Phase II	
04-03-02	South Hominy, Beaverdam 06010105060020	No	No	No	No	No	EEP LWP	No	
04-03-02	Hominy Creek 06010105060030	Yes	No	No	No	No	DWQ TMDL	Asheville Phase II	DWQ Biological Assessment Narrow riparian zone
04-03-02	Newfound Creek 06010105090020	Yes	Yes	No	No	No	SWCD TVA-IPSI	No	DWQ Biological Assessment Severe bank erosion, poor riparian buffer
04-03-02	Ross Creek 06010105070040	Yes	No	No	No	No	Pigeon River Grant Funds TVA-IPSI	Asheville Phase II	
04-03-02	Cane Creek 06010105040010	Yes	Yes	No	No	Yes		No	
04-03-02	Upper Swannanoa 06010105070020	Yes	Yes	No	No	Yes		Black Mountain Phase II	

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	ORW or HQW	Aquatic NHP Elements	Existing, Planned Projects	Muncipality(ies) Phase I or II	Resource Professional Comments
04-03-02	Swannanoa River 06010105070030	Yes	No	Yes	No	No	319 funds CWMTF TVA-IPSI	Asheville Phase II	
04-03-03	Mills River 06010105020020	Yes	Yes	Yes	No	Yes	DWQ TMDL 319 funds	No	
04-03-04	Little Ivy Creek 06010105110020	Yes	No	Yes	Yes	Yes	DWQ TMDL, TVA-IPSI	No	DWQ Biological Assessment Minimal riparian buffers
04-03-05	East Fork Pigeon River 06010106010010	No	No	Yes	No	Yes		No	Public Interest in restoration projects due to 2004 hurricane/flood damage
04-03-05	Crabtree Creek 06010106020010	No	No	No	No	No	Pigeon River Trust Fund (Ag BMPs)	No	DWQ Biological Assessment Degraded riparian zones
04-03-05	Fines Creek 06010106020040	Yes	No	No	No	No	Haywood Waterways Association (Ag BMPs)	No	DWQ Biological Assessment Fish community shows evidence of chronic impairment
04-03-05	Upper Richland Creek 06010105030010	Yes	No	Yes	Yes	Yes	CWMTF (watershed acquisition)	Waynesville Phase II	
04-03-05	Richland Creek Plott Creek, Hyatt Creek 06010106030010	Yes	Yes	No	No	No	CWMTF (restoration)	Waynesville Phase II	DWQ Biological Assessment Habitat degradation
04-03-05	Jonathan Creek 06010106020030	No	No	Yes	No	Yes		No	DWQ Biological Assessment Cattle access. Poor riparian buffers
04-03-06	Cane Creek 06010108040010	Yes	Yes	No	No	Yes		No	
04-03-06	Jacks Creek 06010108050010	Yes	No	No	No	No		No	DWQ Biological Assessment Open canopy, poor riparian buffers
04-03-06	Upper North Toe River 06010108010010	No	No	No	No	No		No	Equinox Env. Consultants Poor riparian buffers

Subbasin	Local Watershed Name and HU code	Impaired Stream(s)	Downward Trend in W. Quality	Public Water Supply	ORW or HQW	Aquatic Elements	Existing, Planned Projects	Muncipality(ies) Phase I or II	Comments
04-03-06	Middle North Toe River 06010108010020	No	No	Yes	No	Yes		No	Equinox Env. Consultants Poor riparian buffers
04-03-06	North Toe River 06010108010030	Yes	Yes	Yes	Yes	Yes		No	
04-03-06	Big Rock Creek 06010108060010	No	No	No	No	Yes	NCWRC	No	DWQ Biological Assessment Narrow riparian buffers
04-03-07	Price Creek 06010108080010	No	No	No	No	Yes		No	
04-03-07	Bald Mountain Creek 06010108080020	No	No	No	No	Yes	LWP	No	

Figure 17 EEP Targeted Watersheds Map of the French Broad River Basin

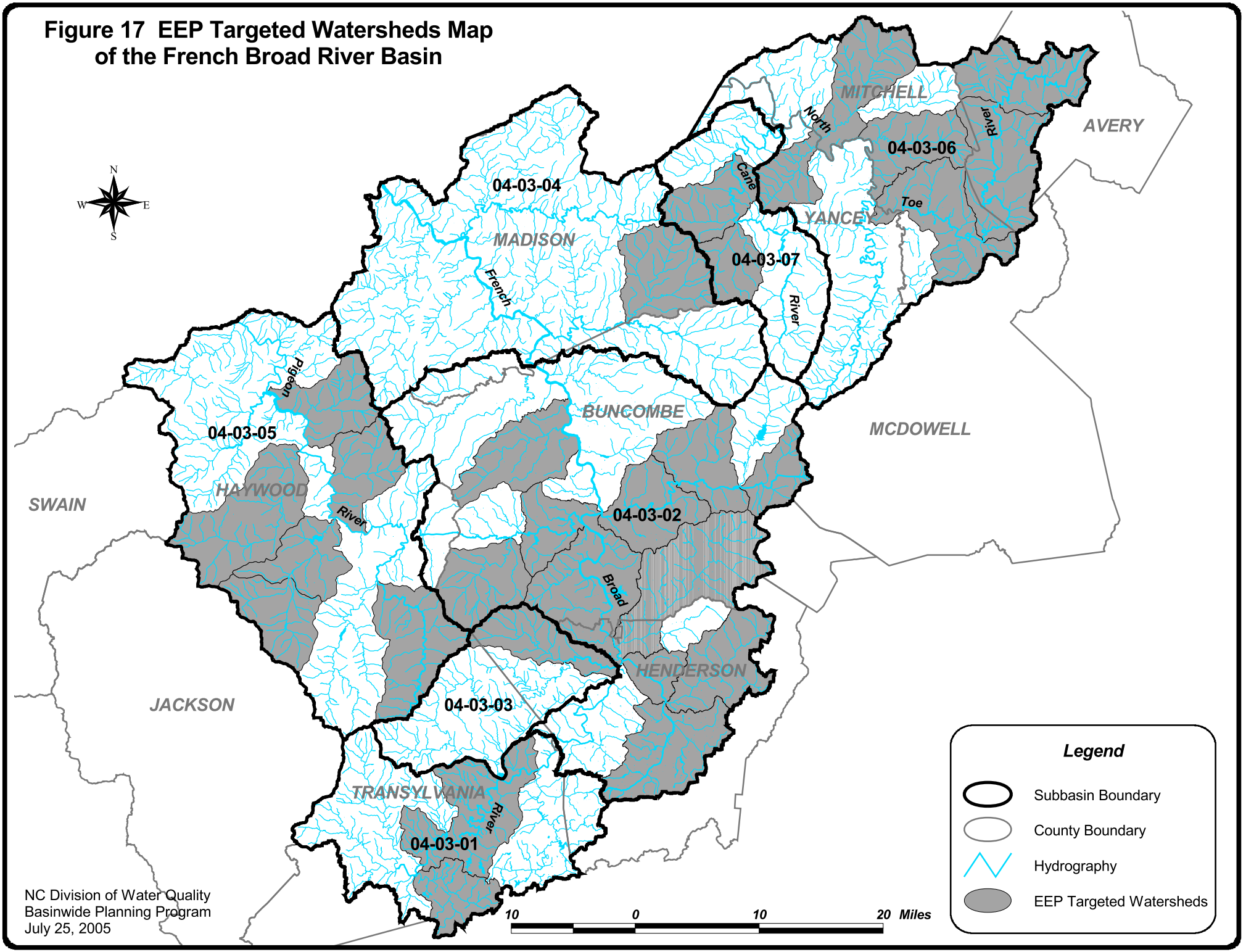


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Table 30 Projects in the French Broad River Basin Funded by the Clean Water Management Trust Fund (December 2003)

Project Number	Application Name	Proposed Project Description	Amount Funded
1997A-012	Waynesville - Acquisition / Allens Creek	Acquire 379 acres of land in a water supply watershed (Allens Ck in French Broad River basin)	$500,000
1997A-030	Buncombe Co SWCD Nonpoint Source Plan / Newfound Creek	Fund a Resource Coordinator position in the Newfound Creek watershed to inventory nonpoint sources of pollution and coordinate implementation of best management practices.	$118,866
1997A-045	Riverlink – Acq and Greenway / French Broad River	Acquire through fee simple purchase 30 acres along the French Broad River and develop a riparian greenway along it.	$250,000
1997A-138	Land of Sky COG – Acq Planning / French Broad River	Establish a riparian corridor protection team for the French Broad River. Team will assess current conditions along the river corridor, develop a plan for preserving and managing the corridor, and lay the groundwork for future riparian acquisitions.	$110,000
1997B-404	NC Council of Trout Unlimited – S Fk Mills River Trail Restoration	Eliminate runoff and chronic sedimentation from about 20 miles of South Fork Mills River Trail.	$25,000
1997B-604	Village of Flat Rock – Wastewater Collection System / King Creek	Construct sewer collection system (184,000 GPD) to eliminate over 400 failing septic systems and 4 private wastewater treatment plants. Waste will be pumped to the City of Hendersonville's WWTP.	$551,695
1997B-613	Madison County – Revolving Fund / Failing Septic Systems	Funds a revolving loan and grant fund for the repair of failing septic tanks and straight piping throughout the county. Anticipates repair or replacement of 150 systems for low-moderate income families in proximity to surface waters.	$903,000
1998A-201	Conservation Fund - Crawford Creek Conservation Easements	Acquire through permanent conservation easements 885 acres along Crawford Creek.	$1,148,000
1998A-416	NCSU – Stream Restoration / Upper French Broad River and tribs	Restore streams and install stormwater control at four sites along HWQ and ORW waters of French Broad River.	$300,000
1998A-605	Toe R. Health District – Revolving Fund / Failing Septic Systems	Capitalize a revolving loan fund to repair failing septic tanks and straight piping, within 500 feet of relatively high quality waters in three economically distressed counties (Avery, Yancey and Mitchell). Initial goal of fixing 150 systems.	$791,500
1998B-007	NC Wildlife Resources Commission – Acq / Lake Logan	Acquire through fee simple purchase 4,374 acres around Lake Logan and its tributaries. CWMTF funds would be used to purchase 500-foot buffers (2,158 acres) along the tributaries to Lake Logan.	$3,800,000
1998B-302	Madison Co DSWC – Beef Cattle BMPs / Little Ivy River	Install livestock watering systems, stabilize streambanks, and construct feed and waste management structures.	$400,000

1998B-303	Reg Water Auth Asheville and Carolina Mtn Land Conserv - Acq/Restor / NPS Mgmt – Mills River	Acquire 50 acres of buffer, replace streamside pesticide mixing stations with state-of-art pesticide handling facilities outside the floodplain, and revegetate over 7 miles of buffer in Mills River watershed.	$730,000
1998B-701	Elisha Mitchell Audubon Soc - Wetland Restor / Beaverdam Creek	Remove stormwater culvert and construct wetlands to treat parking lot drainage (12+ acres). Also restore existing wetlands and ecotones.	$139,700
1999A-005	NC Div Forest Resources - Dupont Forest Acq / Little River	Acquire through fee simple purchase 2,223 acres in the DuPont State Forest along the Little River and its tributaries.	$24,600,000
1999A-408	Land of Sky COG - Acq / Planning / Restoration Design / French Broad	Acquire 53 acre Gordan Tract. Stabilize 1,500 feet of streambank. Funds to prepare streambank stabilization designs for additional sites.	$388,025
1999B-502	Hendersonville – WWTP Upgrade / Collection Sys Construction	Design and construct expanded 4.8-MGD WWTP. Provide tie-on to 14 or more permitted WWTPs and rescind permits. Tie on at least 400 currently operated septic tanks. Relocate and improve city's main pump station at Berkeley Rd.	$627,000
2000A-401	Madison County – Bank Stabilization / Barnard Park	Harden and stabilize 320 linear feet of eroding streambank using bio-engineering methods. Establish or enhance vegetation along 600 feet of the French Board River.	$50,000
2000A-402	Marshall - Bank Stabilization / French Broad River	Stabilize 1,400 feet of riverbank on the downstream half of Blannahassett Island in the French Broad River.	$338,598
2000A-604	Henderson County – Wastewater Collection System	Extend sewer service (3.2 miles) to unsewered areas of the Mills River watershed by collecting wastewater from 5 small WWTPs and providing sewer service to an area with high septic failure rate.	$500,000
2000B-017	Riverlink – Greenway Feasibility Study / French Broad River	Conduct planning and preacquisition activities on 10 contiguous tracts along the French Broad River. Section options and/or appraisal on northern-most tracts.	$25,000
2000B-018	Southern Appalachian Highlands Conservancy – Fall Branch / Roaring Creek Acq	Acquire through fee simple purchase 184 acres along Fall Branch and Roaring Creek.	$333,280
2000B-402	Southwestern NC RC&D – Stream Rest and Storm / Lake Junaluska	Restore 11,500 feet of stream (natural channel design). Construct stormwater demonstration project, eliminate 5 animal access points to streams, and monitor sediment in Richland Creek.	$677,555
2000B-411	Univ Botan Gardens at Asheville – Restoration / Stormwater	Design and construct natural channel design stream restoration project along 2,300 feet of stream. Design and construct water detention structure to filter UNCA campus runoff.	$100,000
2000B-803	Transylvania Co SWCD - Watershed Assessment / Little River	Conduct an inventory along 4.9 miles of the Little River that specifies stream restoration and best management practice (BMP) needs. Prioritize stream restoration and BMP opportunities.	$25,000

2000M-001	Environmental and Conservation Organization Minigrant	Provide funds to cover preacquisition costs for 75 acres that border Bat Fork.	$19,600
2001B-046	Richard L. Hoffman Foundation – Acquisition / White Oak Creek	Acquire through fee simple purchase 197 acres along the White Oak Creek. Includes greenway, environmental educational park, and water quality demonstration components.	$94,000
2001B-405	RiverLink – Restoration / Swannanoa River	Restore streambanks along 10,000 linear feet of the Swannanoa River; establish 29 acres of riparian buffers using permanent conservation easements; and monitor water quality.	$1,508,000
2002A-028	Southern Appalachian Highlands Conservancy – Acq / Rough Creek	Acquire permanent conservation easement on 870 acres along Rough Creek. CWMTF funds would purchase easement on 416 riparian acres.	$689,000
2002B-003	Blue Ridge Rural Land Trust – Acq / French Broad Tracts	Provide funds to cover transaction costs for donated conservation easements on two tracts. A total of 290 acres will be put under permanent conservation easments along the Isaacs Branch and the South Toe River.	$100,000
2002B-401	Buncombe SWC District – Restoration / Newfound Creek	Fund a two-year effort to install best management practices for agricultural and urban sources of sediment and fecal coliform bacteria in the Newfound Creek watershed.	$415,000
2002B-704	UNC Asheville – Stormwater / French Broad River	Construct a stormwater wetland on the UNC-Asheville campus to treat drainage from 81 acres that flows to the French Broad River. Monitor water quality results.	$70,000
2003A-039	Southern Appalachians Highlands Conservancy – Acq / Flat Creek Watershed	Purchase a permanent conservation easement on 2,463 acres along Flat Creek, Slaty, Little Slaty Big Piney and Little Piney Branches. Property has over 15 miles of HQW streams and is adjacent to the Pisgah National Forest.	$3,928,000
2003A-405	Southwestern NC RC&D, Inc. – Rest / Pigeon River	Design, permit and prepare easements for natural channel stream restoration on 3,870 linear feet of Richlands Creek and the Pigeon River. Includes design cost of a stormwater wetland.	$207,000
		Total Funded	**$44,679,794**

Notes:

(1) The total funded amount excludes funded projects that were subsequently withdrawn by the applicant.

(2) Several regional and statewide projects were funded in areas that include the French Broad River basin. The projects include various riparian corridor planning projects, a straight pipe and septic system discharge elimination program and a Watershed Assessment and Restoration Program.

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Appendix I

Population and Growth Trends in the French Broad River Basin

Population and Growth Trends

Below are three different ways of presenting population information for the French Broad River basin. Population estimates are first presented for the entire basin using 2000 county population data and estimates of the percentage of the county within each subbasin. County population data are presented to project county growth estimates based on Office of State Planning information (June and September 2004). Data presented by municipality summarize information on past growth of large urban areas in the basin. While the three different sets of information cannot be directly compared, general conclusions are apparent by looking at the information. Counties with the highest expected growth are associated with the largest municipal areas and the most densely populated subbasins in the basin.

Basin Population and Population Density

Information on basin population and subbasin population density is useful in determining which streams are likely to exhibit more impacts as a result of population growth. This information is presented to estimate overall river basin population and population density by subbasin. It is assumed that county populations (as presented below) are distributed evenly throughout each county; therefore, subbasins that are within counties with large urban areas may overestimate the actual population in that portion of the basin. The overall population of the basin based on 2000 census block data is 393,795, with approximately 139 persons/square mile. Population density estimated by subbasin is presented in the following map.

County Population and Growth Trends

Information on county population projections is presented here for counties that are wholly or partly contained within the basin; however, river basin boundaries do not directly coincide with county boundaries. Therefore, this information is intended to present only an estimate of expected population growth in counties that have some land area in this basin. For more information on county population estimates, contact the Office of State Planning website at http://demog.state.nc.us/.

County	Percent of County in Basin ♦	1990 Population	2000 Population	Estimated % Growth 1990-2000	Estimated Population 2020	Estimated % Growth 2000-2020
Avery	38	14,867	17,167	13.4	20,523	16.4
Buncombe	93	174,357	206,310	15.5	268,001	23.0
Haywood	100	46,948	54,033	13.1	66,059	18.2
Henderson	71	69,747	89,193	21.8	127,044	29.8
Madison	100	16,953	19,635	13.7	23,972	18.1
Mitchell	100	14,433	15,687	8.0	17,508	10.4
Transylvania	82	25,520	29,334	13.0	33,997	13.7
Yancey	100	15,419	17,774	13.2	21,145	15.9
Subtotals		378,244	449,133	15.8	578,249	22.3

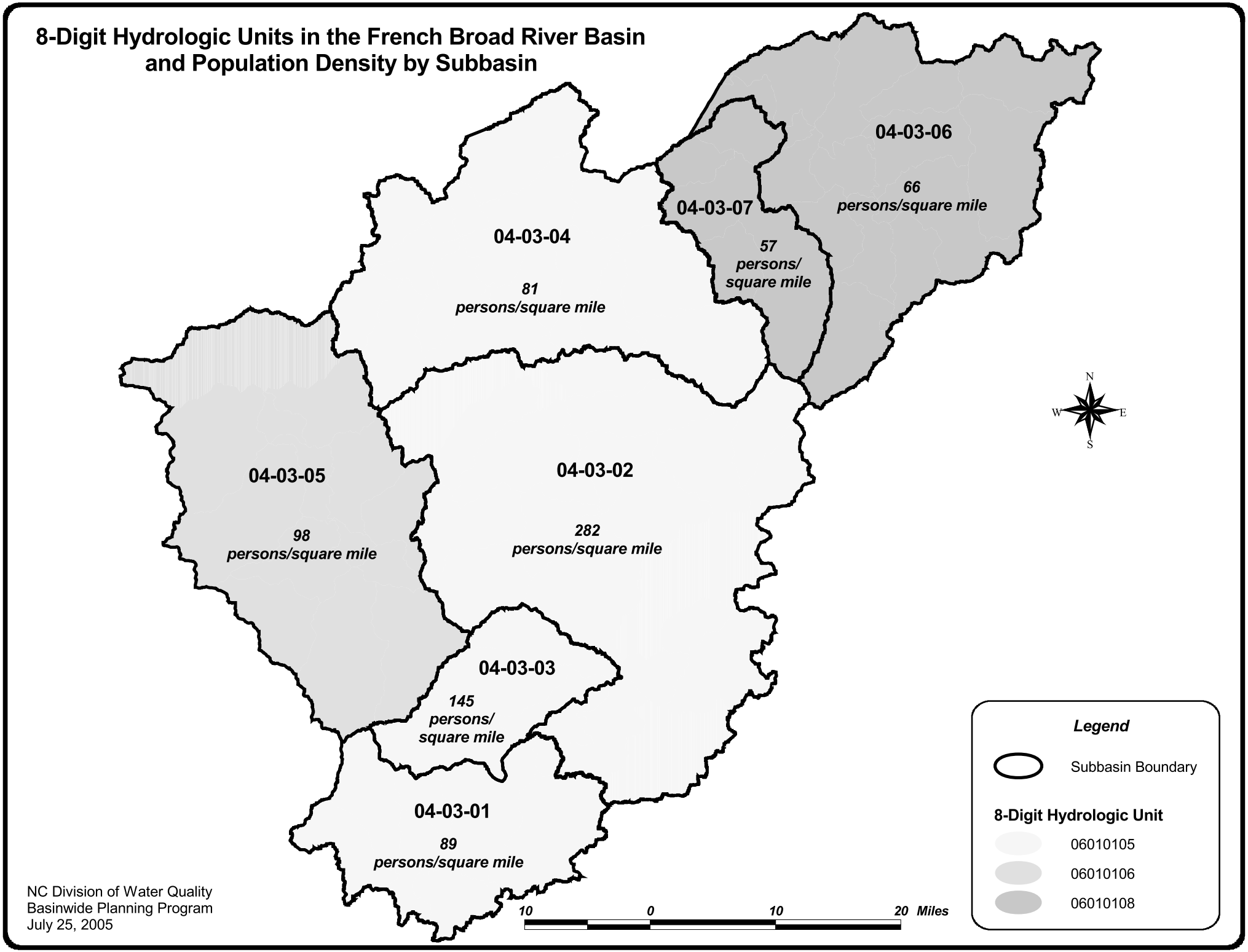
♦ Source: North Carolina Center for Geographic Information and Analysis (CGIA), 1997.

Municipal Population and Growth Trends

The table below presents population data from Office of State Planning for municipalities with populations greater than 2,000 persons, located wholly or partly within the basin. These data represent 12 of the 24 municipalities in the basin.

Municipality	County	1980 Population	1990 Population	2000 Population	Percent Change (1980-90)	Percent Change (1990-2000)
Asheville	Buncombe	54,022	61,855	68,889	14.5	11.4
Black Mountain	Buncombe	4,083	5,533	7,511	35.5	35.7
Brevard	Transylvania	5,323	5,388	6,789	1.2	26.0
Canton	Haywood	4,631	3,790	4,029	-18.2	6.3
Flat Rock	Henderson	…..	1,619	2,565	…..	58.4
Fletcher	Henderson	2,233	2,787	4,185	24.8	50.2
Hendersonville	Henderson	6,862	7,284	10,569	6.1	45.1
Mars Hill	Madison	2,126	1,611	1,764	-24.2	9.5
Spruce Pine	Mitchell	2,282	2,010	2,030	-11.9	1.0
Waynesville	Haywood	8,576	8,438	9,232	-1.6	9.4
Weaverville	Buncombe	1,495	2,107	2,416	40.9	14.7
Woodfin	Buncombe	3,260	2,736	3,162	-16.1	15.6

- - The numbers reported reflect municipality population; however, these municipalities are not entirely within the basin. The intent is to demonstrate growth for municipalities located wholly or partially within the basin.


8-Digit Hydrologic Units in the French Broad River Basin
and Population Density by Subbasin
04-03-06
66
persons/square mile
04-03-07
57
persons/
square mile
04-03-04
81
persons/square mile
04-03-05
98
persons/square mile
04-03-02
282
persons/square mile
04-03-03
145
persons/
square mile
04-03-01
89
persons/square mile
N
W
E
S
10
0
10
20 Miles
Legend
Subbasin Boundary
8-Digit Hydrologic Unit
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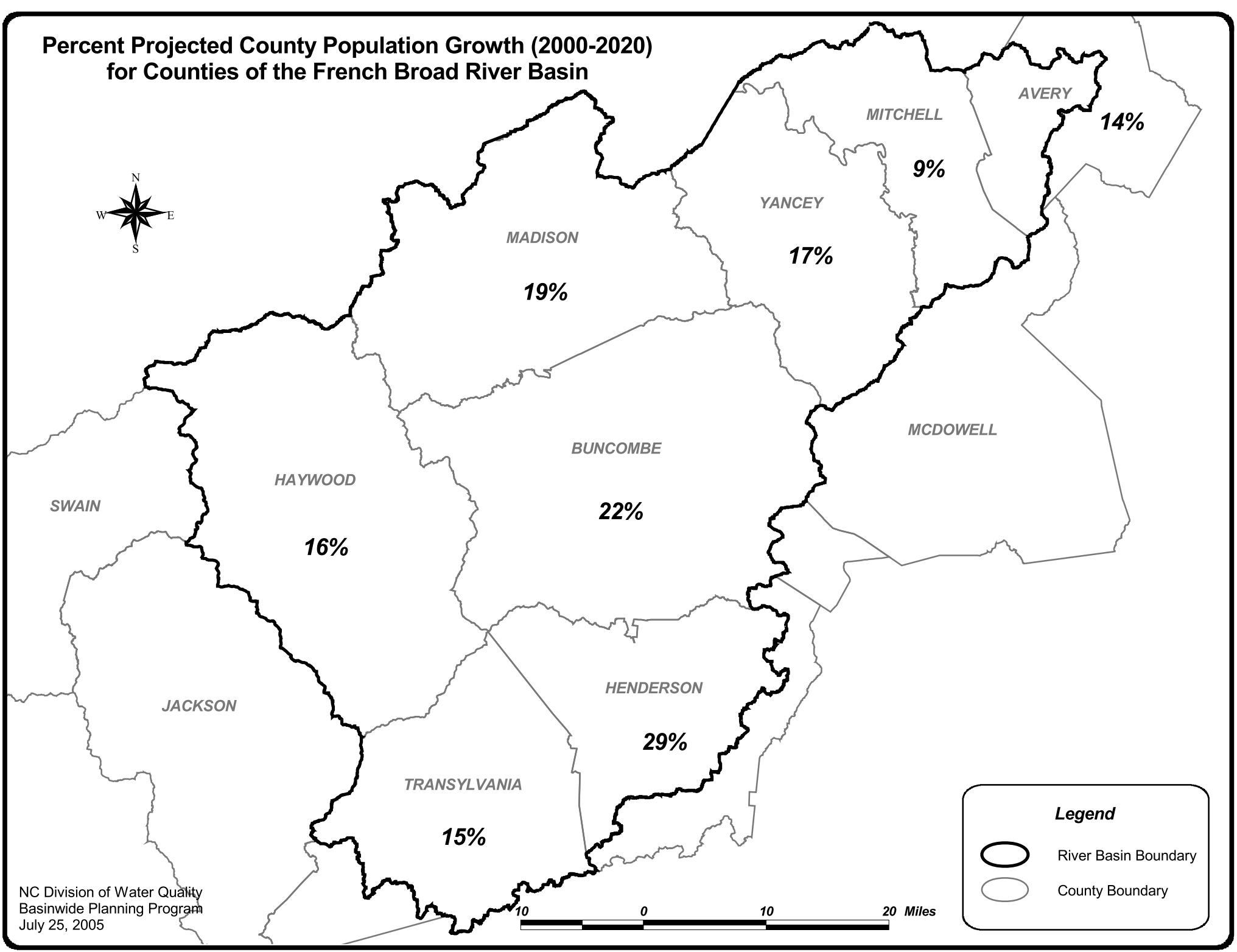
NC Division of Water Quality
Basinwide Planning Program
July 25, 2005

Percent Projected County Population Growth (2000-2020) for Counties of the French Broad River Basin



Appendix II

Local Governments and Planning Jurisdictions in the French Broad River Basin

Local Governments and Planning Jurisdictions in the Basin

The French Broad River basin encompasses all or portions of eight counties and 24 municipalities. The following table provides a listing of these local governments, along with the regional planning jurisdiction (Council of Governments). Only one municipality is located in more than one major river basin.

County	Region	Municipalities
Avery	D	Newland, Sugar Mountain*
Buncombe	B	Asheville, Biltmore Forest, Black Mountain, Montreat, Weaverville, Woodfin
Haywood	A	Canton, Clyde, Maggie Valley, Waynesville
Henderson	B	Flat Rock, Fletcher, Hendersonville, Laurel Park
Madison	B	Hot Springs, Mars Hill, Marshall
Mitchell	D	Bakersville, Spruce Pine
Transylvania	B	Brevard, Rosman
Yancey	D	Burnsville

* Located in more than one major river basin.

Note: Counties adjacent to and sharing a border with a river basin are not included as part of that basin if only a trace amount of the county (<2 percent) is located in that basin, unless a municipality is located in that county.

Region	Name	Location
A	Southwestern Commission	Bryson City
B	Land of the Sky Regional Council	Asheville
D	High Country Council of Governments	Boone

Appendix III

Land Cover
in the
French Broad River Basin

Land Cover

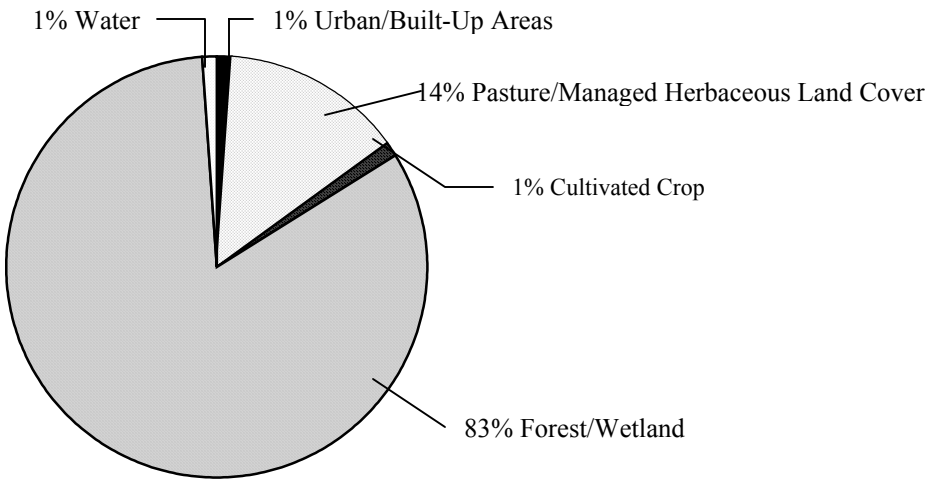
Land cover can be an important way to evaluate the effects of land use changes on water quality. Unfortunately, the tools and database to do this on a watershed scale are not yet available. The information below describes two different ways of presenting land cover in the French Broad River basin.

Land cover information from the North Carolina Center for Geographic Information and Analysis (CGIA) is useful in providing a snapshot of land cover in the basin from 1993 to 1995. This information is also available in a GIS format so it can be manipulated to present amounts of the different land covers by subbasin or at the watershed scale. Land cover information from the National Resources Inventory (NRI) published by the Natural Resource Conservation Service (NRCS) is presented only at a larger scale (8-digit hydrologic unit), but the collection methods allow for between year comparisons. The two datasets cannot be compared to evaluate land cover data. This information is presented to provide a picture of the different land covers and some idea of change in land cover over time. In the future, it is hoped that land cover information like the GIS formatted dataset will be developed to make more meaningful assessments of the effects of land use changes on water quality. This dataset would also be useful in providing reliable and small-scale information on land cover changes that can be used in water quality monitoring, modeling and restoration efforts.

Center for Geographic Information and Analysis (CGIA) Land Cover

The North Carolina Corporate Geographic Database contains land cover information for the French Broad River basin based on satellite imagery from 1993-1995. CGIA developed 24 categories of statewide land cover information. For the purposes of this report, those categories have been condensed into five broader categories as described in the table below. The chart of the following page provides an illustration of the relative amount of land area that falls into each major cover type for the French Broad River basin.

Land Cover Type	Land Cover Description
Urban	Greater than 50 percent coverage by synthetic land cover (built-upon area) and municipal areas.
Cultivated Cropland	Areas that are covered by crops that are cultivated in a distinguishable pattern.
Pasture/Managed Herbaceous	Areas used for the production of grass and other forage crops and other managed areas such as golf courses and cemeteries. Also includes upland herbaceous areas not characteristic of riverine and estuarine environments.
Forest/Wetland	Includes salt and freshwater marshes, hardwood swamps, shrublands and all kinds of forested areas (such as needleleaf evergreens, deciduous hardwoods).
Water	Areas of open surface water, areas of exposed rock, and areas of sand or silt adjacent to tidal waters and lakes.



National Resources Inventory (NRI) Land Cover Trends

Land cover information in this section is from the most current NRI, as developed by the NRCS (USDA-NRCS, June 2001). The NRI is a statistically based longitudinal survey that has been designed and implemented to assess conditions and trends of soil, water and related resources on the Nation's nonfederal rural lands. The NRI provides results that are nationally and temporally consistent for four points in time -- 1982, 1987, 1992 and 1997.

In general, NRI protocols and definitions remain fixed for each inventory year. However, part of the inventory process is that the previously recorded data are carefully reviewed as determinations are made for the new inventory year. For those cases where a protocol or definition needs to be modified, all historical data must be edited and reviewed on a point-by-point basis to make sure that data for all years are consistent and properly calibrated. The following excerpt from the *Summary Report: 1997 National Resources Inventory* provides guidance for use and interpretation of current NRI data:

> *The 1997 NRI database has been designed for use in detecting significant changes in resource conditions relative to the years 1982, 1987, 1992 and 1997. All comparisons for two points in time should be made using the new 1997 NRI database. Comparisons made using data previously published for the 1982, 1987 or 1992 NRI may provide erroneous results because of changes in statistical estimation protocols, and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected.*

The following table summarizes acreage and percentage of land cover from the 1997 NRI for the major watersheds within the basin, as defined by the USGS 8-digit hydrologic units, and compares the coverages to 1982 land cover. Definitions of the different land cover types are also presented.

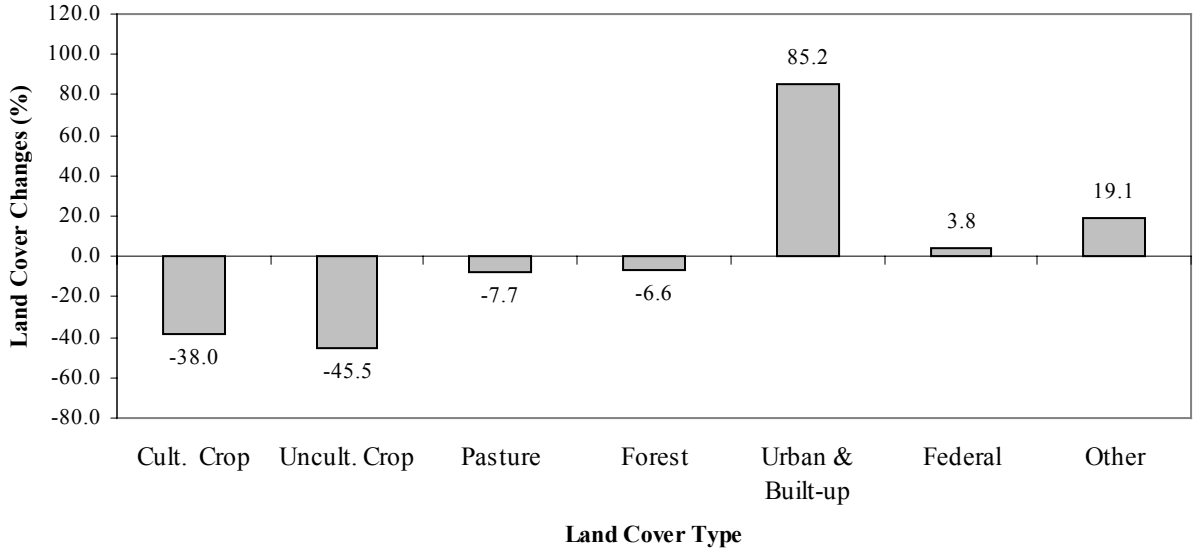
LAND COVER	MAJOR WATERSHED AREAS: Upper French Broad River Acres (1000s)	%	Pigeon River Acres (1000s)	%	Nolichucky River Acres (1000s)	%	1997 TOTALS Acres (1000s)	% of TOTAL	1982 TOTALS Acres (1000s)	% of TOTAL	% change since 1982
Cult. Crop	36.8	3.5	1.6	0.5	0.0	0.0	38.4	2.1	61.9	3.4	-38.0
Uncult. Crop	13.3	1.3	3.5	1.0	2.0	0.5	18.8	1.0	34.5	1.9	-45.5
Pasture	148.6	14.1	39.6	11.2	29.0	7.3	217.2	12.0	235.2	13.0	-7.7
Forest	484.2	46.0	117.6	33.2	243.8	61.3	845.6	46.9	905.1	50.2	-6.6
Urban & Built-Up	141.6	13.5	30.6	8.6	23.4	5.9	195.6	10.8	105.6	5.9	85.2
Federal	184.1	17.5	152.7	43.1	79.5	20.0	416.3	23.1	401.2	22.2	3.8
Other	44.1	4.2	8.3	2.3	19.9	5.0	72.3	4.0	60.7	3.4	19.1
Totals	1052.7	100.0	353.9	100.0	397.6	100.0	1804.2	100.0	1804.2	100.0	
% of Total Basin		58.3		19.6		22.0		100.0			
SUBBASINS	04-03-01 04-03-02 04-03-03 04-03-04		04-03-05		04-03-06 04-03-07						
8-Digit Hydraulic Units	06010105		06010106		06010108						

* Watershed areas as defined by the 8-Digit Hydraulic Units do not necessarily coincide with subbasin titles used by DWQ.
Source: USDA, Soil Conservation Service - 1982 and 1997 NRI

Type	Description
Cultivated Cropland	Harvestable crops including row crops, small-grain and hay crops, nursery and orchard crops, and other specialty crops.
Uncultivated Cropland	Summer fallow or other cropland not planted.
Pastureland	Includes land that has a vegetative cover of grasses, legumes and/or forbs, regardless of whether or not it is being grazed by livestock.
Forestland	At least 10 percent stocked (a canopy cover of leaves and branches of 25 percent or greater) by single-stemmed trees of any size which will be at least 4 meters at maturity, and land bearing evidence of natural regeneration of tree cover. The minimum area for classification of forestland is 1 acre, and the area must be at least 1,000 feet wide.
Urban and Built-up Areas	Includes airports, playgrounds with permanent structures, cemeteries, public administration sites, commercial sites, railroad yards, construction sites, residences, golf courses, sanitary landfills, industrial sites, sewage treatment plants, institutional sites, water control structure spillways and parking lots. Includes highways, railroads and other transportation facilities if surrounded by other urban and built-up areas. Tracts of less than 10 acres that are completely surrounded by urban and built-up lands.
Other	*Rural Transportation*: Consists of all highways, roads, railroads and associated rights-of-way outside urban and built-up areas; private roads to farmsteads; logging roads; and other private roads (but not field lanes). *Small Water Areas*: Waterbodies less than 40 acres; streams less than 0.5 mile wide. *Census Water*: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than 0.5 mile in width. *Minor Land*: Lands that do not fall into one of the other categories.

Source: USDA, Soil Conservation Service - 1982 and 1997 NRI

Data from 1982 are also provided for a comparison of change over 15 years. During this period, urban and built-up land cover increased by 90,000 acres. Uncultivated cropland and pastureland decreased by 34,000 acres. Forest and cultivated cropland cover significantly decreased by 60,000 and 24,000 acres, respectively. Most land cover change is accounted for in the Upper French Broad River hydrologic unit that includes rapidly growing areas in Buncombe and Henderson counties. Below is a graph that presents changes in land cover between 1982 and 1997.



Source: USDA-NRCS, NRI, updated June 2001

Appendix IV

DWQ Water Quality Monitoring Programs in the French Broad River Basin

DWQ Water Quality Monitoring Programs in the French Broad River Basin

Staff in the Environmental Sciences Branch (ESB) and Regional Offices of DWQ collect a variety of biological, chemical and physical data. The following discussion contains a brief introduction to each program, followed by a summary of water quality data in the French Broad River basin for that program. For more detailed information on sampling and assessment of streams in this basin, refer to the *Basinwide Assessment Report* for the French Broad River basin, available from the Environmental Sciences Branch website at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

DWQ monitoring programs for the French Broad River Basin include:

- Benthic Macroinvertebrates
- Fish Assessments
- Aquatic Toxicity Monitoring
- Lake Assessment
- Ambient Monitoring System

Benthic Macroinvertebrate Monitoring

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since macroinvertebrates have life cycles of six months to over one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification to each benthic sample based on the number of different species present in the pollution intolerant groups of Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies), commonly referred to as EPTs. A Biotic Index (BI) value gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (mountains, piedmont, coastal plain and swamp) within North Carolina and bioclassifications fall into five categories: Excellent, Good, Good-Fair, Fair and Poor.

Overview of Benthic Macroinvertebrate Data

There were 57 benthic samples collected during this assessment period. The following table lists the total bioclassifications (by subbasin) for all benthos sites in the French Broad River basin. Benthos sampling may slightly overestimate the proportion of Fair, Poor and Severe stress sites, as DWQ special studies often have the greatest sampling intensity (number of sites/stream) in areas where it is believed that water quality problems exist. Many streams also ceased flowing during the summer drought of 2002. For detailed information regarding the samples collected during this assessment period, refer to the tables at the end of this appendix.

Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent rating for each site) in the French Broad River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
04-03-01	4	1	1	0	0		6
04-03-02	0	3	4	6	1		14
04-03-03	2	1	2	0	0		5
04-03-04	3	3	3	0	0		9
04-03-05	5	3	5	0	1		14
04-03-06	3	3	0	1	0		7
04-03-07	2	0	0	0	0		2
Total (#)	**19**	**14**	**15**	**7**	**2**		**57**
Total (%)	**33.3**	**24.6**	**26.3**	**12.3**	**3.5**		100

Assessing Benthic Macroinvertebrate Communities in Small Streams

The benthic macroinvertebrate community of small streams is naturally less diverse than the streams used to develop the current criteria for flowing freshwater streams. The benthic macroinvertebrate database is being evaluated and a study to systematically look at small reference streams in different ecoregions is being developed with the goal of finding a way to evaluate water quality conditions in such small streams.

Presently, a designation of Not Impaired may be used for flowing waters that are too small to be assigned a bioclassification (less than 4 meters in width) but meet the criteria for a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria. This designation will translate into a use support rating of Supporting. However, DWQ will use the monitoring information from small streams to identify potential impacts to small streams even in cases when a use support rating cannot be assigned.

DWQ will use this monitoring information to identify potential impacts to these waters even though a use support rating is not assigned. DWQ will continue to develop criteria to assess water quality in small streams.

Fish Assessments

Historical studies of fish communities in the French Broad River basin were conducted primarily by the North Carolina Wildlife Resources Commission (NCWRC) in the 1960s and late 1970s. Several streams were sampled by DWQ during the past basinwide planning cycle (1994), and two samples were collected in 1999. Scores are assigned to these samples using the North Carolina Index of Biotic Integrity (NCIBI). The NCIBI uses a cumulative assessment of twelve parameters or metrics. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score.

Overview of Fish Community Data

Fish community samples have been collected at 22 sites in the French Broad River basin during this assessment period. The following table lists the most recent ratings since 1990, by subbasin, for all fish community sites. For detailed information regarding the samples collected during this assessment period, refer to the tables at the end of this Appendix.

Summary of NCIBI Categories for All Freshwater Fish Community Sites (using the most recent rating for each site) in the French Broad River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
04-03-01	0	1	1	0	0		2
04-03-02	0	8	1	0	2		11
04-03-03	0	1	0	0	0		1
04-03-04	2	0	1	0	0		3
04-03-05	0	0	1	1	1		3
04-03-06	1	0	0	1	0		2
04-03-07	0	1	0	0	0		1
Total (#)	**3**	**11**	**4**	**2**	**3**		**23**
Total (%)	**13.0**	**47.8**	**17.4**	**8.7**	**13.0**		100.0

French Broad River Basin Fish Kills

DWQ has systematically tracked reported fish kill events across the state since 1996. From September 1,1997 to August 31,2002, DWQ field investigators reported 5 fish kill events in the French Broad River basin.

Total fish mortality was relatively low in this basin, as all fish kills were caused by an identified event. The largest fish kill event in the basin occurred in 1998 when rapid draining of Lake Junaluska for maintenance work caused a kill of 50,000 bass, sunfish, carp, catfish and goldfish. The rapid drop in the lake level caused silt suspension and decreased levels of dissolved oxygen (DO) and resulted in a kill below the dam in Richland Creek. For more information on fish kills in North Carolina, refer to http://www.esb.enr.state.nc.us/Fishkill/fishkillmain.htm

Overview of Fish Tissue Sampling

There is only one site where fish tissue sampling is conducted in the French Broad River basin. Blue Ridge Paper Products, Inc. (formerly Champion International Corporation) and Progress Energy (formerly Carolina Power & Light Company) perform annual monitoring of fish tissue for dioxins in the Pigeon River watershed including Walters Lake as a requirement of their NPDES permit and FERC license. The purpose of this long-term monitoring program is to determine if concentrations of dioxin (TCDD) and furan in several fish species would decline after the implementation in 1989 of the dioxin reduction program at Blue Ridge Paper 's bleached Kraft pulp and paper mill. The mill is located on the Pigeon River in the Town of

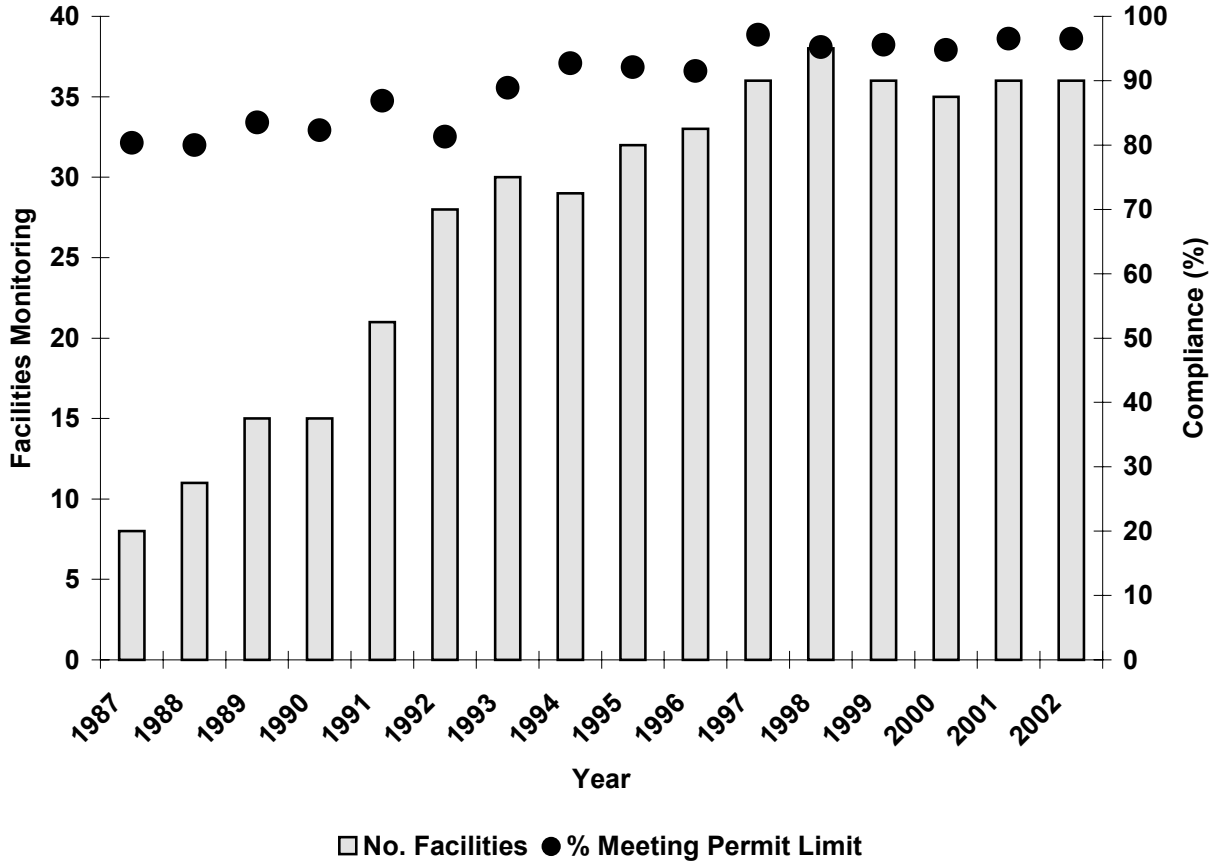
Canton, 20.7 miles upstream of Walters Lake. Common carp still exceed the North Carolina Department of Health and Human Services value of 4.0 ppt in issuing fish consumption advisories. There is still a state issued consumption advisory on common carp in the Pigeon River between Canton and the North Carolina-Tennessee state line. Monitoring of common carp will continue until the advisory is lifted. More detailed information regarding this advisory can be found in subbasin 04-03-05 (Chapter 5).

Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity (WET) by their NPDES permit or by administrative letter. Other facilities may also be tested by DWQ's Aquatic Toxicology Unit (ATU). Per Section 106 of the Clean Water Act, the ATU is required to test at least 10 percent of the major discharging facilities over the course of the federal fiscal year (FFY). However, it is ATU's target to test 20 percent of the major dischargers in the FFY. This means that each major facility would get evaluated over the course of their five-year permit. There are no requirements or targets for minor dischargers.

The ATU maintains a compliance summary for all facilities required to perform tests and provides monthly updates of this information to regional offices and DWQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

Forty-three NPDES permits in the French Broad River basin currently require WET testing. Thirty-seven permits have a WET limit; the other six facilities permits specify monitoring but do not have a limit. Across the state, the number of facilities required to perform WET has increased steadily since 1987, the first year that WET limits were written into permits in North Carolina. Consequently, compliance rates have also risen. Since 1996, the compliance rate has stabilized at approximately 90 percent. The following graph summaries WET monitoring compliance in the French Broad River basin from 1987 to 2002. Facilities with toxicity problems during the most recent two-year review period are discussed in subbasin chapters.



Lakes Assessment Program

Six lakes in the French Broad River basin (Lake Julian, Burnett Reservoir, Lake Kenilworth, Allen Creek Reservoir, Lake Junaluska and Walters Lake) were sampled as part of the Lakes Assessment Program in summer of 2002. Lakes with noted water quality impacts are discussed in the appropriate subbasin chapter.

Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collections of physical and chemical water quality data. North Carolina has more than 378 water chemistry monitoring stations statewide, including 25 stations in the French Broad River basin. Between 23 and 32 parameters are collected monthly at each station. The locations of these stations are listed in the following table and shown on individual subbasin maps. Notable ambient water quality parameters are discussed in the subbasin chapters. Refer to *2003 French Broad River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html for more detailed analysis of ambient water quality monitoring data.

Locations of Ambient Monitoring Stations in the French Broad River Basin by Subbasin

Subbasin/ Map Code	Station Number	Waterbody/ Location	County	Class
04-03-01				
	E0150000	French Broad R at NC 178 at Rosman	Transylvania	B Tr
	E1130000	Little R near Cedar	Transylvania	C Tr
	E1270000	French Broad R at SR 1503 at Blantyre	Transylvania	WS-IV & B
04-03-02				
	E2120000	Mud Cr at SR 1508 near Balfour	Henderson	C
	E2730000	French Broad R at SR 3495 near Skyland	Buncombe	B
	E3520000	Hominy Cr at SR 3413 near Asheville	Buncombe	C
	E4030000	Beetree Cr near Swannanoa	Buncombe	WS-I HQW
	E4170000	Swannanoa R at NC 25 at Asheville	Buncombe	C
	E4280000	French Broad R at SR 1348 at Asheville	Buncombe	B
	E4770000	French Broad R at SR 1634 at Alexander	Buncombe	B
04-03-03				
	E0850000	Davidson R at US 64 near Brevard	Transylvania	WS-V & B Tr
	E1490000	Mills R at End of SR 1337 near Mills River	Henderson	WS-II Tr HQW
04-03-04				
	E5120000	French Broad R at Blennerhassett Island at Marshall	Madison	B
04-03-05				
	E5410000	W Fk Pigeon R upstream Lake Logan near Hazelwood	Haywood	WS-III Tr
	E5495000	Pigeon R at NC 215 near Canton	Haywood	WS-III Tr CA
	E5600000	Pigeon R at SR 1642 at Clyde	Haywood	C
	E6110000	Richland Cr at SR 1184 near Waynesville	Haywood	B
	E6300000	Jonathans Cr at US 276 near Cove Creek	Haywood	C Tr
	E6450000	Cataloochee Cr at SR 1395 near Cataloochee	Haywood	C Tr ORW
	E6480000	Pigeon R at SR 1338 near Hepco	Haywood	C
	E6500000	Pigeon R at Waterville	Haywood	C
04-03-06				
	E7000000	N Toe R at US 19E near Ingalls	Avery	WS-IV Tr
	E8100000	N Toe R at SR 1162 at Penland	Mitchell	C Tr
	E8200000	S Toe R at SR 1168 near Celo	Yancey	B Tr ORW
	E9990000	Nolichucky R beside SR 1321 at Poplar	Mitchell	B
04-03-07				
	E9800000	Cane R at SR 1417 near Sioux	Yancey	C Tr

Benthic Macroinvertebrate Data Collected in the French Broad River Basin, 1983 – 2003
(Current basinwide sampling sites are in bold print.)

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
04-03-01									
French Broad R	SR 1129	Transylvania	6-(1)	07/08/02	96	54	3.62	2.99	Excellent
				07/08/97	92	51	3.48	2.76	Excellent
				07/06/92	108	51	3.84	2.59	Excellent
				08/07/90	98	43	3.90	2.82	Excellent
				03/15/89	107	57	3.53	2.54	Excellent
				08/09/88	96	48	4.11	3.13	Excellent
				07/21/86	98	47	4.00	2.89	Excellent
				08/24/84	87	37	4.03	3.03	Good
				08/22/84	83	31	4.19	3.22	Good
W Fk French Broad R	off NC 281	Transylvania	6-2-(0.5)	10/01/01	43	28	2.45	1.85	Not Rated
				09/12/00	45	29	2.13	1.82	Excellent
				08/06/90	82	45	2.67	1.96	Excellent
				05/14/90	96	55	2.67	1.79	Excellent
W Fk French Broad R	SR 1306	Transylvania	6-2-(0.5)	10/01/01	59	19	5.82	2.77	Fair
				09/12/00	69	15	6.47	3.09	Fair
				08/06/90	51	15	5.97	3.70	Fair
				05/14/90	72	33	4.95	2.89	Good-Fair
W Fk French Broad R	NC 281	Transylvania	6-2-(0.5)	10/01/01	93	41	4.46	2.66	Good
				08/06/90	78	32	4.95	3.85	Good-Fair
				05/14/90	97	44	4.54	3.13	Good
				03/15/89	---	27	---	3.54	Good-Fair
W Fk French Broad R	SR 1312	Transylvania	6-2-(0.5)	02/11/92	99	53	3.14	1.97	Excellent
				05/21/87	49	49	2.49	2.49	Excellent
				10/31/84	94	42	3.89	2.72	Good
W Fk French Broad R	US 64	Transylvania	6-2-(7.5)	07/09/02	91	51	3.02	2.32	Excellent
				07/07/97	94	50	3	2.13	Excellent
				07/06/92	87	47	3.49	2.35	Excellent
				02/11/92	110	57	3.45	2.37	Excellent
				03/14/89	87	50	3.36	2.49	Excellent
Parker Cr	SR 1310	Transylvania	6-2-4	03/15/89	---	44	---	2.56	Good
Flat Cr	SR 1319	Transylvania	6-2-10	07/08/02	---	38	---	2.44	Excellent
N Flat Cr	SR 1319	Transylvania	6-2-10-1	03/14/89	---	38	---	2.77	Good
Woodruff Br	near US 64	Transylvania	6-2-12	03/22/98	---	22	---	1.82	Not Rated
N Fk French Broad R	NC 215	Transylvania	6-3-(6.5)	03/13/89	---	45	---	1.98	Excellent
N Fk French Broad R	SR 1326	Transylvania	6-3-(6.5)	07/09/02	76	34	4.38	2.98	Good
				03/13/89	---	36	---	2.84	Good
N Fk French Broad R	SR 1322	Transylvania	6-3-(6.5)	07/09/02	79	41	3.52	2.74	Excellent
				07/07/97	76	41	3.34	2.54	Excellent
				07/06/92	85	42	3.41	2.46	Excellent
				03/14/89	89	44	3.65	2.72	Excellent
Tucker Cr	SR 1325	Transylvania	6-3-10	03/14/89	---	35	---	2.69	Good-Fair
M Fk French Broad R	NC 178	Transylvania	6-5	03/14/89	---	35	---	1.75	Good
M Fk French Broad R	SR 1131	Transylvania	6-5	07/08/02	---	51	---	2.15	Excellent
E Fk French Broad R	SR 1105	Transylvania	6-6	03/16/89	---	51	---	1.96	Excellent
E Fk French Broad R	SR 1107	Transylvania	6-6	03/16/89	107	54	3.04	2.25	Excellent
S Pr Glady Fk	SR 1105	Transylvania	6-6-7-1	05/21/87	---	29	---	3.13	Good-Fair
Galloway Cr	US 64, ab landfill	Transylvania	6-8	05/21/87	---	16	---	2.61	Not Rated
Galloway Cr	US 64, be landfill	Transylvania	6-8	05/21/87	---	10	---	3.00	Not Rated

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Peter Weaver Cr	SR 1329	Transylvania	6-10	07/24/01	44	24	2.44	1.93	Not Rated
Peter Weaver Cr	P-W Creek Rd	Transylvania	6-10	08/30/00	37	16	4.58	4.15	Not Rated
Peter Weaver Cr	Ab SR 1195	Transylvania	6-10	07/24/01	60	24	5.41	4.48	Not Rated
Peter Weaver Cr	SR 1195	Transylvania	6-10	07/24/01	43	10	5.82	4.79	Not Rated
				08/30/00	57	18	5.90	5.19	Not Rated
				05/16/00	60	25	5.88	4.67	Not Rated
				07/07/97	---	12	---	5.35	Fair
Morgan Mill Cr	SR 1331	Transylvania	6-10-1	08/30/00	44	24	3.00	2.29	Not Rated
Morgan Mill Cr	SR 1388	Transylvania	6-10-1	08/30/00	58	20	5.74	3.99	Not Rated
Morgan Mill Cr	SR 1195	Transylvania	6-10-1	07/24/01	45	14	6.18	5.38	Not Rated
Cherryfield Cr	SR 1332	Transylvania	6-11	08/31/00	60	36	2.46	2.09	Not Rated
Cherryfield Cr	SR 1128	Transylvania	6-11	07/24/01	83	41	4.24	3.20	Not Rated
				08/31/00	69	30	3.89	2.85	Not Rated
Mason Cr	SR 1392	Transylvania	6-11-3	07/23/01	62	31	2.94	1.52	Not Rated
				08/31/00	51	31	2.38	1.88	Not Rated
Catheys Cr	SR 1338,	Transylvania	6-16-(8.5)	03/13/89	---	58	---	2.02	Excellent
				05/21/87	---	49	---	1.79	Excellent
Carson Cr	SR 1103	Transylvania	6-20	07/09/02	---	35	---	3.12	Good
Norton Cr	US 64	Transylvania	6-28-2	05/21/87	---	14	---	4.82	Not Rated
Williamson Cr	SR 1541	Transylvania	6-32	05/21/87	---	44	---	2.42	Good
Little R	US 276	Transylvania	6-38-(1)	05/21/87	---	38	---	3.02	Good
Little R	SR 1560	Transylvania	6-38-(1)	07/09/02	---	35	---	3.50	Good
Little R	off SR 1536, above High Falls	Transylvania	6-38-(20)	08/04/87	83	19	6.41	4.97	Fair
				08/05/85	82	22	5.85	4.66	Fair
Laurel Cr	SR 1536	Transylvania	6-38-17	05/22/87	---	44	---	2.10	Good
Little R	Be High Falls	Transylvania	6-38-(20)	07/24/89	81	32	4.63	3.87	Good
Little R	SR 1533	Transylvania	6-38-(20)	07/11/02	---	24	---	4.23	Good-Fair
				07/08/97	---	25	---	4.25	Good-Fair
				07/07/92	---	26	---	4.18	Good-Fair
Crab Cr	SR 1532	Transylvania	6-38-23	10/03/01	76	30	4.97	4.08	Good-Fair
				10/26/00	95	43	4.71	3.62	Good
				05/22/87	---	38	---	2.94	Good
UT Crab Cr	SR 1127	Henderson	6-38-23	10/26/00	53	29	3.46	2.35	Not Rated
04-03-02									
French Broad R	SR 1503	Transylvania	6-(27)	07/22/86	57	21	5.77	4.30	Fair
				08/18/83	55	20	5.85	4.44	Fair
Gash Cr	SR 1322	Henderson	6-47	09/18/86	40	5	7.58	5.94	Not Rated
Gash Cr	US 64	Henderson	6-47	09/18/86	21	1	8.07	5.77	Not Rated
Gash Cr	SR 1203	Henderson	6-47	09/18/86	26	1	8.31	6.22	Not Rated
Gash Cr	SR 1205	Henderson	6-47	08/28/02	34	3	7.42	6.6	Not Rated
				06/04/96	50	6	7.21	5.28	Not Rated
				08/18/86	19	7	6.12	4.54	Not Rated
Mill Pond Cr	SR 1309	Henderson	6-51	08/28/02	35	6	5.64	5.14	Not Rated
				06/04/96	47	14	6.07	5.01	Not Rated
French Broad R	NC 280	Buncombe	6-(54.5)	09/10/02	65	25	5.60	4.46	Good-Fair
				07/08/97	76	32	5.38	4.48	Good-Fair
				07/08/92	86	41	5.08	4.17	Good
				07/26/90	79	33	5.35	3.98	Good-Fair
				08/04/87	77	29	5.46	4.29	Good-Fair
French Broad R	SR 1348	Buncombe	6-(54.5)	07/10/02	73	30	4.76	3.97	Good
				07/09/97	72	32	5.02	4.02	Good-Fair
				07/23/92	73	32	5.23	4.30	Good-Fair
				08/03/87	70	23	5.25	4.01	Good-Fair
				08/13/85	52	18	5.74	4.37	Fair
				08/18/83	55	18	6.11	4.66	Fair
French Broad R	SR 1634	Buncombe	6-(54.5)	07/10/02	57	18	5.79	4.85	Fair
				07/09/97	55	18	5.55	4.68	Good-Fair
				07/23/92	53	19	6.08	4.79	Fair
				07/24/90	61	19	5.73	4.33	Fair
				08/03/87	67	25	5.72	4.17	Good-Fair
Mud Cr	SR 1125	Henderson	6-55	10/03/01	53	22	4.42	4.08	Not Rated
				10/25/00	52	24	4.25	3.65	Not Rated

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Mud Cr	SR 1126	Henderson	6-55	10/03/01	44	15	5.56	5.11	Not Rated
				10/25/00	37	6	6.66	4.61	Not Rated
				07/11/00	61	16	6.21	5.34	Not Rated
				09/08/97	---	2	---	6.99	Not Rated
Mud Cr	SR 1164	Henderson	6-55	10/04/01	49	11	6.29	5.71	Fair
Mud Cr	SR 1647	Henderson	6-55	10/03/01	39	10	6.69	5.92	Poor
				07/11/00	68	22	5.79	4.74	Fair
				09/08/97	43	5	6.82	6.28	Poor
Mud Cr	SR 1508, ab WWTP	Henderson	6-55	07/11/00	59	14	6.35	5.31	Fair
				09/08/97	40	5	7.09	6.24	Poor
				07/07/92	---	10	---	5.52	Poor
				09/12/85	53	10	6.99	5.59	Poor
Mud Cr	SR 1508, be WWTP	Henderson	6-55	07/12/00	46	12	6.59	5.46	Fair
				09/08/97	47	8	7.08	5.84	Poor
				07/07/92	---	7	---	6.36	Poor
				09/12/85	31	3	7.74	7.17	Poor
Mud Cr	US 25	Henderson	6-55	07/13/00	57	10	7.06	5.70	Poor
				09/09/97	54	12	6.71	5.70	Fair
Bat Fk	SR 1807	Henderson	6-55-8-1	04/11/89	---	2	---	2.55	Not Rated
Bat Fk	US 176	Henderson	6-55-8-1	04/11/89	44	6	7.61	5.99	Not Rated
Bat Fk	SR 1809	Henderson	6-55-8-1	07/10/00	37	14	5.48	5.08	Not Rated
				04/11/89	19	2	8.61	1.29	Not Rated
Bat Fk	SR 1803	Henderson	6-55-8-1	04/12/89	25	4	7.73	6.65	Not Rated
Bat Fk	be Dunn Cr	Henderson	6-55-8-1	07/23/01	45	9	6.33	6.12	Not Rated
Bat Fk	SR 1779	Henderson	6-55-8-1	07/23/01	49	7	6.92	6.02	Not Rated
				07/10/00	50	9	6.93	6.06	Fair
				09/09/97	48	7	6.97	6.31	Fair
				04/11/89	---	2	---	7.64	Poor
King Cr	US 25	Henderson	6-55-8-1-2-(2)	10/25/00	36	10	5.25	5.36	Not Rated
Devils Fk	SR 1006	Henderson	6-55-8-2	10/04/01	27	4	5.80	5.61	Not Rated
				03/03/01	51	7	6.30	5.95	Not Rated
				07/13/00	46	8	6.06	5.29	Not Rated
				10/25/00	36	8	6.25	6.48	Not Rated
Devils Fk	US 64	Henderson	6-55-8-2	07/13/00	43	5	7.83	6.24	Poor
Clear Cr	SR 1591	Henderson	6-55-11-(1)	10/23/00	47	14	4.71	3.82	Not Rated
				06/15/93	38	10	5.52	2.85	Not Rated
Clear Cr	SR 1587	Henderson	6-55-11-(1)	10/24/00	65	23	4.52	3.29	Good-Fair
				06/15/93	35	12	5.53	4.37	Fair
Clear Cr	SR 1586	Henderson	6-55-11-(1)	10/03/01	38	4	6.84	6.38	Poor
				03/14/01	54	8	6.27	5.07	Poor
				07/12/00	42	5	6.26	5.04	Poor
				06/15/93	47	12	6.26	4.79	Fair
Laurel Fk	Nr SR 1592	Henderson	6-55-11-2	10/03/01	43	21	3.28	2.11	Good
				10/24/00	53	28	3.08	2.70	Excellent
				06/15/93	31	31	2.19	2.19	Good
Cox Cr	off SR 1569	Henderson	6-55-11-3	10/23/00	46	22	3.20	2.43	Not Rated
Cox Cr	SR 1587	Henderson	6-55-11-3	10/03/01	50	14	5.27	4.21	Not Rated
				03/14/01	48	13	4.53	3.16	Not Rated
				10/23/00	57	16	4.82	2.84	Not Rated
				06/16/93	---	10	---	3.17	Poor
Puncheon Camp Cr	SR 1591	Henderson	6-55-11-4	06/16/93	22	22	3.12	3.12	Not Rated
Clear Cr	SR 1513	Henderson	6-55-11-(5)	10/03/01	48	10	6.17	5.04	Fair
				03/13/01	71	15	6.11	4.47	Fair
				10/26/00	36	8	5.44	4.50	Poor
				07/12/00	56	14	5.95	5.30	Fair
				07/08/97	---	8	---	5.10	Poor
				07/07/92	---	9	---	5.28	Poor
Mill Cr	SR 1586	Henderson	6-55-11-7	10/03/01	42	8	5.13	4.27	Not Rated
				03/14/01	46	10	5.56	4.65	Not Rated
				10/23/00	25	11	4.90	4.54	Not Rated
Kyles Cr	SR 1579	Henderson	6-55-11-8	10/03/01	60	17	4.72	3.22	Not Rated
				03/14/01	88	37	4.35	3.11	Not Rated
Harper Cr	SR 1582	Henderson	6-55-11-11	10/24/00	56	26	3.62	2.68	Excellent

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Cane Cr	SR 2800	Buncombe	6-57-(1)	08/25/99	80	36	4.43	3.82	Good
Cane Cr	SR 1006	Henderson	6-57-(9)	07/11/02	---	11	---	4.27	Fair
				07/08/97	26	26	4.22	4.22	Good-Fair
				07/07/92	27	27	4.34	4.34	Good-Fair
Bent Cr	ab Boyd's Br	Buncombe	6-67-(1)	11/05/01	35	35	2.55	2.55	Excellent
Bent Cr	be Boyd's Br	Buncombe	6-67-(1)	11/07/01	31	31	2.53	2.53	Excellent
Boyd's Br	near mouth	Buncombe	6-67-6	11/05/01	30	30	1.98	1.98	Excellent
Bent Cr	be WWTP	Buncombe	6-67-(7)	11/07/01	51	18	4.39	2.83	Good-Fair
Wesley Cr	ab rip-rap area	Buncombe	6-67-10	11/06/01	48	21	4.13	3.04	Not Rated
Wesley Cr	be rip-rap area	Buncombe	6-67-10	11/07/01	48	22	4.05	2.90	Not Rated
Dingle Cr	US 25 ab Gerber	Buncombe	6-71	02/10/87	---	10	---	5.22	Not Rated
Dingle Cr	US 25 be Gerber	Buncombe	6-71	02/10/87	---	2	---	4.34	Not Rated
UT Dingle Cr	Blue Ridge Parkway #1	Buncombe	6-71	02/10/87	---	16	---	2.12	Not Rated
Dingle Cr	Blue Ridge Parkway #2	Buncombe	6-71	02/10/87	---	14	---	3.03	Fair
Hominy Cr	US 19/23	Buncombe	6-76	05/15/02	62	35	4.27	3.97	Good
Hominy Cr	SR 1141	Buncombe	6-76	01/18/89	---	18	---	3.19	Fair
Hominy Cr	NC 151	Buncombe	6-76	05/14/02	71	36	4.37	3.90	Good
				09/10/97	71	32	5.18	4.13	Good-Fair
				07/09/92	---	28	---	3.31	Good
Hominy Cr	NC 112	Buncombe	6-76	05/16/02	60	29	4.82	4.28	Good-Fair
				09/09/97	63	16	5.84	4.84	Fair
				07/09/92	---	11	---	3.94	Fair
Hominy Cr	SR 3412	Buncombe	6-76	05/16/02	65	21	5.62	4.95	Fair
				09/09/97	63	13	6.48	5.19	Fair
				07/10/97	---	13	---	4.12	Fair
				07/09/92	---	8	---	3.76	Poor
Web Br	SR 1130	Buncombe	6-76-4	05/14/02	---	24	---	4.26	Not Rated
S Hominy Cr	NC 151	Buncombe	6-76-5	05/15/02	---	38	---	2.99	Good
S Hominy Cr	NC 151	Buncombe	6-76-5	08/28/02	---	26	---	2.72	Good-Fair
				05/14/02	72	35	3.76	3.17	Good
				05/15/00	64	34	4.10	3.77	Good
				09/10/97	38	8	6.34	5.31	Poor
				07/09/92	---	20	---	3.24	Good-Fair
Stony Fk	NC 151	Buncombe	6-76-5-3	05/15/02	65	39	2.49	2	Good
Beaverdam Cr	SR 3449	Buncombe	6-76-5-8	05/15/02	63	44	2.25	1.83	Excellent
Beaverdam Cr	off SR 3449	Buncombe	6-76-5-8	05/15/02	62	34	3.97	3.25	Good
Pole Cr	SR 1220	Buncombe	6-76-6	05/14/02	---	23	---	3.16	Not Rated
Bill Moore Cr	SR 3439	Buncombe	6-76-7	05/14/02	67	38	2.94	2.60	Not Rated
Moore Cr	Brookside Circle	Buncombe	6-76-8	05/14/02	30	9	5.63	4.75	Fair
Canie Cr	Bear Cr Rd	Buncombe	6-76-12	05/16/02	33	3	7.51	7.51	Poor
Swannanoa R	SR 2500	Buncombe	6-78	08/27/02	62	19	5.42	4.22	Fair
				10/06/87	56	19	5.82	4.68	Fair
Swannanoa R	SR 2436	Buncombe	6-78	08/27/02	---	22	---	4.75	Good-Fair
				10/07/87	50	18	5.49	4.65	Good-Fair
Swannanoa R	SR 2416	Buncombe	6-78	08/27/02	75	24	5.86	4.58	Fair
				10/07/87	60	22	5.17	4.26	Fair
Swannanoa R	Azalea Rd	Buncombe	6-78	01/11/93	78	31	5.24	4.33	Good-Fair
Swannanoa R	Azalea Park	Buncombe	6-78	08/27/02	21	21	4.36	4.36	Good-Fair
Swannanoa R	NC 81/240 at River Rd	Buncombe	6-78	03/24/88	70	24	5.88	4.18	Fair
				10/06/87	68	24	5.87	4.42	Good-Fair
				07/24/87	76	29	5.62	4.57	Good-Fair

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Swannanoa R	US 25	Buncombe	6-78	08/28/02	73	26	5.79	4.70	Good-Fair
				07/09/97	62	28	5.44	4.26	Good-Fair
				07/08/92	72	27	5.74	4.43	Good-Fair
				07/27/89	60	15	6.28	4.47	Fair
				03/24/88	47	8	7	5.96	Poor
				10/05/87	54	17	6.40	5.07	Fair
				07/24/87	73	33	5.25	4.21	Good-Fair
				08/12/85	41	9	7.44	5.48	Poor
Flat Cr	above Big Piney Br	Buncombe	6-78-6-(1)	12/11/91	35	35	1.54	1.54	Excellent
Flat Cr	US 70	Buncombe	6-78-6-(4)	12/14/99	62	31	4.10	3.03	Good-Fair
				10/06/87	---	15	---	4.02	Fair
Big Slaty Br	near NC 9	Buncombe	6-78-6-2	12/11/91	---	34	---	1.50	Excellent
Little Slaty Br	near NC 9	Buncombe	6-78-6-3	12/11/91	---	37	---	1.55	Excellent
Big Piney Br	near NC 9	Buncombe	6-78-6-5	12/11/91	---	32	---	1.37	Excellent
Wolfpit Br	near High Top Colony Rd	Buncombe	6-78-10-(1)	12/10/91	---	26	---	1.35	Excellent
N Fk Swannanoa R	SR 2576, ab Grovestone	Buncombe	6-78-11-(13)	10/08/87	---	14	---	3.85	Fair
N Fk Swannanoa R	US 70, be Grovestone	Buncombe	6-78-11-(13)	08/27/02	---	22	---	4.01	Good-Fair
				10/07/87	---	12	---	4.46	Fair
Laurel Br	Private road	Buncombe	6-78-11-16	02/13/92	58	32	2.88	1.70	Excellent
Beetree Cr	SR 2416	Buncombe	6-78-15-(1)	10/06/87	---	19	---	3.72	Good-Fair
Beetree Cr	SR 2427	Buncombe	6-78-15-(1)	03/17/86	72	39	3.59	2.83	Excellent
Beetree Cr	SR 2429	Buncombe	6-78-15-(6)	10/07/87	---	15	---	3.01	Good-Fair
Bull Cr	SR 2408	Buncombe	6-78-18	10/08/87	---	27	---	3.47	Good
Christian Cr	Buckeye Cove Rd	Buncombe	6-78-19	01/12/99	55	32	2.95	2.16	Good
	SR 2838	Buncombe		10/05/87	---	17	---	4.53	Good-Fair
Grassy Br	off SR 2403	Buncombe	6-78-20	12/14/99	---	14	---	4.10	Not Rated
Gashes Cr	SR 3071	Buncombe	6-78-21	05/25/94	61	20	4.71	2.93	Good-Fair
Haw Cr	Ab US 70	Buncombe	6-78-22	12/15/99	---	12	---	3.54	Not Rated
Ross Cr	Chunn's Cove Rd.	Buncombe	6-78-23	06/26/02	43	16	4.33	3.26	Not Rated
				01/12/99	34	15	3.75	2.94	Not Rated
Ross Cr	US 70	Buncombe	6-78-23	06/26/02	29	6	7.03	5.57	Not Rated
				01/12/99	21	2	8.07	6.16	Poor
Sweeten Cr	Biltmore Village	Buncombe	6-78-24	12/15/99	---	3	---	6.42	Not Rated
Sweeten Cr	US 25A	Buncombe	6-78-24	10/05/87	---	1	---	5.50	Not Rated
Newfound Cr	SR 1296	Buncombe	6-84	06/12/89	74	38	3.93	3.02	Excellent
				06/09/88	94	39	4.29	3.53	Excellent
Newfound Cr	SR 1297	Buncombe	6-84	06/12/89	56	16	6.63	4.90	Not Rated
				06/09/88	62	17	6.46	4.87	Not Rated
Newfound Cr	SR 1378	Buncombe	6-84	04/23/86	50	12	6.72	4.76	Fair
Newfound Cr	SR 1622	Buncombe	6-84	07/12/02	70	23	6.16	4.97	Fair
				05/18/99	98	38	5.35	4.34	Good-Fair
				07/09/97	---	20	---	4.97	Good-Fair
				07/27/89	59	17	7.10	5.50	Fair
				06/12/89	52	7	7.64	6.28	Poor
				04/10/89	47	7	7.31	5.65	Poor
				02/15/89	40	3	7.96	6.77	Poor
				06/09/88	65	13	7.33	6.18	Poor
				04/23/86	43	10	6.62	5.13	Poor
Reems Cr	off SR 1003	Buncombe	6-87-(1)	07/10/02	---	38	---	3.30	Excellent
Reems Cr	NC 251	Buncombe	6-87-(10)	07/10/02	---	27	---	3.69	Good-Fair
				07/09/97	---	30	---	3.33	Good
				07/23/92	---	20	---	3.37	Good-Fair
Flat Cr	SR 1740	Buncombe	6-88	07/11/02	---	22	---	3.91	Good-Fair
				04/24/86	75	24	4.94	3.55	Good-Fair
Sandymush Cr	SR 1114	Madison	6-92-(9)	07/10/02	---	32	---	3.50	Good
				07/10/97	---	30	---	4.02	Good
				07/22/92	---	36	---	4.30	Excellent
				07/22/92	---	36	---	4.30	Excellent

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
04-03-03									
Davidson R	US 276	Transylvania	6-54-(15.5)	7/22/02	36	36	3.35	3.35	Excellent
		Transylvania		7/22/97	113	52	3.76	2.65	Excellent
		Transylvania		7/7/92	45	45	1.83	1.83	Excellent
Boylston Cr	SR 1314	Henderson	6-52-(0.5)	7/22/02	59	27	4.62	3.56	Good-Fair
		Henderson		7/21/97	71	23	5.53	4.36	Good-Fair
		Henderson		7/7/92	---	26	---	4.65	Good-Fair
Mills R	SR 1337	Henderson	6-54-(1)	6/25/02	74	39	4.39	3.12	Good
		Henderson		7/21/97	115	53	3.46	2.35	Excellent
		Henderson		8/2/94	---	43	---	2.45	Excellent
		Henderson		7/8/92	88	51	3.21	2.31	Excellent
		Henderson		7/24/90	105	51	3.68	2.52	Excellent
		Henderson		8/8/88	84	37	4.04	2.82	Excellent
		Henderson		8/11/88	---	32	---	2.34	Good
		Henderson		7/22/86	90	48	3.62	2.81	Excellent
		Henderson		8/20/84	90	45	3.44	2.57	Excellent
N Fk Mills R	FS Rd 5000	Henderson	6-54-2-(4)	9/10/97	54	34	3.17	2.63	Good
N Fk Mills R	FS Rd 1206, Ab Rocky Br	Henderson	6-54-2-(4)	6/25/02	---	40	---	1.94	Excellent
	At Rocky Br	Henderson	6-54-2-(4)	7/21/97	---	41	---	1.66	Excellent
	FS Rd 1206, Ab Rocky Br	Henderson	6-54-2-(4)	6/14/93	93	47	3.03	2.03	Excellent
Wash Cr	off SR 1345	Henderson	6-54-2-6	6/14/93	73	47	2.22	1.80	Excellent
N Fk Mills R	SR 1341	Henderson	6-54-2-(9)	6/25/02	70	31	4.62	3.3	Good
		Henderson		6/14/93	102	50	2.99	2.19	Excellent
		Henderson		7/12/85	91	37	3.92	2.81	Excellent
Bradley Cr	FS Rd 1206	Transylvania	6-54-3-17	4/16/91	---	55	---	1.68	Excellent
	FS Rd 1206 ab State Rock Cr	Transylvania		4/16/91	---	47	---	1.85	Excellent
	FS Rd 1206 ab Yellow Gap Cr	Transylvania		7/10/91	---	38	---	1.52	Excellent
	FS Rd 1206	Transylvania		4/16/91	---	60	---	1.61	Excellent
Bradley Fk	FS Rd be Laurel Cr	Henderson	6-54-3-17	9/10/97	66	40	2.43	1.75	Excellent
S Fk Mills R	SR 1340	Henderson	6-54-3-(17.5)	6/25/02	70	35	4.35	3.08	Good
		Henderson		6/15/93	113	57	3.12	2.31	Excellent
Mills R	SR 1353	Henderson	6-54-(5)	6/24/02	58	28	5.54	3.95	Good-Fair
		Henderson		11/7/01	---	6	---	5.08	Poor
		Henderson		10/7/98	19	2	6.69	5.96	Poor
		Henderson		7/21/97	78	24	5.17	3.31	Good-Fair
		Henderson		8/2/94	31	5	6.04	4.43	Poor
		Henderson		6/15/93	90	40	4.18	2.80	Good
		Henderson		7/8/92	81	35	4.19	3.14	Good
UT Mills R	SR 1336	Henderson	6-54-(5)	10/18/94	19	19	2.65	2.65	Good-Fair
UT Mills R	Greenhouse	Henderson	6-54-(5)	12/15/92	4	0	8.43	0	Poor
UT Mills R	SR 1338	Henderson	6-54-(5)	12/15/92	43	15	5.63	3.85	Fair
Brandy Br	NC 191, ab WTP	Henderson	6-54-6	10/18/94	49	10	6.62	5.70	Fair
04-03-04									
French Broad R	NC 213	Madison	6-(54.5)	6/26/02	81	26	5.86	4.59	Good-Fair
				7/7/97	52	25	4.81	3.94	Good-Fair
				7/23/92	67	25	5.39	4.64	Good-Fair
				7/24/90	49	18	5.54	4.73	Good-Fair
				8/9/88	71	22	5.90	4.76	Fair
				7/23/86	79	31	5.45	3.98	Good-Fair
				8/13/85	62	18	5.68	4.52	Good-Fair
				8/29/84	41	16	5.38	4.45	Good-Fair
				8/18/83	54	19	5.61	4.37	Good-Fair
Ivy Cr (R)	SR 2150	Buncombe	6-96-(0.5)	7/9/02	---	32	---	4.13	Good
				7/7/97	---	27	---	2.78	Good-Fair
				7/22/92	---	38	---	3.47	Excellent
Ivy Cr (R)	SR 2153	Buncombe	6-96-(0.5)	8/31/93	100	41	4.67	3.75	Good

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Dillingham Cr	SR 2173 ab Stoney Cr	Buncombe	6-96-1-(1)	8/31/93	---	31	---	2.32	Good
Dillingham Cr	SR 2173, be Stoney Cr	Buncombe	6-96-1-(1)	8/31/93	86	36	4.40	3.17	Good
Stony Cr	SR 2178	Buncombe	6-96-1-5	8/30/93	77	33	3.35	2.38	Good
Carter Cr	At mouth, ab confl w Mineral Cr	Buncombe	6-96-1-5-1	8/30/93	---	29	---	1.92	Excellent
Mineral Cr	off SR 2178	Buncombe	6-96-1-5-2	8/30/93	---	29	---	1.39	Excellent
Paint Fk	SR 1531	Madison	6-96-2	5/30/02	68	29	4.86	3.76	Not Rated
Paint Fk	SR 1539	Madison	6-96-2	5/30/02	70	29	5.09	4.01	Not Rated
N Fk Ivy Cr	SR 2027	Buncombe	6-96-3	9/1/93	---	35	---	2.70	Good
Little Ivy Cr	SR 1547	Madison	6-96-10	5/29/02	62	15	6.49	4.97	Fair
				1/21/97	---	24	---	3.52	Good-Fair
				8/31/93	---	27	---	4.21	Good-Fair
Little Ivy Cr	SR 1610	Madison	6-96-10	5/29/02	78	27	6.19	4.60	Good-Fair
				7/7/97	---	16	---	3.91	Fair
				7/22/92	---	35	---	3.87	Good
M Fk Little Ivy Cr	SR 1526	Madison	6-96-10-1	5/30/02	61	27	4.90	3.60	Not Rated
M Fk Little Ivy Cr	US 19	Madison	6-96-10-1	5/29/02	48	19	6.29	4.43	Not Rated
California Cr	SR 1348	Madison	6-96-10-2	5/28/02	52	28	3.03	2.24	Not Rated
California Cr	SR 1349	Madison	6-96-10-2	1/22/97	---	31	---	2.28	Good
California Cr	SR 1541	Madison	6-96-10-2	5/28/02	42	13	5.77	4.26	Not Rated
				1/22/97	53	29	3.91	2.97	Good-Fair
Big Br	off SR 1540	Madison	6-96-10-5	5/29/02	45	15	5.52	4.73	
Big Br	SR 1549	Madison	6-96-10-5	5/29/02	36	9	5.74	4.68	Not Rated
UT Big Br	NC 213	Madison	6-96-10-5	5/28/02	32	6	7.03	4.76	Not Rated
Ivy Cr (R)	SR 1565	Madison	6-96-(11.7)	8/31/93	85	39	5.10	3.90	Good
Ivy Cr (R)	US 25/70	Madison	6-96-(11.7)	6/26/02	80	30	4.92	3.77	Good-Fair
				7/7/97	59	28	4.72	3.54	Good-Fair
				9/2/93	---	33	---	3.31	Good
				7/22/92	87	36	4.67	3.63	Good
Gabriel Cr	SR 1559. last bridge	Madison	6-96-12	8/31/93	---	21	---	3.86	Good-Fair
Bull Cr	NC 213	Madison	6-96-16	8/31/93	---	25	---	3.46	Good-Fair
Hunter Cr	Ab old reservoir	Madison	6-106-2-(1)	12/10/91	---	30	---	1.65	Excellent
Big Laurel Cr	SR 1503	Madison	6-112	7/8/02	---	45	---	2.37	Excellent
				7/8/97	---	33	---	2.31	Good
Big Laurel Cr	SR 1318	Madison	6-112	7/8/02	80	42	3.31	2.86	Excellent
				1/21/97	65	37	2.73	2.39	Excellent
Big Laurel Cr	SR 1318/1314	Madison	6-112	1/21/97	---	33	---	1.98	Good
Big Laurel Cr	NC 208	Madison	6-112	5/30/02	90	46	4.68	3.55	Good
				7/8/97	---	36	---	2.66	Excellent
				8/19/92	---	38	---	3.00	Excellent
Puncheon Fk	SR 1503	Madison	6-112-5	7/8/02	---	40	---	2.83	Excellent
				7/8/97	---	31	---	2.24	Good
Shelton Laurel Cr	NC 208	Madison	6-112-26	6/27/02	---	32	---	3.64	Good
				7/8/97	---	31	---	3.13	Good
				8/19/92	---	32	---	2.90	Good
				5/16/90	---	44	---	2.55	Excellent
Hickory Fk	SR 1310	Madison	6-112-26-7	5/16/90	---	43	---	1.90	Excellent
W Pr Hickory Fk	SR 1310	Madison	6-112-26-7-1	5/16/90	---	38	---	1.62	Excellent
E Pr Hickory Fk	FS Rd 465	Madison	6-112-26-7-2	5/16/90	---	32	---	1.35	Excellent
L Laurel Cr	NC 208	Madison	6-112-26-13	5/31/02	59	32	2.77	2.00	Not Rated
Spring Cr	NC 209	Madison	6-118-(27)	6/27/02	---	37	---	3.33	Excellent
				7/8/97	---	31	---	3.04	Good
				8/19/92	---	26	---	2.75	Good-Fair

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
04-03-05									
Pigeon R	off NC 215	Haywood	5- (1)	7/24/84	87	37	4.63	3.49	Good
Pigeon R	NC 215	Haywood	5- (1)	7/25/02	59	30	4.93	3.82	Good-Fair
		Haywood		12/15/99	69	36	4.33	3.50	Good
		Haywood		7/22/97	94	44	3.82	2.94	Excellent
		Haywood		9/7/95	74	29	4.59	3.04	Good-Fair
		Haywood		8/2/94	70	30	4.47	3.36	Good
		Haywood		1/10/93	86	34	4.41	2.95	Good
		Haywood		8/19/92	84	37	4.52	3.45	Good
		Haywood		8/11/88	---	34	---	3.25	Good
		Haywood		8/10/88	85	33	5.15	3.69	Good-Fair
		Haywood		2/22/88	87	35	4.56	3.56	Good
		Haywood		7/25/86	80	38	4.77	3.82	Good
		Haywood		7/24/84	82	32	4.30	2.71	Good
		Haywood		8/17/83	86	29	5.13	3.73	Good-Fair
W Fk Pigeon R	SR 1216	Haywood	5-2	7/25/02	37	37	2.47	2.47	Excellent
		Haywood		7/22/97	50	50	1.58	1.58	Excellent
		Haywood		1/12/93	81	47	2.52	1.73	Excellent
		Haywood		7/11/91	---	44	---	1.85	Excellent
		Haywood		5/16/90	48	48	1.83	1.83	Excellent
UT W Fk Pigeon R	near NC 215	Haywood	5-2	5/16/90	---	34	---	1.26	Excellent
Tom Cr	near NC 215	Haywood	5-2-5	12/9/91	---	35	---	1.52	Excellent
		Haywood		7/11/91	---	30	---	1.13	Excellent
M Pr W Fk Pigeon R	at mouth	Haywood		7/11/91	---	39	---	1.55	Excellent
		Haywood		4/17/91	---	42	---	1.40	Excellent
		Haywood	5-2-7	5/16/90	---	42	---	1.70	Excellent
R Pr M Pr W Fk Pigeon R	At road crossing, mouth	Haywood	5-2-7-7	4/17/91	---	42	---	1.37	Excellent
		Haywood		12/9/91	---	36	---	1.75	Excellent
		Haywood		7/11/91	---	34	---	1.65	Excellent
		Haywood		5/16/90	---	36	---	1.50	Excellent
UT L E Fk Pigeon R	near Shining Rock Wilderness	Haywood	5-2-12-(0.5)	4/17/91	---	38	---	1.45	Excellent
L E Fk Pigeon R	SR 1129	Haywood	5-2-12-(5.5)	4/17/91	---	51	---	1.50	Excellent
E Fk Pigeon R	US 276	Haywood	5-3-(6.5)	7/22/02	---	40	---	2.80	Excellent
		Haywood		7/22/97	109	50	3.54	2.43	Excellent
		Haywood		7/25/84	86	38	4.22	2.81	Good
Pigeon R	SR 1642	Haywood	5-(7)	9/10/02	49	9	6.84	5.27	Poor
		Haywood		12/15/99	55	18	5.94	4.34	Fair
		Haywood		7/23/97	78	25	5.96	4.42	Good-Fair
		Haywood		9/7/95	44	16	6.02	5.38	Fair
		Haywood		8/2/94	44	13	6.14	5.29	Fair
		Haywood		8/19/92	63	16	6.74	4.41	Fair
		Haywood		9/11/89	47	7	6.80	4.39	Poor
		Haywood		9/11/89	---	5	---	5.21	Poor
		Haywood		8/10/88	31	4	7.83	5.19	Poor
		Haywood		2/22/88	51	12	6.86	4.70	Poor
		Haywood		7/24/86	34	2	8.23	3.59	Poor
		Haywood		8/25/84	39	5	7.65	5	Poor
Pigeon R	SR 1625, be Richland Cr	Haywood	5-(7)	8/3/94	54	15	6.11	4.77	Fair
Pigeon R	near Crabtree	Haywood	5-(7)	2/22/88	53	16	6.24	4.11	Fair
Pigeon R	SR 1338	Haywood	5-(7)	9/9/02	56	19	5.60	4.36	Good-Fair
		Haywood		7/23/97	78	27	5.44	4.18	Good-Fair
		Haywood		8/3/94	57	22	5.40	4.71	Good-Fair
		Haywood		8/10/88	49	14	6.11	4.01	Fair
		Haywood		2/23/88	46	24	4.95	3.99	Good-Fair
Pigeon R	at Counterfeit Br	Haywood	5-(7)	3/18/92	77	41	4.25	2.97	Good
		Haywood		4/22/92	94	43	4.46	2.90	Good

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Pigeon R	at Hurricane Cr	Haywood	5-(7)	3/18/92	74	30	5.59	3.82	Good-Fair
		Haywood		4/22/92	74	28	5.80	4.50	Good-Fair
Pigeon R	off I-40	Haywood	5-(7)	7/25/02	75	38	4.96	3.98	Good
		Haywood		7/24/97	81	40	4.77	3.13	Good
		Haywood		8/3/94	58	27	4.37	3.61	Good
		Haywood		7/25/90	57	22	4.76	3.97	Good-Fair
		Haywood		7/27/89	62	28	5.24	4.31	Good-Fair
		Haywood		8/10/88	67	24	4.89	3.61	Good-Fair
		Haywood		8/7/87	58	25	5.06	3.75	Good-Fair
		Haywood		7/24/86	67	28	4.77	3.95	Good-Fair
		Haywood		8/12/85	57	17	5.85	4.06	Fair
		Haywood		8/24/84	68	30	4.82	3.58	Good
		Haywood		8/17/83	66	24	5.41	3.68	Good-Fair
Rough Cr	near SR 1616	Haywood	5-8-4-(1)	9/11/97	---	29	---	1.22	Excellent
Richland Cr	Bus 23	Haywood	5-16-(1)	7/29/02	---	31	---	2.91	Good
		Haywood		7/25/97	---	23	---	2.79	Good-Fair
		Haywood		8/18/92	---	17	---	3.51	Fair
Richland Cr	SR 1184	Haywood	5-16-(1)	7/24/02	---	19	---	4.29	Good-Fair
		Haywood		7/24/97	---	24	---	3.22	Good-Fair
		Haywood		8/18/92	---	26	---	3.38	Good-Fair
		Haywood		8/10/88	42	11	6.24	5.30	Fair
		Haywood		8/12/85	28	9	6.07	4.07	Poor
		Haywood		8/17/83	42	9	7.19	4.10	Poor
UT Richland Cr	J&J Farm Rd	Haywood		5/18/99	11	2	6.40	4.99	Not Rated
UT Richland Cr	off SR 1157	Haywood		5/18/99	---	26	---	1.87	Good
Nolen Cr	off SR 1158	Haywood	5-16-4	5/15/02	42	29	2.32	2.21	Not Rated
Hyatt Cr	SR 1159, ds	Haywood	5-16-6	4/18/84	30	10	6.21	4.09	Fair
	SR 1159, us	Haywood		4/18/84	41	17	5.65	3.87	Good-Fair
	SR 1161	Haywood		5/13/02	36	20	3.29	2.63	Not Rated
	SR 1165	Haywood		5/13/02	40	22	4.25	3.91	Not Rated
Shiny Cr	Ab Allen Res.	Haywood	5-16-7-3	7/25/97	---	43	---	1.30	Excellent
Rocky Br	SR 1219	Haywood	5-16-7-9 (1)	12/9/91	---	35	---	1.38	Excellent
Richland Cr	SR 1519	Haywood	5-16-(16)	7/25/02	45	20	5.42	4.46	Good-Fair
		Haywood		7/25/97	---	15	---	4.42	Fair
		Haywood		8/18/92	---	14	---	4.47	Fair
Jonathans Cr	SR 1306	Haywood	5-26-(7)	7/24/97	---	46	---	1.50	Excellent
		Haywood		8/18/92	---	41	---	1.85	Excellent
Jonathans Cr	SR 1305	Haywood	5-26-(7)	7/24/02	---	36	---	1.89	Excellent
Jonathans Cr	SR 1322	Haywood	5-26-(7)	7/25/02	---	36	---	3.57	Excellent
		Haywood		7/24/97	---	41	---	2.67	Excellent
		Haywood		8/18/92	---	33	---	3.30	Good
Jonathans Cr	SR 1349	Haywood	5-26-(7)	9/9/02	---	34	---	3.84	Good
		Haywood		7/24/97	---	39	---	3.11	Excellent
		Haywood		8/18/92	---	23	---	3.70	Good-Fair
Fines Cr	SR 1355	Haywood	5-32	7/24/02	---	24	---	3.52	Good-Fair
		Haywood		7/23/97	---	27	---	2.63	Good-Fair
		Haywood		8/17/92	---	19	---	3.74	Good-Fair
Cataloochee Cr	SR 1395	Haywood	5-41	7/24/02	---	45	---	1.64	Excellent
		Haywood		7/23/97	102	50	2.72	1.68	Excellent
		Haywood		8/17/92	84	42	3.03	1.87	Excellent
		Haywood		7/11/91	80	48	2.72	2.02	Excellent
		Haywood		7/27/89	43	43	1.90	1.90	Excellent
		Haywood		7/27/89	101	53	3.02	1.94	Excellent
		Haywood		1/24/90	85	51	2.34	1.83	Excellent
		Haywood		1/24/90	47	47	1.68	1.68	Excellent
		Haywood		4/11/90	86	56	2.30	1.85	Excellent
		Haywood		7/25/90	95	51	3.16	1.86	Excellent
		Haywood		10/23/90	86	47	2.74	1.82	Excellent
		Haywood		7/24/86	102	47	3.51	2.09	Excellent
		Haywood		8/24/84	96	42	3.37	1.92	Excellent

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
Cataloochee Cr	near SR 1395, ab Palmer Cr	Haywood	5-41	1/24/90	---	45	---	1.52	Excellent
UT Rough Fk	near SR 1395	Haywood	5-41-1	4/18/91	---	47	---	1.66	Excellent
Palmer Cr	near SR 1395	Haywood	5-41-2	4/18/91	---	46	---	1.51	Excellent
Pretty Hollow Cr	near SR 1395 ab	Haywood	5-41-2-4	4/18/91	---	47	---	1.56	Excellent
Lower Double Br	Cataloochee Cr	Haywood	5-41-6	1/24/90	57	36	1.94	1.34	Excellent
		Haywood		4/11/90	57	36	2.25	1.41	Excellent
		Haywood		7/25/90	54	31	2.89	1.73	Excellent
		Haywood		10/23/90	63	37	2.64	1.48	Excellent
L Cataloochee Cr	SR 1397	Haywood	5-41-10	1/24/90	---	40	---	1.95	Excellent
Hurricane Cr	FS Rd off I-40 at Mile Marker 13	Haywood	5-44	7/23/02	---	32	---	1.93	Good
Cold Springs Cr	Gov't Rd, near Cmpgd.	Haywood	5-45	3/18/92	78	45	2.89	1.80	Excellent
		Haywood		4/23/92	84	48	2.98	2.13	Excellent
Big Cr	SR 1322 in GSMNP	Haywood	5-59	7/24/97	---	47	---	1.38	Excellent
Chestnut Br	SR 1322 in GSMNP	Haywood		7/23/02	---	28	---	1.93	Good
04-03-06									
Nolichucky R	SR 1321	Mitchell	7	7/9/02	89	43	4.37	3.62	Good
				7/9/97	71	37	4.03	3.62	Good
				7/21/92	87	41	4.23	3.41	Good
				7/23/90	83	38	4.44	3.41	Good
				8/9/88	93	35	4.95	3.89	Good
				7/23/86	84	37	4.95	3.74	Good
				8/14/85	72	28	4.79	3.53	Good-Fair
				8/29/84	68	31	4.55	3.89	Good
				8/9/83	78	34	4.60	3.96	Good
Roaring Cr	US 19E	Avery	7-2-15	7/10/02	---	37	---	1.73	Excellent
Jones Cr	SR 1100	Avery	7-2-24	9/11/85	75	29	3.75	2.23	Good
N Toe R	US 19E	Avery	7-2-(27.3)	7/10/02	89	39	4.92	3.86	Good
				7/10/97	72	42	4.06	3.56	Good
				7/21/92	99	41	4.32	3.24	Good
				8/8/89	93	34	4.50	3.78	Good
				2/14/89	58	29	4.50	3.23	Good
				8/8/88	34	34	2.83	2.83	Good
				8/4/87	92	38	4.67	3.36	Good
				8/15/85	85	35	4.89	3.57	Good
				8/28/84	84	36	4.28	3.17	Good
N Toe R	be Brushy Cr	Avery	7-2-(27.7)	2/14/89	59	35	4.19	2.99	Good
N Toe R	be indusmin	Mitchell	7-2-(27.7)	9/11/85	50	18	5.71	3.50	Fair
N Toe R	NC 226, below Feldspar	Mitchell	7-2-(27.7)	9/11/85	64	22	5.27	3.87	Good-Fair
N Toe R	SR 1121, ab Feldspar	Mitchell	7-2-(27.7)	9/11/85	83	31	4.78	3.26	Good
N Toe R	SR 1151	Mitchell	7-2-(27.7)	8/15/85	61	17	6.30	3.92	Fair
N Toe R	SR 1162	Mitchell	7-2-(27.7)	7/10/02	60	22	5.90	4.15	Fair
				7/9/97	70	34	4.74	3.72	Good
				7/20/92	78	23	5.25	3.36	Good-Fair
				8/7/89	63	24	5.58	3.50	Good-Fair
				8/3/87	61	20	5.95	3.72	Fair
				8/8/88	---	10	---	2.88	Poor
				7/23/86	70	22	5.93	3.71	Fair
				8/14/85	46	12	6.20	3.67	Fair
				8/28/84	63	22	5.42	3.43	Good-Fair

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
N Toe R	SR 1314	Yancey	7-2-(27.7)	7/9/02	75	36	4.88	3.81	Good
				7/9/97	74	40	4.66	4.17	Good
				7/21/92	94	42	4.83	4.07	Good
Brushy Cr	ab landfill	Avery	7-2-29	2/14/89	---	27	---	2.36	Good-Fair
Brushy Cr	be landfill	Avery	7-2-29	2/14/89	---	24	---	3.40	Good-Fair
Little Bear Cr	be Indusmin	Mitchell	7-2-46-1	9/10/85	9	2	7.60	4.30	Poor
Little Bear Cr	near NC 226 ab Indusmin	Mitchell	7-2-46-1	9/10/85	31	8	4.74	2.76	Fair
Big Crabtree Cr	SR 1002	Mitchell	7-2-48	7/20/92	---	32	---	2.06	Good
Big Crabtree Cr	US 19E	Mitchell	7-2-48	7/11/02	---	37	---	3.02	Excellent
				7/10/97	---	40	---	2.24	Excellent
S Toe R	ab NC 80	Yancey	7-2-52-(1)	1/17/91	---	51	---	2.01	Excellent
S Toe R				6/18/90	---	41	---	2.05	Excellent
S Toe R	be NC 80	Yancey	7-2-52-(1)	1/17/91	---	44	---	1.70	Good
S Toe R				6/18/90	---	46	---	2.12	Excellent
S Toe R	SR 1167	Yancey	7-2-52-(1)	7/11/02	100	50	3.49	2.57	Excellent
				7/10/97	82	40	3.24	2.49	Excellent
				7/20/92	102	48	3.55	2.56	Excellent
				8/9/88	113	48	4.10	2.87	Excellent
				8/13/85	99	42	3.97	3.21	Excellent
				8/19/83	100	41	4.30	3.23	Good
S Toe R	SR 1168	Yancey	7-2-52-(1)	1/29/96	71	48	2.32	1.90	Excellent
S Toe R	SR 1205	Yancey	7-2-52-(1)	1/29/96	43	35	1.85	1.55	Excellent
				1/29/96	56	44	2.04	1.54	Excellent
L Crabtree Cr	SR 1144	Yancey	7-2-52-33	7/10/02	68	29	4.67	2.95	Good-Fair
R Fk Cane Cr	SR 1206	Mitchell	7-2-59-1	7/11/02	76	41	3.27	2.48	Excellent
Big Rock Cr	NC 197	Mitchell	7-2-64	7/9/02	---	36	---	2.97	Excellent
				7/9/97	---	34	---	2.38	Good
				7/21/92	---	43	---	2.71	Excellent
04-03-07									
Cattail Cr	SR 1102	Yancey	7-3-9	1/30/96	39	26	2.27	1.51	Good
Cane R	US 19W	Yancey	7-3-(13.7)	7/9/02	91	46	4.38	3.63	Excellent
				7/9/97	84	46	4.35	3.54	Excellent
				7/21/92	93	48	4.36	3.48	Excellent
				8/7/89	81	37	4.44	3.72	Good
				8/3/87	77	34	4.55	3.65	Good
				8/14/85	62	23	5.17	3.63	Good-Fair
				8/19/83	70	27	5.11	3.81	Good-Fair
Cane R	US 19E	Yancey	7-3-(13.7)	7/10/02	105	49	4.77	3.59	Excellent
Banks Cr	SR 1118	Yancey	7-3-21-4	7/11/02	37	25	2.92	2.10	Not Rated
Bald Mountain Cr	SR 1408	Yancey	7-3-32	7/9/02	---	40	---	2.77	Excellent
				7/8/97	---	32	---	2.47	Good
				7/21/92	---	26	---	3.37	Good-Fair

Fish Community Structure Data Collected in the French Broad River Basin, 1993 – 2003
(Current basinwide sampling sites are in bold print.)

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
04-03-01						
West Fk French Broad R	SR 1309	Transylvania	6-2-(7.5)	10/23/97	---	Not Rated
Little R	SR 1533	Transylvania	6-38-(20)	06/03/02	40	Good-Fair
				10/23/97	46	Good-Fair
Crab Cr	SR 1532	Transylvania	6-38-23	06/03/02	50	Good
04-03-02						
Mud Cr	SR 1647	Henderson	6-55	06/04/02	22	Poor
				09/16/97	20	Poor
Bat Fork	SR 1779	Henderson	6-55-8-1	06/04/02	14	Poor
				09/16/97	24	Poor
Clear Cr	SR 1587	Henderson	6-55-11-(1)	10/02/01	44	Good-Fair
Clear Cr	SR 1586	Henderson	6-55-11-(1)	10/02/01	36	Fair
Clear Cr	SR 1513	Henderson	6-55-11-(5)	10/02/01	44	Good-Fair
Cane Cr	US 25	Henderson	6-57-5	06/04/02	50	Good
				09/16/97	46	Good-Fair
Hominy Cr	NC 151	Buncombe	6-76	09/24/02	40	Good-Fair
				09/17/97	50	Good
South Hominy Cr	NC 151/SR 3449	Buncombe	6-76-5	09/23/02	50	Good
				04/09/97	48	Good
Swannanoa R	SR 2435	Buncombe	6-78	06/18/02	48	Good
				09/19/97	40	Good-Fair
Swannanoa R	US 25	Buncombe	6-78	06/28/93	32	Poor
Beetree Cr	SR 2427	Buncombe	6-78-15-(6)	06/25/97	32	Poor
Newfound Cr	SR 1641	Buncombe	6-84	06/17/02	48	Good
				04/09/97	28	Poor
Reems Cr	NC 251	Buncombe	6-87-(10)	06/18/02	50	Good
				09/17/97	52	Good
				11/17/93	44	Good-Fair
Flat Cr	SR 1742	Buncombe	6-88	06/18/02	50	Good
				04/10/97	56	Good
Sandymush Cr	SR 1107	Madison	6-92-(9)	06/19/02	48	Good
				09/17/97	50	Good
				11/16/93	50	Good
Turkey Cr	SR 1629	Buncombe	6-92-13	06/17/02	48	Good
04-03-03						
Boylston Cr	SR 1314	Henderson	6-52-(6.5)	06/04/02	52	Good
				09/15/97	56	Good
Mills R	SR 1337	Henderson	6-54-(1)	09/15/97	58	Excellent
				10/19/94	---	Not Rated
				06/29/93	---	Not Rated
04-03-04						
(Big) Ivy Cr	SR 2150	Buncombe	6-96-(0.5)	06/18/02	60	Excellent
				09/18/97	58	Excellent
				11/17/93	60	Excellent
Ivy R	US 25/70	Madison	6-96-(11.7)	11/16/93	52	Good
Bull Cr	SR 1574	Madison	6-96-16	06/19/02	40	Good-Fair
Big Laurel Cr	NC 208	Madison	6-112	09/18/97	46	Good-Fair
Shelton Laurel Cr	NC 208/212	Madison	6-112-26	06/20/02	58	Excellent
				06/03/97	58	Excellent
Little Laurel Cr	NC 208	Madison	6-112-26-13	05/04/99	58	Excellent
				09/29/98	60	Excellent
04-03-05						
Richland Cr	SR 1160/1168	Haywood	5-16-(1)	07/17/01	---	Not Rated
Richland Cr	Bus US 23	Haywood	5-16-(1)	07/17/01	---	Not Rated
Richland Cr	Boyd Ave	Haywood	5-16-(1)	07/17/01	28	Poor

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Richland Cr	SR 1184	Haywood	5-16-(1)	07/17/01	28	Poor
Richland Cr	Walnut Trail Rd	Haywood	5-16-(16)	09/24/02	32	Poor
				10/22/97	38	Fair
Winchester Cr	off SR 1157	Haywood	5-16-3	07/18/01	---	Not Rated
Hyatt Cr	SR 1165	Haywood	5-16-6	07/18/01	---	Not Rated
Cherry Cove Cr	above reservoir	Haywood	5-16-7-2	07/19/01	---	Not Rated
Shiny Cr	above reservoir	Haywood	5-16-7-3	07/19/01	---	Not Rated
Old Bald Cr	above reservoir	Haywood	5-16-7-6	07/19/01	---	Not Rated
Rocky Br	SR 1147 & 1219	Haywood	5-16-7-9-(2)	07/18/01	---	Not Rated
Medford Br	off SR 1140	Haywood	5-16-8-1	07/18/01	---	Not Rated
Farmer Br	Brown & Georgia Ave	Haywood	5-16-11	07/18/01	---	Not Rated
Shelton Br	Marshall St	Haywood	5-16-13	07/16/01	---	Not Rated
Raccoon Cr	Bus US 23	Haywood	5-16-14	07/16/01	34	Fair
Factory Br	US 19	Haywood	5-16-15	07/16/01	---	Not Rated
Crabtree Cr	NC 209	Haywood	5-22	09/24/02	40	Good-Fair
				06/03/97	28	Poor
Jonathan Cr	US 276	Haywood	5-26-(7)	10/22/97	46	Good-Fair
				11/16/93	48	Good
Fines Cr	SR 1355	Haywood	5-32	09/24/02	38	Fair
				10/22/97	34	Fair
04-03-06						
North Toe R	SR 1121	Avery	7-2-(0.5)	06/23/97	46	Good-Fair
Big Crabtree Cr	SR 1002	Mitchell	7-2-48	05/04/99	58	Excellent
				09/30/98	58	Excellent
				06/24/97	58	Excellent
Cane Cr	SR 1211	Mitchell	7-2-59	06/24/97	34	Fair
Jacks Cr	SR 1337	Yancey	7-2-63	06/21/02	38	Fair
				10/20/97	34	Fair
Big Rock Cr	NC 226	Mitchell	7-2-64	09/30/98	50	Good
Pigeonroost Cr	SR 1349/NC 197	Mitchell	7-2-69	06/21/02	58	Excellent
				10/20/97	60	Excellent
04-03-07						
Price Cr	SR 1126/1136	Yancey	7-3-21	06/20/02	52	Good
				10/21/97	46	Good-Fair
Bald Mountain Cr	SR 1408	Yancey	7-3-32	10/21/97	---	Not Rated

Appendix V

Other Water Quality Data in the French Broad River Basin

Other Water Quality Research

North Carolina actively solicits "existing and readily available" data and information for each basin as part of the basinwide planning process. Data meeting DWQ quality assurance objectives are used in making use support determinations. Data and information indicating possible water quality problems are investigated further. Both quantitative and qualitative information are accepted during the solicitation period.

DWQ data solicitation includes the following:

- Information, letters and photographs regarding the uses of surface waters for boating, drinking water, swimming, aesthetics and fishing.
- Raw data submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples. Maps showing sampling locations must also be included.
- Summary reports and memos, including distribution statistics and accompanied by documentation of quality assurance methods used to collect and analyze the data.

Contact information must accompany all data and information submitted.

High levels of confidence must be present in order for outside quantitative information to carry the same weight as information collected from within DWQ. This is particularly the case when considering waters for the Impaired categories in the Integrated Report (303(d) list). Methodology for soliciting and evaluating outside data is presented in *North Carolina's 2002 Integrated Report*, which is available on-line at http://h2o.enr.state.nc.us/tmdl/Docs_303/2002/2002_Integrated Rept.pdf. The next data solicitation period for the French Broad River is planned for fall 2006.

Any data submitted to DWQ from other water sampling programs conducted in the French Broad River basin have been reviewed. Data that meet quality and accessibility requirements were considered for use support assessments and the 303(d) list. These data are also used by DWQ to adjust the location of biological and chemical monitoring sites. In particular, DWQ has reviewed and considered information developed through the Volunteer Water Information Network (VWIN) as managed by the UNC-Asheville Environmental Quality Institute. Other programs or research that developed data or information are presented in individual subbasin chapters.

Each county with monitoring stations has a coordinator to organize and train volunteers and to ensure that all stations are monitored monthly. The Asheville Metropolitan Sewerage District is the lead coordinator in Buncombe County and the program is funded internally. Additional special project monitoring sites have been added through funding by Land-of-Sky Regional Council, the Elisha Mitchell Audubon Society, and the Buncombe Soil and Water Conservation District. The Haywood Waterways Association is the lead coordinator in Haywood County and the program is funded through the Pigeon River Fund. The Environmental and Conservation Organization (ECO) is the lead coordinator in Henderson County and the program is funded through the Henderson County Board of Commissioners, the Dornick Foundation, and the Town of Lake Lure. The Madison County Soil and Water Conservation District is the lead coordinator in Madison County and the program is funded through the Pigeon River Fund and the Dornick Foundation. Brevard College is the lead coordinator in Transylvania County and the program is funded through the Dornick Foundation. The subbasin chapters discuss streams where VWIN monitoring revealed water quality impacts.

In the French Broad River basin, VWIN monitors 141 sites, which are listed in the following table. These sites generally agree with DWQ ambient monitoring data, but were not used directly in use support assessments. VWIN has collected at least seven years of monthly data for most sites and over ten years of monthly data for many sites. Parameters monitored include major nutrients, turbidity, suspended solids, pH, alkalinity, conductivity and heavy metals such as zinc, copper and lead.

County	Stream Name	Sampling Location
Buncombe	Big Ivy	Forks of Ivy
	Little Ivy	Forks of Ivy
	Lower Sandymush Creek	NC 64 – Buncombe / Madison Border
	Upper Sandymush Creek	Garret Cove Road
	Sandymush Creek	Willow Creek Road
	Ox Creek	Ox Creek Road
	Lower Newfound Creek	Jenkins Valley Road
	Reems Creek	Ox Creek Road
	French Broad River	Ledges Park / NC 251
	Reems Creek	US 25 / 70
	Reed Creek	UNCA Botanical Gardens
	Glenn Creek	UNCA Botanical Gardens
	Beaverdam Creek	Merrimon Avenue / Beaver Lake
	Bee Tree Creek	Beetree Road near Owen Lake
	Swannanoa River	Near Beetree Road at Owen Lake
	Bull Creek	Old Farm School Road
	Hominy Creek	NC 151
	South Hominy Creek	NC 151
	Bent Creek	Bent Creek Park on NC 191
	French Broad River	Bent Creek Park on NC 191
	French Broad River	Corcoran Park / Glenn Bridge Road
	Flat Creek	Lower Flat Creek Road and Edna Roberts Road
	Cane Creek	HWY 74 and Cane Creek Road
	Ashworth Creek	HWY 74 and Cane Creek Road
	Cane Creek	Mills Gap Road
	Robinson Creek	Cane Creek Road near Mills Gap Road
	Swannanoa River	NC 81
	Haw Creek	NC 81
	Reems Creek	Reems Creek Road
	Ivy Creek	Buckner Branch Road
	Paint Fork	Paint Fork Road in Barnardsville
	Ivy Creek	Dillingham Road

	French Broad River	Jean Webb Park / Riverside Drive
	Swannanoa River	Railroad bridge near NC 70
	South Turkey Creek	Turkey Creek Road
	North Turkey Creek	North Turkey Creek Road
	Flat Creek	US 19 / 23
	Bent Creek	Downstream from Lake Powhatan
	Averys Creek	Glenn Bridge Road
	Grassy Branch	Hickory Tree Road
	Swannanoa River	Azalea Road
	French Broad River	Walnut Island Park / NC 251
	North Fork of the Swannanoa River	Grovestone Quarry
	Lower Hominy Creek	SR 191
	Smith Mill Creek	Louisiana Avenue
	Newfound Creek	Dark Cove Road
	Newfound Creek	Leicester HWY (NC 63)
	Swannanoa River	Bull Creek confluence near Old Farm School Road
	South Creek	Beaver Lake / Merrimon Avenue
	Ross Creek	Lower Chunns Cover Road bridge
	Ross Creek	Tunnel Road
	Ross Creek	Upper Chunns Cove Road
	Ross Creek	NC 81
	Swannanoa River	Thompson Street / Biltmore Village
	Sweeten Creek	Thompson Street / Biltmore Village
	Reed Creek	Entrance to UNCA
	South Creek	Pond at Beaver Lake
Haywood	West Fork of the Pigeon River	Bethel
	East Fork of the Pigeon River	Bethel
	East Fork of the Pigeon River	Cruso / Shining Rock
	Pigeon River	Downstream from Canton
	Pigeon River	Hepco Bridge
	Rush Fork	Crabtree
	Fines Creek	Near confluence with Pigeon River
	Eaglenest Creek	Hazelwood (Richland Creek watershed)
	Plott Creek	Hazelwood (Richland Creek watershed)
	Richland Creek	West Waynesville
	Richland Creek	Lake Junaluska
	Jonathans Creek	Near confluence with Pigeon River
	Allens Creek	Richland Creek watershed
	Rush Fork	Upstream

	Fines Creek	Midstream
	Fines Creek	Upstream
	Cove Creek	HWY 209 and Fines Creek Road
	Hyatt Creek	Upstream
	Hyatt Creek	Downstream
	Ratcliff Cove Branch	Francis Farm Road
	Raccoon Creek (upstream)	Ratcliff Road
	Raccoon Creek (downstream)	Industrial Park
	Crabtree Creek	Upper Crab Creek Road (SR 1509)
	Jonathon Creek	Maggie Valley / Moody Farm Road (SR 1309)
Henderson	French Broad River	Banner Farm Road in Horseshoe
	French Broad River	Butler Bridge Road
	Mud Creek	Erkwood Road
	Mud Creek	North Rugby Road
	Clear Creek	Nix Road
	Crab Creek	Staton Road
	North Fork of Mills River	LL Moore Road
	South Fork of Mills River	South Mills River Road
	Mills River	HWY 191 (Davenport Bridge)
	Mills River	Hooper Lane
	Boylston Creek	Ladson Road
	Bat Fork Creek	Tabor Road
	Cane Creek	Hoopers Creek / Howard Gap Road
	Lower Cane Creek	HWY 25
	Mud Creek	7th Avenue East
	Clear Creek	Apple Valley Road
	Hoopers Creek	Jackson Road
	Big Willow Creek	Patterson Road
	Little Willow Creek	River Road
	Gash Creek	Etowah School Road
	Brittain Creek	Patton Park
	Mill Pond Creek	South Rugby Road
	Shaw Creek	Hunters Glen
	Brandy Branch	Mills River Village on NC 191
	Devils Fork	Dana Road
Madison	Ivy River	25/70
	French Broad River	Barnard Bridge
	French Broad River	Hot Springs
	East Fork of Bull Creek	

	Big Laurel Creek	
	Big Pine Creek	
	Spring Creek	
	Little Laurel Creek	
	Shelton Laurel Creek	
	Big Laurel River	
	Bull Creek	
	Grapevine Creek	
	California Creek	Beech Glen
	Middle Fork	Beech Glen
	Paint Fork	Beech Glen
	Ivy River	Gabriels Creek Road
	Gabriel's Creek	
Transylvania	French Broad River	Mount Lyon Road / Rosman
	East Fork of the French Broad River	Rosman
	North Fork of the French Broad River	64/215
	West Fork of the French Broad River	64/215
	Little River	Dupont Road
	French Broad River	Everett Road
	Williamson Creek	
	Davidson River	Entrance to Pisgah National Forest
	King Creek	Brevard College
	King Creek	Headwaters
	Davidson River	Confluence with French Broad River
	Lamb Creek	Headwaters
	Lamb Creek	Confluence with French Broad River
	French Broad River	Wilson Road
	Little River	Sherwood Forest
	North Fork of French Broad River	Macedonia Bridge
	North Fork of French Broad River	Headwaters
	West Fork of French Broad River	Upstream
	Catheys Creek	Upstream of water supply

Appendix VI

NPDES Discharges
and
Individual Stormwater Permits
in the
French Broad River Basin

NPDES Discharges in the French Broad River Basin (September 2003)

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0000078	RFS Ecusta, Inc.	RFS Ecusta, Inc. (1 Ecusta)	Transylvania	Asheville	Industrial Process & Commercial	Major	27.5	04-03-01	French Broad River
NC0000108	Coats American, Inc	Sylvan Plant	Transylvania	Asheville	Industrial Process & Commercial	Minor	0.015	04-03-01	Galloway Creek
NC0000311	M-B Industries, Inc.	M B Industries Incorporated	Transylvania	Asheville	Industrial Process & Commercial	Minor	0.03	04-03-01	West Fork French Broad River
NC0000337	Agfa Corporation	Agfa Corporation	Transylvania	Asheville	Industrial Process & Commercial	Major	2.4	04-03-01	Little River (Cascade Lake)
NC0021946	Town of Rosman	Rosman WWTP	Transylvania	Asheville	Municipal, < 1MGD	Minor	0.09	04-03-01	French Broad River
NC0024295	Transylvania Utilities Inc	Transylvania Utilities WWTP	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.32	04-03-01	French Broad River
NC0044784	City of Brevard	Cathey's Creek WTP	Transylvania	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-01	Catheys Creek
NC0048658	A & D Water Service Inc	Sherwood Forest WWTP	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-01	Little River
NC0051021	Eagle's Nest Foundation	Eagle's Nest Foundation-Camp	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.008	04-03-01	Little River
NC0055336	Camp Carolina	Camp Carolina	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-01	Lamb Creek (Simpson Lake)
NC0055905	Waterford Place Property Owners Assoc.	Waterford Place WWTP	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.023	04-03-01	Hunts Branch
NC0060534	City of Brevard	Brevard WWTP	Transylvania	Asheville	Municipal, Large	Major	2.5	04-03-01	French Broad River
NC0081001	Morgan Mills Resorts Inc	Morgan Mills Resorts Incorporated	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.01	04-03-01	Morgan Mill Creek (Kaiser Lake)
NC0085031	Conoco Convenience Store	Conoco Convenience Store	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.01	04-03-01	Morgan Mill Creek (Kaiser Lake)
NC0086223	D&D Catfish Resort	D&D Catfish Resort	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.035	04-03-01	Peter Weaver Creek
NC0000094	Fletcher Warehousing Company	Fletcher Warehousing Company	Henderson	Asheville	Industrial Process & Commercial	Minor	4.0	04-03-02	French Broad River
NC0000396	CP&L - A Progress Energy Company	Asheville Steam Electric Power Plant	Buncombe	Asheville	Industrial Process & Commercial	Major	4.8	04-03-02	French Broad River
NC0020478	USDA US Forest Service	Lake Powhatan Recreation Area	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-02	Bent Creek
NC0022811	Cliffs at Walnut Cove LLC	Cliffs at Walnut Cove WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0075	04-03-02	Avery Creek (Dubose Lake)
NC0023591	Silver Line Plastics Corp	Silver Line Plastics Corporation	Buncombe	Asheville	Industrial Process & Commercial	Minor	0.24	04-03-02	French Broad River
NC0024431	Kanuga Conferences Inc	Kanuga Conferences Incorporated	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.035	04-03-02	Little Mud Creek (Kanuga Lake, Wolf Lake)
NC0024911	MSD Buncombe County	French Broad River WRF	Buncombe	Asheville	Municipal, Large	Major	40.0	04-03-02	French Broad River
NC0025534	City of Hendersonville	Hendersonville WWTP	Henderson	Asheville	Municipal, Large	Major	4.8	04-03-02	Mud Creek
NC0025933	Dipak Patel	Days Inn- West Facility	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-02	George Branch
NC0029882	Briarwood Subdivision	Briarwood Subdivision	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0075	04-03-02	Dix Creek
NC0033227	Tyco Electronics Corporation	Tyco Electronics Corporation	Buncombe	Asheville	Industrial Process & Commercial	Minor	0.0175	04-03-02	Cane Creek
NC0033430	Camp Judaea	Camp Judaea	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.03	04-03-02	Henderson Creek
NC0034304	Young Life Windy Gap Camp	Young Life Windy Gap Camp	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.05	04-03-02	Coles Cove Branch

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0034924	Flesher's Fairview Rest Home	Flesher's Fairview Rest Home	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.035	04-03-02	Cane Creek
NC0035807	City of Asheville	Northfork WTP	Buncombe	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-02	Swannanoa River
NC0036251	Blue Star Camps Inc	Blue Star Camps Incorporated	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.06	04-03-02	Mud Creek
NC0036641	Fletcher Academy, Inc.	Fletcher Academy WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.10	04-03-02	Byers Creek
NC0036684	Carolina Water Service Inc of NC	Bent Creek WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.10	04-03-02	Wesley Creek (Bent Creek Ranch Lake)
NC0037176	Bon Worth Inc	Bon Worth Incorporated	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.006	04-03-02	Allen Branch
NC0039187	Lone Star Equities	Valleyview Shopping Center	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.01	04-03-02	Hominy Creek
NC0056961	City of Asheville	DeBruhl WTP	Buncombe	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-02	Beetree Creek
NC0057541	Cummings Cove Properties, LLC	Cummings Cove WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.035	04-03-02	French Broad River
NC0060283	Paris Banks	Ridgeview Acres Mobile Home Park	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0078	04-03-02	Smith Mill Creek
NC0061182	Buncombe County Board of Education	North Buncombe High School	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-02	Stanfield Branch
NC0062634	Wedgefield Acres Mobile Home Park	Wedgefield Acres MHP WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-02	Pond Branch
NC0062928	Ferguson Farthing & Jaros	Ferguson Farthing & Jaros	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0164	04-03-02	George Branch
NC0066249	Country Acres Mobile Home Park	Country Acres Mobile Home Park	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.006	04-03-02	Mcdowell Creek
NC0066362	Benson Apartments	Benson Apartments	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.008	04-03-02	Mud Creek
NC0066664	Henderson County Public Schools	Rugby Middle School	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-02	Mill Pond Creek
NC0066681	Henderson County Public Schools	West Henderson High School	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.0099	04-03-02	Mill Pond Creek
NC0066788	Buncombe County Board of Education	Fairview Elementary School	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.011	04-03-02	Cane Creek
NC0066796	Buncombe County Board of Education	Leicester Elementary School	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0057	04-03-02	Sluder Branch
NC0067288	Culligan Operating Services, Inc.	Hunter's Glen WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.035	04-03-02	Shaw Creek
NC0067342	North View Mobile Home Park	North View Mobile Home Park	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.032	04-03-02	Flat Creek
NC0068152	Buncombe Properties	Buncombe Properties	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-02	Flat Creek
NC0068799	Greystone Enterprises Inc	Greystone Subdivision	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.0217	04-03-02	Clear Creek
NC0069370	Emeritus Corp DBA Pine Park	Emeritus Corporation DBA Pine Park	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-02	Clear Creek
NC0069957	Laurelwood Mobile Home Park	Laurelwood Mobile Home Park	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.002	04-03-02	Beaverdam Creek
NC0071323	Etowah Sewer Company	Etowah Sewer Co	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.125	04-03-02	French Broad River
NC0071862	Henry K Odom	Magnolia Place WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.022	04-03-02	Clear Creek
NC0071897	Henderson's Assisted Living	Henderson's Assisted Living	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.007	04-03-02	Featherstone Creek
NC0073393	Dana Hill Corporation	Dana Hill Corporation	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.03	04-03-02	Devils Fork
NC0073741	Culligan Operating Services, Inc.	Mountain Valley WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-02	French Broad River

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0073814	Buncombe County Board of Education	North Buncombe Elementary School	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.011	04-03-02	Dick Branch
NC0074110	Mountain View Assisted Living	Mountain View Assisted Living	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-02	Featherstone Creek
NC0074136	William F. Hoffman	Lakewood RV Resort of NC LLC	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-02	Dunn Creek
NC0075388	Havon Inc	Pleasant Cove Home WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.012	04-03-02	Pole Creek
NC0075647	Hidden Gap Mobile Home Park	Hidden Gap Mobile Home Park WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-02	Devils Fork
NC0075680	Rosewood Mobile Home Park	Rosewood Mobile Home Park	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-02	Line Creek
NC0076082	Bearwallow Valley Mhp	Bear Wallow Valley Mobile Home Park	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.01	04-03-02	Clear Creek
NC0076147	San Giusto Estates	San Giusto Estates	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0325	04-03-02	Cane Creek
NC0076708	Riverwind Homeowners Association	Riverwind Mobile Home Park	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.036	04-03-02	French Broad River
NC0079251	Clement Pappas NC, Inc.	Clement Pappas plant	Henderson	Asheville	Industrial Process & Commercial	Minor	0.09	04-03-02	Mud Creek
NC0083178	Woodfin Sanitary W&S	Woodfin WTP	Buncombe	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-02	Reems Creek
NC0083313	Brookside Village Association	Brookside Village Association	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-02	Featherstone Creek
NC0085341	Crystal Madden	Crystal Madden	Buncombe	Asheville	100% Domestic < 1MGD	Minor	not limited	04-03-02	Swannanoa River
NC0085456	Charles Binkelman	Binkelman residence	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.0004	04-03-02	Swannanoa River
NC0085464	John & Suzanne Pruett	Pruett residence	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.00036	04-03-02	Swannanoa River
NC0085511	Asheville-Buncombe-Henderson Water Auth.	Mills River Regional WTP	Henderson	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-02	French Broad River
NC0085952	TA Operating Corporation	Candler Travel Center	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-02	George Branch
NC0085979	NC Department of Transportation	Rosman Maintenance Facility	Transylvania	Asheville	Groundwater Remediation	Minor	0.0288	04-03-02	French Broad River
NC0086070	Henderson County Utilities	Justice Academy WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.03	04-03-02	Lewis Creek
NC0086088	SKF USA, Inc.	Girmes Site remediation	Buncombe	Asheville	Groundwater Remediation	Minor	0.108	04-03-02	Gashes Creek (Cedar Mountain Lake)
NC0086436	Buncombe County Board of Education	Cane Creek Elementary School	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.012	04-03-02	Cane Creek
NC0087106	Champion Hills Property Owners Assoc.	Champion Hills WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.07	04-03-02	South Fork Big Willow Creek
NC0087556	Schneider and Riels Development, Inc.	Schneider/Riels Development WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.027	04-03-02	Cane Creek
NC0087653	Rilandwell, Inc.	Waterhill Farms Subdivision WWTP	Buncombe	Asheville	100% Domestic < 1MGD	Minor	0.027	04-03-02	Cane Creek
NC0020460	USDA US Forest Service	Sliding Rock Recreation Area	Transylvania	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-03	Looking Glass Creek
NC0020486	USDA US Forest Service	North Mills River Recreation Area	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.012	04-03-03	North Fork Mills River
NC0033251	Shelley McCoy Alexander	Camp Highlander	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.0074	04-03-03	South Fork Mills River
NC0042277	City of Hendersonville	Hendersonville WTP	Henderson	Asheville	Water Plants and Water Conditioning	Minor	0.18	04-03-03	Brandy Branch
NC0062669	Mills River Restaurant Inc	Mills River Restaurant Incorporated	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.003	04-03-03	Mills River

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0069388	JH Reaban Oil	Mills River Texaco	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.0006	04-03-03	Mills River
NC0069671	J M S Builders	Mills River Village WWTP	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.032	04-03-03	Mills River
NC0070335	Van Wingerden International	Van Wingerden International	Henderson	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-03	Brandy Branch
NC0021733	Town of Marshall	Marshall WWTP	Madison	Asheville	Municipal, < 1MGD	Minor	0.40	04-03-04	French Broad River
NC0025836	Town of Hot Springs	Hot Springs WWTP	Madison	Asheville	Municipal, < 1MGD	Minor	0.08	04-03-04	French Broad River
NC0034207	Madison County Board of Education	Laurel Elementary School WWTP	Madison	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-04	Shelton Laurel Creek
NC0039152	Ohio Electric Motors, Inc.	Ohio Electric Motors Inc	Buncombe	Asheville	Industrial Process & Commercial	Minor	0.003	04-03-04	Paint Fork
NC0049620	Town of Hot Springs	Hot Springs Housing Authority WWTP	Madison	Asheville	Municipal, < 1MGD	Minor	0.01	04-03-04	French Broad River
NC0057151	Town of Mars Hill	Mars Hill WWTP	Madison	Asheville	Municipal, < 1MGD	Minor	0.425	04-03-04	Gabriel Creek
NC0061468	H & K Boone Investments, LLC	Wolf Laurel Resort WWTP	Madison	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-04	Hampton Creek
NC0076431	Carolina Water Service Inc of NC	Wolf Laurel WWTP	Madison	Asheville	100% Domestic < 1MGD	Minor	0.03	04-03-04	Wolf Laurel Branch
NC0080659	Madison County Board of Education	Madison County Middle School WWTP	Madison	Asheville	100% Domestic < 1MGD	Minor	0.009	04-03-04	Brush Creek
NC0082716	English Wolf Lodge	English Wolf Lodge- WWTP	Madison	Asheville	100% Domestic < 1MGD	Minor	0.007	04-03-04	Wolf Laurel Branch
NC0085154	Town of Weaverville	Ivy River WTP	Buncombe	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-04	Ivy Creek (River)
NC0000272	Blue Ridge Paper Products, Inc.	Canton Mill	Haywood	Asheville	Industrial Process & Commercial	Major	29.9	04-03-05	Pigeon River
NC0022454	Midway Medical Center	Midway Medical Center-Canton	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-05	Sally Branch
NC0024805	NC Department of Transportation	Haywood County Rest Area	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.026	04-03-05	Pigeon River
NC0025321	Town of Waynesville	Waynesville WWTP	Haywood	Asheville	Municipal, Large	Major	6.0	04-03-05	Pigeon River
NC0030422	John C. Francis	Green Valley Mobile Home Park	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.009	04-03-05	Hyatt Creek
NC0032361	Autumn Care Of Waynesville	Autumn Care Of Waynesville	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.01	04-03-05	Richland Creek
NC0033600	Silver Bluff Village	Pigeon Valley Rest Home	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-05	Pigeon River
NC0040355	Royal Oaks, Inc.	Springdale Country Club WWTP	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.05	04-03-05	East Fork Pigeon River
NC0044199	McElroy, Inc.	Citgo Truck Stop/Handy Pantry #163	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-05	Pigeon River
NC0049409	Town of Waynesville	Waynesville WTP	Haywood	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-05	Allen Creek
NC0056561	Town of Maggie Valley	Maggie Valley WWTP	Haywood	Asheville	Municipal, Large	Major	1.0	04-03-05	Jonathans Creek
NC0065986	Donald B. Briggs	Dogwood Trails Subdivision	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.02	04-03-05	Evans Branch
NC0067351	Haywood County Board of Education	Bethel School WWTP	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.015	04-03-05	Bird Creek
NC0072729	USDI National Park Service	Mount Pisgah WWTP	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.032	04-03-05	Pisgah Creek
NC0086053	Pilot Travel Centers LLC	Pilot Travel Center #393	Haywood	Asheville	100% Domestic < 1MGD	Minor	0.025	04-03-05	Stingy Branch

Permit	Owner	Facility	County	Region	Type	Class	MGD	Subbasin	Receiving Stream
NC0086843	Junaluska Highlands Water Sys	Junaluska Highlands Water Sys	Haywood	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-05	Rogers Cove Creek
NC0000175	Unimin Corporation	Quartz Operation	Mitchell	Asheville	Industrial Process & Commercial	Major	3.6	04-03-06	North Toe River
NC0000353	Feldspar Corporation	Feldspar Corp- Spruce Pine	Mitchell	Asheville	Industrial Process & Commercial	Major	3.5	04-03-06	North Toe River
NC0000361	Unimin Corporation	Schoolhouse Quartz facility	Avery	Asheville	Industrial Process & Commercial	Major	2.16	04-03-06	North Toe River
NC0000400	K-T Feldspar Corporation	K-T Feldspar Corp-Spruce Pine	Mitchell	Asheville	Industrial Process & Commercial	Major	1.73	04-03-06	North Toe River
NC0021423	Town of Spruce Pine	Spruce Pine WWTP	Mitchell	Asheville	Municipal, < 1MGD	Minor	2.0	04-03-06	North Toe River
NC0021857	Town of Newland	Newland WWTP	Avery	Asheville	Municipal, < 1MGD	Minor	0.32	04-03-06	North Toe River
NC0023566	Taylor Togs, Inc.	Taylor Togs WWTP	Yancey	Asheville	Industrial Process & Commercial	Minor	0.01	04-03-06	Little Crabtree Creek
NC0025461	Town of Bakersville	Bakersville WWTP	Mitchell	Asheville	Municipal, < 1MGD	Minor	0.075	04-03-06	Cane Creek
NC0027685	NC Department of Correction	Avery Correctional Center	Avery	Asheville	100% Domestic < 1MGD	Minor	0.0206	04-03-06	Three Quarter Creek
NC0033685	Avery Development Corporation	Mountain Glen Golf Club	Avery	Asheville	100% Domestic < 1MGD	Minor	0.006	04-03-06	Whiteoak Creek
NC0066729	Mitchell County Board of Education	Tipton Hill Elementary School WWTP	Mitchell	Asheville	100% Domestic < 1MGD	Minor	0.005	04-03-06	Raccoon Creek
NC0066737	Mitchell County Board of Education	Mitchell High School WWTP	Mitchell	Asheville	100% Domestic < 1MGD	Minor	0.0144	04-03-06	Cranberry Branch
NC0073962	NC Department of Correction	Blue Ridge Youth Center WWTP	Avery	Asheville	100% Domestic < 1MGD	Minor	0.007	04-03-06	Three Quarter Creek
NC0075965	Town of Burnsville	Burnsville WTP	Yancey	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-06	Little Crabtree Creek
NC0082767	Town of Spruce Pine	Spruce Pine WTP	Mitchell	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-06	Beaver Creek
NC0083282	Mountain View Motel	Mountain View Motel	Yancey	Asheville	100% Domestic < 1MGD	Minor	0.0025	04-03-06	Little Crabtree Creek
NC0083712	Town of Mars Hill	Mars Hill WTP	Madison	Asheville	Water Plants and Water Conditioning	Minor	not limited	04-03-06	Laurel Creek
NC0084620	Unimin Corporation	Crystal Operation	Mitchell	Asheville	Industrial Process & Commercial	Minor	0.36	04-03-06	North Toe River
NC0085839	Unimin Corporation	Red Hill Quartz Processing Plant	Mitchell	Asheville	Industrial Process & Commercial	Minor	0.682	04-03-06	North Toe River
NC0020290	Town of Burnsville	Burnsville WWTP	Yancey	Asheville	Municipal, < 1MGD	Minor	0.80	04-03-07	Cane River

NPDES Individual Stormwater Permits in the French Broad River Basin (September 2003)

Permit #	Facility Name	Receiving Stream	Subbasin	County
NCS000179	BASF Corporation	Hominy Creek & UT	04-03-02	Buncombe
NCS000209	Branford Wire Manufacturing	Mud Creek	04-03-02	Henderson
NCS000105	Blue Ridge Paper Products, Inc.	Pigeon River & Bowen Branch	04-03-05	Haywood
NCS000340	Royster-Clark, Inc.	Waynesville MSSS to Richland Creek	04-03-05	Haywood
NCS000093	Outboard Marine Corporation	English Creek	04-03-06	Mitchell
NCS000202	United States Gypsum	Toe River	04-03-06	Mitchell

Appendix VII

303(d) Listing
and
Reporting Methodology

Integrated 305(b) and 303(d) Report Summary

The *North Carolina Water Quality Assessment and Impaired Waters List* is an integrated report that includes both the 305(b) and 303(d) reports of previous years. The *305(b) Report* is compiled biennially to update the assessment of water quality in North Carolina and to meet the Section 305(b) reporting requirement of the Clean Water Act. The 305(b) reports present how well waters support designated uses (e.g., swimming, aquatic life support, water supply), as well as likely causes (e.g., sediment, nutrients) and potential sources of impairment. The term "Use Support" refers to the process mandated by 305(b). The *303(d) List* is a comprehensive public accounting of all Impaired waterbodies that is derived from the 305(b) Report/Use Support. An Impaired waterbody is one that does not meet water quality uses, such as water supply, fishing or propagation of aquatic life. Best professional judgement along with numeric and narrative standards criteria and anti-degradation requirements defined in 40 CFR 131 is considered when evaluating the ability of a waterbody to serve its uses.

Section 303(d) of the federal Clean Water Act (CWA) which Congress enacted in 1972 required States, Territories and authorized Tribes to identify and establish a priority ranking for waterbodies for which technology-based effluent limitations required by Section 301 are not stringent enough to attain and maintain applicable water quality standards, establish total maximum daily loads (TMDLs) for the pollutants causing impairment in those waterbodies, and submit, from time to time, the list of Impaired waterbodies and TMDLs to the US Environmental Protection Agency (EPA). Current federal rules require states to submit 303(d) lists biennially, by April 1st of every even numbered year. EPA is required to approve or disapprove the state-developed 303(d) list within 30 days. For each water quality limited segment Impaired by a pollutant and identified in the 303(d) list, a Total Maximum Daily Load (TMDL) must be developed. TMDLs are not required for waters Impaired by pollution. Here, pollution is defined by the EPA as, “man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of the water,” and is related to water control structures (i.e., dams).

The Integrated Report includes descriptions of monitoring programs, the use support methodology, and the Impaired waters list. New guidance from EPA places all waterbody assessment units into one unique assessment category (EPA, 2001b). Although EPA specifies five unique assessment categories, North Carolina elects to use seven categories. Each category is described in detail below:

Category 1: Attaining the water quality standard and no use is threatened. This category consists of those waterbody assessment units where all applicable use support categories are rated " Supporting". Data and information are available to support a determination that the water quality standards are attained and no use is threatened. Future monitoring data will be used to determine if the water quality standard continues to be attained.

Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information are available to determine if the remaining uses are attained or threatened. This category consists of those waterbody assessment units where at least one of the applicable use support categories are rated " Supporting" and the other use support categories are rated "Not Rated" or “No Data”. Also included in this category are waters where at least one of the applicable use support categories, except Fish Consumption, are rated "Supporting"; the remaining applicable use support

categories, except Fish Consumption, are rated "Not Rated"; and the Fish Consumption category is rated "Impaired-Evaluated". Data and information are available to support a determination that some, but not all, uses are attained. Attainment status of the remaining uses is unknown because there are insufficient or no data or information. Future monitoring data will be used to determine if the uses previously found to be in attainment remain in attainment, and to determine the attainment status of those uses for which data and information were previously insufficient to make a determination.

Category 3: Insufficient or no data and information to determine if any designated use is attained. This category consists of those waterbody assessment units where all applicable use support categories, except Fish Consumption, are rated "Not Rated", and the Fish Consumption category is rated "Impaired-Evaluated". Measured data or information to support an attainment determination for any use are not available. Supplementary data and information, or future monitoring, will be required to assess the attainment status.

Category 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL. This category contains three distinct sub-categories:

> **Category 4a: TMDL has been completed**. This category consists of those waterbody assessment units for which EPA has approved or established a TMDL and water quality standards have not yet been achieved. Monitoring data will be considered before moving an assessment unit from Category 4a to Categories 1 or 2.
>
> **Category 4b: Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future**. This category consists of those waterbody assessment units for which TMDLs will not be attempted because other required regulatory controls (e.g., NPDES permit limits, Stormwater Program rules, etc.) are expected to attain water quality standards within a reasonable amount of time. Future monitoring will be used to verify that the water quality standard is attained as expected.
>
> **Category 4c: Impairment is not caused by a pollutant**. This category consists of assessment units that are Impaired by pollution, not by a pollutant. EPA defines pollution as "The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water." EPA staff have verbally stated that this category is intended to be used for impairments related to water control structures (i.e., dams). Future monitoring will be used to confirm that there continues to be an absence of pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment.

Category 5: Impaired for one or more designated uses by a pollutant(s) and requires a TMDL. This category consists of those waterbody assessment units that are Impaired by a pollutant and the proper technical conditions exist to develop TMDLs. As defined by the EPA, the term pollutant means "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into the water." When more than one pollutant is associated with the impairment of a single waterbody assessment unit in this category, the assessment unit will remain in Category 5 until TMDLs for all listed pollutants have been completed and approved by the EPA.

Category 6: Impaired based on biological data. This category consists of waterbody assessment units historically referred to as "Biologically Impaired" waterbodies; these assessment units have no identified cause(s) of impairment although aquatic life impacts have been documented. The waterbody assessment unit will remain in Category 6 until TMDLs have been completed and approved by the EPA.

Category 7: Impaired, but the proper technical conditions do not yet exist to develop a TMDL. As described in the Federal Register, "proper technical conditions" refer to the availability of the analytical methods, modeling techniques and data base necessary to develop a technically defensible TMDL. These elements will vary in their level of sophistication depending on the nature of the pollutant and characteristics of the segment in question" (43 FR 60662, December 28, 1978). These are assessment units that would otherwise be in Category 5 of the integrated list. As previously noted, EPA has recognized that in some specific situations the data, analyses or models are not available to establish a TMDL. North Carolina seeks EPA technical guidance in developing technically defensible TMDLs for these waters. Open water and ocean hydrology fecal coliform Impaired shellfishing waters are included in this category.

For this integrated list, Categories 1 and 2 are considered fully supporting any assessed uses. This portion of the integrated list is extensive (thousands of segments); thus, a printed copy is not provided. A table of waters on Categories 1 through 3 is available for downloading on the DWQ website (http://h2o.enr.state.nc.us/tmdl/General_303d.htm). Categories 5, 6 and 7 constitute the 2004 North Carolina 303(d) List for the State of North Carolina.

Delisting Waters

In general, waters will move from Categories 5, 6 or 7 when data show that uses are fully supported or when a TMDL has been approved by EPA. In some cases, mistakes have been discovered in the original listing decision and the mistakes are being corrected. Waters appearing on the previously approved Impaired waters list will be moved to Categories 1, 2, 3 or 4 under the following circumstances:

- An updated 305(b) use support rating of Supporting, as described in the basinwide management plans.
- Applicable water quality standards are being met (i.e., no longer Impaired for a given pollutant) as described in either basinwide management plans or in technical memoranda.
- The basis for putting the water on the list is determined to be invalid (i.e., was mistakenly identified as Impaired in accordance with 40 CFR 130.7(b)(6)(iv) and/or National Clarifying Guidance for State and Territory 1998 Section 303(d) Listing Decisions. Robert Wayland, III, Director. Office of Wetlands, Oceans and Watersheds. Aug 27, 1997).
- A water quality variance has been issued for a specific standard (e.g., chloride).
- Removal of fish consumption advisories or modification of fish eating advice.
- Typographic listing mistakes (i.e., the wrong water was identified).
- EPA has approved a TMDL.

Scheduling TMDLs

Category 5 waters, those for which a TMDL is needed, are at many different stages on the path to an approved TMDL. Some require additional data collection to adequately define the problem in TMDL terms. Some require more outreach to increase stakeholder involvement. Others need to have a technical strategy budgeted, funded and scheduled. Some are ready for EPA submittal.

North Carolina has prioritized TMDL development for waters Impaired due to bacteria or turbidity. The approach of prioritizing TMDL development based on pollutant has been successfully used in other states. Limited resources are used more effectively with a focus on a particular pollutant. Waters Impaired by other pollutants (i.e., not bacteria) are not excluded from the schedule. However, the majority of waters prioritized for the next few years are associated with bacterial contamination. Compliance with TMDL development schedules provided in the Integrated Report depends upon DWQ and EPA resources.

North Carolina uses biological data to place the majority of waterbody assessment units on the 303(d) list. Additional consideration and data collection are necessary if the establishment of a TMDL for waters on Category 6 is to be expected. It is important to understand that the identification of waters in Category 6 does not mean that they are low priority waters. The assessment of these waters is a high priority for the State of North Carolina. However, it may take significant resources and time to determine the environmental stressors and potentially a cause of impairment. Assigning waters to Category 6 is a declaration of the need for more data and time to adequately define the problems and whether pollution, pollutants or a combination affects waters.

According to EPA guidance (EPA 2004), prioritization of waterbody assessment units for TMDLs need not be reflected in a “high, medium or low” manner. Instead, prioritization can be reflected in the TMDL development schedule. Generally, North Carolina attempts to develop TMDLs within 10 years of the original pollutant listing. Other information for each assessment unit is also utilized to determine the priority in the TMDL development schedule. This information includes the following:

- Year listed. Assessment units that have been on the 303(d) list for the longest period of time will receive priority for TMDL development and/or stressor studies.
- Reason for listing. (Applicable to Category 5 AUs only) AUs with an impairment due to a standard violation will be prioritized based on which standard was violated. Standard violations due to bacteria or turbidity currently receive priority for TMDL development.
- Classification. AUs classified for primary recreation (Class B), water supply (Class WS-I through WS-V), trout (Tr), high quality waters (HQW), and outstanding resource waters (ORW) will continue to receive a higher priority for TMDL development and/or stressor studies.
- Basinwide Planning Schedule. (Applicable to Category 6 AUs only). The basinwide schedule is utilized to establish priority for stressor studies.

Revising TMDLs

Current federal regulations do not specify when TMDLs should be revised. However, there are several circumstances under which it would seem prudent to revisit existing TMDLs. The TMDL analysis of targets and allocations is based upon the existing water quality standards, hydrology, water quality data (chemical and biological), and existing, active NPDES wastewater discharges. Conditions related to any of these factors could be used to justify a TMDL revision. Specific conditions that the Division will consider prior to revising an existing, approved TMDL include the following:

- A TMDL has been fully implemented and the water quality standards continue to be violated. If a TMDL has been implemented and water quality data indicate no improvement or a decline in overall water quality, the basis for the TMDL reduction or the allocation may need to be revised;
- A change of a water quality standard (e.g., fecal coliform to Echerichia coli). The Division will prioritize review of existing TMDLs and data to determine if a revision to TMDLs will be required;
- The addition or removal of hydraulic structures to a waterbody (e.g., dams). Substantial changes to waterbody hydrology and hydraulics have the potential to change many aspects of target setting, including the water quality standard upon which the TMDL was developed, the water quality data, and the water quality modeling;
- Incorrect assumptions were used to derive the TMDL allocations. This would include errors in calculations and omission of a permitted discharge.

Should a TMDL be revised due to needed changes in TMDL targets, the entire TMDL would be revised. This includes the TMDL target, source assessment, and load and wasteload allocations. However, the Division may elect to revise only specific portions of the TMDL. For example, changes may be justifiable to the load and wasteload allocation portions of a TMDL due to incorrect calculations or inequities. In these cases, revisions to the TMDL allocations would not necessarily include a revision of TMDL targets.

Appendix VIII

French Broad River Basin Nonpoint Source Program Description and Contacts

Agriculture

USDA Natural Resources Conservation Service:

Part of the US Department of Agriculture, formerly the Soil Conservation Service. Technical specialists certify waste management plans for animal operations; provide certification training for swine waste applicators; work with landowners on private lands to conserve natural resources, helping farmers and ranchers develop conservation systems unique to their land and needs; administer several federal agricultural cost share and incentive programs; provide assistance to rural and urban communities to reduce erosion, conserve and protect water, and solve other resource problems; conduct soil surveys; offer planning assistance for local landowners to install best management practices; and offer farmers technical assistance on wetlands identification. Each of the individuals listed below can also be contacted via email using the following address format <first name.last name@nc.usda.gov>.

Area 1 Conservationist	Carol S. Litchfield	828-456-6341	589 Raccoon Road, Suite 246, Waynesville NC 28786

County	Contact Person	Phone	Address
Avery	Christine Vance	828-264-3943	P.O. Box 190, Newland, NC 28657
Buncombe	Victor L. McIntyre	828-250-4785	155 Hilliard Avenue, Asheville NC 28801
Haywood	Jesse L. Newton	828-452-2741	589 Raccoon Road, Suite 203, Waynesville NC 28786
Henderson	Robert V. Carter, Jr.	828-697-4949	999 High Country Lane, Hendersonville NC 28792
Madison	Russell C. Blevins	828-649-9099	4388 Hwy 25/70, Suite 2, Marshall NC 28753
Mitchell	J. Clifford Vinson	828-765-5131	11943 Hwy 226 South, Suite C, Spruce NC 28777
Transylvania	Robert Twomey	828-884-3230	203 E Morgan Street, Brevard NC 28712
Yancey	J. Clifford Vinson	828-682-3410	11943 Hwy 226, South, Suite C, Spruce NC 28777

Soil & Water Conservation Districts:

Boards and staff under the administration of the NC Soil and Water Conservation Commission (SWCC). Districts are responsible for: administering the *Agricultural Cost Share Program for Nonpoint Source Pollution Control* at the county level; identifying areas needing soil and/or water conservation treatment; allocating cost share resources; signing cost share contracts with landowners; providing technical assistance for the planning and implementation of BMPs; and encouraging the use of appropriate BMPs to protect water quality.

County	Board Chairman	Phone	Address
Avery		828-733-2291	PO Box 190, Newland NC 28657
Buncombe		828-250-4785	155 Hilliard Avenue, Suite 204, Asheville NC 28801
Haywood		828-452-2741	589 Raccoon Road, Suite 203, Waynesville NC 28786
Henderson		828-697-4949	999 High Country Lane, Hendersonville NC 28792
Madison		828-649-9099	4388 NC Hwy 25/70, Suite 2, Marshall NC 28753
Mitchell		828-765-5131	11943 South Hwy 226, Spruce Pine NC 28777
Transylvania		828-884-3230	203 E Morgan Street, Brevard NC 28712
Yancey		828-682-3410	22 E Bypass Suite 1, Burnsville NC 28714

Division of Soil and Water Conservation:

State agency that administers the *Agricultural Cost Share Program for Nonpoint Source Pollution Control* (ACSP). Allocates ACSP funds to the Soil and Water Conservation Districts, and provides administrative and technical assistance related to soil science and engineering. Distributes Wetlands Inventory maps for a small fee.

Central Office	Carroll Pierce	919-715-6110	1614 Mail Service Center, Raleigh, NC 27604
Central Office	David Williams	919-715-6103	1614 Mail Service Center, Raleigh, NC 27604
Swannanoa Region*	Davis Ferguson	828-296-4698	2090 US Hwy. 70, Swannanoa, NC 28778
Swannanoa Region*	Jeff Young	828-296-6165	2090 US Hwy. 70, Swannanoa, NC 28778

NCDA Regional Agronomists:

The NC Department of Agriculture technical specialists: certify waste management plans for animal operations; provide certification training for swine waste applicators; track, monitor, and account for use of nutrients on agricultural lands; operate the state *Pesticide Disposal Program,* and enforce the state pesticide handling and application laws with farmers.

Central Office	Tom Ellis	919-733-7125	2 West Edenton Street, Raleigh NC 27611
Region 13	Bill Yarborough	828-456-3943	443 Pisgah View Drive, Waynesville NC 28786

Education

NC Cooperative Extension Service:

Provides practical, research-based information and programs to help individuals, families, farms, businesses and communities.

County	Contact Person	Phone	Address
Avery	Michael Pitman	828-733-2415	805 Cranberry Street, Newland NC 28657
Buncombe	Kenneth Reeves	828-255-5522	31 College Place, Asheville NC 28801
Haywood	William L. Skelton	828-456-3575	PO Box 308, Waynesville NC 28786
Henderson	Joy Staton	828-697-4891	740 Glover Street, Hendersonville NC 28792
Madison	Ross Young	828-649-2411	20 Bailey's Branch Road, Marshall NC 28753
Mitchell	Jeffrey K. Vance	828-688-2051	10 South Mitchell Avenue, Bakersville NC 28705
Transylvania	Eric N. Caldwell	828-884-3109	203 East Morgan Street, Brevard NC 28712
Yancey	Johnny Hensley	828-682-6186	10 Orchard Street, Burnsville NC 28714

Forestry

Division of Forest Resources:

Develop, protect, and manage the multiple resources of North Carolina's forests through professional stewardship, enhancing the quality of our citizens while ensuring the continuity of these vital resources.

District 1	Greg Smith	828-667-5211	220 Sardis Road, Asheville NC 28806
District 9	Gerald McCall	828-586-4007	443 NC Highway 16, Sylva, NC 28779
Region 11	Greg Yates	828-251-6509	14 Gaston Mountain Road, Asheville, NC 28806
Central Office	Bill Swartley	919-733-2162	1616 Mail Service Center, Raleigh NC 27699-1616

Construction/Mining

DENR Division of Land Resources:

Administers the NC Erosion and Sedimentation Control Program for construction and mining operations. Conducts land surveys and studies, produces maps, and protects the state's land and mineral resources.

Central Office	Floyd Williams	919-733-4574	512 North Salisbury Street, Raleigh NC 27626
Swannanoa Region*		828-251-6208	2090 US Hwy. 70, Swannanoa, NC 28778

Local Erosion and Sedimentation Control Ordinances:

Several local governments in the basin have qualified to administer their own erosion and sedimentation control ordinances.

City of Asheville		828-259-5830	PO Box 7148, Asheville NC 28802
Buncombe County	Michael Brookshire	828-250-4850	46 Valley Street, Asheville NC 28801
Haywood County	Marc Pruett	828-452-6706	1233 North Main Street, Waynesville NC 28786

General Water Quality

DENR DWQ Planning Section:

Coordinate the numerous nonpoint source programs carried out by many agencies; coordinate the French Broad and Neuse River Nutrient Sensitive Waters Strategies; administer the Section 319 grants program statewide; conduct stormwater permitting; model water quality; conduct water quality monitoring; perform wetlands permitting; conduct animal operation permitting and enforcement; and conduct water quality classifications and standards activities.

Planning Section Chief	Alan Clark	919-733-5083 x 570	
NPS Planning	Rich Gannon	919-733-5083 x 356	1617 Mail Service Center, Raleigh NC 27699
Modeling/TMDL	Michelle Woolfolk	919-733-5083 x 505	1617 Mail Service Center, Raleigh NC 27699
Classifications and Standards	Jeff Manning	919-733-5083 x 579	1617 Mail Service Center, Raleigh NC 27699
Basinwide Planning	Darlene Kucken	919-733-5083 x 354	1617 Mail Service Center, Raleigh NC 27699
Groundwater Planning	Carl Bailey	919-733-5083 x 522	1617 Mail Service Center, Raleigh NC 27699
Urban Stormwater	Bradley Bennett	919-733-5083 x 525	1617 Mail Service Center, Raleigh NC 27699
Monitoring	Jimmie Overton	919-733-9960 x 204	1621 Mail Service Center, Raleigh NC 27699
Animal Operations	Paul Sherman	919-733-5083 x 533	1617 Mail Service Center, Raleigh NC 27699
Wetlands & Stormwater	Tom Reeder	919-733-5083 x 528	1650 Mail Service Center, Raleigh NC 27699

DWQ Regional Offices:

Conduct permitting and enforcement field work on point sources, stormwater, wetlands and animal operations; conduct enforcement on water quality violations of any kind; and perform ambient water quality monitoring.

Swannanoa Region*	Roger Edwards	828-296-4500	2090 US Hwy. 70, Swannanoa, NC 28778

Wildlife Resources Commission:

To manage, restore, develop, cultivate, conserve, protect and regulate the wildlife resources of the state, and to administer the laws enacted by the General Assembly relating to game, game and non-game freshwater fishes, and other wildlife resources in a sound, constructive, comprehensive, continuing and economical manner.

Central Office	Frank McBride	919-528-9886	PO Box 118, Northside NC 27564
Pisgah Center for Wildlife Education	J.P. McCann	828-877-4423	PO Box 1600, Pisgah Forest NC 28768

U.S. Army Corps of Engineers:

Responsible for: investigating, developing and maintaining the nation's water and related environmental resources; constructing and operating projects for navigation, flood control, major drainage, shore and beach restoration and protection; hydropower development; water supply; water quality control, fish and wildlife conservation and enhancement, and outdoor recreation; responding to emergency relief activities directed by other federal agencies; and administering laws for the protection and preservation of navigable waters, emergency flood control and shore protection. Responsible for wetlands and 404 Federal Permits.

Asheville Field Office	Steve McCladen	828-271-7980	151 Patton Ave, Room 208, Asheville NC 28801-5006

Solid Waste

DENR Division of Waste Management:

Management of solid waste in a way that protects public health and the environment. The Division includes three sections and one program -- Hazardous Waste, Solid Waste, Superfund, and the Resident Inspectors Program.

Central Office	Brad Atkinson	919-733-0692	401 Oberlin Road, Suite 150, Raleigh NC 27605
Swannanoa Region*	Al Hetzell	828-296-4500	2090 US Hwy. 70, Swannanoa, NC 28778

On-Site Wastewater Treatment

Division of Environmental Health and County Health Departments:

Safeguard life, promote human health, and protect the environment through the practice of modern environmental health science, the use of technology, rules, public education, and above all, dedication to the public trust.

Services include:

- Training of and delegation of authority to local environmental health specialists concerning on-site wastewater.
- Engineering review of plans and specifications for wastewater systems 3,000 gallons or larger and industrial process wastewater systems designed to discharge below the ground surface.
- Technical assistance to local health departments, other state agencies, and industry on soil suitability and other site considerations for on-site wastewater systems.

Central Office	Steve Steinbeck	919-715-3273	2728 Capital Boulevard, Raleigh NC 27604
Swannanoa Region *	Terrell Jones	828-686-9077	303 Harrisson Hill Road, Swannanoa NC 28778

County	Primary Contact	Phone	Address
Avery	Thomas Singleton	828-733-6031	861 Greenwood Road, Spruce Pine NC 28777
Buncombe	George F. Bond, Jr.	828-250-5203	35 Woodfin Street, Asheville NC 28801-3075
Haywood	Robert C. Wood	828-452-6675	2177 Asheville Road, Waynesville NC 28786
Henderson	Thomas D. Bridges	828-692-4223	1347 Spartanburg Hwy, Hendersonville NC 28792
Madison	Buck Wilson	828-649-3531	140 Health Care Lane, Marshall NC 28753
Mitchell	Thomas Singleton	828-688-2371	861 Greenwood Road, Spruce Pine NC 28777
Transylvania	Steve Smith	828-884-3135	Community Services Building, Brevard NC 28712
Yancey	Thomas Singleton	828-682-3003	861 Greenwood Road, Spruce Pine NC 28777

*** DENR Swannanoa Regional Office covers the following counties:** Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Swain, Transylvania and Yancey.

Appendix IX

French Broad River Basin Workshop Summaries

Issues Associated with Specific Waters of the French Broad River Basin

Water/ Generalized Area	Subbasin	Issue	Workshop
Swannanoa River	04-03-02	Development from Asheville and Black Mountain	Asheville
Little Ivy River	04-03-04	Straight pipes, cattle	Asheville Hendersonville
Davidson River	04-03-03	Eucusta site, who is responsible for this site	Asheville, Hendersonville
Grassy Branch	04-03-02	Fecal Coliform	Asheville
Bull Creek	04-03-02	Sediment and development	Asheville
Ross Creek	04-03-02	Urban stream, impacts from Asheville and Buncombe County	Asheville Hendersonville
Mills River	04-03-03	Development and associated problems; pesticides; maintain and improve current quality, drinking water source, floodplain encroachment, future growth	Asheville Hendersonville Waynesville
Bald Creek	04-03-07	Widening of US 19E	Asheville
Hominy Creek	04-03-02	Downstream of Enka	Asheville Hendersonville
French Broad River	04-03-01	Streambank erosion in Transylvania County, drinking water source, development and access roads, increased runoff	Asheville Hendersonville Waynesville
Cane River	04-03-07	Permit limits for dischargers	Burnsville
Gash Creek	04-03-02	Development pressure-moving from agriculture to semi-urban	Hendersonville
Mill Pond Creek	04-03-02	Starts in landfill, development	Hendersonville
Wolfpen Creek	04-03-02	Highway 64E	Hendersonville
Mud Creek	04-03-02	City of Hendersonville, Hendersonville WWTP discharge, runoff	Hendersonville
Brandy Branch	04-03-03	Part of Mills River Watershed, similar concerns	Hendersonville
Willow Creek	04-03-02	Agricultural practices, plowing close to creek	Hendersonville
Lower Clear Creek	04-03-02	Biological impacts	Hendersonville

Shaw Creek	04-02-02	Development impacts	Hendersonville
Ratcliffe Cove Branch	04-03-05	Agricultural, sediment concerns	Waynesville
Raccoon Creek	04-03-05	Agricultural, sediment concerns, US 19/23 construction	Waynesville
Jonathan Creek	04-03-05	Maggie Valley's WWTP compliance, future threats above confluence with Campbell Creek	Waynesville
Hyatt Creek	04-03-05	Livestock operations, hog farm, development, wastewater treatment package plant, eroding banks	Waynesville
Fines Creek	04-03-05	Poor land use management	Waynesville
Rush Fork	04-03-05	Dairy operations	Waynesville
Pigeon River	04-03-05	Concern above Canton, drinking water source, small individual developments - need septic permit, but do not need to provide stormwater control	Waynesville
Campbell Creek	04-03-05	Protection of drinking water source for Maggie Valley	Waynesville
Hurricane Creek	04-03-05	Sediment, road construction impacts	Waynesville
Banks Creek	04-03-07	Golf course expansion, trout not able to reproduce	Waynesville

Issues Related to Urbanization and Land Use Changes Basinwide

Specific Issue	Recommendation	Workshop
Develop on steeper slopes	Need local sediment and erosion control programs; and education for developers, contractors and homeowners	Hendersonville Waynesville
Land conversion, improper growth, sprawl	Better land use planning, maintaining rural areas	Asheville Hendersonville Waynesville
Higher populations	Need lower density regulations	Hendersonville
Runoff tax/river basin impact (property) tax	Change the way stormwater and runoff is viewed, so that those implementing protective practices receive a financial incentive through lower taxes.	Asheville
Stormwater runoff and increased amounts of impervious surfaces	Require stormwater controls as part of the sediment and erosion control plans.	Waynesville
Development of roads in subdivisions	Need standards and technical assistance, as well as BMPs and stormwater controls to minimize impacts to water quality	Waynesville
Planning and placement of sewer extension	Reconsider county-wide sewer projects	Waynesville
Conservation easements	Protect high quality lands and water though easements with local agencies and organizations	Hendersonville

Issues Related to Water Supply Quantity and Protection

Issue	Workshop
Residential development on WS-III – is there adequate protection outside of Critical Area above Canton	Waynesville
Drinking water supplies – not enforcing existing regulations for critical areas	Waynesville
Increased withdrawal of water from Mills River and French Broad for water supply	Hendersonville

Issues Related to Enforcement, Permitting, Rule Making and Monitoring

Specific Issue	Recommendation
Local ordinances	Should be strengthened and reevaluated
Citizen monitoring	
Buffer Rules	Need more monitoring and enforcement
Point Sources	Should have to land apply all future flow increases
Land Application Sites	More monitoring of sites
Development	Sediment and erosion control inspections needed on development
Forestry	Forestry BMPs manual needed
Nonpoint Source	More inspectors needed
BMPs	Require BMPs to remove nutrients and sediment and remove minimum exclusion
Funding	More money for education and enforcement

Issues Related to Funding Sources and Education

Specific Issue	Workshop
Misinformation	Asheville
Educational programs at local levels for builders and local politicians	Asheville
'Nemo' program for officials	Asheville
Incentives for promoting 'green' development	Asheville
Developing a check list for desirable development characteristics	Asheville
Citizen need to be informed about polluted runoff and microorganisms in private wells	Hendersonville Waynesville
Mutually beneficial buffers are needed	Hendersonville
Projects could be funded by water consumers	Hendersonville
Multiple small projects need to be funded to improve water quality (especially in headwaters)	Hendersonville
Farmland protection	Hendersonville
Funding needed for buffers	Hendersonville
Where can this funding be obtained?	Hendersonville
Well, septic system and groundwater education and awareness are needed	Hendersonville
Public education and outreach to landowners	Hendersonville Waynesville
Technical assistance and funding	Hendersonville Waynesville

Continued funding for straight pipe elimination	Hendersonville
Provide money to assist local governments with aging collection lines	Hendersonville
Who is going to pay for regulations?	Hendersonville
Continue education and technical improvements	Hendersonville
Education for contractors on BMPs (steep slopes)	Hendersonville
Education for developers on BMPs (steep slopes)	Hendersonville
Educate consumers on 'real' costs for high quality water	Hendersonville
Continued funding of cost share program to farmers over life of BMP	Hendersonville
One NC Naturally should look broader to other states to create a mechanized tool for assuring funding	Hendersonville
Bring One NC Naturally to the local level with withdrawers providing some funding to water quality maintenance fund – apply back to affected community	Hendersonville
Greater awareness to landowners about funding available to restore and protect water quality	Waynesville
Home buying and building guides for realtors to distribute	Waynesville
Educate lenders – justify costs	Waynesville
Grant funding for improvements	Waynesville
Clean water training programs for contractors and operators.	Waynesville
Make education materials on sediment/erosion controls to homeowners as well as contractors	Waynesville

Appendix X

Use Support Methodology
and
Use Support Ratings

Introduction to Use Support

All surface waters of the state are assigned a classification appropriate to the best-intended uses of that water. Waters are assessed to determine how well they are meeting the classified or best-intended uses. The assessment results in a use support rating for the use categories that apply to that water.

Use Support Categories

Beginning in 2000 with the *Roanoke River Basinwide Water Quality Plan*, DWQ assesses ecosystem health and human health risk through the use of five use support categories: aquatic life, recreation, fish consumption, water supply, and shellfish harvesting. These categories are tied to the uses associated with the primary classifications applied to NC rivers and streams. Waters are Supporting if data and information used to assign a use support rating meet the criteria for that use category. If these criteria are not met, then the waters are Impaired. Waters with inconclusive data and information are Not Rated. Waters where no data or information are available to make an assessment are No Data. The table below specifies which use support categories apply to which primary classifications.

A single water may have more than one use support rating corresponding to one or more of the use support categories, as shown in the following table. For many waters, a use support category will not be applicable (N/A) to the classification of that water (e.g., shellfish harvesting is only applied to Class SA waters). A full description of the classifications is available in the DWQ document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina* (15A NCAC 2b .0100 and .0200). Information can also be found at http://h2o.enr.state.nc.us/csu/.

Use Support Categories

Primary Classification	Ecosystem Approach	Human Health Approach			
	Aquatic Life	Fish Consumption	Recreation	Water Supply	Shellfish Harvesting
C	X	X	X	N/A	N/A
SC	X	X	X	N/A	N/A
B	X	X	X	N/A	N/A
SB	X	X	X	N/A	N/A
SA	X	X	X	N/A	X
WS I – WS IV	X	X	X	X	N/A

Assessment Period

Data and information are used to assess water quality and assign use support ratings using a five-year data window that ends on August 31 of the year of basinwide biological sampling. For example, if biological data are collected in a basin in 2004, then the five-year data window for use support assessments would be September 1, 1999 to August 31, 2004. There are occasionally some exceptions to this data window, especially when follow up monitoring is needed to make decisions on samples collected in the last year of the assessment period.

Assessment Units

DWQ identifies waters by index numbers and assessment unit numbers (AU). The AU is used to track defined stream segments or waterbodies in the water quality assessment database, for the 303(d) Impaired waters list, and in the various tables in basin plans and other water quality documents. The AU is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU indicates that the AU is smaller than the DWQ index segment. No letter indicates that the AU and the DWQ index segment are the same.

Interpretation of Data and Information

When interpreting the use support ratings, it is important to understand the associated limitations and degree of uncertainty. Although these use support methods are used for analyzing data and information and determining use support ratings, best professional judgment is applied during these assessments. Use support ratings are intended to provide an assessment of water quality using a five-year data window, to describe how well surface waters support their classified uses, and to document the potential stressors contributing to water quality degradation and the sources of these contributions.

Use support methods continue to improve over time, and the information and technology used to make use support determinations also continue to become more accurate and comprehensive. These improvements sometimes make it difficult to make generalizations comparing water quality between basin plans. However, technology and methods improvements result in more scientifically sound use support assessments.

Assessment Methodology

Introduction

Many types of data and information are used to determine use support ratings and to identify stressors and sources of water quality degradation. All existing data pertaining to a stream segment for each applicable use support category are entered into a use support database and may include its use support ratings, basis of assessment, biological and ambient monitoring data, stressors and potential sources. Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data, fish consumption advisories from the NC Department of Health and Human Services, swimming advisories and shellfish sanitation growing area classifications from the NC Division of Environmental Health (as appropriate), and available land cover and land use information.

The following describes the data and methodologies used to conduct use support assessments. These methods will continue to be refined as additional information and technology become available.

Basis of Assessment

Assessments are made on an overall basis of either monitored (M) or evaluated (E), depending on the level of information available. A monitored rating is based on the most recent five-year data window and site-specific data and is therefore treated with more confidence than an evaluated rating.

Supporting ratings are extrapolated up tributaries from monitored streams when there are no problematic dischargers with permit violations or changes in land use/cover. Supporting ratings may also be applied to unmonitored tributaries where there is little land disturbance (e.g., national forests and wildlife refuges, wilderness areas or state natural areas). Problem stressors or sources (except general NPS) are not generally applied to unmonitored tributaries. Impaired ratings are not extrapolated to unmonitored tributaries.

Stressors

Biological and ambient samplings are useful tools to assess water quality. However, biological sampling does not typically identify the causes of impairment, and ambient sampling does not always link water quality standards to a biological response. Linking the causes of impairment and the biological response are a complex process (USEPA, 2000) that begins with an evaluation of physical, chemical or biological entities that can induce an adverse biological response. These entities are referred to as stressors. A stressor may have a measurable impact to aquatic health. Not all streams will have a primary stressor or cause of impairment. A single stressor may not be sufficient to cause impairment, but the accumulation of several stressors may result in impairment. In either case, impairment is likely to continue if the stressor or the various cumulative stressors are not addressed. Use support assessments evaluate the available information related to potential stressors impacting water quality.

A stressor identification process may be initiated after a stream appears on the 303(d) list in order to address streams that are Impaired based on biological data. Intensive studies are required to summarize and evaluate potential stressors to determine if there is evidence that a particular stressor plays a substantial role in causing the biological impacts. Intensive studies consider lines of evidence that include benthic macroinvertebrate and fish community data, habitat and riparian area assessment, chemistry and toxicity data, and information on watershed history, current watershed activities and land uses, and pollutant sources. These studies result in decisions regarding the probable stressors contributing to or causing impairment. The intensity of a stressor study may be limited due to a lack of resources. In these cases, it may still be appropriate to include stressors in use support assessments, but to also note where additional information is needed in order to evaluate other stressors.

Rating Basis	Use Support Category	Assessment Applicability*
S/M	AL	Biological community data or ambient water quality parameters do not exceed criteria in AU during assessment period. Biological and ambient data are independently applied.
S/M	REC	Ambient fecal bacteria parameter does not exceed criteria in AU or AU with RECMON sites is posted with advisories for 61 days or less during assessment period.
S/M	FC	AU does not have site-specific advisory and is not under a mercury advice or drains to areas within a mercury advice, or fish tissue data do not exceed criteria.
S/M	SH	AU is a DEH Approved shellfish growing area.
I/M	AL	Biological community data or ambient water quality parameters exceed criteria in AU during assessment period. Biological and ambient data are independently applied.
I/M	REC	Ambient fecal bacteria parameter exceeds criteria in AU or AU with RECMON sites is posted with advisories for more than 61 days during assessment period.
I/M	FC	Fish tissue data collected in AU during assessment period and basin are under mercury advice or site-specific advisory.
I/M	SH	AU is a DEH Conditionally-Approved, Prohibited or Restricted shellfish growing area.
NR/M	AL	Biological community is Not Rated or inconclusive, or ambient water quality parameters are inconclusive in AU during assessment period. Biological and ambient data are independently applied.
NR/M	REC	Ambient fecal bacteria parameter exceeds annual screening criteria, but does not exceed assessment criteria of five samples in 30 days in AU during assessment period.
S/E	AL	AU is a tributary to a S/M AU and land use is similar between AUs.
S/E	WS	AU is classified as WS, and DEH report notes no significant closures at time of assessment.
I/E	FC	AU is in basin under a mercury advice or drains to areas within a mercury advice and has no fish tissue data.
NR/E	AL	AU is tributary to I/M AU, or AU is in watershed with widespread and changing land use, or other information suggests negative water quality impacts to AU. Discharger in AU has noncompliance permit violations or has failed three or more WET tests during the last two years of the assessment period.
NR/E	REC	Discharger has noncompliance permit violations of fecal bacteria parameter during last two years of assessment period.
ND	AL, REC, FC, SH	No data available in AU during assessment period.

Note: S/M = Supporting/Monitored; I/M = Impaired/Monitored; NR/M = Not Rated/Monitored
S/E = Supporting/Evaluated; I/E = Impaired/Evaluated; NR/E = Not Rated/Evaluated
ND = No Data
AL = Aquatic Life; REC = Recreation; FC = Fish Consumption
SH = Shellfish Harvesting; WS = Water Supply
AU = Assessment Unit; WET = Whole Effluent Toxicity
DEH = Division of Environmental Health; * = for lakes assessments

Where an ambient parameter is identified as a potential concern, the parameter is noted in the DWQ database and use support summary table. Where habitat degradation is identified as a stressor, DWQ and others attempt to identify the type of habitat degradation (e.g., sedimentation, loss of woody habitat, loss of pools or riffles, channelization, lack of riparian vegetation, streambed scour and bank erosion). Habitat evaluation methods are being developed to better identify specific types of habitat degradation.

Aquatic Life Category

The aquatic life category is an ecosystem approach to assessing the biological integrity of all surface waters of the state. The biological community data and ambient water quality data are used in making assessments in this category. These represent the most important monitoring data for making water quality assessments in the aquatic life category. Evaluation information such as compliance and whole effluent toxicity information from NPDES dischargers, land cover, and other more anecdotal information are also used to identify potential problems and to refine assessments based on the monitoring data. The following is a description of each monitoring data type and the criteria used in assigning use support ratings. Criteria used to evaluate the other information and assign use support ratings are also described. Refer to page 14 for lakes and reservoir assessment methods as applied in the aquatic life category.

Biological Data

Benthic macroinvertebrate (aquatic insects) community and fish community samples are the best way to assess the biological integrity of most waterbodies. Unfortunately, these community measures cannot be applied to every stream size and are further limited by geographic region. These community measures are designed to detect current water quality and water quality changes that may be occurring in the watershed. However, they are only directly applied to the assessment unit where the sample was collected.

Where recent data for both benthic macroinvertebrates and fish communities are available, both are evaluated for use support assessments. When two biological monitoring data types conflict, best professional judgment is used to determine an appropriate use support rating. Where both ambient monitoring data and biological data are available, biological data may be given greater weight; however, each data type is assessed independently.

Benthic Macroinvertebrate Criteria

Criteria have been developed to assign bioclassifications to most benthic macroinvertebrate samples based on the number of taxa present in the pollution intolerant aquatic insect groups of *Ephemeroptera, Plecoptera* and *Trichoptera* (EPTs); and the Biotic Index (BI), which summarizes tolerance data for all taxa in each sample. Because these data represent water quality conditions with a high degree of confidence, use support ratings using these data are considered monitored.

If a Fair macroinvertebrate bioclassification is obtained under conditions (such as drought or flood conditions, recent spills, etc.) that may not represent normal conditions or is borderline Fair

(almost Good-Fair), a second sample should be taken within 12-24 months to validate the Fair bioclassification. Such sites will be Not Rated until the second sample is obtained.

Use support ratings are assigned to assessment units using benthic macroinvertebrate bioclassifications as follows.

Waterbody Sample Type or Criteria	Bioclassification	Use Support Rating
Mountain, piedmont, coastal A	Excellent	Supporting
Mountain, piedmont, coastal A	Good	Supporting
Swamp[1]	Natural	Supporting
Mountain, piedmont, coastal A	Good-Fair	Supporting
Smaller than criteria but Good-Fair[2]	Not Impaired	Supporting
Swamp[1]	Moderate Stress	Supporting
Mountain, piedmont, coastal A	Fair	Impaired
Swamp[1]	Severe Stress	Impaired
Mountain, piedmont, coastal A	Poor	Impaired
Criteria not appropriate to assign bioclassification	Not Rated	Not Rated

[1] Swamp streams for benthos sampling are defined as streams in the coastal plain that have no visible flow for a part of the year, but do have flow during the February to early March benthic index period.

[2] This designation may be used for flowing waters that are too small to be assigned a bioclassification (less than three square miles drainage area), but have a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria.

Fish Community Criteria

The North Carolina Index of Biotic Integrity (NCIBI) is a method for assessing a stream's biological integrity by examining the structure and health of its fish community. The NCIBI incorporates information about species richness and composition, indicator species, trophic function, abundance and condition, and reproductive function. Because these data represent water quality conditions with a high degree of confidence, use support ratings using these data are considered monitored. Use support ratings are assigned to assessment units using the NCIBI bioclassifications as follows:

NCIBI	Use Support Rating
Excellent	Supporting
Good	Supporting
Good-Fair	Supporting
Fair	Impaired
Poor	Impaired

If a Fair macroinvertebrate bioclassification is obtained under conditions (such as drought or flood conditions, recent spills, etc.) that may not represent normal conditions or is borderline Fair (almost Good-Fair), a second sample should be taken within 12-24 months to validate the Fair bioclassification. Such sites will not be given a use support rating until validation is obtained.

The NCIBI was recently revised (NCDENR, 2001), and the bioclassifications and criteria have also been recalibrated against regional reference site data (NCDENR, 2000a, 2000b and 2001a). NCIBI criteria are applicable only to wadeable streams in the following river basins: Broad, Catawba, Savannah, Yadkin-Pee Dee, Cape Fear, Neuse, Roanoke, Tar-Pamlico, French Broad, Hiwassee, Little Tennessee, New and Watauga. Additionally, the NCIBI criteria are only applicable to streams in the piedmont portion of the Cape Fear, Neuse, Roanoke and Tar-Pamlico River basins. The definition of "piedmont" for these four river basins is based upon a map of North Carolina watersheds (Fels, 1997). Specifically:

- In the Cape Fear River basin -- all waters except for those draining the Sandhills in Moore, Lee and Harnett counties, and the entire basin upstream of Lillington, NC.
- In the Neuse River basin -- the entire basin above Smithfield and Wilson, except for the south and southwest portions of Johnston County and eastern two-thirds of Wilson County.
- In the Roanoke River basin -- the entire basin in North Carolina upstream of Roanoke Rapids, NC and a small area between Roanoke Rapids and Halifax, NC.
- In the Tar-Pamlico River basin -- the entire basin above Rocky Mount, except for the lower southeastern one-half of Halifax County and the extreme eastern portion of Nash County.

NCIBI criteria have not been developed for:

- Streams in the Broad, Catawba, Yadkin-Pee Dee, Savannah, French Broad, Hiwassee, Little Tennessee, New and Watauga River basins which are characterized as wadeable first to third order streams with small watersheds, naturally low fish species diversity, coldwater temperatures, and high gradient plunge-pool flows. Such streams are typically thought of as "Southern Appalachian Trout Streams".
- Wadeable streams in the Sandhills ecoregion of the Cape Fear, Lumber and Yadkin-Pee Dee River basins.
- Wadeable streams and swamps in the coastal plain region of the Cape Fear, Chowan, Lumber, Neuse, Pasquotank, Roanoke, Tar-Pamlico and White Oak River basins.
- All nonwadeable and large streams and rivers throughout the state.

Ambient Water Quality Monitoring Criteria

Chemical/physical water quality data are collected through the DWQ Ambient Monitoring Program statewide and NPDES discharger coalitions in some basins. All samples collected (usually monthly) during the five-year assessment period are used to assign a use support rating. Ambient water quality data are not direct measures of biological integrity, but the chemical/physical parameters collected can provide an indication of conditions that may be impacting aquatic life. Because these data represent water quality conditions with a high degree of confidence, use support ratings assigned using these data are considered monitored. Where both ambient data and biological data are available, each data type is assessed independently.

The parameters used to assess water quality in the aquatic life category include dissolved oxygen, pH, chlorophyll *a* and turbidity. Criteria for assigning use support ratings to assessment units with ambient water quality data of a minimum of ten samples are as follows:

Ratings Criteria	Rating
Numerical standard exceeded in ≤10% of samples	Supporting
Numerical standard exceeded in >10% of samples	Impaired
Less than 10 samples collected	Not Rated
DO and pH standard exceeded in swamp streams	Not Rated

Multiple Monitoring Sites

There are assessment units with more than one type of monitoring data. When the data from multiple biological data types are not in agreement, best professional judgment is used to assign a bioclassification and use support rating for that assessment unit. Biological monitoring is typically assessed independent of ambient monitoring data and either may be used to assign a use support rating for an assessment unit. Monitoring data are always used over the evaluation information; however, evaluation information can be used to lengthen or shorten monitored assessment units and to assign use support ratings on an evaluated basis to non-monitored assessment units.

NPDES Wastewater Whole Effluent Toxicity (WET) Information

Whole Effluent Toxicity (WET) tests are required for all major NPDES discharge permit holders, as well as those minor NPDES dischargers with complex effluent (defined as not being of 100 percent domestic waste). WET tests are evaluated to determine if the discharge could be having negative water quality impacts. If a stream with a WET test facility has not been sampled for instream chronic toxicity, biological community data or has no ambient water quality data, and that facility has failed three or more WET tests in the last two years of the assessment period, the assessment unit is Not Rated. Because this information is not a direct measure of water quality and the confidence is not as high as for monitoring data, this use support rating is considered evaluated rather than monitored. Problems associated with WET test failures are addressed through NPDES permits.

NPDES Discharger Daily Monitoring Report Information

NPDES effluent data monthly averages of water quality parameters are screened for the last two years of the assessment period. If facilities exceed the effluent limits by 20 percent for two or more months during two consecutive quarters, or have chronic exceedances of permit limits for four or more months during two consecutive quarters, then the assessment unit is Not Rated if no biological or ambient monitoring data are available. If biological or ambient data are available, that data will be used to develop a use support rating for appropriate stream segments. Because this information is not a direct measure of water quality and the confidence is not as high as for monitoring data, this use support rating is considered evaluated rather than monitored.

Fish Consumption Category

The fish consumption category is a human health approach to assess whether humans can safely consume fish from a waterbody. This category is applied to all waters of the state. The use support rating is assigned using fish consumption advisories or advice as issued by the NC

Department of Health and Human Services (NCDHHS). The fish consumption category is different from other categories in that assessments are based on the existence of a DHHS fish consumption advice or advisory at the time of assessment. The advice and advisories are based on DHHS epidemiological studies and on DWQ fish tissue data, so a fish tissue monitoring site will constitute a monitored assessment unit (AU) and all other AUs will be evaluated. DWQ fish tissue data are used to inform DHHS of potential fish tissue toxicity. DHHS is responsible for proclaiming a fish tissue advisory for any waterbody. Fish tissue monitoring data are not used directly for assigning a use support rating in this category.
If a limited site-specific fish consumption advisory or a no consumption advisory is posted at the time of assessment, the water is Impaired. If there are no site-specific advisories posted or the stream is not in a basin where mercury advice is applied, then the assessment unit will be Supporting in this category.

The NCDHHS has developed regional fish consumption advice (all waters south and east of I-85) for certain fish species shown to have elevated levels of mercury in their tissue. DWQ applies the DHHS fish consumption advice for mercury on a basinwide scale rather than an AU scale in recognition that fish move up and downstream regardless of the presence of I-85. All AUs draining below or intersecting I-85 are Impaired in the fish consumption category. AUs with monitoring data are considered Impaired/Monitored, and AUs with no monitoring data are considered Impaired/Evaluated. When a DHHS site-specific advisory is in place for a parameter other than mercury, the assessment is based on that advisory and the mercury advice will take a lower ranking in the assessment. Therefore, when a site-specific advisory is in place in a basin with a mercury advice and the AU has fish tissue monitoring data, the AU will be considered Impaired/Monitored for the specific parameter, rather than Impaired/Evaluated for mercury.

Basins under the mercury advice are the Cape Fear, Chowan, Lumber, Neuse, Pasquotank, Roanoke, White Oak and Yadkin-Pee Dee. All waters in these basins are Impaired in the fish consumption category, even when there is a site-specific advisory. All waters are also considered Monitored or Evaluated, dependent upon the availability of monitoring data.

Only a small portion of the Catawba River basin is intersected by I-85 (lower Mecklenberg, Union and Gaston counties). Due to the presence of dams that impede fish travel throughout the Catawba River basin, only those waters draining to and entering the mainstem Catawba below I-85 and are not impeded by dams are considered Impaired/Evaluated.

Basins not under the mercury advice are the Broad, French Broad, Hiwassee, Little Tennessee, New, Savannah and Watauga. All waters in these basins are Supporting in the fish consumption category if there is no site-specific advisory; waters are Impaired if there is a site-specific advisory. All waters are also considered Monitored or Evaluated, dependent upon the availability of monitoring data.

In order to separate this regional advice from other fish consumption advisories and to identify actual fish populations with high levels of mercury, only waters with fish tissue monitoring data are presented on the use support maps.

Recreation Category

This human health related category evaluates waters for the support of primary recreation activities such as swimming, water-skiing, skin diving, and similar uses usually involving human body contact with water where such activities take place in an organized manner or on a frequent basis. Waters of the state designated for these uses are classified as Class B, SB and SA. This category also evaluates other waters used for secondary recreation activities such as wading, boating, and other uses not involving human body contact with water, and activities involving human body contact with water where such activities take place on an infrequent, unorganized or incidental basis. Waters of the state designated for these uses are classified as Class C, SC and WS.

The use support ratings applied to this category are currently based on the North Carolina fecal coliform bacteria water quality standard where ambient monitoring data are available or on the duration of local or state health agencies posted swimming advisories. Use support ratings for the recreation category may be based on other bacteriological indicators and standards in the future.

DWQ conducts monthly ambient water quality monitoring that includes fecal coliform bacteria testing. The Division of Environmental Health (DEH) tests coastal recreation waters (beaches) for bacteria levels to assess the relative safety of these waters for swimming. If an area has elevated bacteria levels, health officials will advise that people not swim in the area by posting a swimming advisory and by notifying the local media and county health department.

The North Carolina fecal coliform bacteria standard for freshwater is: 1) not to exceed the geometric mean of 200 colonies per 100 ml of at least five samples over a 30-day period; and 2) not to exceed 400 colonies per 100 ml in more than 20 percent of the samples during the same period. The AU being assessed for the five-year data window is Supporting in the recreation category if neither number (1) nor (2) of the standard are exceeded. The AU being assessed is Impaired in the recreation category if either number (1) or (2) is exceeded. Waters without sufficient fecal coliform data are Not Rated, and waters with no data are noted as having No Data.

Assessing the water quality standard requires significant sampling efforts beyond the monthly ambient monitoring sampling and must include at least five samples over a 30-day period. Decades of monitoring have demonstrated that bacteria concentrations may fluctuate widely in surface waters over a period of time. Thus, multiple samples over a 30-day period are needed to evaluate waters against the North Carolina water quality standard for recreational use support. Waters classified as Class SA, SB and B are targeted for this extra sampling effort due to the greater potential for human body contact. Therefore, some waters will be Not Rated in this category based on a DWQ yearly screening of all waters where an AU is above 200 colonies per 100 ml, or more than 20 percent of samples are above 400 colonies per 100 ml, and where the extra sampling effort has not been conducted.

Waters with beach monitoring sites will be Impaired if the area is posted with an advisory for greater than 61 days of the assessment period. Waters with beach monitoring sites with advisories posted less than 61 days will be Supporting. Other information can be used to Not Rate unmonitored waters.

DWQ Ambient Monitoring Fecal Coliform Screening Criteria

As with other information sources, all available information and data are evaluated for the recreation category using the assessment period. However, DWQ conducts an annual screening of DWQ ambient fecal coliform data to assess the need for additional monitoring or immediate action by local or state health agencies to protect public health.

Each March, DWQ staff will review bacteria data collections from ambient monitoring stations statewide for the previous sampling year. Locations with annual geometric means greater than 200 colonies per 100 ml, or when more than 20 percent of the samples are greater than 400 colonies per 100 ml, are identified for potential follow-up monitoring conducted five times within 30 days as specified by the state fecal coliform bacteria standard. If bacteria concentrations exceed either portion of the state standard, the data are sent to DEH and the local county health director to determine the need for posting swimming advisories. DWQ regional offices will also be notified.

Due to limited resources and the higher risk to human health, primary recreation waters (Class B, SB and SA) will be given monitoring priority for an additional five times within 30 days sampling. Follow-up water quality sampling for Class C waters will be performed as resources permit. Any waters on the 303(d) list of Impaired waters for fecal coliform will receive a low priority for additional monitoring because these waters will be further assessed for TMDL development.

DWQ attempts to determine if there are any swimming areas monitored by state, county or local health departments or by DEH. Each January, DEH, county or local health departments are asked to list those waters which were posted with swimming advisories in the previous year.

Shellfish Harvesting Use Support

The shellfish harvesting use support category is a human health approach to assess whether shellfish can be commercially harvested and is therefore applied only to Class SA waters. The following data sources are used to assign use support ratings for shellfish waters.

Division of Environmental Health (DEH) Shellfish Sanitation Surveys

DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Estuarine waters are delineated according to DEH shellfish management areas (e.g., Outer Banks, Area H-5) which include Class SA, SB and SC waters. DEH samples growing areas regularly and reevaluates the areas by conducting shellfish sanitation surveys every three years to determine if their classification is still applicable. DEH classifications may be changed after the most recent sanitary survey. Classifications are based on DEH bacteria sampling, locations of pollution sources, and the availability of the shellfish resource. Growing waters are classified as follows.

DEH Classification	DEH Criteria
Approved (APP)	**Fecal Coliform Standard for Systematic Random Sampling:** The median fecal coliform Most Probable Number (MPN) or the geometric mean MPN of the water shall not exceed 14 per 100 milliliters (ml), and the estimated 90th percentile shall not exceed an MPN of 43 MPN per 100 ml for a 5-tube decimal dilution test. **Fecal Coliform Standard for Adverse Pollution Conditions Sampling:** The median fecal coliform or geometric mean MPN of the water shall not exceed 14 per 100 ml, and not more than 10 percent of the samples shall exceed 43 MPN per 100 ml for a 5-tube decimal dilution test.
Conditionally Approved-Open (CAO)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan. These areas tend to be open more frequently than closed.
Conditionally Approved-Closed (CAC)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan. These areas tend to be closed more frequently than open.
Restricted (RES)	Sanitary Survey indicates limited degree of pollution, and the area is not contaminated to the extent that consumption of shellfish could be hazardous after controlled depuration or relaying.
Prohibited (PRO)	No Sanitary Survey; point source discharges; marinas; data do not meet criteria for Approved, Conditionally Approved or Restricted Classification.

Assigning Use Support Ratings to Shellfish Harvesting Waters (Class SA)

DWQ use support ratings may be assigned to separate segments within DEH management areas. In assessing use support, the DEH classifications and management strategies are only applicable to DWQ Class SA (shellfish harvesting) waters. It is important to note that DEH classifies all actual and potential growing areas (which includes all saltwater and brackish water areas) for their suitability for shellfish harvesting. This will result in a difference of acreage between DEH areas classified as CAC, PRO and RES, and DWQ waters rated as Impaired. For example, if DEH classifies a 20-acre area CAC, but only 10 acres are Class SA, only those 10 acres of Class SA waters are rated as Impaired.

The DEH "Closed" polygon coverage includes CAC, RES and PRO classifications, and it is not currently possible to separate out the PRO from the RES areas. Therefore, these areas are a combined polygon coverage, and DWQ rates these waters as Impaired.

Sources of fecal coliform bacteria are more difficult to separate out for Class SA areas. DEH describes the potential sources in the sanitary surveys, but they do not describe specific areas affected by these sources. Therefore, in the past, DEH identified the same sources for all Class SA sections of an entire management area (e.g., urban runoff and septic systems). Until a better way to pinpoint sources is developed, this information will continue to be used. A point source discharge is only listed as a potential source when NPDES permit limits are exceeded.

DWQ and DEH are developing the database and expertise necessary to assess shellfish harvesting frequency of closures. In the interim, DWQ has been identifying the frequency of closures in Class SA waters using an interim methodology based on existing databases and GIS shapefiles. There will be changes in reported acreages in future assessments using the permanent methods and tools that result from this project.

Past Interim Frequency of Closure-Based Assessment Methodology

The interim method was used for the 2001 White Oak, 2002 Neuse and 2003 Lumber River basin use support assessments. Shellfish harvesting use support ratings for Class SA waters using the interim methodology are summarized below.

Percent of Time Closed within Basin Data Window	DEH Growing Area Classification	DWQ Use Support Rating
N/A	Approved*	Supporting
Closed ≤10% of data window	Portion of CAO closed ≤10% of data window	Supporting
Closed >10% of the data window	Portion of CAO closed >10% of data window	Impaired
N/A	CAC and PRO/RES**	Impaired

* Approved waters are closed only during extreme meteorological events (hurricanes).

** CAC and P/R waters are rarely opened to shellfish harvesting.

For CAO areas, DWQ worked with DEH to determine the number of days and acreages that CAO Class SA waters were closed to shellfish harvesting during the assessment period. For each growing area with CAO Class SA waters, DEH and DWQ defined subareas within the CAO area that were opened and closed at the same time. The number of days these CAO areas were closed was determined using DEH proclamation summary sheets and the original proclamations.

The number of days that APP areas in the growing area were closed due to preemptive closures because of named storms was not counted. For example, all waters in growing area E-9 were preemptively closed for Hurricane Fran on September 5, 1996. APP waters were reopened September 20, 1996. Nelson Bay (CAO) was reopened September 30, 1996. This area was considered closed for ten days after the APP waters were reopened.

Current Assessment Methodology

Use support assessment for the 2005 Cape Fear River basin will be conducted such that only the DEH classification will be used to assign a use support rating. By definition, CAO areas are areas that DEH has determined do not, or likely do not, meet water quality standards and these areas will be rated Impaired, along with CAC and PRO/RES areas. Only APP areas will be rated Supporting.

Growing areas that have been reclassified by DEH during the assessment period from a lower classification to APP will be rated Supporting. Areas that are reclassified from APP to any other classification during the assessment period will be rated Impaired.

Over the next few years, DWQ, DEH, Division of Coastal Management (DCM) and Division of Marine Fisheries (DMF) will be engaged in developing a fully functionally database with related georeferenced (GIS) shellfish harvesting areas. The new database and GIS tools will be valuable for the above agencies to continue to work together to better serve the public. Using the new database with georeferenced areas and monitoring sites, DEH will be able to report the number of days each area was closed excluding closures related to named storms.

Water Supply Use Support

This human health related use support category is used to assess all Class WS waters for the ability of water suppliers to provide potable drinking water. Water quality standards established for drinking water apply to water delivered to consumers after it has been treated to remove potential contaminants that may pose risks to human health. Ambient standards established by states under the Clean Water Act are not intended to ensure that water is drinkable without treatment. Modern water treatment technologies are required to purify raw water to meet drinking water standards as established by the North Carolina Division of Environmental Health.

Water supply use support is assessed by DWQ using information from the seven DEH regional water treatment plant consultant staff. Each January, the DEH staff consultants are asked to submit a spreadsheet listing closures and water intake switch-overs for all water treatment plants in their region. This spreadsheet describes the length and time of the event, contact information, and the reason for the closure or switch.

The spreadsheets are reviewed by DWQ staff to determine if any closures/switches were due to water quality concerns. Those closures/switches due to water quantity problems and reservoir turnovers are not considered for use support. The frequency and duration of closures/switches due to water quality concerns are considered when assessing use support. Using these criteria, North Carolina's surface water supplies are currently rated Supporting on an Evaluated basis. Specific criteria for rating waters Impaired are to be determined on a case-by-case basis.

Use of Outside Data

DWQ actively solicits outside data and information in the year before biological sampling in a particular basin. The solicitation allows approximately 60 days for data to be submitted. Data from sources outside DWQ are screened for data quality and quantity. If data are of sufficient quality and quantity, they may be incorporated into use support assessments. A minimum of ten samples for more than a one-year period is needed to be considered for use support assessments.

The way the solicited data are used depends on the degree of quality assurance and quality control of the collection and analysis of the data as detailed in the 303(d) report and shown in the table below. Level 1 data can be use with the same confidence as DWQ data to determine use support ratings. Level 2 or Level 3 data may be used to help identify causes of pollution and stressors. They may also be used to limit the extrapolation of use support ratings up or down a stream segment from a DWQ monitoring location. Where outside data indicate a potential problem, DWQ evaluates the existing DWQ biological and ambient monitoring site locations for adjustment as appropriate.

Criteria Levels for Use of Outside Data in Use Support Assessments			
Criteria	**Level 1**	**Level 2**	**Level 3**
Monitoring frequency of at least 10 samples for more than a one-year period	Yes	Yes/No	No
Monitoring locations appropriately sited and mapped	Yes	Yes	No
State certified laboratory used for analysis according to 15A NCAC 2B .0103	Yes	Yes/No	No
Quality assurance plan available describing sample collection and handling	Yes, rigorous scrutiny	Yes/No	No

Lakes and Reservoir Use Assessment

Like streams, lakes are classified for a variety of uses. All lakes monitored as part of North Carolina's Ambient Lakes Monitoring Program carry the Class C (aquatic life) classification, and most are classified Class B and SB (recreation) and WS-I through WS-V (water supply). The surface water quality numeric standard specifically associated with recreation is fecal coliform. For water supplies, there are 29 numeric standards based on consumption of water and fish. Narrative standards for Class B and Class WS waters include aesthetics such as no odors and no untreated wastes. There are other numeric standards that also apply to lakes for the protection of aquatic life and human health. These standards also apply to all other waters of the state and are listed under the Class C rules.

When possible, lake use support assessments are made using standards based methodologies similar to those used for free-flowing waters. Parameters with sufficient (ten or more observations), quality-assured observations are compared to surface water quality standards. When standards are exceeded in more than 10 percent of the assessment period, portions or all of the waterbody are rated Impaired. However, in many cases, the standards based approach is incapable of characterizing the overall health of a reservoir.

For nutrient enrichment, one of the main causes of impacts to lakes and reservoirs, a more holistic or weight of evidence approach is necessary since nutrient impacts are not always reflected by the parameters sampled. For instance, some lakes have taste and odor problems associated with particular algal species, yet these lakes do not have chlorophyll *a* concentrations above 40 µg/l frequently enough to impair them based on the standard. In addition, each reservoir possesses unique traits (watershed area, volume, depth, retention time, etc.) that dramatically influence its water quality, but that cannot be evaluated through standards comparisons. In such waterbodies, aquatic life may be Impaired even though a particular indicator is below the standard. Where exceedances of surface water quality standards are not sufficient to evaluate a lake or reservoir, the weight of evidence approach can take into consideration indicators and parameters not in the standards to allow a more sound and robust determination of water quality.

The weight of evidence approach uses the following sources of information to determine the eutrophication (nutrient enrichment) level as a means of assessing lake use support in the aquatic life category:

- Quantitative water quality parameters - dissolved oxygen, chlorophyll *a*, pH, etc.
- Algal bloom reports
- Fish kill reports
- Hydrologic and hydraulic characteristics – watershed size, lake volume, retention time, volume loss, etc.
- Third party reports – citizens, water treatment plant operators, state agencies, etc.
    - Taste and odor
    - Sheens
    - Odd colors
    - Other aesthetic and safety considerations

One of the major problems associated with lakes and reservoirs is increasing eutrophication related to nutrient inputs. Several water quality parameters help to describe the level of eutrophication. In implementing the weight of evidence approach for eutrophication, more consideration is given to parameters that have water quality standards. Each parameter is assessed for percent exceedance of the state standard. The eutrophication-related parameters and water quality indicators without numeric standards are reviewed based on interpretation of the narrative standards in 15A NCAC 2B .0211(2) and (3). The following table lists the information considered during a lake/reservoir use assessment, as well as the criteria used to evaluate that information.

A modification to lake use assessment is the evaluation and subsequent rating of a lake or reservoir by segments. In some portions of a waterbody, such as shallow coves, there may be documented water quality problems while other areas of that waterbody do not demonstrate significant problems. In such cases, the portion with documented problems (sufficient data, ambient data above standards, and supporting public data) will be rated as Impaired while the other portions are rated as Supporting or Not Rated. The following table highlights the weight of evidence approach for assessing lake water quality.

Lake/Reservoir Weight of Evidence Use Assessment for Aquatic Life Category	
Assessment Type	**Criteria**
EUTROPHICATION	
Water Quality Standards	
Chl *a*	>10% above standard (N>9) = P; exceeding 40 µg/l but not 10% of time = C
DO	Below or above standard >10% of samples (N>9)
pH	Below or above standard >10% of samples (N>9)
Turbidity	>10% above standard (N>9)
% Total Dissolved Gases	>10% above standard (N>9)
Temperature	Minor and infrequent excursions of temperature standards due to anthropogenic activity. No impairment of species evident (N>9).
Metals (excluding copper, iron and zinc)	>10% above standard (N>9)
Other Data	
% Saturation DO	>10% above >120%
Algae	Blooms during 2 or more sampling events in 1 year with historic blooms.
Fish	Kills related to eutrophication.
Chemically/ Biologically Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.
Aesthetics Complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state agency.
TSI	Increase of 2 trophic levels from one 5-year period to next.
Historic DWQ Data	Conclusions from other reports and previous use support assessments.
AGPT	Algal Growth Potential Test 5-9 mg/l = C 10 or more mg/l = P
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat; clogging intakes.
Taste and Odor	Public complaints = P; Potential based on algal spp = C
Sediments	Clogging intakes - dredging program necessary.

Note: C = of notable Concern or productive

P = Problematic or highly productive

E = parameter is Exceeded, but in less than 10 percent of the measurements

References

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____. 2000b. *Fish Community Metric Re-Calibration and Biocriteria Development for the Outer Piedmont (Cape Fear, Neuse, Roanoke and Tar River Basins)*. October 17, 2000. *Ibid*.

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USEPA. 2000. *Stressor Identification Guidance Document*. EPA/822/B-00/025. Office of Water. Washington, DC.

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040301	6-20b	Carson Creek	From Carson Creek dam to French Broad River	B Tr	S	M	2.8 Miles		
040301	6-11	Cherryfield Creek	From source to French Broad River	C Tr	S	M	4.1 Miles		
040301	6-38-23	Crab Creek	From source to Little River	C Tr HQW	S	M	5.4 Miles		
040301	6-2-10	Flat Creek	From source to West Fork French Broad River	C Tr	S	M	1.2 Miles		
040301	6-(1)	FRENCH BROAD RIVER	From source to Nicholson Creek	B Tr	S	M	19.7 Miles		
040301	6-(27)c	FRENCH BROAD RIVER	From Glade Creek to Bryson Creek	B	S	M	8.8 Miles		
040301	6-38-(20)	Little River	From Cascade Lake Dam to French Broad River	C	S	M	4.9 Miles		
040301	6-38-(1)	Little River (Cascade Lake)	From source to Merrill Creek	C Tr	S	M	14.8 Miles		
040301	6-11-3	Mason Creek	From source to Cherryfield Creek	C Tr	S	M	2.6 Miles		
040301	6-5	Middle Fork French Broad River	From source to French Broad River	B Tr	S	M	4.1 Miles		
040301	6-10-1a	Morgan Mill Creek (Kaiser Lake)	From source to US 64	B Tr	S	M	1.7 Miles		
040301	6-10-1b	Morgan Mill Creek (Kaiser Lake)	From US 64 to River Mile 1.92	B Tr	S	M	0.2 Miles		
040301	6-10-1c	Morgan Mill Creek (Kaiser Lake)	FromRiver Mile 1.92 to Peter Weaver Creek	B Tr	NR	M	0.1 Miles		
040301	6-3-(6.5)	North Fork French Broad River	From Indian Creek to French Broad River	B Tr	S	M	10.1 Miles		
040301	6-10a	Peter Weaver Creek	From source to Morgan Mill Creek	C Tr	S	M	2.3 Miles		
040301	6-10b	Peter Weaver Creek	From Morgan Mill Creek to French Broad River	C Tr	NR	M	0.8 Miles		
040301	6-2-(0.5)a	West Fork French Broad River	From source to Above trout farms	B Tr	S	M	1.4 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040301	6-2-(0.5)b	West Fork French Broad River	From Above trout farms to below trout farm	B Tr	I	M	0.6 Miles	nutrient enrichment	trout farms
040301		West Fork French Broad River	From Above trout farms to below trout farm	B Tr	I	M	0.6 Miles	riparian area loss	livestock access
040301	6-2-(0.5)c	West Fork French Broad River	From below trout farm to Transylvania County SR 1312	B Tr	S	M	5.0 Miles		
040301	6-2-(7.5)	West Fork French Broad River	From Transylvania County SR 1312 to French Broad River	B Tr HQW	S	M	4.8 Miles		
040301	6-2-12	Woodruff Branch	From source to West Fork French Broad River	C Tr	NR	M	1.5 Miles		
040302	6-55-8-1a	Bat Fork	From source to State Route 1779	C	NR	M	4.8 Miles		
040302	6-55-8-1b	Bat Fork	From State Route 1779 to Johnson Drainage Ditch	C	I	M	1.5 Miles	riparian area loss	livestock access
040302		Bat Fork	From State Route 1779 to Johnson Drainage Ditch	C	I	M	1.5 Miles	toxic impacts	
040302		Bat Fork	From State Route 1779 to Johnson Drainage Ditch	C	I	M	1.5 Miles	channelization hydromo	
040302	6-76-5-8	Beaverdam Creek	From source to South Hominy Creek	C Tr	S	M	6.2 Miles		
040302	6-78-15-(1)	Beetree Creek (Beetree Reservoir)	From source to Asheville Water Supply Dam	WS-I HQW	S	M	5.0 Miles		
040302	6-67-(1)	Bent Creek	From source to Powhatan Dam	B Tr	S	M	3.5 Miles		
040302	6-67-(7)	Bent Creek	From Powhatan Dam to French Broad River	B	S	M	3.0 Miles		
040302	6-76-7a	Bill Moore Creek (Enka Lake)	From source to backwaters of Enka Lake	C	S	M	2.9 Miles		
040302	6-67-6	Boyd Branch	From source to Bent Creek	C	S	M	1.3 Miles		
040302	6-57-(1)	Cane Creek	From source to Ashworth Creek	C Tr	S	M	7.4 Miles		
040302	6-57-(9)a	Cane Creek	From Ashworth Creek to Cushion Branch	C	I	M	9.6 Miles	sedimentation	

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-57-(9)b	Cane Creek	From Cushion Branch to French Broad River	C	S	M	2.4 Miles		
040302	6-76-12	Canie Creek	From source to Hominy Creek	C	NR	M	2.3 Miles		
040302	6-78-19	Christian Creek (Davis Lake)	From source to Swannanoa River		S	M	4.5 Miles		
040302	6-55-11-(1)a	Clear Creek	From source to Laurel Creek	B Tr	NR	M	2.7 Miles		
040302	6-55-11-(1)b	Clear Creek	From Laurel Creek to Puncheon Camp Creek	B Tr	S	M	2.5 Miles		
040302	6-55-11-(1)c	Clear Creek	From Puncheon Camp Creek to Lewis Creek	B Tr	I	M	2.1 Miles	riparian area loss	
040302		Clear Creek	From Puncheon Camp Creek to Lewis Creek	B Tr	I	M	2.1 Miles	toxic impacts	agricultural activities
040302		Clear Creek	From Puncheon Camp Creek to Lewis Creek	B Tr	I	M	2.1 Miles	nutrient enrichment	agricultural activities
040302		Clear Creek	From Puncheon Camp Creek to Lewis Creek	B Tr	I	M	2.1 Miles	sedimentation	
040302	6-55-11-(5)	Clear Creek	From Lewis Creek to Mud Creek	C	I	M	6.5 Miles	nutrient enrichment	agricultural activities
040302		Clear Creek	From Lewis Creek to Mud Creek	C	I	M	6.5 Miles	toxic impacts	agricultural activities
040302		Clear Creek	From Lewis Creek to Mud Creek	C	I	M	6.5 Miles	sedimentation	
040302		Clear Creek	From Lewis Creek to Mud Creek	C	I	M	6.5 Miles	riparian area loss	
040302	6-55-11-3a	Cox Creek	From source to Hickory Acres	C Tr	S	M	1.5 Miles		
040302	6-55-11-3b	Cox Creek	From Hickory Acres to Clear Creek	C Tr	NR	M	1.1 Miles		
040302	6-55-8-2a	Devils Fork	From source to first unnamed tributary west of State Route 1006	C	NR	M	3.4 Miles		
040302	6-55-8-2b	Devils Fork	From first unnamed tributary west of State Route 1006 to Johnson Drainage Ditch	C	I	M	2.7 Miles	channelization hydromo	

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-55-8-2b	Devils Fork	From first unnamed tributary west of State Route 1006 to Johnson Drainage Ditch	C	I	M	2.7 Miles	sedimentation	
040302		Devils Fork	From first unnamed tributary west of State Route 1006 to Johnson Drainage Ditch	C	I	M	2.7 Miles	toxic impacts	agricultural activities
040302	6-78-6-(4)	Flat Creek	From Big Piney Branch to Swannanoa River	C	S	M	3.0 Miles		
040302	6-88	Flat Creek	From source to French Broad River	C	S	M	11.1 Miles		
040302	6-(27)d	FRENCH BROAD RIVER	From Bryson Creek to Gash Creek	B	S	M	4.4 Miles		
040302	6-(54.5)b	FRENCH BROAD RIVER	From Mud Creek to NC 146	B	S	M	8.2 Miles		
040302	6-(54.5)c	FRENCH BROAD RIVER	From NC 146 to Craggy Dam	B	S	M	18.3 Miles		
040302	6-(54.5)d	FRENCH BROAD RIVER	From Craggy Dam to Fletcher Martin Road	B	I	M	6.4 Miles		
040302	6-(54.5)e	FRENCH BROAD RIVER	From Fletcher Martin Road to Sandymush Creek	B	I	M	3.9 Miles		
040302	6-47	Gash Creek	From source to French Broad River	C	NR	M	3.7 Miles		
040302	6-78-20	Grassy Branch	From source to Swannanoa River	C	NR	M	4.2 Miles		
040302	6-55-11-11	Harper Creek	From source to Clear Creek	B Tr	S	M	2.6 Miles		
040302	6-78-22	Haw Creek	From source to Swannanoa River	C	NR	M	4.6 Miles		
040302	6-76a	Hominy Creek	From source to George Branch	C	S	M	9.7 Miles		
040302	6-76b	Hominy Creek	From George Branch to South Hominy Creek	C	S	M	3.1 Miles		
040302	6-76c	Hominy Creek	From South Hominy Creek to Moore Creek	C	S	M	3.3 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-76d	Hominy Creek	From Moore Creek to French Broad River	C	I	M	7.8 Miles	toxic impacts	
040302		Hominy Creek	From Moore Creek to French Broad River	C	I	M	7.8 Miles	riparian area loss	
040302		Hominy Creek	From Moore Creek to French Broad River	C	I	M	7.8 Miles	stream bank erosion	
040302	6-55-8-1-2-(1)	King Creek [McCabe Pond, Jordans Lake, Bonclarken Lake, Madonna Lake (Highlands Lake)]	From source to Madonna Lake Dam	B	NR	M	4.8 Miles		
040302	6-55-11-8	Kyles Creek	From source to Clear Creek	C Tr	NR	M	4.1 Miles		
040302	6-55-11-2	Laurel Fork	From source to Clear Creek	C Tr	S	M	2.3 Miles		
040302	6-55-11-7	Mill Creek	From source to Clear Creek	C	NR	M	2.4 Miles		
040302	6-51	Mill Pond Creek	From source to French Broad River	WS-IV	NR	M	3.1 Miles		
040302	6-76-8	Moore Creek	From source to Hominy Creek	C	NR	M	3.2 Miles		
040302	6-55a	Mud Creek	From source to State Route 1125	C	S	M	2.4 Miles		
040302	6-55b	Mud Creek	From State Route 1125 to Little Mud Creek	C	NR	M	1.9 Miles		
040302	6-55c	Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	nutrient enrichment	agricultural activities
040302		Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	channelization hydromo	
040302		Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	toxic impacts	agricultural activities
040302		Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	low dissolved oxygen	agricultural activities
040302		Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	scour	

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-55c	Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	riparian area loss	
040302		Mud Creek	From Little Mud Creek to Byers Creek	C	I	M	11.0 Miles	sedimentation	
040302	6-55d	Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	sedimentation	
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	nutrient enrichment	agricultural activities
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	channelization hydromo	
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	toxic impacts	agricultural activities
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	scour	
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	riparian area loss	
040302		Mud Creek	From Byers Creek to French Broad River	C	I	M	2.2 Miles	low dissolved oxygen	agricultural activities
040302	6-84a	Newfound Creek	From source to SR 1296	C	I	M	3.9 Miles	nutrient enrichment	agricultural activities
040302		Newfound Creek	From source to SR 1296	C	I	M	3.9 Miles	riparian area loss	
040302		Newfound Creek	From source to SR 1296	C	I	M	3.9 Miles	stream bank erosion	
040302		Newfound Creek	From source to SR 1296	C	I	M	3.9 Miles	embedded substrates	
040302	6-84b	Newfound Creek	From State Route 1296 to SR 1297	C	I	M	1.3 Miles	nutrient enrichment	agricultural activities
040302		Newfound Creek	From State Route 1296 to SR 1297	C	I	M	1.3 Miles	stream bank erosion	
040302		Newfound Creek	From State Route 1296 to SR 1297	C	I	M	1.3 Miles	riparian area loss	
040302		Newfound Creek	From State Route 1296 to SR 1297	C	I	M	1.3 Miles	embedded substrates	

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-84c	Newfound Creek	From State Route 1297to State Route 1378	C	I	M	2.3 Miles	nutrient enrichment	agricultural activities
040302		Newfound Creek	From State Route 1297to State Route 1378	C	I	M	2.3 Miles	stream bank erosion	
040302		Newfound Creek	From State Route 1297to State Route 1378	C	I	M	2.3 Miles	embedded substrates	
040302		Newfound Creek	From State Route 1297to State Route 1378	C	I	M	2.3 Miles	riparian area loss	
040302	6-84d	Newfound Creek	From State Route 1378 to Dix Creek	C	I	M	4.4 Miles	stream bank erosion	
040302		Newfound Creek	From State Route 1378 to Dix Creek	C	I	M	4.4 Miles	nutrient enrichment	agricultural activities
040302		Newfound Creek	From State Route 1378 to Dix Creek	C	I	M	4.4 Miles	embedded substrates	
040302		Newfound Creek	From State Route 1378 to Dix Creek	C	I	M	4.4 Miles	riparian area loss	
040302	6-84e	Newfound Creek	From Dix Creek to French Broad River	C	S	M	1.7 Miles		
040302	6-78-11-(13)	North Fork Swannanoa River	From Asheville Water Supply Dam to Swannanoa River	C	S	M	5.3 Miles		
040302	6-76-6	Pole Creek	From source to Hominy Creek	C	NR	M	5.3 Miles		
040302	6-87-(1)	Reems Creek	From source to U.S. Highway 23	C Tr	S	M	10.2 Miles		
040302	6-87-(10)	Reems Creek	From U.S. Highway 23 Bridge to French Broad River	C	S	M	4.5 Miles		
040302	6-78-23a	Ross Creek (Lake Kenilworth)	From source to I-240	B	S	M	2.6 Miles		
040302	6-78-23b	Ross Creek (Lake Kenilworth)	From I-240 to backwaters of Lake Kenilworth	B	NR	M	1.1 Miles		
040302	6-78-23c	Ross Creek (Lake Kenilworth)	Lake Kenilworth	B	NR	M	12.0 Acres		
040302	6-92-(1)	Sandymush Creek	From source to Little Sandymush Creek	C Tr	S	M	9.8 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-92-(9)	Sandymush Creek	From Little Sandymush Creek to French Broad River	C	S	M	10.7 Miles		
040302	6-76-5	South Hominy Creek	From source to Hominy Creek	C Tr	S	M	12.4 Miles		
040302	6-76-5-3	Stony Fork	From source to South Hominy Creek	C Tr	S	M	4.5 Miles		
040302	6-78a	Swannanoa River	From source to North Fork Swannanoa River	C	I	M	7.0 Miles	riparian area loss	
040302		Swannanoa River	From source to North Fork Swannanoa River	C	I	M	7.0 Miles	sedimentation	urban development
040302		Swannanoa River	From source to North Fork Swannanoa River	C	I	M	7.0 Miles	toxic impacts	
040302		Swannanoa River	From source to North Fork Swannanoa River	C	I	M	7.0 Miles	nutrient enrichment	urban development
040302		Swannanoa River	From source to North Fork Swannanoa River	C	I	M	7.0 Miles	channelization hydromo	urban development
040302	6-78b	Swannanoa River	From North Fork Swannanoa River to Beetree Creek	C	S	M	4.6 Miles		
040302	6-78c	Swannanoa River	From Beetree Creek to Bull Creek	C	I	M	2.6 Miles	riparian area loss	
040302		Swannanoa River	From Beetree Creek to Bull Creek	C	I	M	2.6 Miles	nutrient enrichment	urban development
040302		Swannanoa River	From Beetree Creek to Bull Creek	C	I	M	2.6 Miles	sedimentation	urban development
040302		Swannanoa River	From Beetree Creek to Bull Creek	C	I	M	2.6 Miles	channelization hydromo	urban development
040302	6-78d	Swannanoa River	From Bull Creek to French Broad River	C	S	M	11.5 Miles		
040302	6-78-24	Sweeten Creek (Busbee Reservoir)	From source to Swannanoa River	C	NR	M	3.8 Miles		
040302	6-92-13	Turkey Creek	From source to Sandymush Creek	C	S	M	9.1 Miles		
040302	6-76-5-4	Warren Creek	From source to South Hominy Creek	C Tr	S	M	3.5 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040302	6-76-4	Webb Branch	From source to Hominy Creek	C	NR	M	3.8 Miles		
040302	6-67-10	Wesley Creek (Bent Creek Ranch Lake)	From source to Bent Creek	B	S	M	1.9 Miles		
040303	6-52-(6.5)	Boylston Creek	From a point 0.3 mile upstream of Murray Branch to French Broad River	WS-IV	S	M	6.1 Miles		
040303	6-54-3-17-(4.5	Bradley Creek	From Hendersonville Water Supply Dam to South Fork Mills River	WS-II ORW	S	M	2.5 Miles		
040303	6-34-(1)	Davidson River	From source to Looking Glass Creek	WS-V&B Tr H	S	M	5.4 Miles		
040303	6-34-(15.5)	Davidson River	From Avery Creek to proposed Davidson River Flats Recreation Area sewage effluent outfall	WS-V&B Tr	S	M	0.2 Miles		
040303	6-34-(17)	Davidson River	From proposed Davidson River Flats Recreation Area Sewage effluent outfall to Olin Corporation Water Supply Dam	WS-V&B Tr	S	M	3.3 Miles		
040303	6-54-(1)a	Mills River	From source to River Mile 1.03	WS-II Tr HQW	S	M	1.0 Miles		
040303	6-54-(1)b	Mills River	From River Mile 1.03 to a point 0.5 mile upstream of N.C. Hwy. 191	WS-II Tr HQW	S	M	1.8 Miles		
040303	6-54-(4.5)	Mills River	From a point 0.5 mile upstream of N.C. Hwy. 191 to City of Hendersonville water supply intake located 0.1 mile downstream of N.C. Hwy. l91	WS-II Tr HQW	S	M	0.7 Miles		
040303	6-54-(5)	Mills River	From City of Hendersonville water supply intake to a point 0.7 mile upstream of mouth of Mills River	WS-III	S	M	1.8 Miles		
040303	6-54-(6.5)	Mills River	From a point 0.7 mile upstream of mouth of Mills River to French Broad River	WS-III CA	S	M	0.7 Miles		
040303	6-54-2-(4)	North Fork Mills River	From Hendersonville Water Supply Dam to Rocky Fork	WS-II Tr HQW	S	M	2.9 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040303	6-54-2-(9)	North Fork Mills River	From North Fork Mills River Recreation Area Swimming Pool Intake to Mills River	WS-II Tr HQW	S	M	2.5 Miles		
040303	6-54-3-(17.5)	South Fork Mills River	From the upstream side of mouth of Queen Creek to Mills River	WS-II Tr HQW	S	M	4.2 Miles		
040304	6-96-10-5	Big Branch	From source to Little Ivy Creek	WS-II HQW	NR	M	2.9 Miles		
040304	6-112	Big Laurel Creek	From source to French Broad River	C Tr	S	M	30.8 Miles		
040304	6-96-16	Bull Creek	From source to Ivy Creek	C	S	M	3.8 Miles		
040304	6-96-10-2a	California Creek	From source to Sprinkle Creek	WS-II HQW	S	M	3.6 Miles		
040304	6-96-10-2b	California Creek	From Sprinke Creek to Little Ivy Creek	WS-II HQW	NR	M	3.8 Miles		
040304	6-112-26-13-1	Cold Spring Branch	From source to Allen Creek	C	NR	M	1.4 Miles		
040304	6-(54.5)f	FRENCH BROAD RIVER	From Sandymush Creek to North Carolina-Tennessee State Line	B	S	M	33.1 Miles		
040304	6-96-(0.5)	Ivy Creek (River)	From source to Adkins Branch	WS-II HQW	S	M	7.4 Miles		
040304	6-96-(11.3)	Ivy Creek (River)	From Adkins Branch to a point 0.6 mile downstream of Adkins Branch (Town of Mars Hill water supply intake)	WS-II HQW C	S	M	0.5 Miles		
040304	6-96-(11.7)	Ivy Creek (River)	From a point 0.6 mile downstream of Adkins Branch to French Broad River	C	S	M	10.5 Miles		
040304	6-96-10a	Little Ivy Creek (River)	From California Creek to State Route 1547	WS-II HQW	I	M	2.6 Miles	sedimentation	
040304		Little Ivy Creek (River)	From California Creek to State Route 1547	WS-II HQW	I	M	2.6 Miles	nutrient enrichment	agricultural activities
040304		Little Ivy Creek (River)	From California Creek to State Route 1547	WS-II HQW	I	M	2.6 Miles	toxic impacts	agricultural activities
040304	6-96-10b	Little Ivy Creek (River)	From State Route 1547 to Ivy Creek	WS-II HQW	S	M	2.1 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040304	6-96-10-1a	Middle Fork Little Ivy Creek	From source to Bailey Branch	WS-II HQW	S	M	3.5 Miles		
040304	6-96-10-1b	Middle Fork Little Ivy Creek	From Bailey Branch to Little Ivy Creek	WS-II HQW	NR	M	2.1 Miles		
040304	6-96-10-3	Paint Fork	From source to Little Ivy Creek	WS-II HQW	S	M	7.1 Miles		
040304	6-112-5	Puncheon Fork	From source to Big Laurel Creek	C Tr	S	M	5.2 Miles		
040304	6-112-26	Shelton Laurel Creek	From source to Big Laurel Creek	C Tr	S	M	14.8 Miles		
040304	6-118-(1)	Spring Creek	From source to Reservoir Branch	C Tr	S	M	20.3 Miles		
040304	6-118-(27)	Spring Creek	From Reservoir Branch to French Broad River	C	S	M	1.7 Miles		
040305	5-41	Cataloochee Creek	From source to Walters Lake, Pigeon River	C Tr ORW	S	M	8.1 Miles		
040305	5-16-7-2	Cherry Cove Creek	From source to Allen Creek	WS-I HQW	NR	M	2.5 Miles		
040305	5-59-22	Chestnut Branch	From source to Big Creek	C Tr HQW	S	M	3.3 Miles		
040305	5-22	Crabtree Creek	From source to Pigeon River	C	S	M	3.3 Miles		
040305	5-3-(6.5)	East Fork Pigeon River	From a point 0.5 miles upstream of Bee Branch to Pigeon River	WS-III Tr	S	M	13.0 Miles		
040305	5-16-15	Factory Branch	From source to Lake Junaluska Richland Creek	B	NR	M	2.4 Miles		
040305	5-16-11	Farmer Branch	From source to Richland Creek	B	NR	M	2.9 Miles		
040305	5-32	Fines Creek	From source to Pigeon River	C	I	M	9.7 Miles	nutrient enrichment	agricultural activities
040305	5-44	Hurricane Creek	From source to Pigeon River	C Tr	S	M	5.4 Miles		
040305	5-16-6a	Hyatt Creek	From source to State Route 1159	C	NR	M	0.9 Miles		
040305	5-16-6b	Hyatt Creek	From State Route 1159 to Richland Creek	C	S	M	2.6 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040305	5-26-(7)	Jonathans Creek	From a point 0.4 mile downstream of Fie Creek to Pigeon River	C Tr	S	M	14.6 Miles		
040305	5-16-8-1	Medford Branch	From source to Browning Branch	C	NR	M	1.8 Miles		
040305	5-16-4	Nolen Creek	From source to Richland Creek	C	S	M	1.8 Miles		
040305	5-16-7-6	Old Bald Creek	From source to Allen Creek	WS-I HQW	NR	M	2.4 Miles		
040305	5-(1)	PIGEON RIVER	From source to Garden Creek	WS-III Tr	S	M	4.8 Miles		
040305	5-(6.5)	PIGEON RIVER	From Garden Creek to Canton Water Intake	WS-III Tr CA	S	M	0.8 Miles		
040305	5-(7)a	PIGEON RIVER (Waterville Lake below elevation 2258)	From Canton Water Supply Intake to 0.15 miles downstream of W. Park St.	C	S	M	0.5 Miles		
040305	5-(7)b	PIGEON RIVER (Waterville Lake below elevation 2258)	From 0.15 miles downstream of W. Park St to State Route 1642 (Main Street)	C	I	M	6.4 Miles	toxic impacts	
040305	5-(7)d	PIGEON RIVER (Waterville Lake below elevation 2258)	From Crabtree Creek to White Oak Road	C	S	M	7.2 Miles		
040305	5-(7)e	PIGEON RIVER (Waterville Lake below elevation 2258)	From White Oak Road to Waterville Reservoir Dam	C	NR	M	773.1 Acres	dioxin fish tissue	
040305	5-(7)f	PIGEON RIVER (Waterville Lake below elevation 2258)	From Waterville Reservoir Dam to North Carolina/Tennessee State line	C	S	M	12.0 Miles		
040305	5-16-14	Raccoon Creek	From source to Richland Creek	B	I	M	4.7 Miles	stream bank erosion	
040305		Raccoon Creek	From source to Richland Creek	B	I	M	4.7 Miles	riparian area loss	
040305	5-16-(16)a	Richland Creek	From Lake Junaluska Dam to Jones Cove Branch	B	I	M	1.6 Miles	riparian area loss	
040305	5-16-(16)b	Richland Creek	From Jones Cove Branch to Pigeon River	C	S	M	0.7 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040305	5-16-(1)a	Richland Creek (Lake Junaluska)	From source to US Route 23	B	NR	M	8.0 Miles		
040305	5-16-(1)b	Richland Creek (Lake Junaluska)	From US Route 23 to Boyd Ave	B	I	M	2.3 Miles	riparian area loss	
040305	5-16-(1)c	Richland Creek (Lake Junaluska)	From Boyd Ave to Depot Street	B	I	M	0.7 Miles	riparian area loss	
040305	5-16-(1)d	Richland Creek (Lake Junaluska)	From Depot Street to Shelton Branch	B	S	M	0.9 Miles		
040305	5-16-(1)e	Richland Creek (Lake Junaluska)	From Shelton Branch to backwater of Lake Junaluska	B	I	M	2.0 Miles	riparian area loss	
040305	5-16-(1)f	Richland Creek (Lake Junaluska)	Lake Junaluska	B	I	M	200.0 Acres	algal blooms	
040305		Richland Creek (Lake Junaluska)	Lake Junaluska	B	I	M	200.0 Acres	sedimentation	
040305	5-16-7-9-(1)	Rocky Branch	From source to dam at Old Waynesville Reservoir	C HQW	NR	M	2.2 Miles		
040305	5-16-7-9-(2)	Rocky Branch	From dam at Old Waynesville Reservoir to Allen Creek	C	NR	M	0.2 Miles		
040305	5-8-4-(2)	Rough Creek	From Canton Reservoir to Beaverdam Creek	C HQW	S	M	1.2 Miles		
040305	5-16-13	Shelton Branch	From source to Richland Creek	B	NR	M	2.7 Miles		
040305	5-16-7-3	Shiny Creek	From source to Allen Creek	WS-I HQW	NR	M	2.9 Miles		
040305	5-2a	West Fork Pigeon River (Lake Logan)	From source to backwaters of Lake Logan	WS-III Tr	S	M	7.8 Miles		
040305	5-16-3	Winchester Creek	From source to Richland Creek	C	NR	M	2.5 Miles		
040306	7-2-48	Big Crabtree Creek (Crabtree Creek)	From source to North Toe River	C Tr	S	M	14.6 Miles		
040306	7-2-64	Big Rock Creek	From source to North Toe River	C Tr	S	M	13.9 Miles		
040306	7-2-63	Jacks Creek	From source to North Toe River	C	I	M	8.5 Miles	riparian area loss	

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source
040306	7-2-63	Jacks Creek	From source to North Toe River	C	I	M	8.5 Miles	algal blooms	
040306	7-2-52-33	Little Crabtree Creek	From source to South Toe River	C Tr	S	M	6.3 Miles		
040306	7	NOLICHUCKY RIVER	From source to North Carolina-Tennessee State Line	B	S	M	10.0 Miles		
040306	7-2-(0.5)	North Toe River	From source to a point 0.2 mile upstream of Pyatt Creek	WS-V Tr	S	M	22.0 Miles		
040306	7-2-(21.5)	North Toe River	From a point 0.2 mile upstream of Pyatt Creek to a point 0.5 mile upstream of U.S. Hwy. 19E	WS-IV Tr	S	M	9.4 Miles		
040306	7-2-(27.7)b	North Toe River	From Grassy Creek to South Toe River	C Tr	I	M	11.3 Miles	turbidity	
040306		North Toe River	From Grassy Creek to South Toe River	C Tr	I	M	11.3 Miles	riparian area loss	
040306	7-2-(27.7)c	North Toe River	From South Toe River to Nolichucky River	B Tr	S	M	24.8 Miles		
040306	7-2-69	Pigeonroost Creek	From source to North Toe River	C Tr	S	M	7.1 Miles		
040306	7-2-59-1	Right Fork Cane Creek	From source to Cane Creek	C Tr	S	M	1.2 Miles		
040306	7-2-15	Roaring Creek	From source to North Toe River	WS-V Tr	S	M	4.9 Miles		
040306	7-2-52-(1)	South Toe River	From source to U.S. Hwy. 19E		S	M	25.9 Miles		
040307	7-3-32	Bald Mountain Creek	From source to Cane River	C Tr	S	M	8.0 Miles		
040307	7-3-21-4	Banks Creek	From source to Price Creek	C Tr	S	M	4.2 Miles		
040307	7-3-(13.7)a	Cane River	From Town of Burnsville water supply intake to Big Creek	C Tr	S	M	21.6 Miles		
040307	7-3-(13.7)b	Cane River	From Big Creek to North Toe River	C Tr	I	M	3.5 Miles	turbidity	
040307	7-3-21	Price Creek	From source to Cane River	C Tr	S	M	8.0 Miles		

Aquatic Life Use Support Ratings for Monitored Waters in the French Broad River Basin

Subbasin	Assessment Unit #	Name	Description	Class	Rating	Basis	Length/Area	Stressor	Source

Notes

Rating = Use Support Rating

Basis = Rating Basis

S = Supporting

I = Impaired

NR = Not Rated

Recreation Use Support Ratings French Broad River Basin

Subbasin	Name	Assessment Unit #	Description	Class	Length	Area	Rating	Basis
040301	FRENCH BROAD RIVER	6-(1)	From source to Nicholson Creek	B Tr	19.7	Miles	S	M
040301	FRENCH BROAD RIVER	6-(27)c	From Glade Creek to Bryson Creek	B	8.8	Miles	S	M
040301	Little River (Cascade Lake)	6-38-(1)	From source to Merrill Creek	C Tr	14.8	Miles	S	M
040302	Beetree Creek (Beetree Reservoir)	6-78-15-(1)	From source to Asheville Water Supply Dam	WS-I HQW	5.0	Miles	S	M
040302	FRENCH BROAD RIVER	6-(27)d	From Bryson Creek to Gash Creek	B	4.4	Miles	S	M
040302	FRENCH BROAD RIVER	6-(54.5)b	From Mud Creek to NC 146	B	8.2	Miles	I	M
040302	FRENCH BROAD RIVER	6-(54.5)c	From NC 146 to Craggy Dam	B	18.3	Miles	S	M
040302	FRENCH BROAD RIVER	6-(54.5)d	From Craggy Dam to Fletcher Martin Road	B	6.4	Miles	S	M
040302	FRENCH BROAD RIVER	6-(54.5)e	From Fletcher Martin Road to Sandymush Creek	B	3.9	Miles	S	M
040302	Hominy Creek	6-76d	From Moore Creek to French Broad River	C	7.8	Miles	S	M
040302	Hominy Creek	6-76d	From Moore Creek to French Broad River	C	7.8	Miles	S	M
040302	Hominy Creek	6-76d	From Moore Creek to French Broad River	C	7.8	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Mud Creek	6-55c	From Little Mud Creek to Byers Creek	C	11.0	Miles	S	M
040302	Swannanoa River	6-78d	From Bull Creek to French Broad River	C	11.5	Miles	S	M
040303	Davidson River	6-34-(17)	From proposed Davidson River Flats Recreation Area Sewage effluent outfall to Olin Corporation Water Supply Dam	WS-V&B Tr	3.3	Miles	S	M

Recreation Use Support Ratings French Broad River Basin

Subbasin	Name	Assessment Unit #	Description	Class	Length	Area	Rating	Basis
040303	Mills River	6-54-(1)b	From River Mile 1.03 to a point 0.5 mile upstream of N.C. Hwy. 191	WS-II Tr HQ	1.8	Miles	S	M
040304	FRENCH BROAD RIVER	6-(54.5)f	From Sandymush Creek to North Carolina-Tennessee State Line	B	33.1	Miles	S	M
040305	Cataloochee Creek	5-41	From source to Walters Lake, Pigeon River	C Tr ORW	8.1	Miles	S	M
040305	Jonathans Creek	5-26-(7)	From a point 0.4 mile downstream of Fie Creek to Pigeon River	C Tr	14.6	Miles	S	M
040305	PIGEON RIVER	5-(1)	From source to Garden Creek	WS-III Tr	4.8	Miles	S	M
040305	PIGEON RIVER	5-(6.5)	From Garden Creek to Canton Water Intake	WS-III Tr CA	0.8	Miles	S	M
040305	PIGEON RIVER (Waterville Lake below elevation 2258)	5-(7)b	From 0.15 miles downstream of W. Park St to State Route 1642 (Main Street)	C	6.4	Miles	S	M
040305	PIGEON RIVER (Waterville Lake below elevation 2258)	5-(7)d	From Crabtree Creek to White Oak Road	C	7.2	Miles	S	M
040305	PIGEON RIVER (Waterville Lake below elevation 2258)	5-(7)f	From Waterville Reservoir Dam to North Carolina/Tennessee State line	C	12.0	Miles	S	M
040305	Richland Creek (Lake Junaluska)	5-16-(1)a	From source to US Route 23	B	8.0	Miles	I	M
040305	Richland Creek (Lake Junaluska)	5-16-(1)b	From US Route 23 to Boyd Ave	B	2.3	Miles	I	M
040305	Richland Creek (Lake Junaluska)	5-16-(1)c	From Boyd Ave to Depot Street	B	0.7	Miles	I	M
040305	Richland Creek (Lake Junaluska)	5-16-(1)d	From Depot Street to Shelton Branch	B	0.9	Miles	I	M
040305	Richland Creek (Lake Junaluska)	5-16-(1)e	From Shelton Branch to backwater of Lake Junaluska	B	2.0	Miles	I	M
040305	West Fork Pigeon River (Lake Logan)	5-2a	From source to backwaters of Lake Logan	WS-III Tr	7.8	Miles	S	M
040306	NOLICHUCKY RIVER	7	From source to North Carolina-Tennessee State Line	B	10.0	Miles	S	M
040306	North Toe River	7-2-(0.5)	From source to a point 0.2 mile upstream of Pyatt Creek	WS-V Tr	22.0	Miles	S	M

Recreation Use Support Ratings French Broad River Basin

Subbasin	Name	Assessment Unit #	Description	Class	Length	Area	Rating	Basis
040306	North Toe River	7-2-(21.5)	From a point 0.2 mile upstream of Pyatt Creek to a point 0.5 mile upstream of U.S. Hwy. 19E	WS-IV Tr	9.4	Miles	S	M
040306	North Toe River	7-2-(27.7)b	From Grassy Creek to South Toe River	C Tr	11.3	Miles	S	M
040306	North Toe River	7-2-(27.7)b	From Grassy Creek to South Toe River	C Tr	11.3	Miles	S	M
040306	South Toe River	7-2-52-(1)	From source to U.S. Hwy. 19E		25.9	Miles	S	M
040307	Cane River	7-3-(13.7)a	From Town of Burnsville water supply intake to Big Creek	C Tr	21.6	Miles	S	M

Notes

Rating= Use Support Rating

Basis= Rating Basis

The stressor for the recreation category is fecal coliform bacteria.

S=Supporting

I=Impaired

NR=Not Rated

Appendix XI

Glossary
of
Terms and Acronyms

Glossary

§	Section.
30Q2	The minimum average flow for a period of 30 days that has an average recurrence of one in two years.
7Q10	The annual minimum 7-day consecutive low flow, which on average will be exceeded in 9 out of 10 years.
B (Class B)	Class B Water Quality Classification. This classification denotes freshwaters protected for primary recreation and other uses suitable for Class C. Primary recreational activities include frequent and/or organized swimming and other human contact such as skin diving and water skiing.
balds	Balds are high elevation areas where soils can support a diverse tree population; however, there are no trees present. Grassy balds are dominated by herbaceous plant species. Heath balds are dominated by dense shrub communities. Definition provided by the NC Natural Heritage Program (www.ncnhp.org).
basin	The watershed of a major river system. There are 17 major river basins in North Carolina.
benthic macroinvertebrates	Aquatic organisms, visible to the naked eye (macro) and lacking a backbone (invertebrate), that live in or on the bottom of rivers and streams (benthic). Examples include, but are not limited to, aquatic insect larvae, mollusks and various types of worms. Some of these organisms, especially aquatic insect larvae, are used to assess water quality. See EPT index and bioclassification for more information.
benthos	A term for bottom-dwelling aquatic organisms.
best management practices	Techniques that are determined to be currently effective, practical means of preventing or reducing pollutants from point and nonpoint sources, in order to protect water quality. BMPs include, but are not limited to: structural and nonstructural controls, operation and maintenance procedures, and other practices. Often, BMPs are applied as system of practices and not just one at a time.
bioclassification	A rating of water quality based on the outcome of benthic macroinvertebrate sampling of a stream. There are five levels: Poor, Fair, Good-Fair, Good and Excellent.
BMPs	See *best management practices*.
BOD	Biochemical Oxygen Demand. A measure of the amount of oxygen consumed by the decomposition of biological matter or chemical reactions in the water column. Most NPDES discharge permits include a limit on the amount of BOD that may be discharged.
C (Class C)	Class C Water Quality Classification. This classification denotes freshwaters protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, and others uses.
CAMA	Coastal Area Management Act
channelization	The physical alteration of streams and rivers by widening, deepening or straightening of the channel, large-scale removal of natural obstructions, and/or lining the bed or banks with rock or other resistant materials.
chlorophyll *a*	A chemical constituent in plants that gives them their green color. High levels of chlorophyll *a* in a waterbody, most often in a pond, lake or estuary, usually indicate a large amount of algae resulting from nutrient overenrichment or eutrophication.
coastal counties	Twenty counties in eastern NC subject to requirements of the Coastal Area Management Act (CAMA). They include: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington.
Coastal Plain	One of three major physiographic regions in North Carolina. Encompasses the eastern two-fifths of state east of the *fall line* (approximated by Interstate I-95).

conductivity	A measure of the ability of water to conduct an electrical current. It is dependent on the concentration of dissolved ions such as sodium, chloride, nitrates, phosphates and metals in solution.
degradation	The lowering of the physical, chemical or biological quality of a waterbody caused by pollution or other sources of stress.
DENR	Department of Environment and Natural Resources.
DO	Dissolved oxygen.
drainage area	An alternate name for a watershed.
DWQ	North Carolina Division of Water Quality, an agency of DENR.
dystrophic	Naturally acidic (low pH), "black-water" lakes which are rich in organic matter. Dystrophic lakes usually have low productivity because most fish and aquatic plants are stressed by low pH water. In North Carolina, dystrophic lakes are scattered throughout the Coastal Plain and Sandhills regions and are often located in marshy areas or overlying peat deposits. NCTSI scores are not appropriate for evaluating dystrophic lakes.
EEP	Ecosystem Enhancement Program
effluent	The treated liquid discharged from a wastewater treatment plant.
EMC	Environmental Management Commission.
EPA	United States Environmental Protection Agency.
EPT Index	This index is used to judge water quality based on the abundance and variety of three orders of pollution sensitive aquatic insect larvae: Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies).
eutrophic	Elevated biological productivity related to an abundance of available nutrients. Eutrophic lakes may be so productive that the potential for water quality problems such as algal blooms, nuisance aquatic plant growth and fish kills may occur.
eutrophication	The process of physical, chemical or biological changes in a lake associated with nutrient, organic matter and silt enrichment of a waterbody. The corresponding excessive algal growth can deplete dissolved oxygen and threaten certain forms of aquatic life, cause unsightly scums on the water surface and result in taste and odor problems.
fall line	A geologic landscape feature that defines the line between the piedmont and coastal plain regions. It is most evident as the last set of small rapids or rock outcroppings that occur on rivers flowing from the piedmont to the coast.
FS	Fully supporting. A rating given to a waterbody that fully supports its designated uses and generally has good or excellent water quality.
GIS	Geographic Information System. An organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information.
habitat degradation	Identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour.
headwaters	Small streams that converge to form a larger stream in a watershed.
HQW	High Quality Waters. A supplemental surface water classification.
HU	Hydrologic unit. See definition below.
Hydrilla	The genus name of an aquatic plant - often considered an aquatic weed.
hydrologic unit	A watershed area defined by a national uniform hydrologic unit system that is sponsored by the Water Resources Council. This system divides the country into 21 regions, 222 subregions, 352 accounting units and 2,149 cataloging units. A hierarchical code consisting of two digits for each of the above four levels combined to form an eight-digit hydrologic unit (cataloging unit). An eight-digit hydrologic unit generally covers an average of 975 square miles. There are 54 eight-digit hydrologic (or cataloging) units in North Carolina. These units have been further subdivided into eleven and fourteen-digit units.

hypereutrophic	Extremely elevated biological productivity related to excessive nutrient availability. Hypereutrophic lakes exhibit frequent algal blooms, episodes of low dissolved oxygen or periods when no oxygen is present in the water, fish kills and excessive aquatic plant growth.
impaired	Term that applies to a waterbody that has a use support rating of partially supporting (PS) or not supporting (NS) its uses.
impervious	Incapable of being penetrated by water; non-porous.
kg	Kilograms. To change kilograms to pounds multiply by 2.2046.
lbs	Pounds. To change pounds to kilograms multiply by 0.4536.
loading	Mass rate of addition of pollutants to a waterbody (e.g., kg/yr)
macroinvertebrates	Animals large enough to be seen by the naked eye (macro) and lacking backbones (invertebrate).
macrophyte	An aquatic plant large enough to be seen by the naked eye.
mesotrophic	Moderate biological productivity related to intermediate concentrations of available nutrients. Mesotrophic lakes show little, if any, signs of water quality degradation while supporting a good diversity of aquatic life.
MGD	Million gallons per day.
mg/l	Milligrams per liter (approximately 0.00013 oz/gal).
NCIBI	North Carolina Index of Biotic Integrity. A measure of the community health of a population of fish in a given waterbody.
NH_3-N	Ammonia nitrogen.
nonpoint source	A source of water pollution generally associated with rainfall runoff or snowmelt. The quality and rate of runoff of NPS pollution is strongly dependent on the type of land cover and land use from which the rainfall runoff flows. For example, rainfall runoff from forested lands will generally contain much less pollution and runoff more slowly than runoff from urban lands.
NPDES	National Pollutant Discharge Elimination System.
NPS	Nonpoint source.
NR	Not rated. A waterbody that is not rated for use support due to insufficient data.
NS	Not supporting. A rating given to a waterbody that does not support its designated uses and has poor water quality and severe water quality problems. Both PS and NS are called impaired.
NSW	Nutrient Sensitive Waters. A supplemental surface water classification intended for waters needing additional nutrient management due to their being subject to excessive growth of microscopic or macroscopic vegetation. Waters classified as NSW include the Neuse, Tar-Pamlico and Chowan River basins; the New River watershed in the White Oak basin; and the watershed of B. Everett Jordan Reservoir (including the entire Haw River watershed).
NTU	Nephelometric Turbidity Units. The units used to quantify turbidity using a turbidimeter. This method is based on a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of the light scattered by a standard reference suspension under the same conditions.
oligotrophic	Low biological productivity related to very low concentrations of available nutrients. Oligotrophic lakes in North Carolina are generally found in the mountain region or in undisturbed (natural) watersheds and have very good water quality.
ORW	Outstanding Resource Waters. A supplemental surface water classification intended to protect unique and special resource waters having excellent water quality and being of exceptional state or national ecological or recreational significance. No new or expanded wastewater treatment plants are allowed, and there are associated stormwater runoff controls enforced by DWQ.

pH	A measure of the concentration of free hydrogen ions on a scale ranging from 0 to 14. Values below 7 and approaching 0 indicate increasing acidity, whereas values above 7 and approaching 14 indicate a more basic solution.
phytoplankton	Aquatic microscopic plant life, such as algae, that are common in ponds, lakes, rivers and estuaries.
Piedmont	One of three major physiographic regions in the state. Encompasses most of central North Carolina from the Coastal Plain region (near I-95) to the eastern slope of the Blue Ridge Mountains region.
PS	Partially supporting. A rating given to a waterbody that only partially supports its designated uses and has fair water quality and severe water quality problems. Both PS and NS are called impaired.
riparian zone	Vegetated corridor immediately adjacent to a stream or river. See also SMZ.
river basin	The watershed of a major river system. North Carolina is divided into 17 major river basins: Broad, Cape Fear, Catawba, Chowan, French Broad, Hiwassee, Little Tennessee, Lumber, Neuse, New, Pasquotank, Roanoke, Savannah, Tar-Pamlico, Watauga, White Oak and Yadkin River basins.
river system	The main body of a river, its tributary streams and surface water impoundments.
runoff	Rainfall that does not evaporate or infiltrate the ground, but instead flows across land and into waterbodies.
SA	Class SA Water Classification. This classification denotes saltwaters that have sufficient water quality to support commercial shellfish harvesting.
SB	Class SB Water Classification. This classification denotes saltwaters with sufficient water quality for frequent and/or organized swimming or other human contact.
SC	Class SC Water Classification. This classification denotes saltwaters with sufficient water quality to support secondary recreation and aquatic life propagation and survival.
sedimentation	The sinking and deposition of waterborne particles (e.g., eroded soil, algae and dead organisms).
seeps	Seeps are areas that remain wet due to groundwater seepage. The plant community generally consists of a dense bed of wetland herbs.
silviculture	Care and cultivation of forest trees; forestry.
SOC	Special Order by Consent. An agreement between the Environmental Management Commission and a permitted discharger found responsible for causing or contributing to surface water pollution. The SOC stipulates actions to be taken to alleviate the pollution within a defined time. The SOC typically includes relaxation of permit limits for particular parameters, while the facility completes the prescribed actions. SOCs are only issued to facilities where the cause of pollution is not operational in nature (i.e., physical changes to the wastewater treatment plant are necessary to achieve compliance).
streamside management zone (SMZ)	The area left along streams to protect streams from sediment and other pollutants, protect streambeds, and provide shade and woody debris for aquatic organisms.
subbasin	A designated subunit or subwatershed area of a major river basin. Subbasins typically encompass the watersheds of significant streams or lakes within a river basin. Every river basin is subdivided into subbasins ranging from one subbasin in the Watauga River basin to 24 subbasins in the Cape Fear River basin. There are 133 subbasins statewide. These subbasins are not a part of the national uniform hydrologic unit system that is sponsored by the Water Resources Council (see *hydrologic unit*).
Sw	Swamp Waters. A supplemental surface water classification denoting waters that have naturally occurring low pH, low dissolved oxygen and low velocities. These waters are common in the Coastal Plain and are often naturally discolored giving rise to their nickname of "blackwater" streams.
TMDL	Total maximum daily load. The amount of a given pollutant that a waterbody can assimilate and maintain its uses and water quality standards.

TN	Total nitrogen.
TP	Total phosphorus.
tributary	A stream that flows into a larger stream, river or other waterbody.
trophic classification	Trophic classification is a relative description of a lake's biological productivity, which is the ability of the lake to support algal growth, fish populations and aquatic plants. The productivity of a lake is determined by a number of chemical and physical characteristics, including the availability of essential plant nutrients (nitrogen and phosphorus), algal growth and the depth of light penetration. Lakes are classified according to productivity: unproductive lakes are termed "oligotrophic"; moderately productive lakes are termed "mesotrophic"; and very productive lakes are termed "eutrophic".
TSS	Total Suspended Solids.
turbidity	An expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a sample. All particles in the water that may scatter or absorb light are measured during this procedure. Suspended sediment, aquatic organisms and organic particles such as pieces of leaves contribute to instream turbidity.
UT	Unnamed tributary.
watershed	The region, or land area, draining into a body of water (such as a creek, stream, river, pond, lake, bay or sound). A watershed may vary in size from several acres for a small stream or pond to thousands of square miles for a major river system. The watershed of a major river system is referred to as a basin or river basin.
WET	Whole effluent toxicity. The aggregate toxic effect of a wastewater measured directly by an aquatic toxicity test.
WS	Class WS Water Supply Water Classification. This classification denotes freshwaters used as sources of water supply. There are five WS categories. These range from WS-I, which provides the highest level of protection, to WS-V, which provides no categorical restrictions on watershed development or wastewater discharges like WS-I through WS-IV.
WWTP	Wastewater treatment plant