New River

Basinwide Water Quality Plan

North Carolina
Department of Environment
and Natural Resources

Division of Water Quality
Water Quality Section July, 2000

Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Alan W. Klimek, P.E. Director
Division of Water Quality

April 22, 2003

Thank you for your interest in North Carolina's water quality issues. Enclosed is the basinwide water quality plan that you recently requested from the Division of Water Quality (DWQ).

The basinwide planning program aims to identify and restore full use to impaired waters, identify and protect highly valued resource waters, and protect the quality and intended uses of North Carolina's surface waters while allowing for sound economic planning and reasonable growth. North Carolina relies on the input and experience of its public to ensure that the water quality plans are effective. DWQ coordinates plan development; however, plan implementation and effectiveness entails the coordinated efforts and endorsement of many agencies, groups, local governments, and the general public. Your participation is essential for us to achieve our goals.

Our website (http://h2o.enr.state.nc.us/wqs/) provides detailed information on our program, other basin plans, current events, publications, and rules and regulations. Please visit us at this site.

DWQ appreciates your interest in water quality issues, and we hope to continue working with you into the future. Please contact me if you have any further questions or ideas on specific basins at (919) 733-5083, ext. 354.

Sincerely,

Darlene Kucken

Darlene Kucken
Basinwide Planning Program Coordinator

Enclosure

NEW RIVER BASINWIDE WATER QUALITY PLAN

July 2000

Prepared by:

NC Department of Environment & Natural Resources
Division of Water Quality
Water Quality Section
1617 Mail Service Center
Raleigh, NC 27699-1617

(919) 733-5083 ext. 583

This document was approved and endorsed by the NC Environmental Management Commission on July 13, 2000 to be used as a guide by the NC Division of Water Quality in carrying out its Water Quality Program duties and responsibilities in the New River basin. This plan is the first five-year update to the original New River Basinwide Water Quality Management Plan approved by the NC Environmental Management Commission in 1995.

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

Executive Summary

North Carolina's Basinwide Approach to Water Quality Management

Basinwide water quality planning is a nonregulatory 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 for each of the seventeen major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by the Division of Water Quality, their implementation and the protection of water quality entails the coordinated efforts of many agencies, local governments and stakeholders in the state. The first basinwide plan for the New River basin was completed in 1995.

This document is the first five-year update of the *New River Basinwide Water Quality Plan.* The format of this plan was revised in response to comments received during the first planning cycle. Much of the general information in the first plan was replaced by more detailed information specific to the New River basin. A greater emphasis was placed on identifying causes and sources of pollution for individual streams in order to facilitate local restoration efforts.

Comments from a pubic workshop held in the basin were seriously considered during plan development. While all of the comments may not have been addressed to the satisfaction of the commentors, this input will help guide continuing DWQ activities in the basin.

Goals of the Basinwide Approach

The goals of DWQ's basinwide program 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;
- develop appropriate management strategies to protect and restore water quality;
- assure equitable distribution of waste assimilative capacity for dischargers; and
- improve public awareness and involvement in the management of the state's surface waters.

New River Basin Overview

The New River flows from the western side of the Blue Ridge Mountains as two separate streams, the North and South Forks. At the confluence of these forks, the New River flows northward into Virginia, looping back briefly into North Carolina before continuing through Virginia into West Virginia where it joins the Kanawha River. Eventually, waters from this basin drain to the Gulf of Mexico via the Ohio and Mississippi Rivers.

A segment of the river basin, including the lower South Fork New River and the North Carolina portion of the New River mainstem, was designated as both a National Scenic River and a state Natural and Scenic River in 1976. This 26.5-mile stretch of river is also classified as Outstanding Resource Waters (ORW) due to its recreational and ecological significance, as well

as excellent water quality. The entire New River was designated an American Heritage River in 1998. Several significant natural heritage areas have been identified in the basin, including a series of unique high elevation mountains, hanging valleys and Southern Appalachian bogs.

About one-half of the land in the basin is forested and about 25 percent is pastureland. Comparisons of land cover between 1982 and 1992 show a significant decrease in cultivated cropland and substantial increases in the urban/developed and uncultivated cropland land uses. Usage that includes rural highways, farm roads and private roads outside of developed areas also increased over the 10-year period.

The population of the basin, based on 1990 census data, was estimated at 53,662 people. The overall population density of the basin was 71 persons per square mile, compared to a statewide average of 139 persons per square mile. The percentage increase in population over the past ten years (1980 to 1990) was only 6.4 percent, compared to a statewide increase of 12.7 percent over the same 10-year period. Population density is greatest in and around the Town of Boone.

Assessment of Water Quality in the New River Basin

Waters are classified according to their best intended uses. Determining how well a waterbody supports its designated uses is an important method of interpreting water quality data and assessing water quality. This determination results in a use support rating. The use support ratings refer to whether the classified uses of the water (such as water supply, aquatic life protection and swimming) are fully supported, partially supported or not supported. For instance, waters classified for fishing and water contact recreation (Class C) are rated as fully supporting if data used to determine use support (such as chemical/physical data collected at ambient sites or benthic macroinvertebrate bioclassifications) did not exceed specific criteria. However, if these criteria were exceeded, then the waters are rated as partially supporting or not supporting, depending on the degree of exceedence. Streams rated as either partially supporting or not supporting are considered *impaired.*

Overall water quality conditions in the basin are good; trout waters are abundant. Only 2 percent of monitored and evaluated streams are considered impaired. Most of the impaired waters are found in the South Fork New River subbasin (05-07-01). A summary of current use support ratings for monitored and evaluated streams in the New River basin is presented in Table 1.

Table 1 Use Support Summary (1999) for Monitored and Evaluated Streams in the New River Basin

	Stream Miles	Percent (%) *
Fully Supporting	763.6	95
Impaired	12.0	2
Partially Supporting	*3.8*	
Not Supporting	*8.2*	
Not Rated	25.6	3
Total	801.2	100%

* = Percent based on total of all named and classified streams.

Recommended Management Strategies for Restoring Impaired Waters

The long-range mission of basinwide management is to provide a means of addressing the complex problem of planning for increased development and economic growth while protecting and/or restoring the quality and intended uses of the New River basin's surface waters. In striving towards its mission, DWQ's highest priority near-term goals are to:

- identify and restore impaired waters in the basin;
- identify and protect high value resource waters and biological communities of special importance; and
- protect unimpaired waters while allowing for reasonable economic growth.

Within this basinwide plan, DWQ presents management strategies for those waters considered to be impaired. Table 2 presents impaired waters in the New River basin, the sources of impairment, summaries of the recommended management strategies, and location of further information in the basinwide plan.

Table 2 Impaired Waters within the New River Basin (as of 1999)*

Subbasin	Chapter in Section B	Listed Water	Use Support Rating	Potential Sources	Recommended Management Strategy
05-07-01	1	Naked Creek+	NS	NP, P	Local actions are needed on NPS inventory and BMP implementation. DWQ will continue to work with the Jefferson WWTP.
05-07-01	1	Peak Creek	NS	NP	An interagency team has formed to address acid drainage problems. DWQ will continue to assist with remediation.
05-07-01	1	Ore Knob Branch	NS	NP	Same as Peak Creek.
05-07-01	1	Little Peak Creek	NS	NP	Same as Peak Creek.
05-07-02	2	Little Buffalo Creek+	PS	P, NP	DWQ will continue to work with West Jefferson WWTP. Local actions are needed on NPS inventory/BMP implementation.

Key: NS = Not Supporting PS = Partially Supporting
NP = Nonpoint sources P = Point Sources

+ = Only limited progress towards developing and implementing NPS strategies for these impaired waters can be expected without additional resources.

* = These waters are also on the 303(d) list, and a TMDL and/or management strategy will be developed to remove the water from the list.

Water quality problems in the basin are primarily attributed to nonpoint source pollution (NPS) and include urban runoff and sedimentation (resulting primarily from land clearing activities, loss of riparian vegetation, livestock grazing on streambanks, and erosion of rural roads). However, some streams are degraded by point source pollution. For these streams, the plan presents a management strategy to reduce that pollutant source.

The task of quantifying nonpoint sources of pollution and developing management strategies for these impaired waters is very resource intensive. It is overwhelming, given the current limited resources of DWQ, other agencies (e.g., Division of Land Resources, Division of Soil and Water Conservation, Cooperative Extension Service, etc.) and local governments. Therefore, only limited progress towards restoring waters that are impaired by nonpoint sources can be expected during this five-year cycle unless substantial resources are put toward solving NPS problems.

DWQ plans to further evaluate impaired waters in the New River basin in conjunction with other agencies that deal with nonpoint source pollution issues and develop management strategies for a portion of these impaired waters for the next *New River Basinwide Water Quality Plan.*

Addressing 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 New River basin that are on this list are discussed in the individual subbasin descriptions in Section B.) 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.

There are approximately 2,387 impaired stream miles on the 303(d) list in NC. The rigorous and demanding task of developing TMDLs for each listed water during a 13-year time frame will require the focus of many resources. It will be a priority for North Carolina's water quality programs over the next several years to develop TMDLs for 303(d) listed waters. This task will be accomplished through the basinwide planning process and schedule.

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, the NC Agricultural Cost Share Program, the Wetlands Restoration Program, and the federally funded Conservation Reserve Enhancement Program.

With increased development occurring, there will be significant challenges ahead in balancing economic growth with the protection of water quality in this mountainous basin. 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 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.

Section A

General Basinwide Information

Chapter 1 -
Introduction to Basinwide Water Quality Planning

1.1 What is Basinwide Water Quality Planning?

Basinwide water quality planning is a nonregulatory 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 for each of the seventeen major river basins in the state, as shown in Figure A-1 and Table A-1. Preparation of an individual basinwide management plan is a five-year process, which is broken down into four major phases as presented in Table A-2. While these plans are prepared by the Division of Water Quality, their implementation and the protection of water quality entails the coordinated efforts of many agencies, local governments and stakeholder groups in the state. The first round of plans was completed in 1998. Each plan is now being updated at five-year intervals during round two.

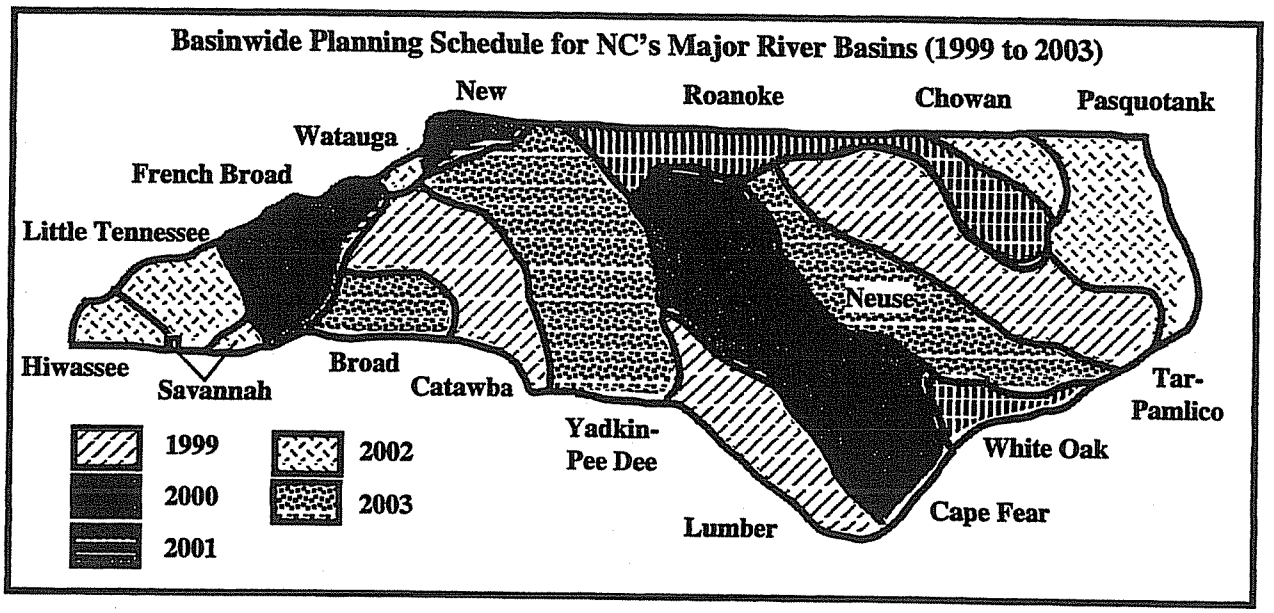


Figure A-1 Basinwide Planning Schedule (1999 to 2003)

1.2 Goals of Basinwide Water Quality Planning

The goals of basinwide management 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;
- develop appropriate management strategies to protect and restore water quality;
- assure equitable distribution of waste assimilative capacity for dischargers; and
- improve public awareness and involvement in the management of the state's surface waters.

Table A-1 Schedule for Second Round of Basinwide Planning (1998 to 2003)

Basin	DWQ Biological Data Collection	River Basin Public Workshops	Public Mtgs. and Draft Out For Review	Final Plan Receives EMC Approval	Begin NPDES Permit Issuance
Neuse	Summer 95	3/1997	9/1998	12/1998	1/1999
Lumber	Summer 96	4/1998	2/1999	5/1999	11/1999
Tar-Pamlico	Summer 97	6/1998	4/1999	7/1999	1/2000
Catawba	Summer 97	2/1999	9/1999	12/1999	3/2000
French Broad	Summer 97	5/1999	2/2000	5/2000	8/2000
New	**Summer 98**	**6/1999**	**4/2000**	**7/2000**	**11/2000**
Cape Fear	Summer 98	7/1999	4/2000	7/2000	12/2000
Roanoke	Summer 99	4/2000	3/2001	7/2001	1/2002
White Oak	Summer 99	10/2000	7/2001	10/2001	6/2002
Savannah	Summer 99	10/2000	12/2001	3/2002	8/2002
Watauga	Summer 99	11/2000	12/2001	3/2002	9/2002
Little Tennessee	Summer 99	3/2001	11/2001	2/2002	10/2002
Hiwassee	Summer 99	10/2000	12/2001	3/2002	8/2002
Chowan	Summer 2000	3/2001	2/2002	5/2002	11/2002
Pasquotank	Summer 2000	3/2001	2/2002	5/2002	12/2002
Broad	Summer 2000	11/2001	9/2002	12/2002	7/2003
Yadkin	Summer 2001	11/2001	11/2002	3/2003	9/2003

Note: A basinwide plan was completed for all 17 basins during Round 1 (1993 to 1998).

Table A-2 Five-Year Process for Development of an Individual Basinwide Management Plan

Years 1 to 3 **Water Quality Data Collection and Identification of Goals and Issues**	• Identify sampling needs • Canvass for information • Coordinate with other agencies and local interest groups to establish goals and objectives and identify and prioritize issues • Summarize data from ambient monitoring stations • Conduct biological monitoring activities • Conduct special studies and other water quality sampling activities
Years 3 to 4 **Data Assessment and Model Preparation**	• Gather data from special studies to prepare models and TMDLs • Develop preliminary pollution control strategies • Coordinate with local stakeholders and other agencies • Develop use support ratings
Year 4 **Preparation of Draft Basinwide Plan**	• Develop draft basinwide plan based on water quality data, use support ratings, modeling data and recommended pollution control strategies • Present preliminary findings at informal meetings and incorporate comments into draft plan
Year 5 **Public Review and Approval of Plan**	• Circulate draft plan for review • Hold public meetings after approval by NC Environmental Management Commission's Water Quality Committee • Revise plan after public review period • Submit final document to Environmental Management Commission for approval • Begin basinwide permitting and implementation at end of Year 5

1.3 Major Components of the Basinwide Plan

The second round of basinwide plans uses a different format from the earlier basinwide plans. Each plan is subdivided into three major sections. The intent of the format change is to make the plans easier to read and understand, but still comprehensive in content.

Section A: Basinwide Information

- Introduces the basinwide planning approach used by the state.
- Provides an overview of the river basin including: hydrology, land use, local government jurisdictions, population and growth trends, natural resources, wastewater discharges, animal operations and water usage.
- Presents general water quality information including summaries of water quality monitoring programs and use support ratings in the basin.

Section B: Subbasin Information

- Summarizes recommendations from first basin plan, achievements made, what wasn't achieved and why, current priority issues and concerns, and goals and recommendations for the next five years by subbasin.

Section C: Current and Future Initiatives

- Presents current and future water quality initiatives by federal, state and local agencies, and corporate, citizen and academic efforts.
- Describes DWQ goals and initiatives beyond the five-year planning cycle for the basin.

1.4 Benefits of Basinwide Water Quality Planning

Several benefits of basinwide planning and management to water quality include:

- *Improved efficiency.* The state's efforts and resources are focused on one river basin at a time.
- *Increased effectiveness.* The basinwide approach is in agreement with basic ecological principles.
- *Better consistency and equability.* By clearly defining the program's long-term goals and objectives, basinwide plans encourage *consistent* decision-making on permits and water quality improvement strategies.
- *Increased public participation in the state's water quality protection programs.* The basinwide plans are an educational tool for increasing public involvement and awareness about water quality issues.
- *Increased integration of point and nonpoint source pollution assessment and controls.* Once waste loadings from both point and nonpoint sources are established, management strategies can be developed to ensure compliance with water quality standards.

1.5 How to Get Involved

To assure that basinwide plans are accurately written and effectively implemented, it is important for local citizens and other stakeholders to participate in the planning process. DWQ offers two opportunities for the public to participate in the process:

- Public workshops: Held before writing the basinwide plans. DWQ staff present information about basinwide planning and the water quality of the basin. Participants then break into smaller groups where they can ask questions, share their concerns, and discuss potential solutions to water quality issues in the basin.
- Public meetings: Held after the Water Quality Committee of the Environmental Management Commission has approved the draft basinwide plan. DWQ staff present more detailed information about the draft basinwide plan and its major recommendations. Then, the public is invited to comment and ask questions.
- Public Comment Period: Held after the Water Quality Committee of the Environmental Management Commission has approved the draft plan. The comment period is at least thirty days in length from the date of the first public meeting.

Citizens seeking involvement in efforts to restore and protect water quality can call the DWQ Planning Branch at (919) 733-5083 and ask to speak to the basinwide planner for your river basin.

1.6 Other References

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

- *New River Basinwide Assessment Report.* July 1999. This technical report presents the physical, chemical and biological data in the New River basin. 120 pp.
- *New River Basinwide Water Quality Management Plan.* September 1995. This first basinwide plan for the New River basin presents water quality data, information and recommended management strategies for the first five-year cycle. 159 pp.
- NC Division of Water Quality Basinwide Planning Website http://h2o.enr.state.nc.us. Click on Water Quality Section and then, under Programs, click on Basinwide Planning Program.
- NC Division of Water Quality Environmental Sciences Branch Website http://www.esb.enr.state.nc.us/
- *A Guide to Water Quality in North Carolina.* This document will be available soon. The 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.
- *North Carolina's Basinwide Approach to Water Quality Management: Program Description.* Creager, C.S. and J.P. Baker. 1991. DWQ Water Quality Section. Raleigh, NC.
- *NC Basinwide Wetlands and Riparian Restoration Plan for the New River Basin.* September 1998. DWQ NC Wetlands Restoration Program. Raleigh, NC.

Anyone interested in receiving these documents can contact the DWQ Planning Branch at (919) 733-5083 or by e-mail http://h2o.enr.state.nc.us/basinwide/default.htm.

1.7 Division of Water Quality Functions and Locations

The major activities coordinated by DWQ through basinwide planning are listed in Figure A-2. Information on the location, address and phone numbers for each Branch and Regional Office are also shown in Figure A-2 and Figure A-3.

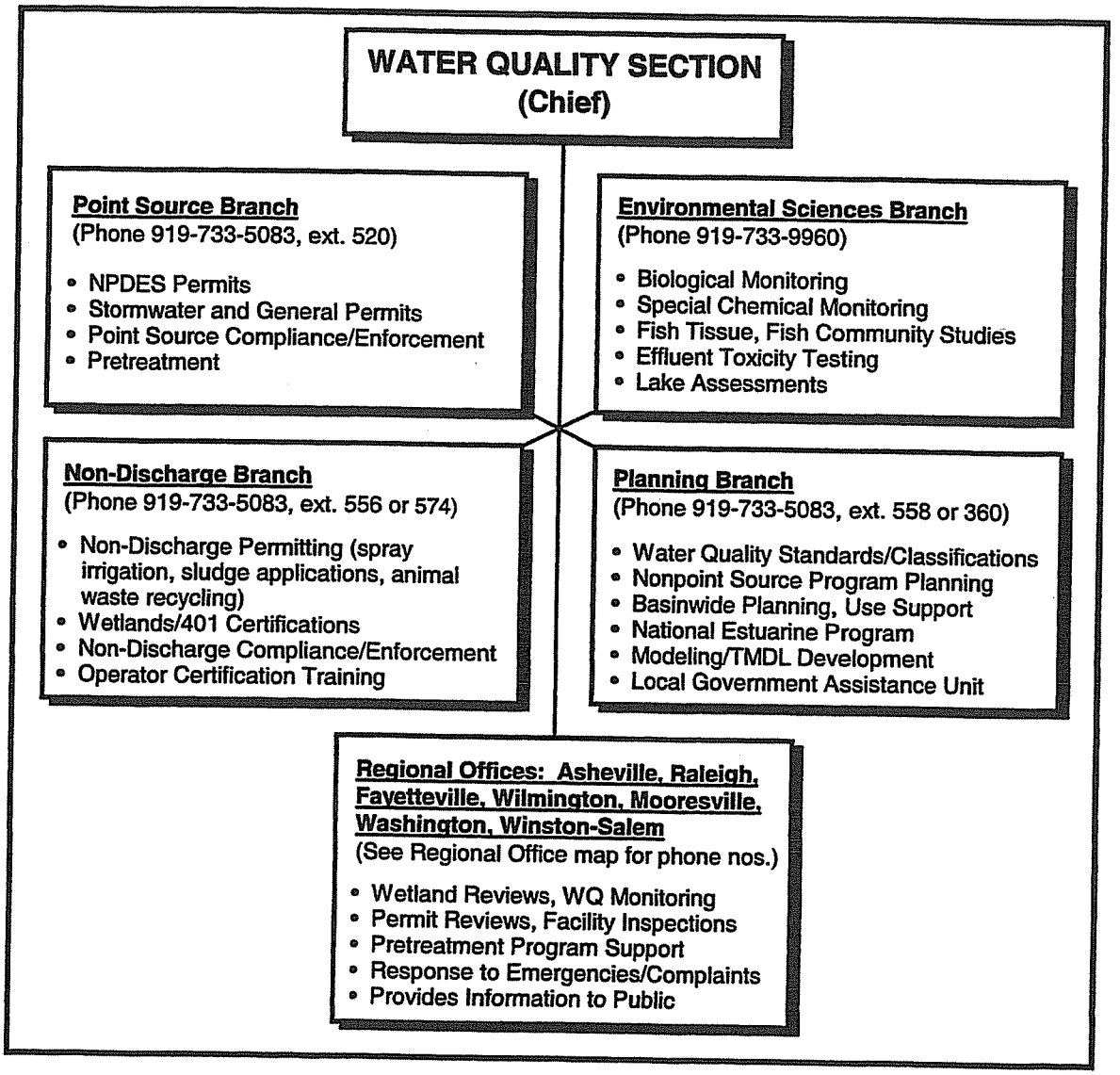
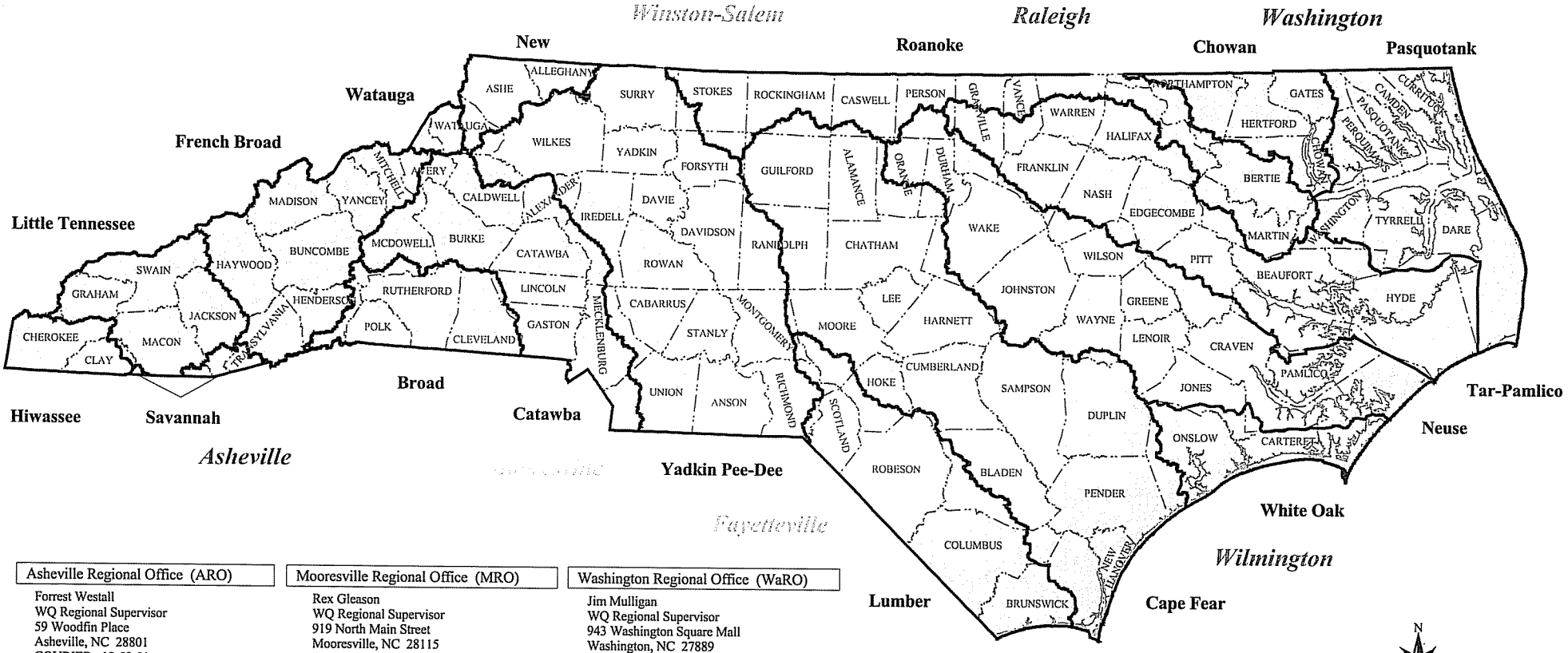


Figure A-2 Water Quality Section Organization Structure

Figure A-3 North Carolina Department of Environment and Natural Resources Division of Water Quality Regional Offices



Asheville Regional Office (ARO)

Forrest Westall
WQ Regional Supervisor
59 Woodfin Place
Asheville, NC 28801
COURIER 12-59-01
Phone: (828) 251-6208
Fax: (828) 251-6452

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

Mooresville Regional Office (MRO)

Rex Gleason
WQ Regional Supervisor
919 North Main Street
Mooresville, NC 28115
COURIER 09-08-06
Phone: (704) 663-1699
Fax: (704) 663-6040

Alexander	Lincoln
Cabarrus	Mecklenburg
Catawba	Rowan
Cleveland	Stanly
Gaston	Union
Iredell	

Washington Regional Office (WaRO)

Jim Mulligan
WQ Regional Supervisor
943 Washington Square Mall
Washington, NC 27889
COURIER 16-04-01
Phone: (252) 946-6481
Fax: (252) 946-9215

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)

Steve Tedder
WQ Regional Supervisor
585 Waughtown Street
Winston-Salem, NC 27107
COURIER 13-15-01
Phone: (336) 771-4600
Fax: (336) 771-4630

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

Fayetteville Regional Office (FRO)

Paul Rawls
WQ Regional Supervisor
225 Green Street
Suite 714 / Systel Building
Fayetteville, NC 28301-5043
COURIER 14-56-25
Phone: (910) 486-1541
Fax: (910) 486-0707

Anson	Moore
Bladen	Richmond
Cumberland	Robeson
Harnett	Sampson
Hoke	Scotland
Montgomery	

Raleigh Regional Office (RRO)

Ken Schuster
WQ Regional Supervisor
3800 Barrett Drive
Raleigh, NC 27609
INTEROFFICE
Phone: (919) 571-4700
Fax: (919) 571-4718

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

Wilmington Regional Office (WiRO)

Rick Shiver
WQ Regional Supervisor
127 Cardinal Drive Extension
Wilmington, NC 28405-2845
COURIER 04-16-33
Phone: (910) 395-3900
Fax: (910) 350-2004

Brunswick	New Hanover
Carteret	Onslow
Columbus	Pender
Duplin	

Central Office

DENR
DIVISION OF WATER QUALITY
WATER QUALITY SECTION
1617 MAIL SERVICE CENTER
RALEIGH NC 27699-1617
COURIER 52-01-00
Phone: (919) 733-5083
Fax: (919) 733-9919

NCDENR

Planning Branch
Basinwide Planning Program Unit
November 1, 2003

Chapter 2 -
Basin Overview

2.1 General Overview

The New River basin is located within the Blue Ridge Province of the Appalachian Mountain region of western North Carolina (Figure A-4). The New River originates at the confluence of the North Fork New River and the South Fork New River in northeastern Ashe County. It flows northward through Alleghany County and into Virginia, looping back only briefly into North Carolina before continuing through Virginia into West Virginia where it joins the Gauley River to form the Kanawha River. Eventually, waters from this basin drain to the Gulf of Mexico via the Ohio and Mississippi Rivers. Despite its name, the New River is part of the oldest river system in North America, flowing through rugged terrain containing metamorphic rocks that date to 1.1 billion years old.

New River Basin Statistics

Total Area: 753 mi^2
Stream Miles: 801
No. of Counties: 3
No. of Municipalities: 6
No. of Subbasins: 3
Population (1990): 53,662*
Pop. Density (1990): 71 persons/sq. mi.

* Based on % of county land area estimated to be within the basin.

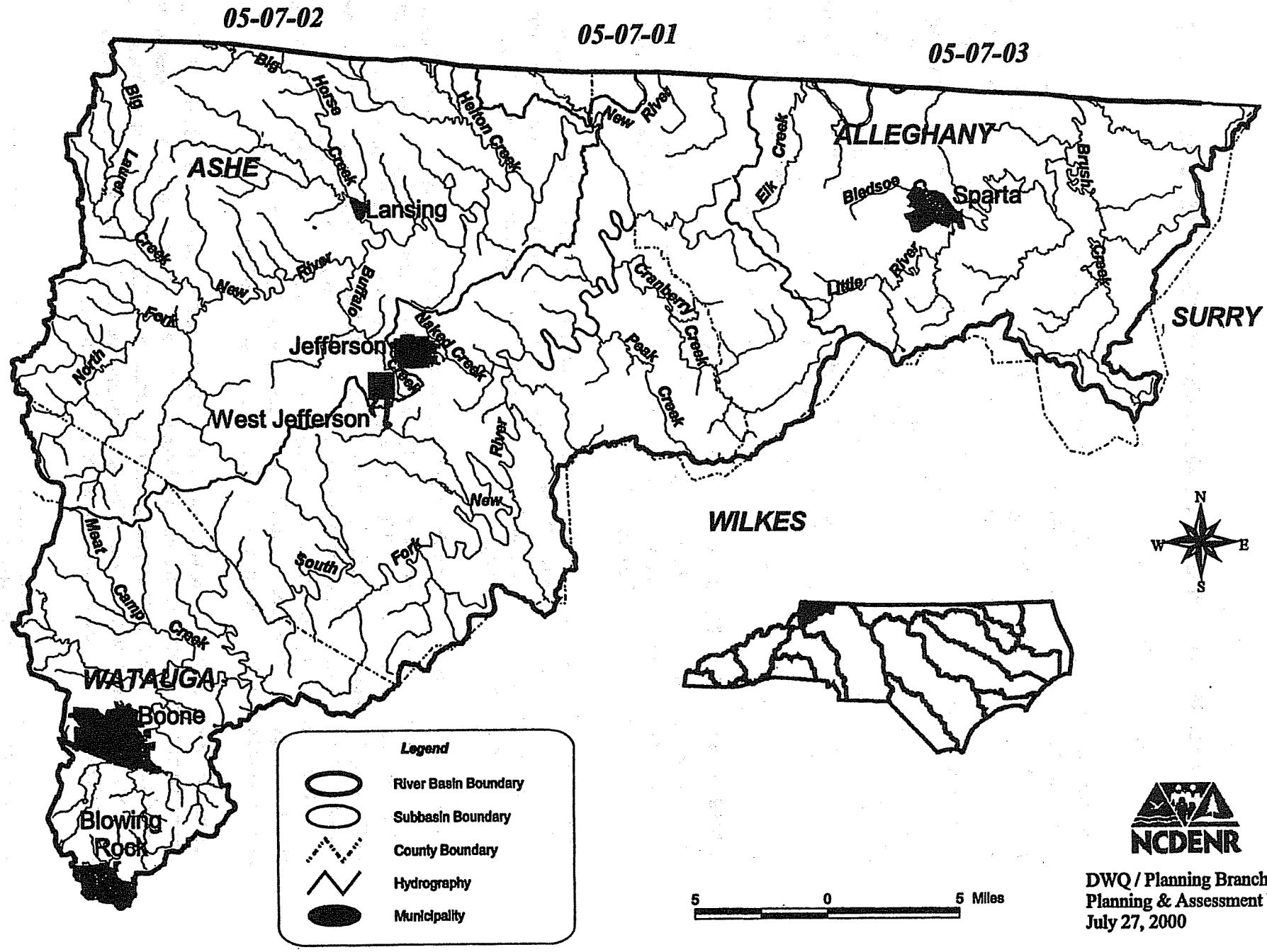
The New River basin in North Carolina is composed of three major drainages: North Fork New River, South Fork New River and Little River. Water quality is generally good. Trout waters are abundant and many streams have been classified as High Quality or Outstanding Resource Waters.

Population of the basin, based on 1990 census data, was estimated to be 53,662. The overall population density of the basin was 71 persons per square mile compared to a statewide average of 139 persons per square mile. Population in 1998 among the municipalities ranges from 14,198 in Boone to 173 in Lansing.

A segment of the river basin, including the lower South Fork New River and the North Carolina portion of the New River mainstem, was designated as both a National Scenic River and a state Natural and Scenic River in 1976. This 26.5-mile stretch of river is also classified as Outstanding Resource Waters (ORW) due to its recreational and ecological significance, as well as excellent water quality. The entire New River was named an American Heritage River in 1998. The basin is home to many rare, threatened and endangered species. Several significant natural heritage areas have been identified in the basin, including a series of unique high elevation mountains, hanging valleys and Southern Appalachian bogs.

The land comprising the New River basin is mountainous and distinctly rural. Over half of the land in the basin is forested with another 25 percent devoted to pastureland. Steep slopes limit the land that is suitable for development and crop production. Therefore, most agricultural and development activities, with the exception of Christmas tree production, are concentrated in valleys. Roads are also located along streams and rivers in the basin.

General Map of the New River Basin



2.2 Local Governments and Planning Jurisdictions in the Basin

The basin encompasses all or part of the following three counties and six municipalities (Table A-3). All counties are located in the Region D Council of Governments.

Table A-3 Local Governments and Planning Units within the New River Basin

County	% of County in Basin*	Council of Government Region+	Municipalities
Alleghany	91%	Region D Council of Governments	Sparta
Ashe	99%	Region D Council of Governments	Jefferson Lansing West Jefferson
Watauga	37%	Region D Council of Governments	Boone Blowing Rock

* Source: North Carolina Center for Geographic Information and Analysis

\+ Region D Council of Governments is located in Boone.

2.3 Surface Water Hydrology

Most federal government agencies, including the US Geological Survey and the US Natural Resources Conservation Service (NRCS), use a system of defining watersheds that is different from that used by the Division of Water Quality (DWQ) and many other state agencies in North Carolina. Under the federal system, the New River basin is made up of one hydrologic area referred to as a hydrologic unit. DWQ has a two-tiered system in which the state is divided into 17 major river basins with each basin further subdivided into subbasins. Table A-4 compares the two systems. The New River basin is subdivided by DWQ into three subbasins which correspond with the watersheds of the North Fork New River, South Fork New River and Little River (shown on Figure A-4). Maps of each subbasin are included in Section B of this plan.

Table A-4 Hydrologic Subdivisions in the New River Basin (USDA, November 1995)

Watershed Name and Major Tributaries	USGS 8-digit Hydrologic Units	DWQ 6-digit Subbasin Codes
South Fork New River and portion of New River Meadow, Piney, East and Middle Forks Cranberry, Peak, Howard, Meat Camp, Roan, Naked and Winkler Creeks	05050001	05-07-01
North Fork New River Roaring, Brush, and Hoskin Forks Helton, Silas, Buffalo, Three Top, Big Laurel and Long Hope Creeks	05050001	05-07-02
Little River and portion of New River Brush Creek and Laurel Branch Elk, Glade, Bledsoe and Pine Swamp Creeks	05050001	05-07-03

Hydrologic Features

In this basin, 801 miles of freshwater streams drain 753 square miles of mountainous terrain. The average drainage area per stream mile is 0.94 square miles. In comparison, the neighboring Watauga River basin has an average drainage area of 0.65 square miles per stream mile, while the largest river basin in the state, the Cape Fear, drains 1.5 square miles per stream mile. In the Watauga River basin there are many streams draining small areas of land (high drainage density due to very steep terrain). But in the Cape Fear, there are fewer streams draining much larger portions of land. The New River basin falls between the two with moderate drainage density.

Areas with high drainage density are associated with high flood peaks, high sediment production, relatively low suitability for traditional agriculture, and high development costs for the construction of buildings and the installation of roads and bridges. Within the New River basin, the South Fork New River subbasin has the highest drainage density, while the Little River subbasin has the lowest.

Appalachian State University Lake is the only major lake in the New River basin. It is an 18-acre impoundment of Norris Branch in the South Fork New River watershed (subbasin 05-07-01). The reservoir was constructed in 1970 to serve as a water supply for Appalachian State University and is classified as WS-II.

One operational hydroelectric facility exists in the New River basin. Sharpe Falls is located on the North Fork New River (subbasin 05-07-02) near the community of Dresden. The project is a "run-of-river" type facility and operates so that instantaneous inflow equals outflow most of the time. This kind of operation typically results in minimal impoundment of the river.

The headwaters of Laurel Branch, in the Little River watershed (subbasin 05-07-03), contain three impoundment dams. Two of the ponds were constructed in series for erosion control during the construction of the Olde Beau Golf Course Community. They currently provide a source of water for irrigation purposes.

2.4 Land Cover

Land cover information in this section is from the National Resources Inventory (NRI) of 1992 and 1982, as developed by the Natural Resources Conservation Service (USDA, 1994). The NRI is a multi-resource national inventory based on soils and other resource data collected at scientifically selected random sample sites. It is considered accurate to the 8-digit hydrologic unit scale established by the US Geological Survey.

Table A-5 summarizes acreage and percentage of land cover from the 1992 NRI for the North Carolina portion of the basin, as defined by the USGS 8-digit hydrologic units, and compares the coverages to 1982 land cover. Land cover in the basin, as presented in Table A-5, is dominated by forestland which covers approximately 53 percent of the land area. Agriculture (including cultivated and uncultivated cropland and pastureland) covers approximately 33 percent. Only 6 percent of the land area is developed. A description of land cover types, including the "Other" category, to which 8 percent of land in the basin is assigned, can be found in Table A-6.

Table A-5 Land Cover in the New River Basin by Major Watersheds
(Source: USDA-NRCS, 1982 and 1992 NRI)

LAND COVER	1992 TOTAL		1982 TOTAL		% change since 1982
	Acres (1000s)	%	Acres (1000s)	% of TOTAL	
Cultivated Crop	8.0	2.0	16.5	3.0	-51.5
Uncultivated Crop	29.3	6.0	24.9	5.0	17.7
Pasture	126.5	25.0	130.5	26.0	-3.1
Forest	265.9	53.0	269.6	54.0	-1.4
Urban & Built-up	30.9	6.0	22.5	4.0	37.3
Other	42.0	8.0	38.6	8.0	8.8
Totals	502.6	100.0	502.6	100.0	
SUBBASINS	05-07-01, 05-07-02, 05-07-03				
8- Digit Hydraulic Units	05050001 – Upper New				

Comparisons of land cover between 1982 and 1992 (Figure A-5) show a significant decrease in cultivated cropland and substantial increases in the urban/developed and uncultivated cropland land uses. Usage that includes rural highways, logging roads and private roads outside of developed areas also increased over the 10-year period.

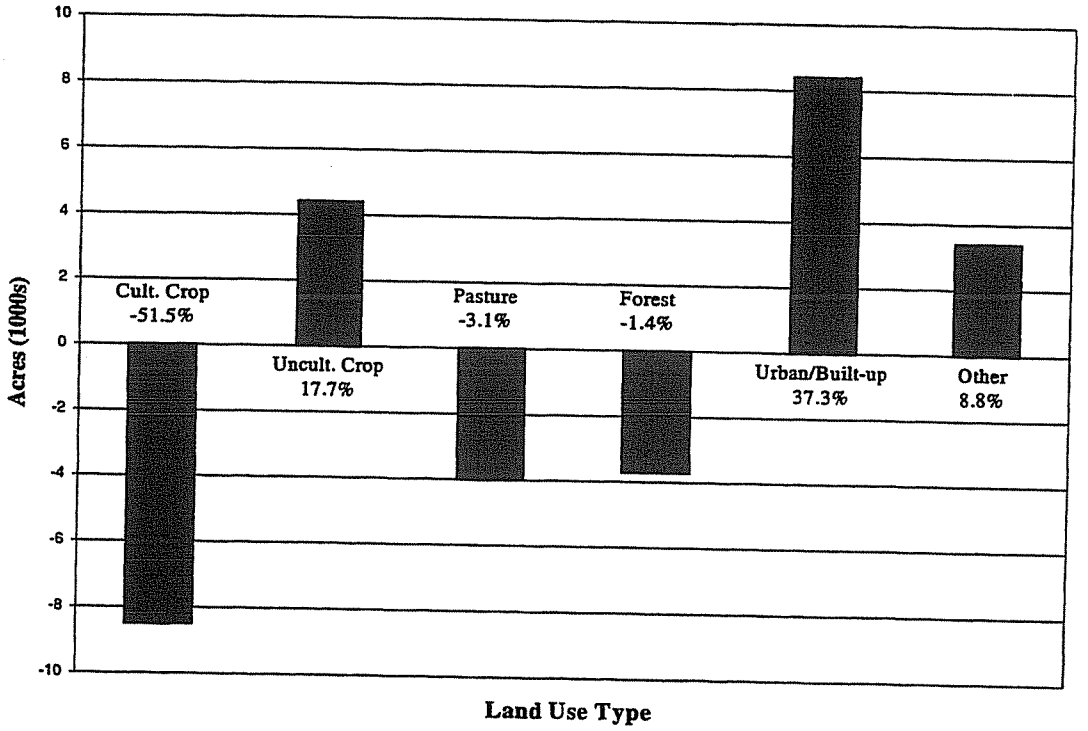


Figure A-5 Land Cover Changes from 1982 to 1992 for the New River Basin
(Source: USDA-NRCS 1992 NRI)

Table A-6 Description of Land Cover Types (Source: USDA-NRCS, 1992 NRI)

Land Cover Type	Land Cover 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	Forage plants for livestock grazing, including 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; must be at least 1,000 feet wide.
Urban and Built-up Land	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 in size and streams less than one-half mile wide. *Census Water*: Large waterbodies consisting of lakes and estuaries greater than 40 acres and rivers greater than one-half mile in width. *Minor Land*: Lands not in one of the other categories.

Table A-7 Description of Land Cover Categories (Source: CGIA, 1996)

Land Cover Type	Land Cover Description
Urban	Greater than 50% coverage by synthetic land cover (built-upon area) and municipal areas.
Cultivated	Areas that are covered by crops that are cultivated in a distinguishable pattern (such as rows).
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, conifers, deciduous hardwoods).
Water	Areas of open surface water, areas of exposed rock, and areas of sand or silt adjacent to tidal waters and lakes.

The most recent land cover information for the New River basin is based on satellite imagery collected from the North Carolina Corporate Geographic Database. The state's Center for Geographic Information and Analysis (CGIA) developed statewide land cover information based on this 1993-1995 satellite imagery. This land cover data is divided into 24 categories. For the purposes of this report, those categories have been condensed into five broader categories as described in Table A-7. An important distinction between this land cover dataset and that of the NRI is that there is no actual groundtruthing of the satellite-generated data.

Unfortunately, due to differences in the system of categorizing various land cover classes, it is not possible to establish trends in land cover changes by comparing this data set to previously attained land cover data. However, it is anticipated that comparisons will be possible with future satellite data since a strong consensus-based effort was made to develop the classification system that was used with the 1996 data.

Figure A-6 provides an illustration of the relative amount of land area that falls into each major cover type for the New River basin. Section B of this plan provides land cover data specific to each subbasin.

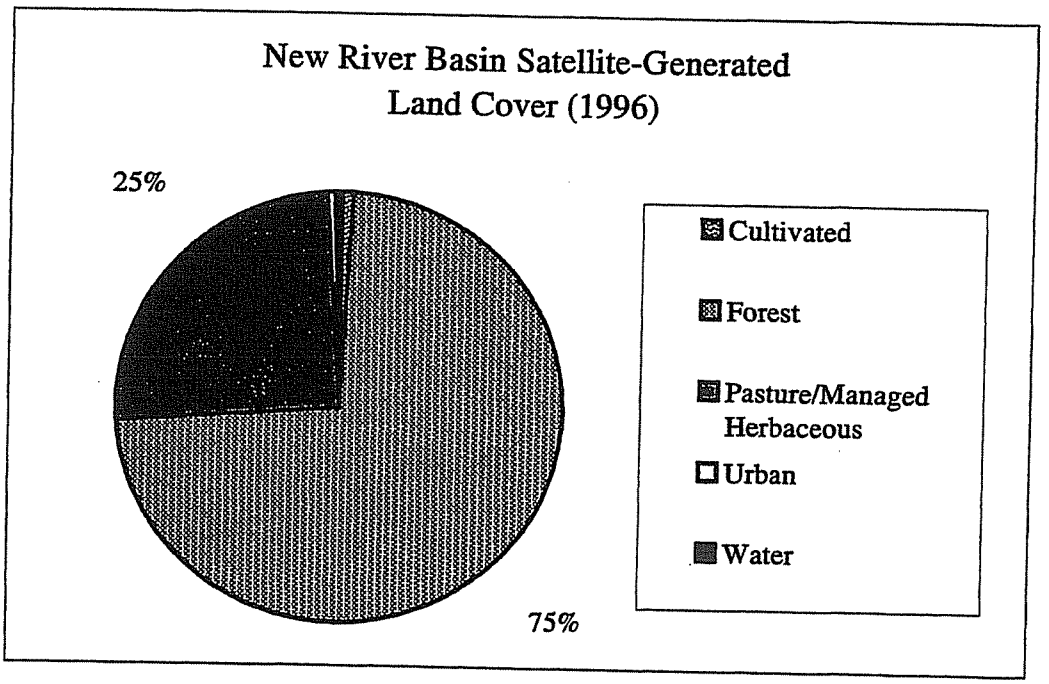


Figure A-6 Percentages within Major Land Cover Categories in the New River Basin (Source: CGIA, 1996)

2.5 Population and Growth Trends

Population

The New River basin has an estimated population of 53,662 based on 1990 census data. Figure A-7 displays subbasin population density information. Table A-8 presents census data for 1970, 1980 and 1990 for each of the subbasins. It also includes population densities (persons/square

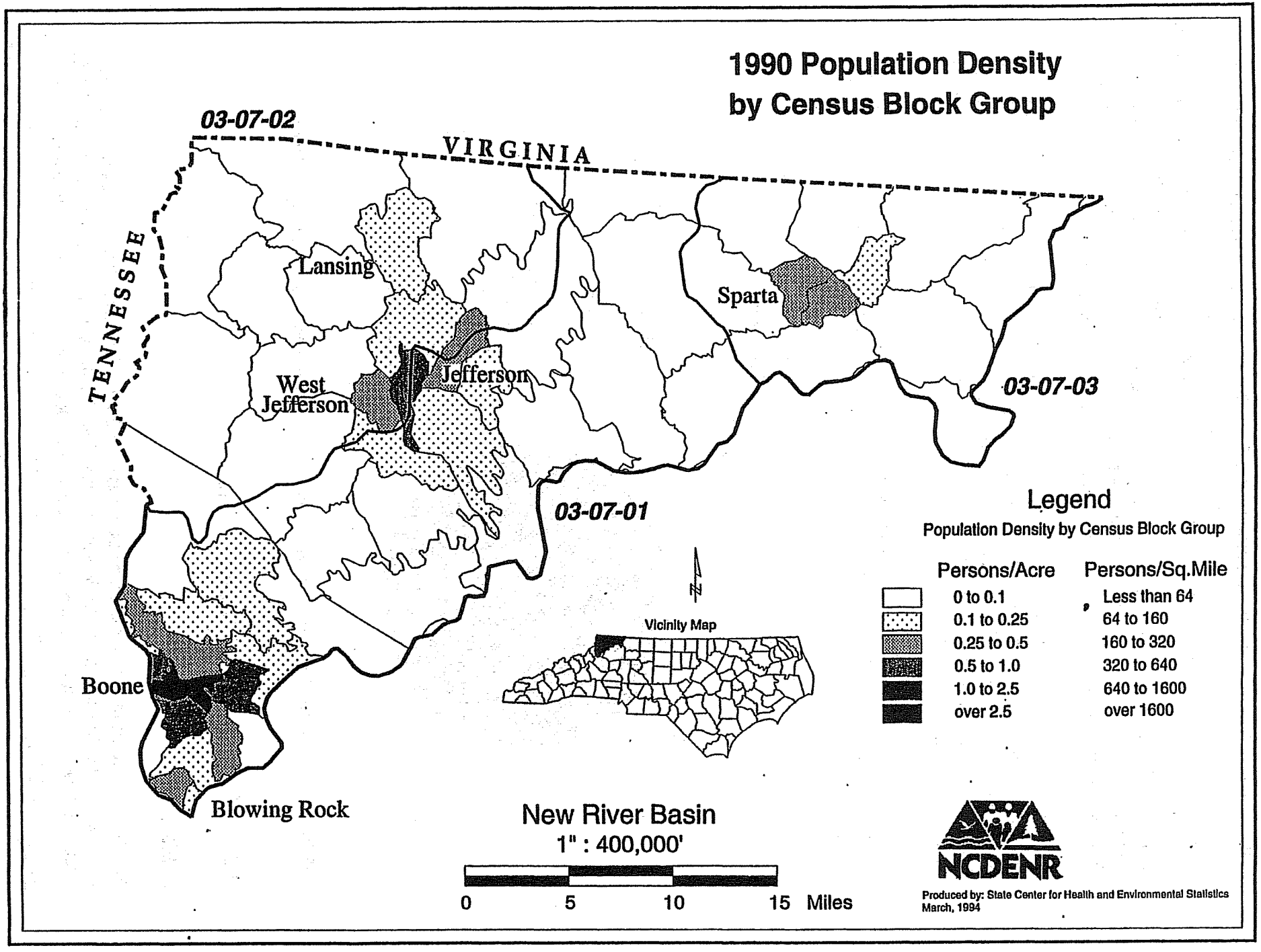


Figure A-7 1990 Population Density by Census Block Group

mile) based on the *land area* (excludes open water) for each subbasin. Most of the basin's population is located in the South Fork New River watershed (subbasin 05-07-01) in and around the Boone-Blowing Rock and Jefferson-West Jefferson areas. This particular subbasin contains approximately 63% of the total basin population and has a population density of 100 persons/square mile versus the basinwide average of 71 persons/square mile.

In using these data, it should be noted that some of the population figures are estimates because the census block group boundaries do not generally coincide with subbasin boundaries. The census data are collected within boundaries such as counties and municipalities. By contrast, the subbasin lines are drawn along natural drainage divides separating watersheds. Therefore, where a census block group straddles a subbasin line, an estimate is made on the percentage of the population that is located in the subbasin. This is done by simply determining the percentage of the census block group area located in the subbasin and then taking that same percentage of the total census block group population and assigning it the subbasin. Use of this method necessitates assuming that population density is evenly distributed throughout a census block group, which is not always the case. However, the level of error associated with this method is not expected to be significant for the purposes of this document. It is also important to note that the census block groups change every ten years, so comparisons between years must be considered approximate.

Table A-8 New River Subbasin Population, Densities (1970, 1980 and 1990) and Land Area Summaries

SUBBASIN	POPULATION (Number of Persons)			POPULATION DENSITY (Persons/Square Mile)			AREA	
	1970	1980	1990	1970	1980	1990	(Acres)	(Sq. Miles)
05-07-01	23,964	30,692	33,966	70	90	100	218,138	341
05-07-02	10,948	11,971	12,118	43	47	48	163,309	255
05-07-03	6,399	7,784	7,578	41	50	49	100,147	156
TOTALS	**41,311**	**50,447**	**53,662**	**55**	**67**	**71**	**481,594**	**752**

Growth Trends

Statistics showing population change in each subbasin of the New River basin are presented in Figure A-8. Basinwide, the percentage increase in population from 1980 to 1990 was only 6.4 percent compared to a statewide increase of 12.7 percent over the same 10-year period.

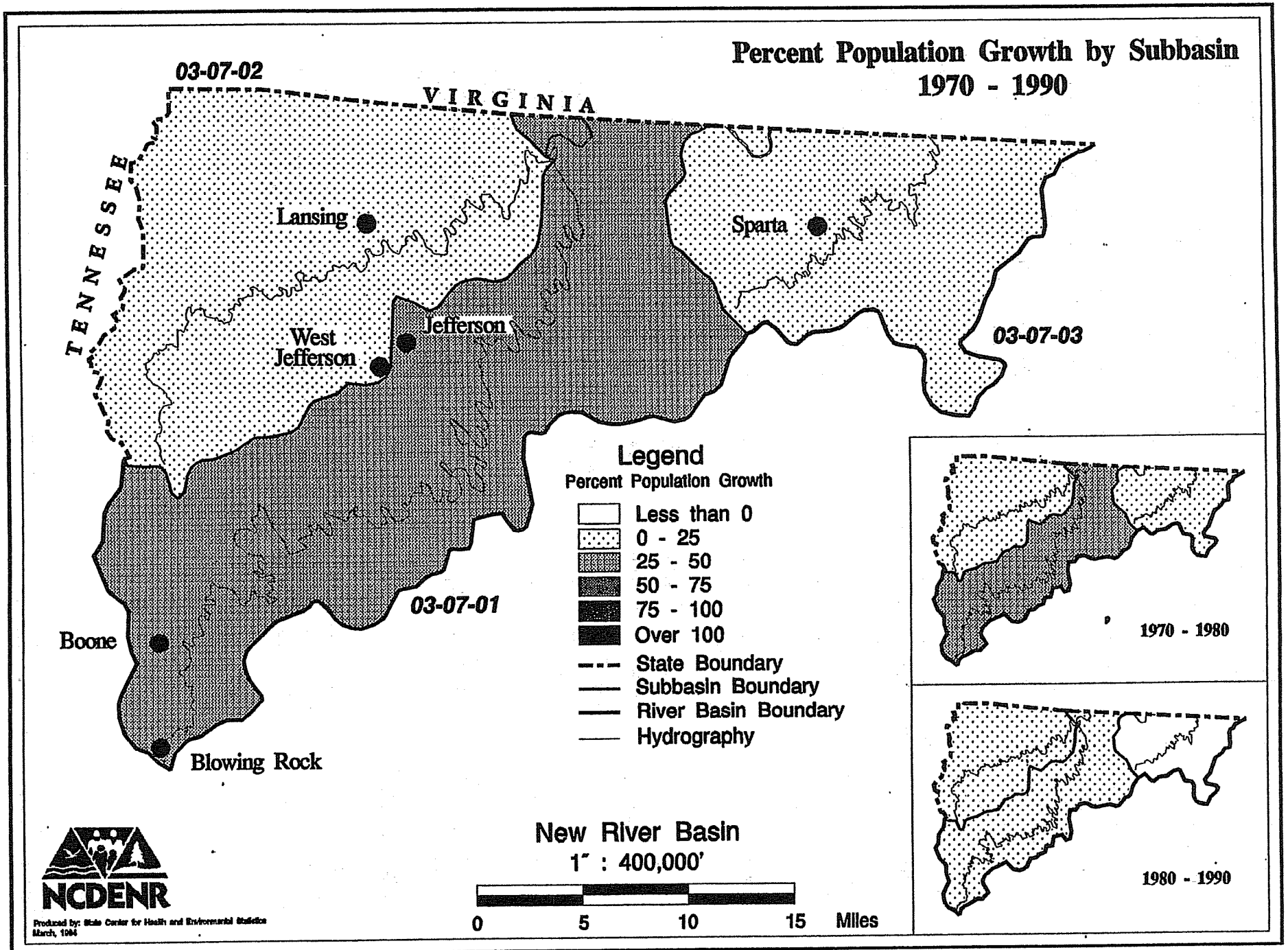


Figure A-8 Population Growth by Subbasin (1970 to 1990)

Table A-9 presents population data for municipalities with populations greater than 1,000 persons that are located wholly or partially within the basin. The table includes more recent data (1998) which indicates that West Jefferson is currently the fastest growing municipality in the basin with an increase in population of 10.5 percent from 1990 to 1998. Population in Boone and Jefferson also increased over the same 8-year period by 9.6 and 9.1 percent, respectively. Population growth in the majority of municipalities in the basin slowed considerably after 1990.

Table A-9 Population (1980, 1990, 1998) and Population Change for Municipalities Located Wholly or Partly in the New River Basin
(North Carolina Municipal Population, 1995 and 1998)

Municipality	County	Apr-80	Apr-90	Jul-98	% Change (1980-90)	% Change (1990-98)
Blowing Rock *	Watauga	1,274	1,219	1,280	-4.3	5.0
Boone	Watauga	10,191	12,949	14,198	27.1	9.6
Jefferson	Ashe	1,086	1,300	1,418	19.7	9.1
Lansing	Ashe	194	171	173	-11.9	1.2
Sparta	Alleghany	1,687	1,957	1,968	16.0	0.6
West Jefferson	Ashe	822	1,002	1,107	21.9	10.5

* The numbers reported reflect municipality population; however, the municipality is not entirely contained within the basin. The intent is to demonstrate growth for municipalities located wholly or partially within the basin.

Table A-10 shows the projected population and percent change in growth between 1990 and 2016 for counties that are wholly or partly contained within the basin. Since river basin boundaries do not usually coincide with county boundaries, these numbers are not directly applicable to the New River basin. Even though over 90 percent of Ashe and Alleghany counties are contained within the basin, only 37 percent of Watauga County is encompassed (Table A-3).

Table A-10 Past and Projected Population (1990 to 2016) and Population Change by County (Office of State Planning, 1998)

County	1990	Estimated Population 2016	Estimated Pop. Change 1990 - 2016
Alleghany	8,727	8,580	-147
Ashe	21,987	24,859	2,872
Watauga	13,672	17,539	3,867
Total	**44,386**	**50,978**	**6,592**

These data have been adjusted based on the percent of the county located in the New River basin (Table A-3).

2.6 Natural Resources

2.6.1 Ecological Significance of the New River Basin

While the New River is renowned as one of the oldest existing rivers in North America, it is also notable for the number of rare and endemic aquatic animals it supports. Many of these species are found nowhere else in North Carolina. While most of the floodplain and upland vegetation along the river has been heavily altered by farming and pasturing, patches of intact natural communities persist and waters are generally of high quality.

One distinctive feature of the New River basin is a series of high elevation mountains (4600 feet or higher) clustered in a band stretching from central Ashe through northeastern Watauga County. Unlike most of the Blue Ridge and much of the rest of the New River basin, these mountains are underlain by mafic rocks, which are high in elements such as magnesium, iron and calcium. Mafic rocks are more resistant to erosion than surrounding rocks and weathering of them forms unusually nutrient-rich, high pH soils. Because these peaks are composed largely of the mafic rock, *amphibolite*, they have been informally named the "Amphibolite Mountains" by the NC Natural Heritage Program. Most of the rare plants and distinctive natural communities found in the New River basin are associated with the rich soils and high elevations of these mountains. Of the nearly 120 rare plants documented from the New River basin, over 70% occur in the Amphibolite Mountains. In fact, all seventeen natural communities known to occur in the basin are found in the Amphibolites, including the only known example worldwide of the Southern Appalachian Fen wetland.

Another ecologically significant feature of the New River basin is the presence of numerous Southern Appalachian bogs. This particular type of bog is restricted to the mountains of North Carolina, Tennessee and Virginia. They are naturally rare since the flat, bottomland locations where they occur make up a very small part of the mountain landscape. For this reason, the Southern Appalachian bog community is also one of the most imperiled communities in western North Carolina. They are highly susceptible to human alterations, such as draining, filling, conversion to pasture or impoundment. Since bogs are usually very small in size, such alterations affect them quickly and drastically.

2.6.2 Significant Natural Heritage Areas & Rare Aquatic Species

1. Amphibolite Mountains Macrosite. The core area of some of the larger amphibolite mountains (discussed in the previous section), Three Top, Bluff, Phoenix, Paddy, Jefferson and several high peaks that border Long Hope Valley, are essentially unfragmented and heavily forested. This area is identified in Figure A-9 as the Amphibolite Mountains Macrosite. One particularly important feature of the Amphibolite Mountains Macrosite is the hanging valley of upper Long Hope Creek, which straddles the border of Ashe and Watauga counties. The upper part of the creek has low gradient, decreasing in elevation only about 100-feet per mile as it flows northeastward through a broad valley at an elevation of 4400 feet (as high as many mountain tops). The gentle valley ends abruptly as the creek plunges over a waterfall and into a narrow, steep gorge. Hanging valleys are formed most often on previously glaciated terrain of

the northern and western United States. They are uncommon in the unglaciated South and are largely a result of erosion-resistant rock beds.

2. Long Hope Valley/Mountain Bogs. The rare combination of gentle valley topography and high elevation in Long Hope Valley encouraged the development of numerous unique bogs (described in Section 2.6.1). At least twenty-three bogs, the largest concentration in North Carolina, occur at Long Hope Valley. The nearest comparable concentration of bogs occurs hundreds of miles away to the north at Cranberry Glades in West Virginia. Other examples of this rare community occur at Sparta Bog, Skunk Cabbage Bog, Peak Creek Bog, Idlewild Bog and many other bogs scattered along the southeastern margin of the New River basin (Figure A-9). Southern Appalachian bogs are naturally open and usually have a mixture of vegetation types, including patches of open tree canopy, shrub thickets, and beds of herbs, fens, grasses and sedges. They are floristically related to bogs of the northern United States and Canada, often containing a combination of disjunct northern plant species and typically southern wetland species. Several of these northern disjunct species occur in North Carolina only in bogs of the New River basin.

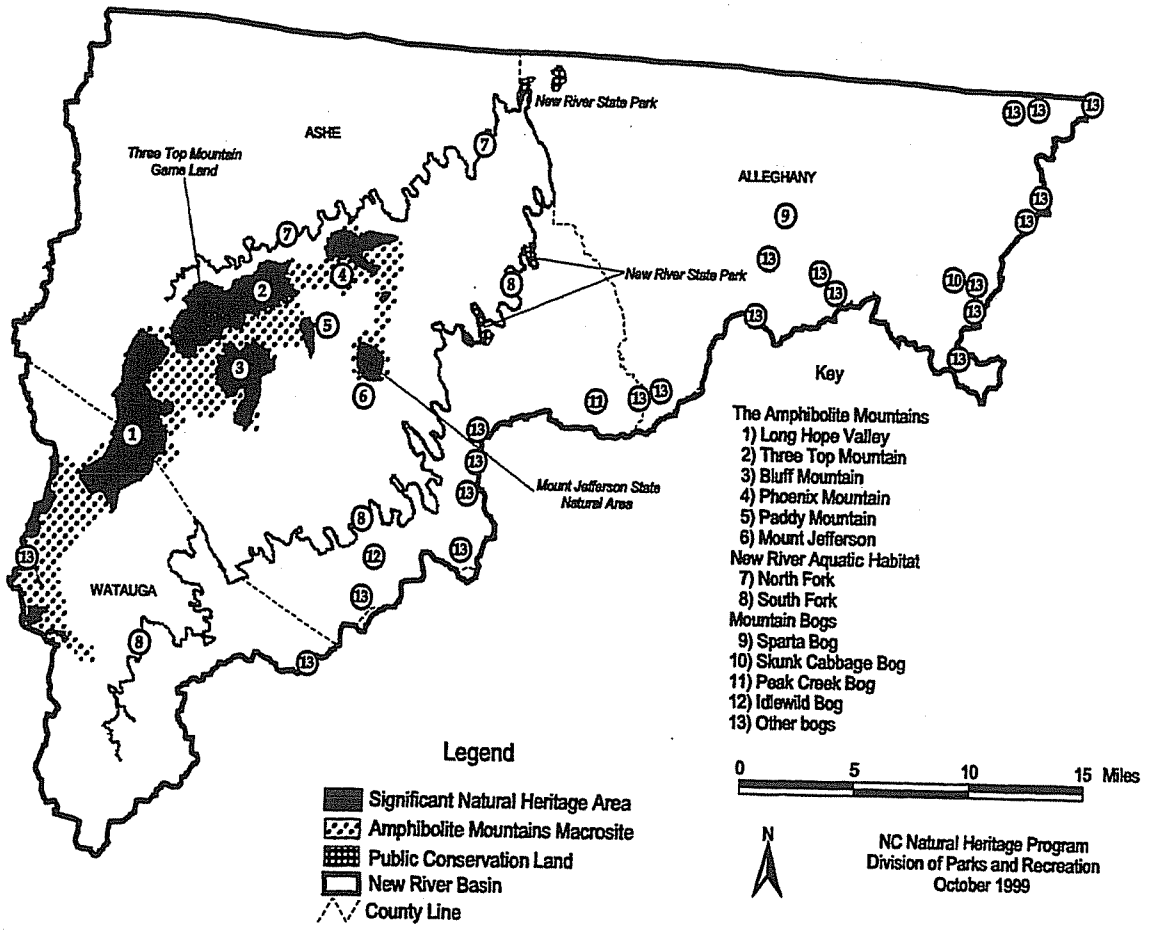


Figure A-9 Public Lands and Significant Natural Heritage Areas in the New River Basin

3. South Fork New River Aquatic Habitat. A section of the South Fork New River identified by the NC Natural Heritage Program as the South Fork New River Aquatic Habitat is considered to be of state biological significance for its cluster of sixteen rare animal species, including three fishes endemic to the New River drainage (Table A-11). This river is also the state's only known location for the Gammon's *Stenelmis* riffle beetle.

Table A-11 Rare Aquatic Animals in the South Fork New River Habitat

Major Taxon	Common Name	Scientific Name	State Status
fish	Sharpnose darter*	*Percina oxyrhynchus*	SC
fish	Kanawha minnow*	*Phenacobius teretulus*	SC
fish	Kanawha darter*	*Etheostoma kanawhae*	SR
fish	Logperch	*Percina caprodes*	T
fish	Tongue-tied minnow	*Exoglossum laurae*	SR
mollusk	Spike	*Elliptio dilatata*	SC
mollusk	Green floater	*Lasmigona subviridis*	E
aq insect	mayfly	*Ephemerella floripara*	SR
aq insect	stonefly	*Attaneuria ruralis*	SR
aq insect	caddisfly	*Ceraclea mentiea*	SR
aq insect	caddisfly	*C. slossonae*	SR
aq insect	dragonfly – Pygmy snaketail	*Ophiogomphus howei*	SR
aq insect	dragonfly – Brook snaketail	*O. aspersus*	SR
aq insect	dragonfly – Twin-horned snaketail	*O. mainensis*	SR
aq insect	dragonfly – Zebra clubtail	*Stylurus scudderi*	SR
aq insect	beetle – Gammon's riffle beetle	*Stenelmis gammoni*	SR

* These fish are endemic to the New River drainage.

Rare Species Listing Criteria

E = Endangered (those species in danger of becoming extinct)
T = Threatened (considered likely to become endangered within the foreseeable future)
SC = Special Concern (have limited numbers and vulnerable populations in need of monitoring)
SR = Significantly Rare (those whose numbers are small and whose populations need monitoring)

4. North Fork New River Aquatic Habitat. A section of the North Fork New River is considered to be of regional biological significance for its cluster of eight rare animal species, all of which are found in the South Fork Habitat as well: the Kanawha minnow, Kanawha darter, the tongue-tied minnow, the green floater (mollusk), *Ceraclea mentiea, C. slossonae*

(caddisflies), the twin-horned snaketail, and zebra clubtail (dragonflies). This area has been identified by the NC Natural Heritage Program as the North Fork New River Aquatic Habitat.

A number of other rare and uncommon aquatic species are found in North Carolina only in the New River basin. These species are listed below in Table A-12. A particularly notable wetland plant, the Federally Threatened Virginia spiraea, is found along streambanks in the New River basin as well as other North Carolina mountain streams. It is the only nationally listed species found in the basin.

Table A-12 Other Rare Aquatic and Wetland Dwelling Animal Species in the New River Basin

Major Taxon	Common Name	Scientific Name	State Status	Federal Status
fish	Bigmouth chub	*Nocomis platyrhynchus*	U	
fish	New River shiner	*Notropis scabriceps**	U	
fish	Appalachia darter	*Percina gymnocephala**	U	
crustacean	New River crayfish	*Cambarus chasmodactylu**	U	
mollusk	Purple wartyback	*Cyclonaias tuberculata**	SR	
mollusk	Pistolgrip	*Tritogonia verrucosa**	SR	
aq snail	Seep mudalia	*Leptoxis dilatata**	SR	
Rare Wetland-Dwelling Plant In The New River Basin				
plant	Virginia spiraea	*Spiraea virginiana*		T

* These species are only found in North Carolina in the New River drainage.

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)
U = Uncommon

2.6.3 Public Lands in the New River Basin

Over 1,300 acres along the South Fork New River make up the New River State Park (Figure A-9). In 1999, an amendment to the Wild and Scenic Rivers Act removed a cap on the amount of acreage the park could obtain. Therefore, additional land acquisitions are ongoing, with plans to protect as much of the land as possible that can be seen from river level along the lower section.

Conservation lands in the Amphibolite Mountain region include Mount Jefferson State Natural Area and Three Top Mountain Game Land. Mount Jefferson is known for its magnificent oak-hickory forests. The peak is approximately 4,700 feet in elevation and provides a sweeping view of a large portion of the New River basin, including the towns of Jefferson and West Jefferson.

The Three Top Mountain game preserve covers about one-third of Three Top Mountain. There is also a private preserve which protects nearly all of Bluff Mountain.

Recently, over 300 acres of the Sparta bog was purchased by the NC Department of Transportation as mitigation for wetlands destroyed during road construction. The land will likely be transferred to the Wildlife Resources Commission for management.

2.7 Permitted Wastewater and Stormwater Discharge Facilities

Discharges that enter surface waters through a pipe, ditch or other well-defined point 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 which 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.

The primary pollutants associated with point source discharges are:

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

2.7.1 Wastewater Discharges in the New River Basin

Type of Wastewater Discharge

Major Facilities: Municipal Wastewater Treatment Plants with flows ≥1 MGD (million gallons per day); and some industrial facilities (depending on flow and potential impacts on public health and water quality).
Minor Facilities: Any facilities not meeting the definition of Major.
100% Domestic Waste: Facilities that only treat domestic-type waste (water from bathrooms, sinks, washers).
Municipal Facilities: Facilities that serve a municipality. Can treat waste from homes and industries.
Nonmunicipal: Facilities with wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation. This category includes a variety of facilities such as schools, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

There are 18 permitted discharges in the New River basin. Table A-13 provides summary information (numbers of facilities and permitted flows) regarding the discharges by types and subbasin. More detailed information regarding the dischargers characterized in the table is provided in Appendix I.

Figure A-10 shows the location of major and minor permitted wastewater discharges within the basin. The number of triangles on the map depicting major discharges does not correspond exactly to the number of major facilities listed in Table A-13, because some major facilities have more than one discharge location called an outfall. Each outfall received its own triangle on Figure A-10.

NPDES Permitted Dischargers in the New River Basin

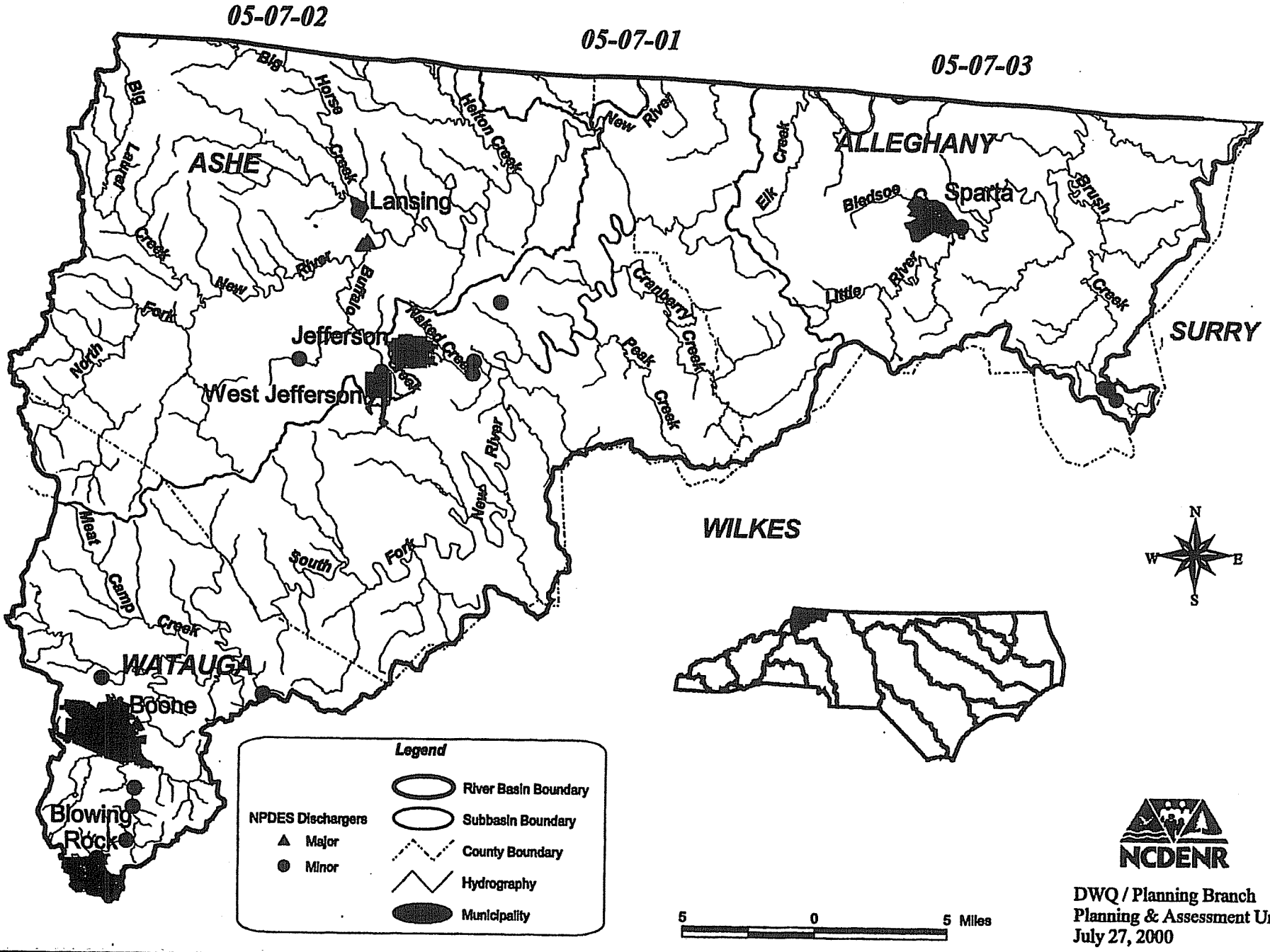


Table A-13 Summary of NPDES Dischargers and Permitted Flows for the New River Basin

	Subbasin			
Facility Categories	**05-07-01**	**05-07-02**	**05-07-03**	**TOTAL**
Total Facilities	10	4	4	18
Total Permitted Flow (MGD)	4.3963	1.447	0.649	6.4923
Major Discharges	1	1	0	2
Total Permitted Flow (MGD)	3.2	1.018	0	4.218
Minor Discharges	9	3	4	16
Total Permitted Flow (MGD)	1.1963	0.429	0.649	2.2743
100% Domestic Waste	6	2	4	12
Total Permitted Flow (MGD)	4.088	0.06	0.649	4.797
Municipal Facilities	3	2	1	6
Total Permitted Flow (MGD)	4.3	0.419	0.6	5.319
Nonmunicipal Facilities	7	2	3	12
Total Permitted Flow (MGD)	0.0963	1.028	0.049	1.1733

2.7.2 Stormwater Discharges in the New River Basin

Amendments were made to the Clean Water Act in 1990 and, most recently in 1999, pertaining to permit requirements for stormwater discharges associated with industrial activities and storm sewer systems. DWQ administers these regulations in North Carolina through the state stormwater program. The goal of the DWQ stormwater discharge permitting regulations is to prevent pollution via stormwater runoff by controlling the source(s) of pollutants.

The municipal permitting requirements are designed to lead into the formation of comprehensive stormwater management programs for municipal areas. Currently, there are no municipalities in the New River basin large enough to require a stormwater discharge permit.

EPA Stormwater Rules

Phase I – December 1990

- Requires a NPDES permit for municipal storm sewer systems serving populations of 100,000 or more.
- Requires a NPDES stormwater permit for eleven categories of industry.
- Requires a NPDES stormwater permit for construction sites that are 5 acres or more.

Phase II – November 1999

- Requires a NPDES permit for some municipal storm sewer systems serving populations under 100,000, located in urbanized areas.
- Provides incentives to industrial facilities covered under Phase I for protecting operations from stormwater exposure.
- Requires a NPDES stormwater permit for construction sites that are 1-5 acres.

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. Stormwater permits are granted in the form of general permits (which cover a wide variety of more common activities) or individual permits. Excluding construction stormwater general permits, there are 22 general stormwater permits active within the basin. No individual stormwater permits are currently held.

The primary concern with runoff from industrial facilities is the contamination of stormwater from contact with exposed materials. Poor housekeeping can lead to significant contributions of sediment and other water quality pollutants. To address these issues, each NPDES stormwater permitted facility must develop a Stormwater Pollution Prevention Plan (SPPP) that addresses the facility's potential impacts on water quality. Facilities identified as having significant potential to impact water quality are also required to conduct analytical monitoring to characterize pollutants in stormwater discharges under individual NPDES stormwater permits.

The state stormwater management rules (15A NCAC 2H .1000) regulate development activities in 20 coastal counties and on land statewide that drains to Outstanding Resource Waters (ORW) and/or High Quality Waters (HQW). Under this program, development is permitted as either low density or high density. Low density limits the impervious, or built upon, area and allows natural infiltration and attenuation of stormwater runoff. High density requires installation and maintenance of a structural best management practice to control and treat stormwater runoff from the site. Surface waters in the New River basin classified as ORW or HQW are presented in Section A, Part 3.2 on Figure A-11.

2.8 Animal Operations

In 1992, the Environmental Management Commission 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. Within the past five years there have been several additional pieces of legislation enacted that affect animal operations in North Carolina and the New River basin.

There were only nine registered animal operations in the New River basin, containing a total of 300 swine (40,500 pounds SSLW) and 2,031 cattle (2,843,400 pounds SSLW) as of September 1998. These numbers reflect only operations required by law to be registered, and therefore, do not represent the total number of animals in the basin. The majority of registered cattle operations are in the Little River subbasin (05-07-03), while registered swine operations are in the South Fork New River subbasin (05-07-01). As of September 1998, there were no registered animal operations in subbasin 05-07-02.

Steady State Live Weight (SSLW) is the result, in pounds, after a conversion factor has been applied to the number (head count) of swine, cattle or poultry on a farm. The conversion factors, which come from the Natural Resources Conservation Service (NRCS) guidelines, vary depending on the type of animals on the farm and the type of operation (for example, there are

five types of hog farms). Since the amount of waste produced varies by the size of the animal, SSLW is the best way to compare the sizes of the farms.

Information on animal capacity by subbasin (Table A-14) was provided by the NC Department of Agriculture. A negligible percentage of the state's total capacity for swine and poultry is found in the New River basin; however, the basin contains four percent of the state capacity for dairy, with the highest concentrations located in the Little River subbasin (05-07-03). Overall, swine and dairy production in the New River basin decreased this decade while poultry production increased 52%.

Table A-14 Estimated Populations of Swine, Dairy and Poultry in the New River Basin

Subbasin	Total Swine Capacity		Swine Change	Total Dairy Capacity		Dairy Change	Poultry Capacity		Poultry Change
	1998	1994	94-98 (%)	1998	1994	94-98 (%)	1998	1994	94-98 (%)
05-07-01	443	176	152	533	1,445	-63	420,262	235,662	78
05-07-02	0	449	-100	80	80	0	50,050	50,000	0
05-07-03	26	103	-75	3,644	6,563	-44	71,500	71,500	0
TOTALS	469	728	-36	4,257	8,088	-47	541,812	357,162	52
% of State Total	<1%	<1%		4%	6%		<1%	<1%	

2.9 Water Use and Minimum Streamflow

2.9.1 Local Water Supply Planning

The North Carolina General Assembly has mandated a local and state water supply planning process under North Carolina General Statute 143-355(l) and (m) to assure that communities have an adequate supply of water for future needs. Under this statute all units of local government that provide or plan to provide public water supply service are required to prepare a Local Water Supply Plan (LWSP) and to update that plan at least every five years. The information presented in a LWSP is an assessment of a water system's present and future water needs and its ability to meet those needs. The current LWSPs are based on 1992 data. Plans are being updated this year (1999) based on 1997 water supply and water use information.

Water use and population information contained in the LWSPs submitted by water system located in the New River basin is presented in Table A-15. Six systems that use water from the New River basin provided approximately 2.4 million gallons per day (MGD) to 18,928 people in 1992. Projections of future needs show that these systems expect their service populations to increase by 23.5% to 24,750 people by the year 2020. Average daily water use for these systems is expected to nearly double over the 28-year period. This information only represents systems submitting a LWSP and does not reflect the needs of the many public water systems in this basin that are not required to prepare a plan because they are not operated by a unit of local government. The information is self-reported and has not been field verified. However, plans have been reviewed by staff engineers for consistency and reasonableness. More information is

available for these and other systems across the state that submitted a LWSP from the Division of Water Resources Website: www.dwr.ehnr.state.nc.us/home.htm.

Table A-15 Water Use and Population for Water Systems in the New River Basin

Population and Water Use for Water Systems in the New River Basin							
		Population			Average Daily Water Use		
County	System	1992	2000	2020	1992	2000	2020
					MGD	MGD	MGD
Alleghany	Sparta	2,005	2,185	2,890	0.194	0.224	0.294
Ashe	Jefferson	1,330	1,550	2,050	0.128	0.170	0.290
Ashe	Lansing	167	188	217	0.019	0.021	0.025
Ashe	West Jefferson	1,022	1,195	1,395	0.230	0.264	0.300
Watauga	Blowing Rock	1,455	1,935	3,135	0.313	0.416	0.674
Watauga	Boone	12,949	13,850	15,063	1.490	1.700	2.700
	Total	18,928	20,903	24,750	2.374	2.795	4.283

2.9.2 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. Division of Water Resources (DWR), in conjunction with the Wildlife Resources Commission, recommends conditions relating to release of flows to satisfy minimum instream flow requirements. The permits are issued by the Division of Land Resources. Table A-16 presents projects DWR has been involved with in the New River basin.

Table A-16 Minimum Streamflow Projects in the New River Basin

Name	Location	Waterbody	Drainage Area (sq. mi.)	Min. Release (cu.ft/sec)
Hydroelectric Dams: North Fork New River, Ashe County				
Sharpe Falls	Near the community of Dresden	North Fork New River	110	None*
Impoundment Dams: Laurel Branch, Alleghany County				
Roaring Gap	Golf course	Laurel Branch	1.06	1.4
Old Beau Upper	Golf course	Laurel Branch	1.33	None**
Old Beau Lower	Golf course	Laurel Branch	1.54	1.6

* Even though there is no minimum flow, the project must operate in a run-of-river mode; i.e., instantaneous inflow equals instantaneous outflow. Note: A noncompliant project can noticeably alter the streamflow.

** The upper and lower ponds were built in series so that the system will provide 1.6 cu.ft/sec. downstream.

2.9.3 Water Withdrawals and Interbasin Transfers

Prior to 1999, North Carolina General Statute 143-215.22H only required water users to register their water withdrawals and transfers with the Division of Water Resources (DWR) if the amount was one million gallons or more of surface or groundwater per day. Beginning in 1999, withdrawals and transfers greater than 100,000 gallons per day, with the exception of water used for agricultural activities, must be registered with DWR. In addition, transfers of 2 MGD or more require a certification from the Environmental Management Commission, according to G.S. 143-215.22I. In the New River basin, there are two registered withdrawals, other than local water supply systems or power generating facilities, with the cumulative capacity to withdraw 1.1 MGD. Both of these registered withdrawals are from surface water (DENR-DWR, 2000).

Table A-17 lists two potential transfers involving the New River basin. The river basin boundaries that apply to these requirements are designated on a map entitled *Major River Basins and Sub-Basins in North Carolina* and filed in the Office of the Secretary of State. Both transfers listed involve the Town of Blowing Rock, which has service area in the New, Catawba and Yadkin-Pee Dee River basins. The transfers cannot be quantified due to undocumented consumptive losses (examples: septic systems, lawn irrigation).

Table A-17 Potential Interbasin Transfers in the New River Basin

Supplying System	Receiving System	Source Subbasin	Receiving Subbasin	Net Transfer (MGD)
Blowing Rock	Blowing Rock	New	Catawba	Unknown (out)
Blowing Rock	Blowing Rock	New	Yadkin-Pee Dee	Unknown (out)

All local water systems are required to report existing and anticipated interbasin transfers as part of the local water supply planning process. This information will be available for future updates of this Basinwide Water Quality Plan and will allow an assessment of cumulative impacts.

Chapter 3 -
Summary of Water Quality Information for the New River Basin

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

Point Sources

Piped discharges from:

- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Nonpoint Sources

- Roads, parking lots and rooftops
- Forestry
- Agricultural lands
- Rural residential development
- Septic systems
- Mining

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, oil and grease, pesticides and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Unlike point sources of 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.

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.

3.2 Description of Surface Water Classifications and Standards

3.2.1 Program Overview

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.

3.2.2 Surface Water 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. For example, a stream in the mountains might have a C Tr classification, where C is the primary classification followed by the Tr (Trout) supplemental classification. A full description of the state's primary and supplemental classifications is available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina.* Information on this subject is also available at DWQ's website: http://h2o.enr.state.nc.us/wqhome.html.

Table A-18 Primary and Supplemental Surface Water Classifications

PRIMARY FRESHWATER CLASSIFICATIONS	
Class	**Best Uses**
C	Aquatic life propagation/protection and secondary recreation.
B	Primary recreation and Class C uses.
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-IV provides the least protection. A Critical Area (CA) designation can also be listed for watershed areas within a half-mile that drain to the water supply intake or reservoir where an intake is located.
SUPPLEMENTAL CLASSIFICATIONS	
Class	**Best Uses**
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.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.

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 a 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 waters establish the basic protection level for all state surface waters. With the exception of swamp waters, all of the other primary and supplemental classifications have more stringent standards than for C, 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. These waters may be designated as HQW or ORW.

High Quality Waters

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 must address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume and toxic substances.

Criteria for HQW Classification

- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native and special native trout waters or primary nursery areas by the Wildlife Resources Commission.
- Critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture.
- Waters classified by DWQ as WS-I, WS-II and SA are HQW by definition, but these waters are not specifically assigned the HQW classification because the standards for WS-I, WS-II and SA waters are at least as stringent as those for waters classified HQW.

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 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. Section A, Part 2.7.2 describes these stormwater controls in more detail. In addition, the Division of Land Resources requires more stringent sedimentation controls for land-disturbing projects within one mile and draining to HQWs.

Outstanding Resource Waters

A small percentage of North Carolina's surface waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource designation. The requirements for ORW waters are more stringent than those for HQWs.

The ORW rule defines outstanding resource values as:

- 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;
- being within a state or national park or forest; or
- having special ecological or scientific significance.

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 stormwater controls for most new developments are required. In some cases, the unique characteristics of the waters and resources that are to be protected require that a customized ORW management strategy be developed. Many streams in the New River basin fall under such a management strategy which is discussed in greater detail below.

3.2.3 Classifications and Standards in the New River Basin

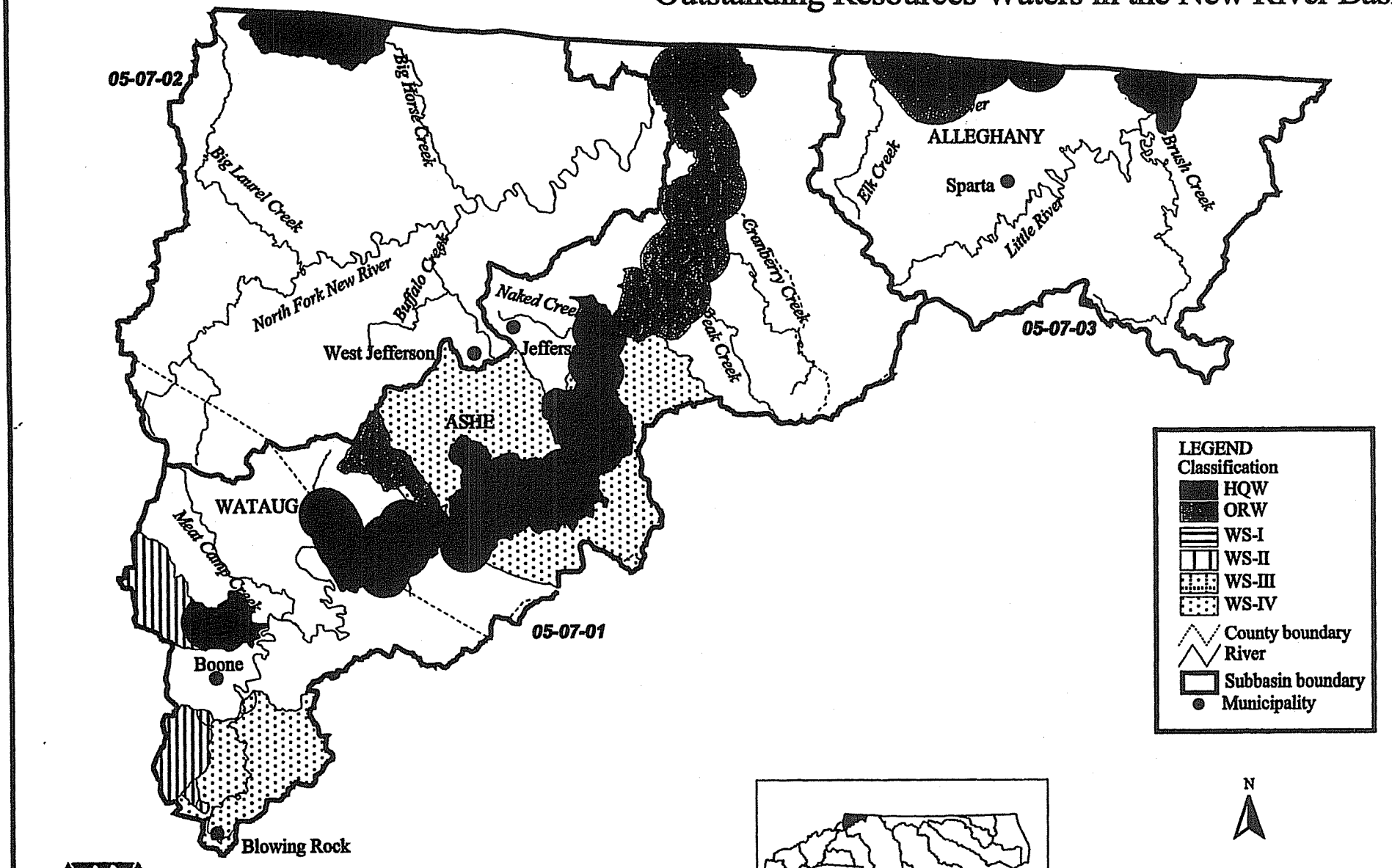
The waters of the New River basin have a variety of surface water quality classifications applied to them. Water Supply watersheds range from WS-II to WS-IV. Water supply watersheds, Outstanding Resource Waters and High Quality Waters are shown on Figure A-11.

In 1976, a portion of the New River basin including the lower South Fork New River and the North Carolina portion of the New River mainstem was designated a National Scenic River, as well as a state Natural and Scenic River, one of just four in North Carolina. This 26.5-mile stretch of river is classified as ORW due to its recreational and ecological significance in addition to its excellent water quality. Having only the downstream portion of a relatively large watershed qualify for the supplemental ORW classification presented a unique situation for water quality management. Therefore, a customized ORW management strategy for point source discharges was developed for upstream waters using the HQW discharge limitations as a framework. In addition, instead of applying the stormwater controls for freshwater ORWs to the entire river basin, the controls are applied within one mile and draining to the designated ORWs. This special management strategy applies to almost all streams in subbasins 05-07-01 and 05-07-02, as well as a few streams in subbasin 05-07-03. The strategy is represented by a "+" symbol after the stream classification.

Other Outstanding Resource Waters in the basin are Old Field Creek from the confluence with Call Creek to the mouth at South Fork New River and Call Creek (West Prong Old Field Creek) in its entirety. In addition to excellent water quality, these waters were found to be supporting a naturally reproducing population of brook trout. Populations of brook trout, North Carolina's only native trout species, are becoming more and more rare due to habitat degradation and competition for food from non-native species.

Streams classified as High Quality Waters in the New River basin include portions of Howard Creek and the South Fork mainstem in the South Fork New River watershed, Big Horse Creek and three tributaries in the North Fork New River watershed, and a small segment of the Little River mainstem. Water supply watersheds WS-I & II are also, by definition, HQWs.

Water Supply Watersheds, High Quality Waters, and Outstanding Resources Waters in the New River Basin



NCDENR

October 1999

Classification and standards for the entire basin can be found in a separate document entitled *Classifications and Water Quality Standards Assigned to the Waters of the New River Basin.* This document may be obtained by calling the Planning Branch of DWQ at (919) 733-5083, extension 360. It can also be accessed through the DWQ Water Quality Section website: http://h2o.enr.state.nc.us/wqhome.html.

Pending Reclassifications in the New River Basin

Currently, the Town of Blowing Rock is in the beginning stages of a project designed to alleviate low drinking water supply levels in drought and heavy use periods that will likely result in the reclassification of a small portion of the Middle Fork South Fork New River watershed. There are no other reclassifications pending. However, excellent water quality was again observed at the Little River station at NC 1424. This station is located in a section of stream that has not been designated High Quality Waters and does not fall within the special ORW management strategy for the New River basin. The data indicate that more of the Little River (upstream of the current segment) could qualify for the HQW supplemental classification.

3.3 DWQ Water Quality Monitoring Programs in the New River Basin

The Environmental Sciences Branch of DWQ collects 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 New River basin for that program. A more complete discussion of DWQ monitoring within the basin can be found in the *New River Basinwide Assessment Report* (DENR-DWQ, July 1999).

DWQ monitoring programs for the New River Basin include:

- Benthic Macroinvertebrates (Section 3.3.1)
- Fish Assessments (Section 3.3.2)
- Aquatic Toxicity Monitoring (Section 3.3.3)
- Lake Assessment (Section 3.3.4)
- Ambient Monitoring System (Section 3.3.5)

3.3.1 Benthic Macroinvertebrates

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily 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 more than one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears, even though a toxic substance may be carried away fairly quickly. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification rating 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. Unique criteria have been developed for each of three ecoregions (mountains, piedmont and coastal plain) within North Carolina. These ratings fall into five categories ranging from Poor to Excellent.

Overview of Benthic Macroinvertebrate Data

Appendix II lists all the benthic macroinvertebrate collections in the New River basin between 1983 and 1998, giving site location, collection date, taxa richness, biotic index values and bioclassifications. Benthic macroinvertebrates have been collected at 85 sites in the New River basin since 1983; 36 of these sites were sampled during 1998 basinwide surveys or special studies. For the 1998 collections, the following bioclassifications were found: Excellent – 15 (42%), Good – 13 (36%), Good-Fair – 4 (11%), Fair – 1 (<1%), and Poor – 3 (8%). The distribution of water quality ratings is similar for both the 1998 collection and all collections since 1983, suggesting little overall change in water quality within the New River basin.

Individual sites, however, often show distinct long-term changes in water quality. The benthos sampling may slightly overestimate the proportion of Fair and Poor sites, as DWQ special studies often have the greatest sampling intensity (number of sites/stream) in areas with severe water quality problems. Table A-19 lists the most recent ratings since 1983 (by subbasin) for all benthos sites in the New River basin.

Table A-19 Summary of Benthic Macroinvertebrate Ratings for All Freshwater Benthos Sites (Using the Most Recent Rating for Each Site) in the New River Basin

Subbasin 05-07-01 to 05-07-03	Excellent	Good	Good-Fair	Fair	Poor	Total
South Fork New River: 01	15	15	9	1	5	45
North Fork New River: 02	7	12	3	2	2	26
Little River: 03	4	7	1	1	1	14
Total (#)	**26**	**34**	**13**	**4**	**8**	**85**
Total (%)	**31%**	**40%**	**15%**	**5%**	**9%**	

Trends in water quality over the past five years were evaluated at 34 sites in the New River basin, with the majority of sites showing no change in water quality other than flow-related bioclassification changes (Table A-20). Positive changes were primarily related to improvements in wastewater treatment while negative changes were mainly associated with impacts from urban runoff and construction including Naked Creek near Jefferson and Bledsoe Creek near Sparta. Subbasin chapters in Section B contain more specific information regarding these streams. There are 20 sites in the New River basin for which long-term trends have been evaluated. Positive changes in water quality were noted at seven of the 20 sites.

Table A-20 Summary of Trends Over Time in Benthic Macroinvertebrate Ratings Assigned in the New River Basin

Subbasin 05-07-01 to 05-07-03	# Trend Sites	5-Year Change			Long-Term (>5 Years) Change		
		None	+	-	None	+	-
South Fork New River: 01	16	14	1	1	6	4	0
North Fork New River: 02	9	7	1	1	5	1	0
Little River: 03	9	7	0	1	2	2	0
Total	34	28	2	3	13	7	0

3.3.2 Fish Assessments

Historical studies of fish communities in the New River basin do exist and were conducted primarily by the North Carolina Wildlife Resources Commission (WRC) in the 60s and late 70s. However, during the first round of basinwide sampling, no fish community samples were collected by DWQ. In 1998, 12 sites on streams representing each of the three subbasins were sampled and scores assigned using the North Carolina Index of Biotic Integrity (NCIBI). The NCIBI uses a cumulative assessment of 12 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. Appendix II contains more information regarding the NCIBI and additional fish community sampling data.

The NCIBI is a modification of the Index of Biotic Integrity initially proposed by Karr (1981) and Karr, et al. (1986). The Index has been subsequently modified and is continually being refined for applicability to wadeable streams in North Carolina. The IBI method was developed for assessing a stream's biological integrity by examining the structure and health of its fish community. The scores derived from this index are a measure of the ecological health of the water and may not directly correlate to water quality. Currently, the NCIBI is applicable only to coolwater and warmwater streams that are wadeable from one shoreline to the other and for a distance upstream/downstream of 600 feet. Nonwadeable streams and larger rivers that must be sampled with a boat are not currently evaluated with the NCIBI.

Many of the streams sampled in the New River basin had high numbers of trout, but were assigned low NCIBI scores because the present metrics are not applicable to coldwater trout streams. Additionally, a survey of mountain reference streams in September 1998 found that none of the streams sampled could achieve the Excellent NCIBI class expected at such sites. However, makeup of the fish community can still be used to point out streams where the community is altered due to degradation of water quality or habitat; therefore, NCIBI scores are presented in this report, but NCIBI classes are not listed, and the data was not used for use support evaluations. Use support evaluations are discussed in Part 3.5.2 of this section.

Overview of Fish Community Assessment Data

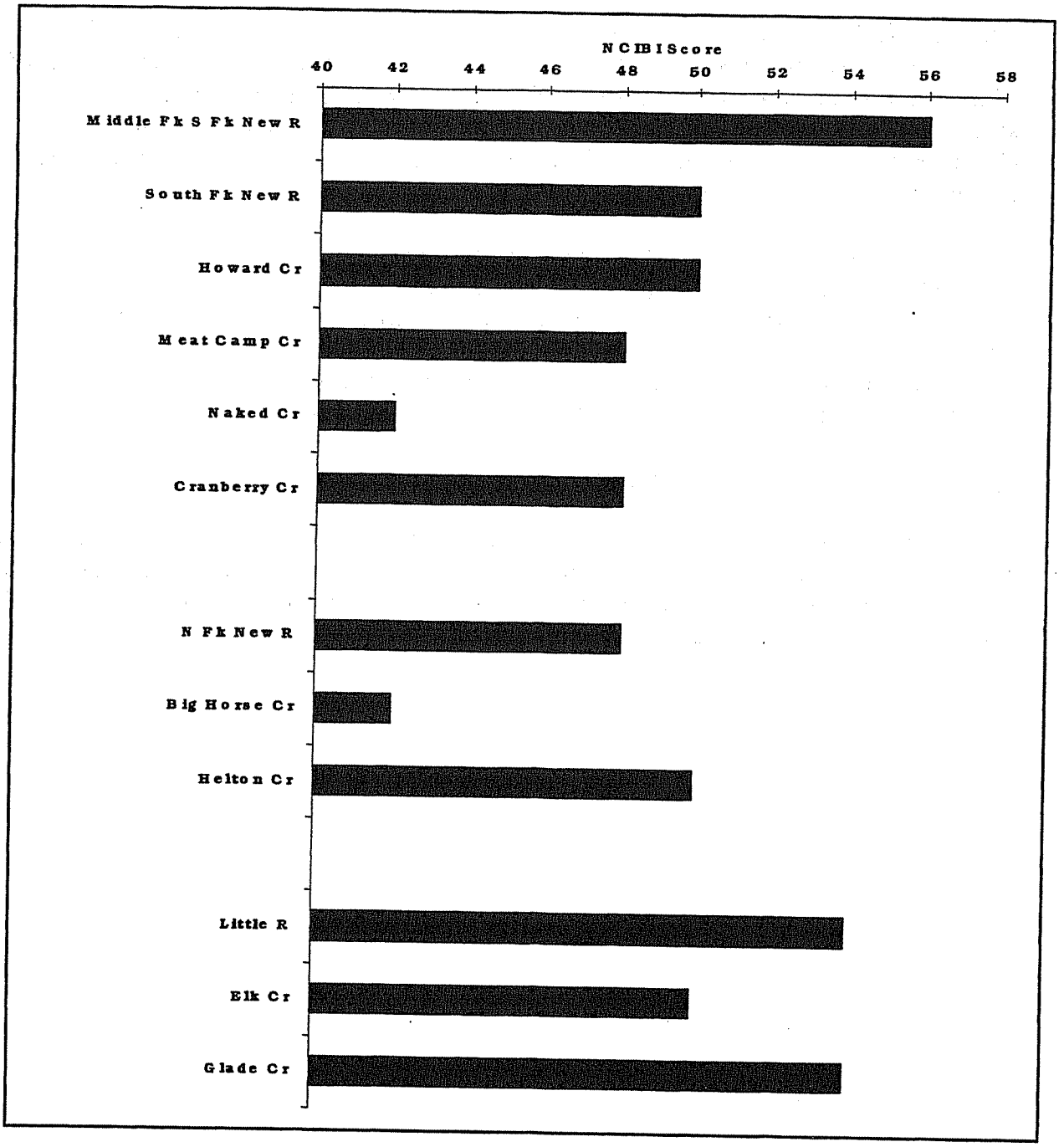
The 1998 NCIBI scores for the New River basin, grouped by subbasin, are presented in Figure A-12. Generally, a higher score represents a healthier fish community. Scores ranged from 56 at Middle Fork South Fork New River to 42. Watershed sizes at the 12 sites ranged from 7.6 square miles at Naked Creek to 56.2 square miles at the Big Horse Creek location. Coincidentally, these two streams had the lowest biological integrity scores. Subbasin chapters in Section B contain more specific information regarding these streams.

In the 1998 sampling effort, 5,359 fish, representing 32 of the 50 documented species, were collected. Three of the five fish species listed with special state status (Section A, Part 2.6.2, Table A-11) were observed by DWQ during the 1998 sampling. The rare tongue-tied minnow was observed at five sites, most of which were in the South Fork New River subbasin. The Kanawha minnow was observed at three sites and the Kanawha darter at seven sites with the highest concentrations in Cranberry Creek and the North Fork New River.

Overview of Fish Tissue Sampling Data

Fish tissue samples were collected at 7 stations within the New River drainage between 1993 and 1998. These fish tissue surveys were conducted as part of DWQ basinwide assessments. None of the tissue samples collected contained metals at detectable levels or at levels that exceeded FDA and EPA criteria. Currently, there are no fish consumption advisories in the New River basin.

Figure A-12 North Carolina Index of Biotic Integrity Scores for the New River Basin, 1998



3.3.3 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 by their NPDES permit or by administrative letter. Other facilities may be tested by DWQ's Aquatic Toxicology Laboratory.

The Aquatic Toxicology Unit maintains a compliance summary for all facilities required to perform tests and provides a monthly update 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. A summary of compliance for the New River basin from 1986 through 1998 is presented in Table A-21 below.

Table A-21 Summary of Compliance with Aquatic Toxicity Tests in the New River Basin

Year	Number of Facilities	Number of Tests †	% Meeting Permit Limit*
1986	1	5	60.0
1987	2	12	66.7
1988	3	22	77.3
1989	4	30	93.3
1990	4	39	89.7
1991	4	46	95.6
1992	4	43	97.7
1993	4	45	95.5
1994	5	54	92.6
1995	5	60	91.7
1996	6	69	92.7
1997	6	70	90.0
1998	6	70	98.6

* This number was calculated by determining whether a facility was meeting its ultimate permit limit during the given time period, regardless of any SOCs in force.

† "No. Tests" is not the actual number of tests performed, but the number of opportunities for limit compliance evaluation. Assumptions were made about compliance for months where no monitoring took place based on data previous to that month. Facilities compliant in a given month were assumed to be in compliance during months following, until the next actual monitoring event. This same policy was applied to facilities in noncompliance.

3.3.4 Lake Assessment

Appalachian State University (ASU) Lake (subbasin 05-07-01) was sampled as part of DWQ's Lake Assessment Program in 1998. The lake was oligotrophic in June and July according to its North Carolina Trophic State Index (NCTSI) score. This lake is discussed in further detail in the South Fork New River subbasin chapter (Section B, Chapter 1).

3.3.5 Ambient Monitoring System Program

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collection of physical and chemical water quality data. North Carolina has 380 monitoring stations statewide, including six stations in the New River basin (Table A-22). Locations of the New River basin ambient stations are presented on Figure A-13.

Table A-22 Ambient Monitoring System Stations within the New River Basin

STORET No.	Station Name	Subbasin
K2100000	South Fork New River at US Hwy 221 & 421 at Perkinsville	05-07-01
K3250000	South Fork New River at NC Hwy 16 & 88 near Jefferson	05-07-01
K4500000	South Fork New River at US Hwy 221 near Scottsville	05-07-01
K7500000	North Fork New River at NC Hwy 21 at Crumpler	05-07-02
K7900000	New River at SR 1345 at Amelia	05-07-03
K9900000	Little River at NC Hwy 18 near Blevins Crossroads	05-07-03

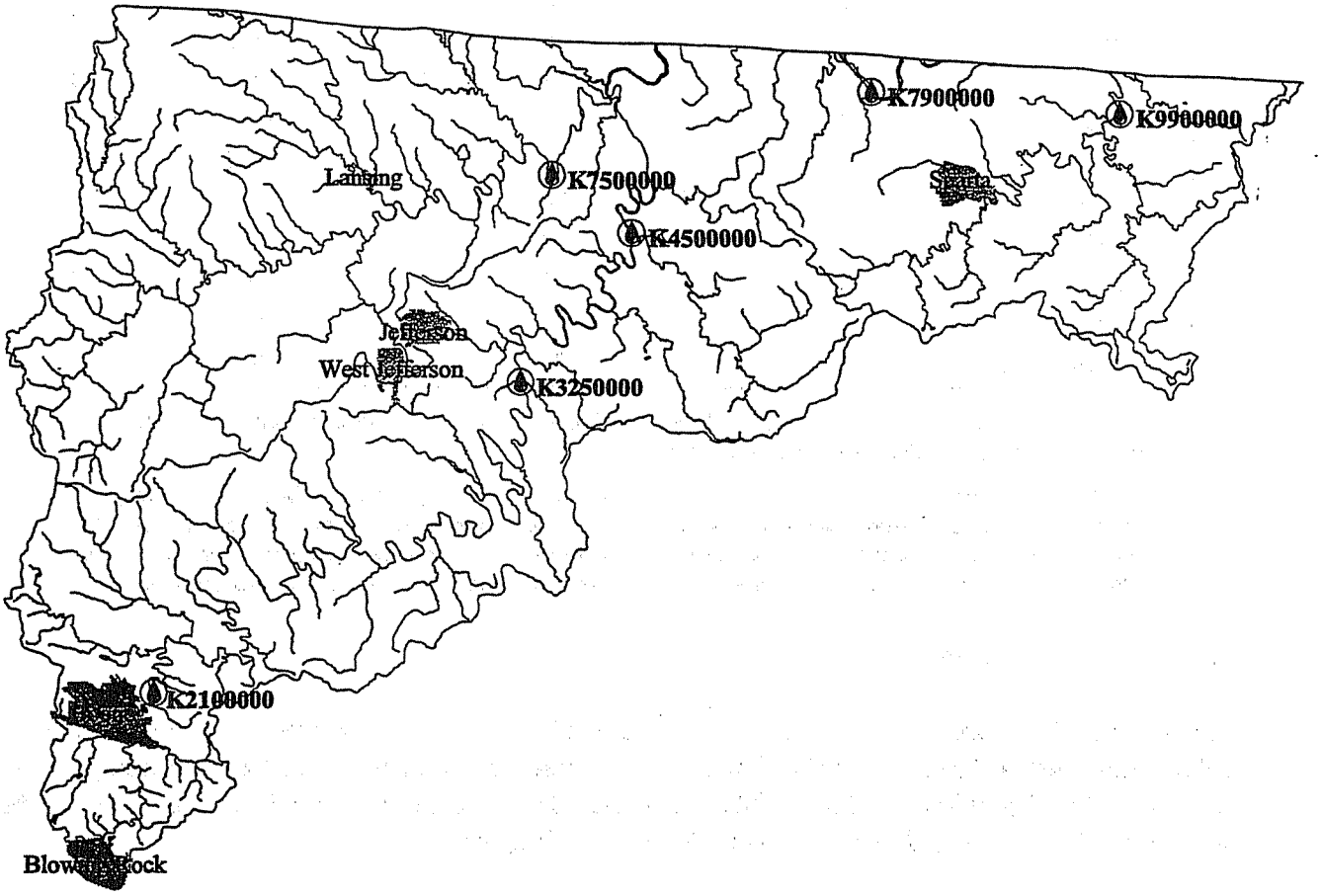


Figure A-13 Ambient Monitoring Stations in the New River Basin

Data summarized in this section are less than five years old; most were collected between April 1994 and August 1998. Each station was sampled at least 40 times during this period of record. Overall, water quality data from ambient stations in the New River basin are good. Discussion of the more significant findings obtained from these data follow.

Sediment

As is characteristic of most larger drainages, the cumulative effects of urban runoff, land-disturbing activities and development create an upstream to downstream increase in sediment load that can be observed in data from the South Fork New River watershed. The uppermost station near Perkinsville has relatively low suspended solids concentrations. Near Jefferson, suspended residue exceeded the 20 mg/l reference value 28 percent of the time. Values ranged from 1 to 76 mg/l compared to upstream station values that did not exceed 33 mg/l. Continuing downstream, the maximum concentration was even higher (92 mg/l) near Scottsville. Suspended residue concentrations at the Little River station also exceeded the reference value in 13 percent of samples collected; values ranged from 1 to 210 mg/l.

Nutrients

Nutrient levels were highest at the uppermost station on the South Fork New River. Total phosphorus at the station near Perkinsville (below Boone & Blowing Rock WWTPs) ranged from 0.01 to 0.59 mg/l, but the maximum recorded concentration was less than 0.14 mg/l near Scottsville. Ammonia concentrations followed the same pattern. Values ranged from 0.01 to 1.5 mg/l at the uppermost station while concentrations near Scottsville fell below 0.11. However, since improvements were made to the wastewater treatment plant in Boone in 1996, phosphorus, ammonia and total nitrogen loadings have decreased dramatically. For example, the mean of sixteen phosphorus samples collected in 1995/96 at Station K2100000 was 0.21 mg/l. Sixteen consecutive samples collected in 1997/98 from the same station had a mean phosphorus concentration of only 0.12 mg/l. Nitrate concentrations have increased significantly at the Perkinsville site since 1998. This is likely a result of improved nitrification of ammonia at the Boone wastewater treatment plant. Please refer to the *New River Basinwide Assessment Report* for further information, including graphs, of these data (DENR, July 1999).

Pathogens

Fecal coliform bacteria are widely used as an indicator of the potential presence of pathogens typically associated with the intestinal tract of warm-blooded animals. The water quality standard for fecal coliform bacteria is based on a geometric mean of 200 colonies per 100 milliliters of solution. The geometric means of fecal coliform samples were well below the standard at all ambient stations in the New River basin. These means ranged from 35.6 colonies/100ml at South Fork New River (Station K4500000) to 111.4 colonies/100ml at the Little River station.

Much higher fecal coliform levels were occasionally observed at both the Little River and New River mainstem stations. Five high levels ranging from 2,500 to 10,000 colonies/100ml were recorded at the Little River station between April 1994 and August 1998. Five high levels were also recorded at the New River station during the same 4-year period ranging from 2,000 to 160,000 colonies/100ml. Sources of bacteria in surface waters include improperly treated discharges of domestic wastewater, waste directly deposited by wildlife or livestock, leaking or failing septic systems, pet waste, and leaking sewer lines or pump station overflows. Because of the nature of these pollution sources, levels can be elevated considerably after rainfall.

3.4 Other Water Quality Research

Two special studies were conducted by DWQ in the New River basin since 1995. The effects of acid mine drainage (from the abandoned Ore Knob mine) on stream fauna were evaluated in April of 1996. Although Section 319 funds were used on a project to improve pH in the vicinity of the mine (refer to Section C for details), this study indicated that conditions are still poor in Peak Creek and Little Peak Creek below the Ore Knob mine area. The 1998 basinwide sampling suggested some slight improvement in Peak Creek, but benthic macroinvertebrate samples in January 1999 received a Poor water quality rating for two sites downstream of Ore Knob. Current use support information for these streams is detailed in Section B, Chapter 1.

DWQ also investigated the effects of Christmas tree farming on water quality in Ashe and Alleghany counties during May 1998. Study sites in subbasin 05-07-01 included Meadow Fork, Piney Fork, Reeves Branch and Nathans Creek, and in subbasin 05-07-02 included Little Phoenix Creek, Silas Creek and Old Field Creek. The results of this study indicated that established Christmas tree farms in these areas had little negative effect on the fauna of adjacent streams when integrated pest management and adequate buffer zones were used. However, Christmas tree farming often occurs on the same land that cattle graze, with trees on the higher ground and cattle grazing adjacent to the stream. The effect of cattle grazing on stream quality may be more substantial than the effects of runoff from established Christmas tree farms.

Any data submitted to DWQ from other water sampling programs conducted in the New 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.

3.5 Use Support Summary

3.5.1 Introduction to Use Support

As was previously discussed in Part 3.2, waters are classified according to their best intended uses. Determining how well a waterbody supports its designated uses is an important method of interpreting water quality data and assessing water quality. Use support assessments for the New River basin are summarized in this section and presented in the appropriate subbasin chapters.

Use support ratings for streams and lakes:

- *Fully Supporting (FS)*
- *Partially Supporting (PS)*
- *Not Supporting (NS)*
- *Not Rated (NR)*

The use support ratings refer to whether the classified uses of the water (such as water supply, aquatic life protection and swimming) are fully supported (FS), partially supported (PS) or not supported (NS). For instance, waters classified for fishing and water contact recreation (Class C) are rated as fully supporting if data used to determine use support (such as chemical/physical data collected at ambient sites or benthic macroinvertebrate bioclassifications) did not exceed specific criteria. However, if these criteria were exceeded, then the waters would be rated as PS or NS, depending on the degree of exceedence. Streams rated as either partially supporting or not supporting are considered *impaired.*

Categories for impaired waters:

- *Partially Supporting*
- *Not Supporting*

An additional use support category, fully supporting but threatened (ST), was used in previous basinwide plans. In the past, ST was used to identify a water that was fully supporting but had some notable water quality problems. ST could represent constant, degrading or improving conditions. North Carolina's use of ST was very different from that of the US Environmental Protection Agency (EPA), which uses it to identify waters that are characterized by declining water quality. In addition, the EPA requires the inclusion of ST waters on the 303(d) list in its proposed revision to the 303(d) list rules (Appendix IV). Due to the difference between EPA's and North Carolina's definitions of ST, North Carolina no longer uses this term. Because North Carolina has used fully supporting but threatened as a subset of fully supporting (FS) waters, those waters formerly called ST are now rated FS. Waters that are fully supporting but have some notable water quality problems are discussed individually in the subbasin chapters (Section B).

Streams which had no data to determine their use support were listed as not rated (NR). For a more complete description of use support methodology, refer to Appendix III.

3.5.2 Revisions to Methodology Since 1992-1993 305(b) Report

Methodology for determining use support has been revised. As mentioned above, fully supporting but threatened (ST) is no longer a use support category. Additionally, in the past, evaluated information from older reports and workshops was included in the use support process. Streams rated using this information were rated on an evaluated basis. In the current use support process, this older, evaluated information has been discarded, and streams are now rated using only monitored information (including current and older monitoring data). Streams are rated on a monitored basis if data are less than five years old. Streams are rated on an evaluated basis under the following conditions:

- If the only existing data for a stream are more than five years old.
- If a stream is a tributary to a monitored segment of a stream rated fully supporting (FS), the tributary will receive the same rating on an evaluated basis. If a stream is a tributary to a monitored segment rated partially supporting (PS) or not supporting (NS), the stream will be considered not rated (NR).

These changes resulted in a reduction in streams rated on an evaluated basis.

As detailed previously in the fish assessment discussion (Part 3.3.2), the NCIBI is currently applicable only to coolwater and warmwater streams that are wadeable from one shoreline across to the other and for a distance of 600 feet. The fish community in coldwater trout streams of the New River basin cannot be accurately evaluated at the present time with this index. Although NCIBI scores are presented in this document, classes were not developed and the data were not used for use support evaluations. A review of the present metrics will be done, and the metrics will be modified to allow mountain reference sites to reflect an Excellent NCIBI class for these coldwater fish communities.

3.5.3 Comparison of Use Support Ratings to Streams on the 303(d) List

Section 303(d) of the federal Clean Water Act requires states develop a 303(d) list of waters not meeting water quality standards or which have impaired uses. The 303(d) list and accompanying data are updated as the basinwide plans are revised. In some cases, the new data will demonstrate water quality improvement and waters may receive a better use support rating. These waters may be removed from the 303(d) list since water quality improvement has been attained. In other cases, the new data will show a stable or decreasing trend in overall water quality resulting in the same, or lower, use support rating. Attention remains focused on these waters until water quality has improved.

In some cases, a waterbody appears on the 303(d) list, but has a fully supporting rating. There are two major reasons for this: 1) biological data show full use support, but chemical impairment continues; or 2) fish consumption advisories exist on the water. These waters will remain on the 303(d) list until the problem pollutant meets water quality standards or a TMDL is developed. Thus, there are inconsistencies between the use support impaired waters and the 303(d) listed waters. Waters considered supporting their uses may continue to appear on the 303(d) list because of standards violations.

For more information about TMDLs and how waters on the state's 303(d) list will be addressed, refer to Chapter 4, Part 4.7 of this section. Detailed information on listing requirements and approaches can be found in Appendix IV.

3.5.4 Use Support Ratings for the New River Basin

A summary of current use support ratings for the New River basin is presented in Table A-23. For further information and the definition of a monitored or an evaluated stream, refer to Appendix IV.

Table A-23 Use Support Summary Information for All Monitored and Evaluated Streams in the New River Basin (1999)

Support Status	Monitored and Evaluated Streams		Monitored Streams Only	
	Miles	%	Miles	%
Fully Supporting	763.6	95	407.4	97
Impaired	12.0	2	11.1	3
Partially Supporting	*3.8*		*3.8*	
Not Supporting	*8.2*		*7.3*	
Not Rated	25.6	3		
Total	801.2	100%	418.5	100%

Table A-24 shows the total number of stream miles for each category of use support basinwide and for each subbasin. Ninety-five percent of stream miles in the New River basin were found to be fully supporting designated uses. Only 2% of monitored and evaluated stream miles are considered impaired. A color map showing use support ratings for all subbasins is presented as Figure A-14. Table A-25 shows a list of impaired waters in the New River basin.

Table A-24 Use Support Ratings by Subbasin in Miles (1995-1999)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
05-07-01	354.0	0	8.2	23.5	385.7
05-07-02	263.2	3.8	0	2.1	269.1
05-07-03	146.4	0	0	0	146.4
TOTAL	**763.6**	**3.8**	**8.2**	**25.6**	**801.2**
%	95%	1%	1%	3%	100%

Table A-25 Impaired Waters within the New River Basin (as of 1999)*

Subbasin	Chapter in Section B	Listed Water	Use Support Rating	Potential Sources	Recommended Management Strategy
05-07-01	1	Naked Creek +	NS	NP, P	DWQ will continue to work with the WWTP. Local actions are needed on NPS inventory and BMP implementation.
05-07-01	1	Peak Creek	NS	NP	An interagency team has formed to address acid drainage problems. DWQ will continue to assist with remediation.
05-07-01	1	Ore Knob Branch	NS	NP	Same as Peak Creek.
05-07-01	1	Little Peak Creek	NS	NP	Same as Peak Creek.
05-07-02	2	Little Buffalo Creek +	PS	P, NP	DWQ will continue to work with the WWTP. Local actions are needed on NPS inventory and BMP implementation.

Key: NS = Not Supporting PS = Partially Supporting
NP = Nonpoint sources P = Point Sources

* = These waters are also on the 303(d) list, and a TMDL and/or management strategy will be developed to remove the waters from the list.

+ = Only limited progress towards developing and implementing NPS strategies for these impaired waters can be expected without additional resources.

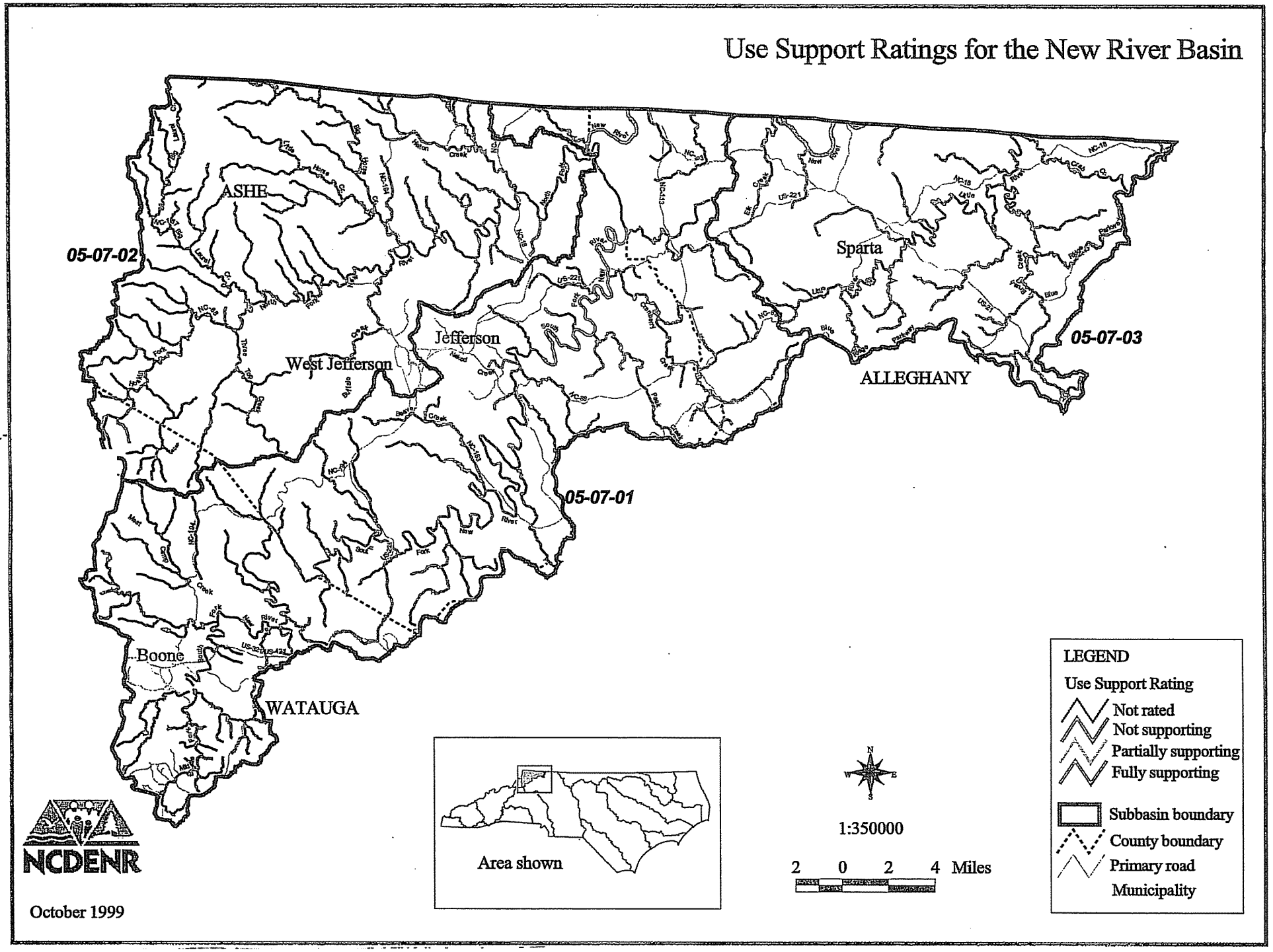


Figure A-14 Use Support Ratings for the New River Basin

Chapter 4 -
Water Quality Issues Related to the Entire New River Basin

4.1 Overview

The 1995 New River Basinwide Water Quality Management Plan included several recommendations to address water quality issues in the basin. Most of these recommendations were for specific stream segments and are discussed separately in the individual subbasin chapters in Section B. This chapter discusses water quality issues that relate to the entire New River basin. Habitat degradation is the main water quality issue in the basin, and includes sedimentation (resulting primarily from land clearing activities, loss of riparian vegetation, rural roads, and livestock grazing on streambanks) as well as impacts from urban runoff.

4.2 Habitat Degradation

Instream habitat degradation is identified 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 to a supporting rating. DWQ is working to develop a reliable habitat assessment methodology.

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 will need to be addressed to further improve water quality in North Carolina's streams and rivers.

4.3 Sedimentation

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 logging 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 (DENR-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 fish habitat vital to reproduction and impacts aquatic insects that fish feed upon. Sediment filling rivers and streams decreases their storage volume and increases the frequency of floods. Suspended sediment increases the cost of treating municipal drinking water supplies (DENR-DLR, 1998).

Major Causes of Sedimentation in the New River Basin

- Land clearing activities (construction and preparing land for Christmas tree farming and crops)
- Streambank erosion
- Runoff from unpaved rural roads and eroding road grades

During 1998 basinwide monitoring, DWQ aquatic biologists reported streambank erosion and sedimentation throughout the New River basin that was moderate to severe. Some streams are currently considered biologically impaired due to habitat degradation related in part to these impacts. Even in streams that were not listed as impaired, 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 (DENR-DWQ, July 1999).

The Wildlife Resources Commission's *Fisheries Management Direction for the New River Basin* also lists sedimentation of the New River and tributary streams as one of three major concerns in the basin (NCWRC, May 1998). The Environmental Defense Fund discussed sedimentation of streams in the New River basin in a publication entitled *Soiled Streams: Cleaning Up Sediment Pollution in North Carolina's Waters* (EDF, 1998).

4.3.1 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. Land clearing activities that contribute to sedimentation in the New River basin include: construction of homes and subdivisions as well as commercial and public buildings; plowing soil to plant crops; site preparation and harvest on Christmas tree farms; and road projects. 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 protect water quality. Where programs are not effective, as evidenced by violation of instream water quality standards and where DWQ can identify a source, then appropriate enforcement action can be taken. Generally, this would entail requiring the landowner or responsible party to install acceptable BMPs.

Some Best Management Practices

Agriculture

- Using no till or conservation tillage practices
- Strip cropping, contour farming and use of terraces
- Taking land on the steepest terrain out of production

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 and other areas
- Replanting vegetation on disturbed areas
- Leaving natural buffer areas around small streams and rivers

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 (refer to Part 2.7.2 of this section for more information). An erosion and sediment control plan must also be developed 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 a plan is not required.

For activities not subject to these rules, such as agriculture and forestry, sediment controls are carried out on a voluntary basis through programs administered by several different agencies. Forestry operations, however, must comply with nine performance standards to remain exempt from permitting requirements of the SPCA. The performance standards can be found in the document *Forest Practice Guidelines Related to Water Quality.*

4.3.2 Streambank Erosion and Loss of Riparian Vegetation

During 1998 basinwide sampling, DWQ biologists reported degradation of benthic and fish communities at numerous sites throughout the New 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 watersheds (DENR-DWQ, July 1999).

The Wildlife Resources Commission's *Fisheries Management Direction for the New River Basin* also reports that riparian vegetation along many stream segments throughout the New River basin are "damaged to the extent that the (ecological) health of the streams is being compromised" (NCWRC, May 1998).

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 even more. Trout require higher levels of dissolved oxygen available in coldwater. 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 impacts the habitat that aquatic insects and fish need to survive (WNCT, 1999).

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 down-cutting 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).

Probably the best-known and most widely used category of BMPs is the retention of naturally vegetated buffer strips along streams. Streamside buffers serve many functions including nutrient filtering, bank stabilization, reduction of soil and land loss, moderating water temperature (which helps maintain higher levels of dissolved oxygen and hence a more suitable fish environment), and providing wildlife habitat and corridors for movement (EPA, 1999).

4.3.3 Unpaved Rural Roads and Eroding Road Grades

As is typical of settlement in mountainous areas, many roads in the New River basin follow streams. The roads are often constructed on the streambank with very little (if any) vegetated buffer to filter sediment and other pollutants from surface runoff. Many of the steep road grades are actively eroding because of a lack of stabilization. Additionally, when road maintenance activities are conducted, there is often inadequate space for structural BMPs to be installed to control erosion from the land-disturbing activity.

Roads built to accommodate vehicles and equipment used to plant, tend and harvest Christmas trees and timber in the New River basin also contribute to sediment runoff. These roads are generally unpaved and accelerate erosion unless they are maintained with stable drainage structures and foundations. In the mountainous areas of North Carolina, ordinary forest roads are known to lose as much as 200 tons of soil per acre of roadway during the first year following disturbance (DENR-DFR, September 1989).

4.3.4 New Rules Regarding Sediment Control

The Division of Land Resources (DLR) has the primary responsibility for assuring that erosion is minimized and sedimentation is reduced. For the past several years, there were inadequate staff to achieve the mission of the agency; however, in its 1999-2001 biennial budget, the NC General Assembly provided funding for 10 new positions in the Land Quality Section of DLR.

In February 1999, the NC Sedimentation Control Commission adopted significant changes for strengthening the Erosion and Sedimentation Control Program. The following rule changes were filed as temporary rules, subject to approval by the Rules Review Commission and the NC General Assembly:

- 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:

- 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 de-watering 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.

In August 1999, the Sediment Control Commission initiated rule making to increase plan review fees to $40 per acre. In addition, the Commission voted to request that Governor Hunt use his authority to put into effect at an earlier date (before August 1, 2000) the rules adopted in February (DENR-DLR, September 1999). For information on North Carolina's Erosion and Sedimentation Control Program or to report erosion and sedimentation problems, visit the new website: http://www.dlr.enr.state.nc.us/ or you may call the NC Division of Land Resources, Land Quality Section at (919) 733-4574.

4.3.5 Recommendations

It is recommended that the Department of Transportation, as well as county highway departments, take special care when constructing and maintaining (including mowing) roads along streams in the New River basin. The lack of riparian vegetation and streambank erosion is well-documented and will lead to increased instream habitat degradation if these problems remain unchecked. Vegetation along streams should remain as undisturbed as possible when conducting these construction and maintenance activities, keeping in mind that most of these streams are to be managed in a manner similar to HQWs pursuant to Administrative Code Section: 15A NCAC 2B .0225 e(4).

DWQ will continue to work cooperatively with DLR and other agencies that administer sediment control programs 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 New River basin. 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 for cost sharing with local governments that set up new erosion and sedimentation control programs or conduct their own training workshops. The Sediment Control Commission will provide 40% of the cost of starting a new local erosion and sedimentation control program for up to 18 months. Two municipalities or a municipality and county can develop a program together and split the match. It is recommended that local governments draft and implement local erosion and sedimentation control programs.

Funding is also available through numerous federal and state programs for farmers to restore and/or protect riparian buffer zones along fields or pastures, develop alternative watering sources for livestock, and fence animals out of streams (see Section C, Part 2.3.1). 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. The publication can also be accessed online at http://www.epa.gov/OWOW/watershed/wacademy/fund.html. Local contacts for various state and local agencies are listed in Appendix VI.

4.4 Urban Runoff

Runoff from built-up (developed) areas carries a wide variety of contaminants to streams including sediment, oil and grease from roads and parking lots, street litter, and pollutants from the atmosphere. Generally, there are also a larger number of point source discharges in these areas. Cumulative impacts from habitat and floodplain alterations, point and nonpoint source pollution can cause severe impairment to streams.

4.4.1 Rural Development

More than three-quarters of the land in western North Carolina has a slope in excess of 30%. Building site preparation and access are complicated by shallow bedrock, high erosion rates, soils that are subject to sliding, and lack of adequate sites for septic systems. Additionally, road grades of 12% or less are desirable. Unpaved roads with grades in excess of 12% erode easily and are difficult to maintain (WNCT, 1999). This terrain presents a kind of "no win" situation. Development could occur in the relatively flat stream and river valleys placing pressure on floodplains and riparian zones and displacing agricultural land uses. Alternatively, it could occur on the steep slopes causing acute problems in handling large amounts of erosion and sedimentation during construction and chronic problems with failing septic systems and eroding road grades. Development occurs in both places in different portions of the New River basin.

4.4.2 Urbanization

Urbanization often has greater hydrologic effects than any other land use, as native watershed vegetation is replaced with impervious surfaces in the form of paved roads, buildings, parking lots, and residential homes and yards. Urbanization results in increased surface runoff and correspondingly earlier and higher peak flows after storms. 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).

In and around municipalities in the New River basin, 1998 DWQ biological assessments revealed that streams are being impacted and, in some cases, impaired because of urban stormwater runoff. Most of the impacts are in terms of habitat degradation (see Part 4.4 of this section), but runoff from developed and developing areas can also carry toxic pollutants to a stream (DENR-DWQ, July 1999).

The presence of intact riparian buffers and/or wetlands in urban areas can lessen these impacts and restoration of these watershed features should be considered where feasible; however, the amount of impervious cover should be limited as much as possible. Wide streets, huge cul-de-sacs, 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.

4.4.3 Stormwater Regulations

DWQ administers a number of programs aimed at controlling stormwater runoff. These include: 1) programs for the control of development activities near High Quality Waters (HQW) and Outstanding Resource Waters (ORW) and activities within designated Water Supply (WS) watersheds; 2) NPDES stormwater permit requirements for industrial activities and municipalities; and 3) NPDES stormwater permit requirements for construction or land development activities on one acre of land or more. For more detailed information on current and proposed stormwater rules, refer to Part 2.7.2 of this section.

4.4.4 Recommendations

DWQ will work with counties and municipalities to make them aware of waters that are currently protected by HQW, ORW and water supply watershed designations, to update the list as streams are reclassified and to enforce the rules that apply to these waters. Specifically, a short presentation about these rules will be developed and presented to the Region D Council of Governments. Packets of information including DWQ's brochure *High Quality What?* and a map showing HQW, ORW and water supply watershed designations for the New River basin will be assembled and distributed to each county government and municipality. The need for attention to this matter came as a direct result of citizen input at the 1999 New River basin workshop (refer to Section C, Chapter 1 for more information).

Planning Recommendations for New Development

- Minimize number and width of residential streets.
- Minimize size of parking areas (angled parking and narrower slots).
- Place sidewalks on only one side of residential streets.
- Vegetate road right-of-ways, parking lot islands and highway dividers to increase infiltration.
- Plant and protect natural buffer zones along streams and tributaries.
- Minimize floodplain development.
- Protect and restore wetland/bog areas.

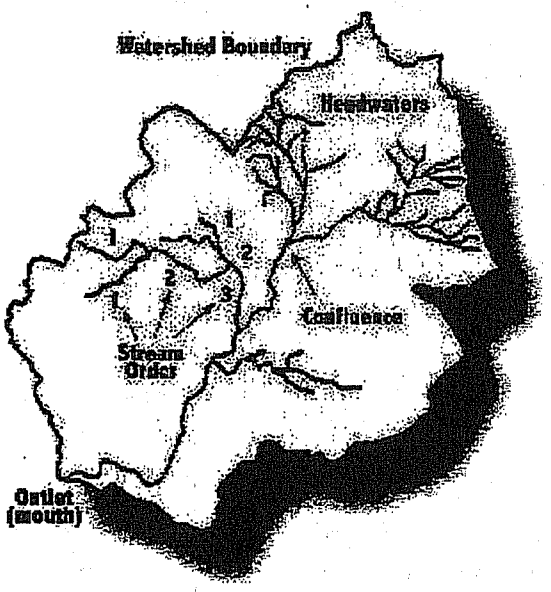
Proactive planning efforts at the local level are needed to assure that development is done in a manner that minimizes impacts to water quality. These planning efforts must find a

balance among 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.

Public education is needed in the New River basin in order for citizens to understand the value of urban planning and stormwater management. Action should be taken by county governments and municipalities in the New River basin to plan for new development in urban and rural areas. For more detailed information regarding recommendations for new development found in the text box, refer to EPA's website: www.epa.gov/owow/watershed/wacademy/acad2000/protection.

4.5 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. However, impairment of headwater streams can (and does) impact the larger stream or river.



Headwater areas are found from the mountains to the coast along all river systems and drain all of the land in a river basin. 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 and excluding cattle from streams. Local rural and urban planning initiatives should also consider impacts to headwater streams when land is being developed.

On a larger scale, all streams in the North Carolina portion of this basin are the headwaters of the New River basin. They are important as sources of water for downstream water supplies and as food production sources for downstream aquatic life. For a more detailed description of

watershed hydrology, please refer to EPA's Watershed Academy Website: http://www.epa.gov/OWOW/watershed/wacademy/acad2000/watershedmgt/principle1.html.

4.6 Priority Issues for the Next Five Years

4.6.1 Introduction

Clean water is crucial to the health, economic and ecological well-being of the state. Tourism, water supplies, recreation and a high quality of life for residents are dependent on the water resources within any given river basin. Water quality problems are varied and complex. Inevitably, water quality impairment is due to human activities within the watershed. Solving these problems and protecting the surface water quality of the basin in the face of continued growth and development will be a major challenge. Looking to the future, water quality in this basin will depend on the manner in which growth and development occur.

The long-range mission of basinwide management is to provide a means of addressing the complex problem of planning for increased development and economic growth while protecting and/or restoring the quality and intended uses of the New River basin's surface waters. In striving towards its mission, DWQ's highest priority near-term goals are to:

- identify and restore impaired waters in the basin;
- identify and protect high value resource waters and biological communities of special importance; and
- protect unimpaired waters while allowing for reasonable economic growth.

4.6.2 Strategies for Restoring and Protecting Impaired Waters

Impaired waters are those waters identified in Section A, Chapter 3 as partially supporting (PS) or not supporting (NS) their designated uses based on DWQ monitoring data. These waters are summarized by subbasin in Table A-26 and indicated on Figure A-15. The impaired waters are also discussed individually in the subbasin chapters in Section B.

These waters are impaired, at least in part, due to nonpoint sources (NPS) of pollution. The tasks of identifying nonpoint sources of pollution and developing management strategies for these impaired waters is very resource intensive. Accomplishing these tasks is overwhelming, given the current limited resources of DWQ, other agencies (e.g., Division of Land Resources, Division of Soil and Water Conservation, Cooperative Extension Service, etc.) and local governments. Therefore, only limited progress towards restoring NPS impaired waters can be expected during this five-year cycle unless substantial resources are put toward solving NPS problems. Due to these restraints, this plan has no NPS management strategies for two of the streams with NPS problems.

DWQ plans to further evaluate the impaired waters in the New River basin in conjunction with other NPS agencies and develop management strategies for a portion of these impaired waters for the next New River Basinwide Water Quality Plan, in accordance with the requirements of Section 303(d) (see Part 4.7 below).

4.6.3 Addressing 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 priority. The waters in the New River basin that are on this list are presented in the individual subbasin descriptions in Section B. For information on listing requirements and approaches, refer to Appendix IV.

Section 303(d) of the federal Clean Water Act requires states to develop a 303(d) list of waters not meeting water quality standards or which have impaired uses. States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. In the last few years, the TMDL program has received a great deal of attention as the result of a number of lawsuits filed across the country against EPA. These lawsuits argue that TMDLs have not adequately been developed for specific impaired waters. As a result of these lawsuits, EPA issued a guidance memorandum in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list. The schedules for TMDL development, according to this EPA memo, are to span 8-13 years.

There are approximately 2,387 impaired stream miles on the 303(d) list in NC. The rigorous and demanding task of developing TMDLs for each of these waters during an 8 to 13-year time frame will require the focus of much of the water quality program's resources. Therefore, it will be a priority for North Carolina's water quality programs over the next several years to develop TMDLs for 303(d) listed waters. This task will be accomplished through the basinwide planning process and schedule.

Section B

Water Quality Data and Information by Subbasin

Chapter 1 -
New River Subbasin 05-07-01
Includes the South Fork New River Watershed

1.1 Water Quality Overview

Subbasin 05-07-01 at a Glance

Land and Water

Land area:	341 mi^2
% of basin land area:	45
Stream miles:	385.8
Lake acres:	18

Population Statistics

1990 Est. pop.:	33,966 people
Pop. density:	100 persons/mi^2

Land Cover (%)

Forest/Wetland:	74.09
Surface Water:	0.79
Urban:	0.83
Cultivated Crop:	0.72
Pasture/ Managed Herbaceous:	23.57

Use Support Summary

Freshwater Streams:

Fully Supporting:	354.0 miles
Partially Supporting:	0 miles
Not Supporting:	8.2 miles
Not Rated:	23.5 miles

Lakes:

Appalachian State University Lake – Fully Supporting

The South Fork New River and its tributaries drain fairly mountainous terrain including the City of Boone and portions of the towns of Blowing Rock and Jefferson. Major tributaries include Middle and East Forks of the South Fork New River, Naked, Roan, Peak and Cranberry Creeks. A map of this subbasin including water quality sampling locations is presented as Figure B-1.

Biological ratings for these sample locations are presented in Table B-1. The current sampling resulted in impaired ratings for four streams in this subbasin. Refer to Appendix III for a complete listing of monitored waters and use support ratings.

Most of the High Quality and Outstanding Resource Waters in the New River basin are found in the South Fork New River watershed, despite the fact that 63 percent of the basin population lives in the drainage. These waters provide habitat for 24 rare, threatened or endangered species including three fish species that are found only in the New River basin. Portions of New River State Park and Mount Jefferson State Natural Area are also located in this subbasin.

Land use is primarily forest and agriculture, with the highest percentage of agricultural land use near Jefferson and in the headwaters of Cranberry Creek. Historically, cattle grazing (pasture) has been the major agricultural activity, but the amount of land used for Christmas tree farming has been increasing within the last decade.

There are nine permitted dischargers in the subbasin, but Boone WWTP is the only major discharge. Three facilities conduct self-monitoring tests for whole effluent toxicity: Blowing Rock, Boone and Jefferson WWTPs. All of these treatment plants reported some toxicity problems in 1995-1996, but few failures were noted in 1997 and 1998.

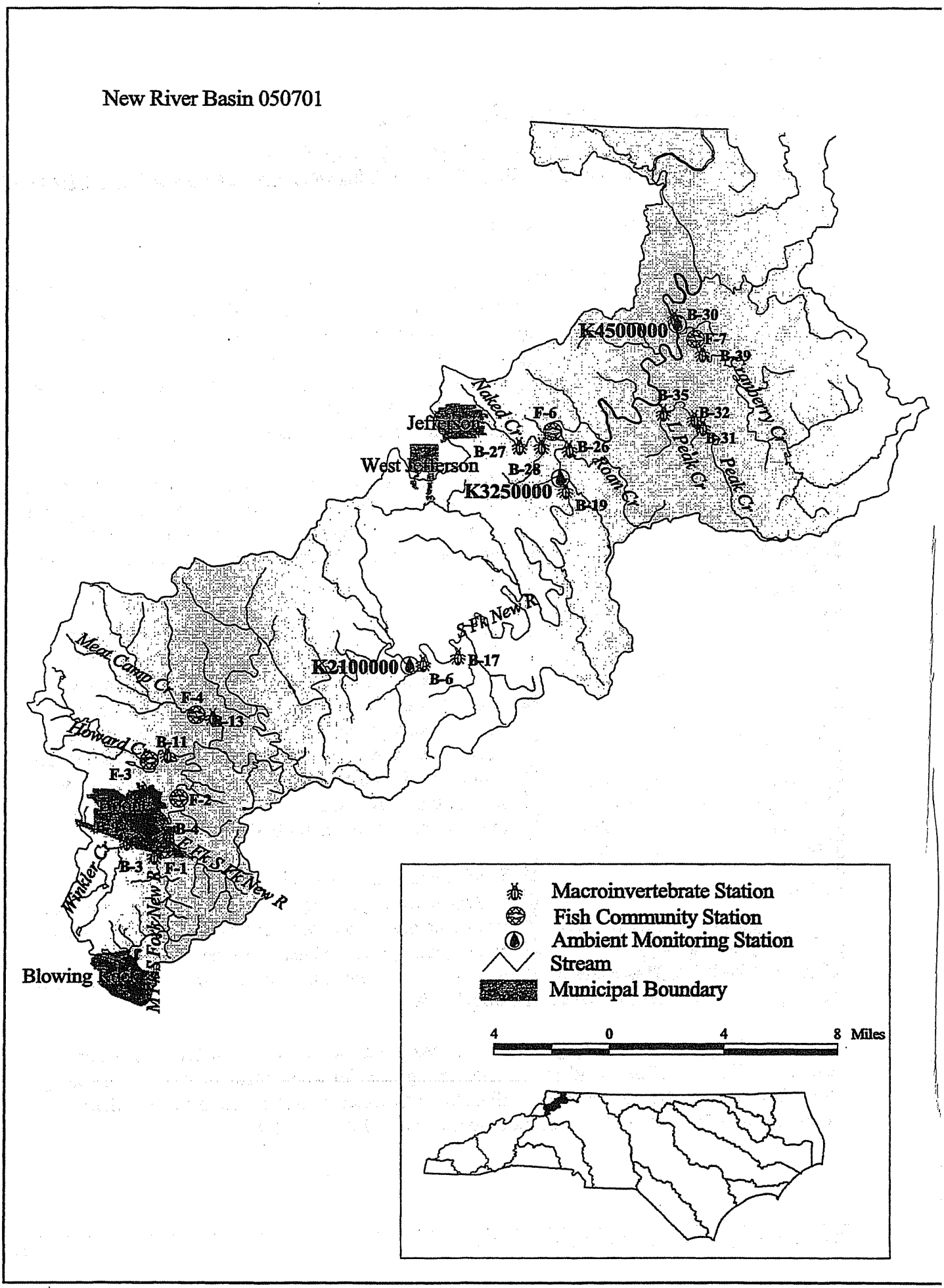


Figure B-1 Sampling Locations within Subbasin 05-07-01

Benthic macroinvertebrate data indicate good water quality at most sites in this subbasin, although between-year changes in flow likely caused a drop in bioclassification between 1993 and 1998 for the Middle and East Forks of the South Fork New River, Winkler Creek and the headwaters of Naked Creek. These sites are small streams in agricultural or urban drainages, and the biological communities are more heavily impacted by fluctuations in flow.

The South Fork New River at Perkinsville is still somewhat impacted by the Boone WWTP discharge. However, there was an increase in the proportion of pollution intolerant organisms at the Perkinsville site in 1998, which may be related to improvements at the wastewater treatment plant and in the Town of Boone. Little Peak Creek continues to be affected by acid mine drainage. Peak and Little Peak Creeks, Ore Knob Branch and Naked Creek are impaired and are discussed further in following sections.

The South Fork New River is rated as High Quality Waters (HQW) from Elk Creek to Dog Creek and as Outstanding Resource Waters (ORW) downstream of Dog Creek. The 1998 macroinvertebrate samples still indicate Excellent water quality in the HQW and ORW segments of the river, and Excellent ratings were also assigned to Howard, Roan and Cranberry Creeks. Significant improvement was noted for Meat Camp Creek which improved from Good (1993) to Excellent (1998).

Table B-1 Biological Assessment Ratings (1998) for New River Subbasin 05-07-01 Sites

Site(s)	Stream	County	Road	Rating
Benthic Macroinvertebrates				
B-3	Middle Fork South Fork	Watauga	SR 1522	Good
B-4	East Fork South Fork	Watauga	SR 1522	Good
B-6	South Fork New River	Watauga	US 421	Good-Fair
B-9	Winkler Creek	Watauga	SR 1549	Good
B-11	Howard Creek	Watauga	SR 1328	Excellent
B-13	Meat Camp Creek	Watauga	SR 1333	Excellent
B-16/17	South Fork New River	Ashe	US 221/SR 1169	Excellent
B-19	South Fork New River	Ashe	NC 16/18	Excellent
B-26	Roan Creek	Ashe	SR 1588	Excellent
B-27	Naked Creek	Ashe	NC 16/18	Good-Fair
B-28	Naked Creek	Ashe	Old SR 1585	Poor
B-30	South Fork New River	Ashe	US 221	Excellent
B-31	Peak Creek	Ashe	Above Ore Knob	Good
B-32	Peak Creek	Ashe	Below Ore Knob	Poor
B-35	Little Peak Creek	Ashe	Near mouth	Poor
B-39/40	Cranberry Creek	Ashe	SR 1603/SR 1600	Excellent
Fish Community*				
F-1	Middle Fork South Fork	Watauga	SR 1522	Not Rated
F-2	South Fork New River	Watauga	US 421	Not Rated
F-3	Howard Creek	Watauga	SR 1306	Not Rated
F-4	Meat Camp Creek	Watauga	SR 1333	Not Rated
F-6	Naked Creek	Ashe	NC 16/88	Not Rated
F-7	Cranberry Creek	Ashe	SR 1600	Not Rated

* Refer to Section A, Part 3.3.2 for more information on fish community ratings.

Fish community analyses were conducted at six locations in this subbasin. Middle Fork South Fork New River received the highest NCIBI score. All three of the basin's special status fish species were observed at this location. NCIBI metrics are currently being revised; therefore, biological ratings were not assigned (see Section A, Chapter 3, Part 3.3.2 and Appendix II). Fish tissue samples were collected from 5 sites and showed no levels of metals exceeding criteria; analyses for organic compounds (such as pesticides) were not conducted.

Water chemistry is recorded monthly from three sites on the South Fork New River: Perkinsville, Jefferson and Scottsville. There were few differences between the Scottsville and Jefferson sites with no water quality problems recorded at either site. Relative to the two downstream sites, the Perkinsville site had elevated conductivity and nutrient values, although phosphorus and ammonia concentrations declined after the upgrade of the Boone WWTP. All South Fork sites become turbid after rainfall with an increasing sediment load downstream.

Appalachian State University (ASU) Lake

COUNTY:	Watauga	**CLASSIFICATION:**	WS-II Tr CA
SURFACE AREA:	18 acres (45 hectares)	**MEAN DEPTH:**	33 feet (10 meters)
VOLUME:	$0.70 \times 10^6 m^3$	**WATERSHED:**	34 mi^2 (89 km^2)

ASU Lake is a small impoundment of Norris Branch located in the South Fork New River watershed. The lake serves as the water supply for Appalachian State University. Construction of the lake and dam began in 1970 and was completed in 1974. The dam is 112 feet high, and the lake has a maximum depth of 112 feet (34 meters) near the dam. This lake is not publicly accessible. The shoreline of ASU Lake is forested; however, the watershed upstream of the lake is a mixture of forested land as well as residential and commercial development.

ASU Lake was most recently sampled in June, July and August 1998 near the dam. There are no water quality problems associated with this oligotrophic lake. There have been no indications of algal blooms, surface scums or algal mats in this lake, and there have been no public complaints of taste or odor problems associated with treated drinking water.

For more detailed information on sampling and assessment of streams in this subbasin, refer to the *Basinwide Assessment Report* for the New River basin (DENR-DWQ, July 1999), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

1.2 Status and Recommendations for Previously Impaired Waters

The 1995 New River Basinwide Plan identified five impaired stream segments in this subbasin. This section reviews use support and recommendations detailed in the 1995 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for each stream.

Segments of three streams are currently rated as impaired based on the most recent DWQ monitoring data: Naked Creek below the Jefferson WWTP; Peak Creek below Ore Knob Branch; and Little Peak Creek. Ore Knob Branch is also considered impaired based on an evaluation of current conditions. Each of these streams is presented and discussed below.

1.2.1 **Middle Fork South Fork New River** (4.7 miles at NC 321)

1995 Recommendation(s)

This segment of Middle Fork South Fork New River was listed as impaired due to nonpoint sources and the discharge of solids from the Blowing Rock WWTP. The 1995 plan recommended that efforts to address water quality issues in the Middle Fork watershed should concentrate on nonpoint source pollution reduction and included several recommendations to address sediment control and pollution from urban stormwater runoff. The sludge management plan at Blowing Rock WWTP was being modified to provide better handling of solids from the facility.

Status of Progress

Improvements to the Blowing Rock WWTP sludge disposal program are complete. The benthos rating at this site improved from Fair in 1989 to Good-Fair in 1998. This stream has been removed from the list of impaired waters.

1.2.2 **South Fork New River near Perkinsville** (2.5 miles at NC 221/421)

1995 Recommendation(s)

Part of the South Fork New River mainstem was listed as partially supporting due to the Boone WWTP discharge and nonpoint sources, based on biological data collected in 1993. The 1995 plan discussed problems the facility was having meeting the BOD permit limitation and outlined DWQ's plans to help the plant upgrade the existing treatment works and implement a more effective sludge handling system. The plan also documented considerable improvements in the handling of sediment from the Radford Quarries of Boone.

Status of Progress

Benthic macroinvertebrate sampling in 1998 showed an improved biological rating from Fair (1993) to Good-Fair. In 1996, the Boone WWTP switched from a trickling filter system to an oxidation ditch which resulted in a decrease in the toxicity of the facility's discharge. Also, sludge from the facility is now being pressed and dried on-site to greatly reduce its volume. It is then used for fertilizer by local citizens. Water chemistry in the South Fork New River at this location still shows elevated levels of conductivity and nutrients when compared to downstream data; however, ammonia and phosphorus concentrations have declined significantly since the upgrade was completed. The Boone WWTP discharge had a 50 percent effluent toxicity test failure rate in 1995-1996, but has passed all toxicity tests since July 1996. This stream has been removed from the list of impaired waters.

Current Water Quality Projects

The Town of Boone is drafting a stormwater management plan as follow-up to floodplain management activities that were completed in 1997 and 1998. Stream restoration, including bank stabilization, is also planned for sections of the South Fork New River. Section C contains more information on these and other water quality initiatives in the New River basin.

1.2.3 Naked Creek (2.0 miles from Jefferson WWTP to South Fork New River)

1995 Recommendation(s)

Approximately 2.0 miles of Naked Creek were listed as partially supporting downstream of the Jefferson WWTP discharge. Nonpoint sources, including agriculture, road construction and urban runoff from the Town of Jefferson, were also a cause for listing. In 1994, the Jefferson WWTP was in noncompliance with the ammonia permit limitation. Discharge from this facility failed three toxicity tests during the first half of 1994. The town had been advised that disposal of landfill leacheate through the treatment plant (thought to be causing the toxicity problem) may not be appropriate and that alternative methods of disposal should be investigated. The recommendation was that DWQ work with the town to bring this facility into compliance.

Status of Progress

Biological collections in 1998 showed further degradation of water quality from Fair in 1993 to Poor. Naked Creek is currently listed as not supporting. This section of Naked Creek is impaired due to habitat degradation and excess nutrients. Sources of pollution are both nonpoint (agriculture, road and residential construction, and urban runoff from the Town of Jefferson) and point (Jefferson WWTP). The Naked Creek watershed is very developed and extensive segments of the stream are channelized. Habitat problems include sedimentation, bank erosion and a lack of riparian vegetation.

Toxic and organic indicator species of benthic macroinvertebrates were abundant during the 1998 basinwide sampling, reflecting the continued impact of the wastewater treatment plant discharge. The stream received a benthic bioclassification rating of Poor below the WWTP. Although the rating above the WWTP was Good-Fair in 1998, impacts from built-up areas, new development and road construction, as well as agricultural land clearing activities and extensive livestock access, are apparent and contribute to impairment downstream.

2000 Recommendation(s)

An engineering design has been submitted by the Town of Jefferson for an upgrade to the WWTP. DWQ has approved the design and a new NPDES permit is pending. The upgrade includes an expansion of the aeration, clarification and sludge holding portions of the treatment plant. The upgrade is currently projected for completion in 2002. DWQ will continue to work with the Town of Jefferson to resolve toxicity problems associated with the WWTP discharge.

Public education regarding the importance of good riparian buffer zones is needed in the Jefferson/West Jefferson area. Additionally, an erosion control ordinance can be an effective

tool to lessen sedimentation impacts from new development in this growing area. Please refer to Section A, Chapter 4 for a more detailed discussion of impacts from urbanization, sedimentation and loss of riparian vegetation.

1.2.4 **Peak Creek** (2.9 miles from Ore Knob Branch to South Fork New River)
Little Peak Creek (2.4 miles from source to Peak Creek)
Ore Knob Branch (0.9 miles from source to Peak Creek)

1995 Recommendation(s)

Approximately 2.9 miles of Peak Creek and 2.5 miles of Little Peak Creek were listed as impaired due to the effects of acidic and metals-laden runoff from an abandoned copper mine. When the 1995 basin plan was being drafted, a neutralization system was being installed in an attempt to counteract the low pH mine drainage. The system was not complete at the time the stream was sampled in 1993. Sampling above and below Ore Knob Branch showed that a large portion of the mine drainage was coming from this tributary as well as from Little Peak Creek. More intensive sampling by DWQ was recommended.

Status of Progress

As a result of benthic macroinvertebrate sampling in 1996 and 1998, Peak Creek below Ore Knob Branch, above and below Little Peak Creek, and Little Peak Creek all were assigned a Poor rating. In August 1998, pH in Little Peak Creek was 5.8; and in Peak Creek, pH declined from 7.0 upstream of the tributaries to 5.5 downstream. The water quality standard for pH in these waters is a range from 6.0 to 9.0 pH units. Metals concentrations also exceeded water quality standards, indicating toxicity to fish and aquatic insects.

These segments of Peak Creek and Little Peak Creek were devoid of fish and had a very sparse invertebrate community during a DWQ special study conducted in 1998. The stream bottoms were coated with a reddish-orange precipitate (formation of iron oxides). A passive limestone treatment system was installed in 1993-94 in the vicinity of the mine and tailings were also revegetated. However, these remediation efforts resulted in little long-term water quality improvement. This early project is detailed in Section C, Chapter 2, Part 2.2.1. Sedimentation and bank erosion impacts were also documented in Peak and Little Peak Creeks and are likely due in part to agricultural land uses in areas upstream of the Ore Knob area.

Ore Knob Branch has not been monitored within the last five years; however, conditions in the receiving water (Peak Creek) have not improved, and the pH in Ore Knob Branch in 1998 was only 3.2. Since there is no evidence of recovery in this segment, it is considered impaired due to low pH and toxic levels of dissolved copper, iron and zinc.

2000 Recommendation(s)

DWQ staff will continue to assist in the multiagency partnership described below, providing technical assistance as needed.

Current Water Quality Projects

In 1998, the Army Corps of Engineers (COE) began a detailed site assessment of the Ore Knob mine area. Funding has been provided by the Clean Water Management Trust Fund to match COE money for a project to restore water quality in the Peak Creek watershed. Preliminary plans include diverting surface water and groundwater around the tailings area and installing a series of settling ponds and/or constructed wetlands designed to retain metals and increase pH. Section C contains more detailed information regarding this and other water quality initiatives in the New River basin.

1.3 Status and Recommendations for Newly Impaired Waters

No additional stream segments in this subbasin were rated as impaired based on recent DWQ monitoring (1994-1999). However, impacts to many streams from narrow riparian buffer zones, sedimentation and moderate to severe bank erosion were observed. Part 1.5 below discusses specific streams where these impacts were observed.

1.4 303(d) Listed Waters

There are four stream segments (8.2 stream miles) in this subbasin that are impaired and on the state's year 2000 303(d) list (not yet EPA approved). Segments of Naked, Peak and Little Peak Creeks, and Ore Knob Branch are discussed above. Refer to Appendix IV for more information on the state's 303(d) list and listing requirements.

1.5 Other Issues and Recommendations

The surface waters discussed in this section are fully supporting designated uses based on recent DWQ monitoring; however, these data revealed some impacts to water quality. Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended.

Impacts to water quality from surrounding land use have produced lower numbers of pollution intolerant benthic macroinvertebrate taxa (lower EPT richness) in several streams in this subbasin. Middle Fork South Fork New River and Naked Creek below Jefferson are discussed in Part 1.2 above. Other streams include East Fork South Fork New River, Mill Creek, Pine Swamp Creek, Dog Creek, Nathans Creek and Prathers Creek. Many of these streams have narrow riparian zones and severe bank erosion contributing to sedimentation and other forms of habitat degradation. Refer to Chapter 4 of this section for more information regarding these problems.

Chapter 2 -
New River Subbasin 05-07-02
Includes the North Fork New River Watershed

2.1 Water Quality Overview

Subbasin 05-07-02 at a Glance

Land and Water

Land area:	255 mi^2
% of basin land area:	34
Stream miles:	269.1

Population Statistics

1990 Est. pop.:	12,118 people
Pop. density:	48 persons/mi^2

Land Cover (%)

Forest/Wetland:	84.40
Surface Water:	0.27
Urban:	0.18
Cultivated Crop:	0.19
Pasture/ Managed Herbaceous:	14.96

Use Support Summary

Freshwater Streams:

Fully Supporting:	263.2 miles
Partially Supporting:	3.8 miles
Not Supporting:	0 miles
Not Rated:	2.1 miles

The North Fork New River's major tributaries are Big Horse Creek, Helton Creek, Three Top Creek, Big Laurel Creek and Buffalo Creek. Little Buffalo Creek drains a portion of the Town of West Jefferson. Most of this mountainous subbasin is in Ashe County, although small headwater portions of Three Top Creek flow from Watauga County and headwater sections of Horse and Helton Creeks begin in Virginia. A map of this subbasin including water quality sampling locations is presented as Figure B-2.

Biological ratings for these sample locations are presented in Table B-2. The current sampling resulted in impaired ratings for one stream in this subbasin. Refer to Appendix III for a complete listing of monitored waters and use support ratings.

The upper reaches of Big Horse Creek and its tributaries are classified as High Quality Waters (HQW), and other waters including portions of the North Fork New River mainstem are being recommended for reclassification. Significant natural heritage areas are located within the watershed, as well as Three Top Mountain Game Land. The waters provide habitat for at least eight rare species including three fish species that are found only in the New River basin.

Much of the land cover within this mountainous subbasin is forest, although some of the land is used for agriculture including pasture and cultivated cropland. Very small portions of the subbasin are urban or developed. There are only four permitted dischargers in the subbasin; the two largest facilities are United Chemi-Con and the West Jefferson WWTP.

Benthic macroinvertebrate data indicate consistently excellent water quality at three sites on the mainstem of the North Fork New River. Lower ratings were given to Three Top and Buffalo Creeks in 1998 than in 1993. A large proportion of pollution tolerant organisms was found at Silas Creek, although the stream at this location is too small to rate. An improvement was noted for Little Buffalo Creek below the West Jefferson WWTP. Three Top, Silas and Buffalo Creeks are within agricultural or developed drainages; and therefore, the macroinvertebrate communities

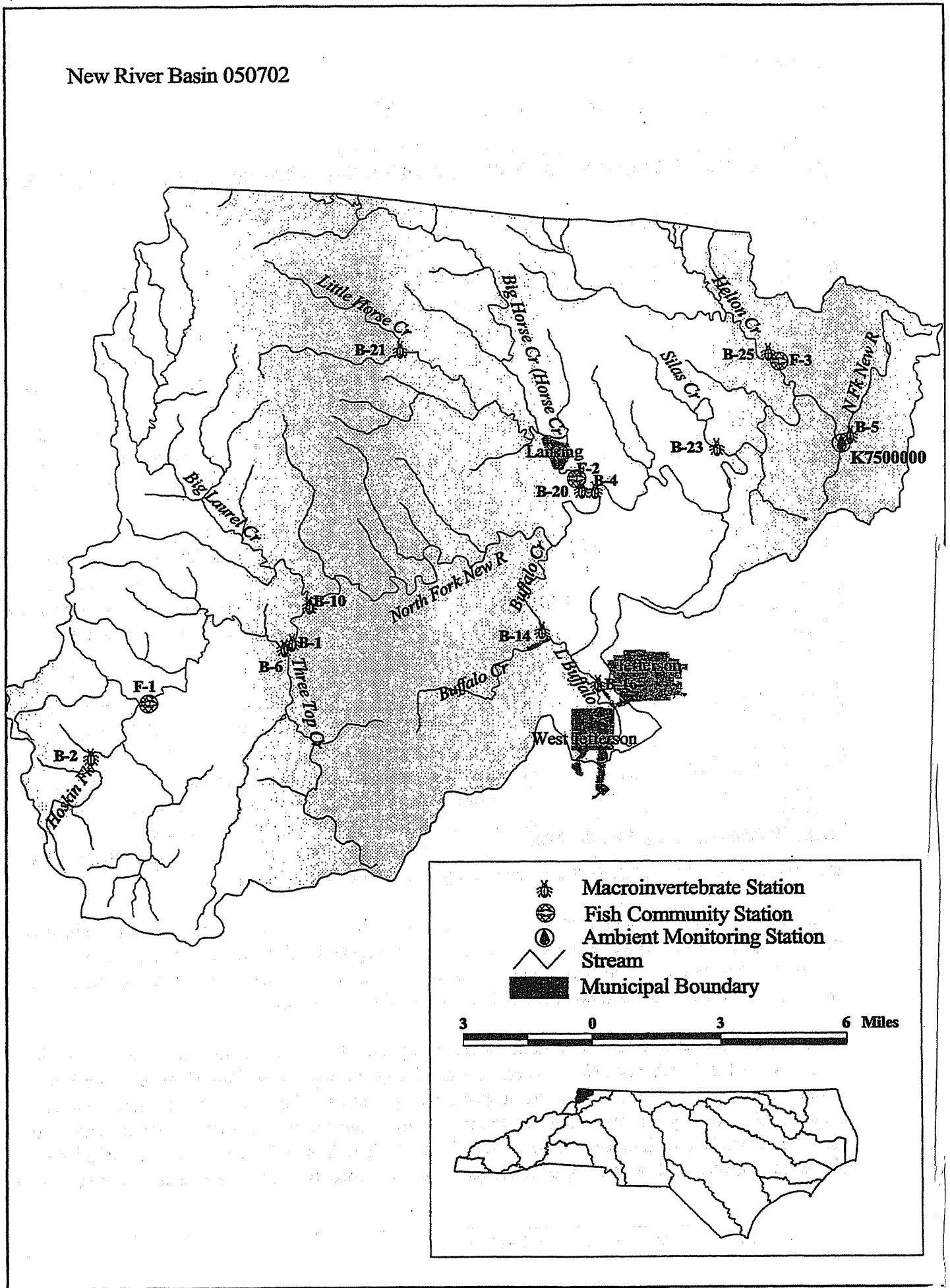


Figure B-2 Sampling Locations within Subbasin 05-07-02

are more heavily impacted by fluctuations in flow. The improved rating at the Little Buffalo Creek location may reflect improvements made at the West Jefferson WWTP.

No between-year changes in ratings were noted at three other tributary sites (Hoskins Fork, Big Laurel and Big Horse Creeks). All three of these tributaries were rated Good or Excellent during both basinwide surveys in 1993 and 1998, suggesting that nonpoint source runoff in these subwatersheds is not causing significant impacts to water quality. In addition, data were collected for the first time from two other tributaries: Little Horse Creek (Good) and Helton Creek (Excellent).

Table B-2 Biological Assessment Ratings (1998) for New River Subbasin 05-07-02 Sites

Site	Stream	County	Road	Rating
Benthic Macroinvertebrates				
B-1	North Fork New River	Ashe	SR 1100	Excellent
B-2	Hoskins Fork	Ashe	NC 88	Good
B-4	North Fork New River	Ashe	SR 1644	Excellent
B-5	North Fork New River	Ashe	NC 16	Excellent
B-6	Three Top Creek	Ashe	SR1100	Good
B-10	Big Laurel Creek	Ashe	NC 88	Excellent
B-14	Buffalo Creek	Ashe	NC 88/194	Good-Fair
B-16	Little Buffalo Creek	Ashe	Near SR 1153	Fair
B-20	Big Horse Creek	Ashe	SR 1644	Excellent
B-21	Little Horse Creek	Ashe	SR 1334	Good
B-23	Silas Creek	Ashe	SR 1544	Not rated
B-25	Helton Creek	Ashe	SR 1536	Excellent
Fish Community*				
F-1	North Fork New River	Ashe	SR 1119	Not Rated
F-2	Big Horse Creek	Ashe	SR 1350	Not Rated
F-3	Helton Creek	Ashe	SR 1536	Not Rated

* Refer to Section A, Part 3.3.2 for more information on fish community ratings.

Fish community analyses were conducted at three locations in this subbasin. Big Horse Creek (at SR 1350) was assigned one of the lowest NCIBI scores during the 1998 basinwide sampling, and it was one of only a few sites where no trout were collected. NCIBI metrics are currently being revised; therefore, ecological health ratings were not given to these three locations (see Section A, Chapter 3, Part 3.3.2 and Appendix II).

Monthly water chemistry is collected from one location in this subbasin on the North Fork New River mainstem at NC 16 near Crumpler. These data have indicated good water quality with few violations of water quality criteria.

For more detailed information on sampling and assessment of streams in this subbasin, refer to the *Basinwide Assessment Report* for the New River basin (DENR-DWQ, July 1999), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

2.2 Status and Recommendations for Previously Impaired Waters

The 1995 New River Basinwide Plan identified one impaired stream segment in this subbasin: Little Buffalo Creek at NC 221. Little Buffalo Creek was again assigned an impaired rating, based on the most recent DWQ monitoring data. This section reviews use support and recommendations detailed in the 1995 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for this stream.

2.2.1 Little Buffalo Creek (3.8 miles from source to Buffalo Creek)

1995 Recommendation(s)

Approximately 1.7 miles of Little Buffalo Creek were listed as not supporting primarily due to bypasses of influent wastewater from the West Jefferson WWTP. Nonpoint sources include urban runoff and storm sewers from the Town of West Jefferson. Unnamed tributaries draining West Jefferson are piped under the town in storm sewers. Floor drains from businesses and one industry did lead directly to this storm sewer system and discharges from these drains were observed. The West Jefferson WWTP was under a Special Order by Consent (SOC) which required the town to resolve inflow and infiltration problems and attain compliance with the NPDES permit by December 31, 1995.

Status of Progress

Little Buffalo Creek received a Fair biological assessment rating in 1998, an improvement from the Poor rating assigned in 1993. Floor drains from businesses in the Town of West Jefferson have been eliminated. Stormwater infiltration into the West Jefferson WWTP collection system has been reduced significantly as a result of improvements made by the town under the SOC. More than 30 percent of the facility's treatment capacity has been restored. Modifications to the system may be responsible for improvements in water quality downstream of the facility. However, instream toxicity is still impacting benthic macroinvertebrates.

Little Buffalo Creek is biologically impaired and currently rated partially supporting. Sources of pollution are both point (West Jefferson WWTP) and nonpoint (extensive loss of riparian vegetation and urban runoff/storm sewers from the Town of West Jefferson). In addition to the tributaries mentioned above, sections of Little Buffalo Creek have also been placed in culvert pipes. Riparian buffer zones have been eliminated in many places, and in others, vegetation consists of only grass. More macroinvertebrates were collected in 1998 than in 1993, and there was a greater diversity of species represented in the sample. However, pollution tolerant organisms still dominate the benthic community in this stream.

2000 Recommendation(s)

Final construction plans have been submitted by the Town of West Jefferson for an upgrade of the WWTP, and the town is currently waiting for grant money to complete the project. If state grant money is awarded, the upgrade should be completed sometime in 2001. DWQ will continue to work with West Jefferson to resolve problems with the WWTP discharge.

Public education regarding the importance of good riparian buffer zones is needed in the West Jefferson/Jefferson area. Additionally, an erosion control ordinance can be an effective tool to lessen sedimentation impacts from new development in this growing area. Please refer to Section A, Chapter 4 for a more detailed discussion of impacts from sedimentation, loss of riparian vegetation and urbanization.

2.3 Status and Recommendations for Newly Impaired Waters

Although no additional stream segments were rated as impaired since 1994 in this subbasin, impacts from narrow riparian buffer zones, sedimentation and moderate to severe bank erosion were observed. Part 2.5 below discusses specific streams where these impacts were observed.

2.4 303(d) Listed Waters

Little Buffalo Creek is impaired and on the state's year 2000 303(d) list (not yet EPA approved). Refer to Appendix IV for more information on the state's 303(d) list and listing requirements.

2.5 Other Issues and Recommendations

The surface waters discussed in this section are fully supporting designated uses based on recent DWQ monitoring; however, these data revealed some impacts to water quality. Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended.

Lower numbers of intolerant benthic macroinvertebrate taxa (lower EPT richness) were observed in several streams in this subbasin. These streams include Buffalo Creek, Silas Creek and Three Top Creek. Benthic community impacts may be due, in part, to the effects of high flow and scouring prior to the 1998 basinwide survey. However, portions of these streams have narrow riparian zones and severe bank erosion that likely contributes to sedimentation and other forms of habitat degradation. Refer to Section A, Chapter 4 for more information regarding these problems.

Fish collections in Big Horse Creek (0.5 miles above the confluence with the North Fork New River) revealed fish abundance, overall diversity of species and diversity of darters. In addition, this site was one of the few locations from which no trout were collected. This site is below the Town of Lansing's WWTP discharge, but the 56-square mile watershed includes many sources of nonpoint source pollution as well.

Chapter 3 -
New River Subbasin 05-07-03
Includes the Little River Watershed

3.1 Water Quality Overview

Subbasin 05-07-03 at a Glance

Land and Water	
Land area:	156 mi^2
% of basin land area:	21
Stream miles:	146.4
Population Statistics	
1990 Est. pop.:	7,578 people
Pop. density:	49 persons/mi^2
Land Cover (%)	
Forest/Wetland:	52.76
Surface Water:	0.40
Urban:	0.44
Cultivated Crop:	1.57
Pasture/ Managed Herbaceous:	44.83
Use Support Summary	
Freshwater Streams:	
Fully Supporting:	146.4 miles
Partially Supporting:	0 miles
Not Supporting:	0 miles
Not Rated:	0 miles

This New River subbasin includes a portion of the watershed of the New River and the entire Little River watershed in Alleghany County. Flowing in a northeasterly direction, the Little River and its tributaries (including Brush Creek and Glade Creek) drain the Town of Sparta. Elk Creek, a New River tributary, is also included in this subbasin. A map including water quality sampling locations is presented as Figure B-3.

Biological ratings for these sample locations are presented in Table B-3. Refer to Appendix III for a complete listing of monitored waters and use support ratings.

The lower portion of the Little River is considered High Quality Waters (HQW), and the North Carolina portion of the New River has been designated Outstanding Resource Waters. It has been recommended that more of the Little River be considered for reclassification as HQW.

Agriculture (primarily pasture) and forest are the major land uses in the subbasin. Sparta is the only urban area, and the Sparta WWTP is the largest permitted discharger; only 14 percent of the basin's population resides in this subbasin. All waters are currently fully supporting designated uses.

Basinwide assessments show water quality in this subbasin continues to be generally rated Good to Excellent, based on benthic macroinvertebrate data. Some rating declines observed in 1998 may be due to flow changes, different sampling times or borderline classifications, rather than actual water quality degradation. New River, Elk Creek and Little River at SR 1128 are stations where decline in ratings may not be linked to an actual decline in water quality. The negative change in Bledsoe Creek from Good (1993) to the low end of Good-Fair (1998), however, is a reflection of increased impacts from urban development in and around the Town of Sparta.

Point source impacts (Fair benthos bioclassification) were observed prior to 1990 in the Little River below Sparta. But after improvements were made to the Sparta WWTP, water quality

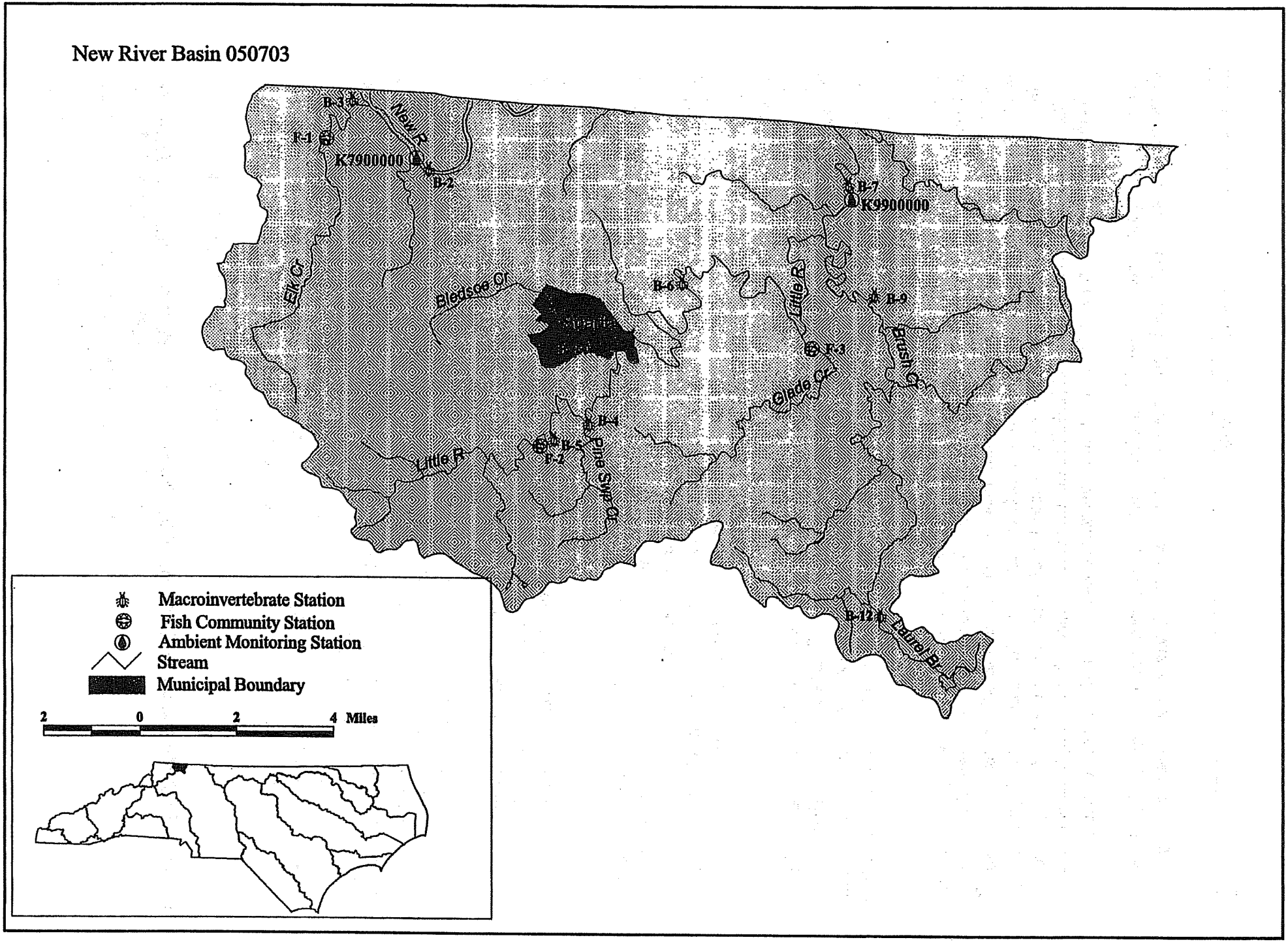


Figure B-3 Sampling Locations within Subbasin 05-07-03

improved markedly, and the downstream station received Excellent bioclassification ratings in both 1993 and 1998.

Special studies between 1988 and 1992 showed impacts to Laurel Branch during and after the construction of a golf community in the headwaters of this stream. The bioclassification dropped from Good-Fair to Fair-Poor over this period. In 1998, this stream was added to the basinwide sampling schedule and assigned a Good-Fair bioclassification. The last sample indicated recovery in Laurel Branch downstream of the development.

Table B-3 Biological Assessment Ratings (1998) for New River Subbasin 05-07-03 Sites

Site	Stream	County	Road	Rating
Benthic Macroinvertebrates				
B-2	New River	Alleghany	SR 1345	Good
B-3	Elk Creek	Alleghany	SR 1344	Good
B-4	Pine Swamp Creek	Alleghany	SR 1128	Good
B-5	Little River	Alleghany	SR 1128	Good
B-6	Little River	Alleghany	NC 1424	Excellent
B-7	Little River	Alleghany	NC 18	Excellent
B-8	Bledsoe Creek	Alleghany	SR 1172	Good-Fair
B-9	Brush Creek	Alleghany	SR 1422	Good
B-12	Laurel Branch	Alleghany	SR 1105	Good
Fish Community*				
F-1	Little River	Alleghany	SR 1128	Not Rated
F-2	Elk Creek	Alleghany	SR 1341	Not Rated
F-3	Glade Creek	Alleghany	SR 1422	Not Rated

* Refer to Section A, Part 3.3.2 for more information on fish community ratings.

Fish community analyses were conducted at three locations in this subbasin: Little River at SR 1128, Glade Creek and Elk Creek. NCIBI metrics are currently being revised; therefore, ecological health ratings were not assigned (see Section A, Chapter 3, Part 3.3.2 and Appendix II). However, data from Elk Creek (New River tributary) and Glade Creek (Little River tributary) show that nonpoint source pollution is causing impacts in this subbasin. Data from both of these streams indicate sedimentation and nutrient enrichment (DENR-DWQ, July 1999).

Fish tissue samples were collected from two sites: Little River at SR 1128 and Elk Creek. No samples exceeded water quality criteria for metals. Analyses for organic compounds (such as pesticides) were not conducted.

Ambient water chemistry stations are located on the New River at Amelia (SR 1345) and on the Little River near Blevins Crossroads (NC 18). Suspended solids concentrations at the Little River station exceeded a 20 mg/l reference value in 13 percent of samples collected between 1994 and 1998. Although the geometric means of bacteriological samples were below the 200

colonies/100ml reference level, these two stations had the highest levels of fecal coliform basinwide. Maximum values reached 10,000 colonies/100ml at the Little River station and 160,000 colonies/100ml at the New River station. Two of the most common pollutants in runoff associated with livestock grazing in riparian areas (with direct access to streams) are sediment and bacteria. Nutrient levels were also elevated at both stations. Straight piping of wastewater and failing septic systems also cause high levels of fecal coliform bacteria and nutrients in streams. Please refer to Section A, Chapter 3.3.5 for a more detailed discussion of ambient monitoring data.

For more detailed information on sampling and assessment of streams in this subbasin, refer to the *Basinwide Assessment Report* for the New River basin (DENR-DWQ, July 1999), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

3.2 Status and Recommendations for Previously Impaired Waters

The 1995 New River Basinwide Plan identified two segments of Laurel Branch as impaired in this subbasin. This section reviews use support and recommendations detailed in the 1995 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for these stream segments.

3.2.1 **Laurel Branch** (3.3 miles downstream of NC 21 and at SR 1105)

1995 Recommendation(s)

In 1988, headwater reaches of Laurel Branch were impounded by ponds built and managed by the Olde Beau golf course community. During and after construction of this community, much sedimentation was documented and the stream's bioclassification dropped from Good-Fair to Fair, and in some reaches to Poor, prior to 1990. Restoration of Laurel Branch was required by DWQ in 1989. Efforts included removing sediment, stabilizing the banks, and adding more natural stream substrate. Although the restoration was complete in 1991, and adequate instream habitat was present at the basinwide sampling location, the stream still received a rating of Fair in 1992. Several recommendations for improving sediment control were outlined in the 1995 basin plan.

Status of Progress

Laurel Branch was sampled again in 1998 during basinwide sampling and improvement was observed in the biological community. The stream received a Good-Fair rating. It is believed that this improvement is a result of a decrease in sediment loading combined with seven years of gradual biological recovery. There are still impacts to the biological community; however, the stream is no longer considered impaired.

3.3 Status and Recommendations for Newly Impaired Waters

Although no additional stream segments were rated as impaired since 1994 in this subbasin, impacts from narrow riparian buffer zones, sedimentation and moderate to severe bank erosion were observed. Part 3.5 below discusses specific streams where these impacts were observed.

3.4 303(d) Listed Waters

Currently, there are no waters rated as impaired in this subbasin. Additionally, there are no streams on the state's year 2000 303(d) list (not yet EPA approved). Refer to Appendix IV for more information on the state's 303(d) list and listing requirements.

3.5 Other Issues and Recommendations

The surface waters discussed in this section are fully supporting designated uses based on recent DWQ monitoring; however, these data revealed some impacts to water quality. Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended.

Increased development in and around the Town of Sparta and damage to riparian vegetation has degraded water quality in Bledsoe Creek. The stream receives very little shade and bank erosion and sedimentation impacts are evident. It is recommended that urban stormwater impacts to Bledsoe Creek be addressed to prevent further degradation of water quality in the biologically viable portions of this stream. Refer to Section A, Chapter 4 for more information about urbanization impacts and habitat degradation.

Fish community data from Elk Creek (New River tributary) and Glade Creek (Little River tributary) indicate sedimentation and nutrient enrichment. Pastures in the upper sections of these watersheds likely influence water quality at these locations.

Section C

Current and Future Water Quality Initiatives

Chapter 1 -
Workshop Summary

One workshop was held in the New River basin on June 24, 1999. The workshop was sponsored by the Ashe County Soil and Water Conservation District, the Natural Resources Conservation Service, New River Community Partners and the Town of Jefferson. There were 31 people in attendance representing a wide variety of interests.

DWQ staff gave presentations about basinwide planning and water quality assessment. A participant also presented information regarding the American Heritage Rivers Initiative. Workshop attendees were asked to discuss the following questions in small groups:

1) What are the most important issues to be addressed in the next basin plan?
2) Where are the problem areas or waters in the basin?

The discussion on these questions was very productive. Comments and responses were recorded. A general summary providing common ideas and viewpoints expressed by more than one group is presented below. DWQ considered these comments while drafting the revised New River Basinwide Water Quality Plan and will continue to use these comments to guide water quality activities in the New River basin. Detailed workshop notes are included as Appendix V.

Important Issues Basinwide

The most frequently cited threats to water quality identified by workshop participants were:

- Sedimentation (variety of sources)
- Nonpoint source pollution (agriculture, silviculture and urban runoff)
- Development
- Septic tanks and construction in floodplains
- Lack of public education regarding impacts to water quality and regulations

Please refer to Section A, Chapter 4 for discussion of some of these issues. All groups commented that nonpoint source pollution, primarily from excess sediment and/or nutrients and bacteriological contamination, was a major threat to water quality in the New River basin.

Problem Areas

All 12 streams mentioned were sampled by DWQ during 1998 basinwide sampling. Several streams were mentioned by more than one group:

- Peak and Little Peak Creeks
- Little Buffalo Creek
- Big and Little Horse Creek watersheds
- Laurel Branch

Chapter 2 -
Current Water Quality Programs and Projects

2.1 Introduction

This chapter summarizes some of the federal, state and localized programs and projects designed to improve and maintain water quality in the New River basin. Table C-1 outlines these projects. Many projects have applicability basinwide; some are for specific streams. This chapter is organized according to program or organization, rather than project. Therefore, included in the table is a reference to the part of this chapter where details regarding each project are provided.

Table C-1 Summary of Water Quality Improvement Projects in the New River Basin

Stream or Watershed	Project	Part of Section C	Project Lead	Funding Source
South Fork New River	Riparian Restoration	2.4.2	National Committee for the New River	CWMTF
South Fork New River	Stream Restoration	2.4.3	Town of Boone	CWMTF
Boone Creek	Stream Restoration	2.4.3	Town of Boone	CWMTF
Peak Creek Watershed	Ore Knob Mine Drainage Remediation	2.2.1	NC and Corps of Engineers	Section 319 CWMTF
Big Horse Creek	"Virginia Creeper" trail ext.	2.4.4	Ashe County	CWMTF
Helton Creek	Agricultural BMPs	2.3.1	Ashe Soil & Water Conservation	Ag. Cost Share
North and South Forks of the New River	NPS BMP implementation	2.2.4	Ashe County NRCS	EQIP
Basinwide	Watershed Planning & Education	2.4.5	The Conservation Fund	CWMTF
Basinwide	Christmas Tree BMP Demonstration Project	2.2.1	Avery County Coop. Extension Service	Section 319
Basinwide	Wetland & Riparian Restoration	2.3.1	NC Wetlands Restoration Program	State
Basinwide	Watershed-based Hazard Mitigation Plan	2.4.1	New River Community Partners*	FEMA
Basinwide	Restore riparian buffers; obtain conservation easements; strengthen public education; encourage BMPs	2.4.1	New River Community Partners*	American Heritage Rivers

- New River Community Partners includes the Conservation Trust for NC, The Conservation Fund, the Environmental Defense Fund, other organizations and governments, as well as local citizens (see Part 2.4.1).

Table C-1 does not represent a complete summary of the information in this chapter; rather it is a guide to information about projects in specific watersheds and the various organizations working in the New River basin.

2.2 Federal Initiatives

2.2.1 Clean Water Act – Section 319 Program

Section 319 of the Clean Water Act provides grant money for nonpoint source demonstration projects. Approximately $1 million is available annually for demonstration and education projects across the state. 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 319 grant program, including application deadlines and requests for proposals, are available online at http://h2o.enr.state.nc.us/nps/bigpic.htm.

Three projects in the New River basin have been partially funded (federal Section 319 money must be matched with nonfederal dollars) through the Section 319 base program between 1990 and 2000. Funding for the projects totaled $576,857. Table C-1 outlines the projects and a description of each is provided below.

Ore Knob Acid Drainage Remediation Projects
($456,857 – Section 319; $1,033,680 – CWMTF)

Drainage (both surface and groundwater) from the abandoned Ore Knob Mine is extremely acidic and has been severely impacting Peak and Little Peak Creeks, as well as Ore Knob Branch for many years. For more specific water quality information regarding these streams, refer to Section B, Chapter 1.

The Ore Knob Mine Drainage projects in the early 1990s attempted to address acidic drainage from the abandoned copper mine using the Anoxic Alkaline Drainage Treatment System (AADTS). This technology was previously used to treat acidic drainage from abandoned coal mines in Tennessee and was only six years old; therefore, this project was considered a demonstration. The AADTS involves intercepting acidic seepage as it leaves the tailings area while the concentration of dissolved oxygen is still low, then raising the pH by routing the acidic seepage water through limestone-filled trenches (maintaining the anoxic environment). Lastly, the water flows into a constructed wetland which is used as a retention area for oxidized and precipitated metals. In addition to the water quality treatment, the project included reshaping and revegetating the 20-acre tailings area in order to reduce surface runoff.

The initial project was completed in 1992. Revegetation of the tailings dam was unsuccessful due to the steep slope and extremely low acidity and erosive nature of the unconsolidated sandy loam soil. An expansion of the AADTS was funded by Section 319 in 1993. The project resulted in some reduced acidity in receiving streams for a short period of time. However, funds were not available for maintenance, and stream acidity increased again in a matter of months as the limestone treatment trenches became saturated with acid and metals. Overall, water quality in the receiving waters from Ore Knob Mine showed no substantial changes in pH, copper, zinc or iron between 1991 and 1996.

A new project to remediate acid drainage from the Ore Knob Mine is currently being partially funded by the Clean Water Management Trust Fund. In 1998, the Army Corps of Engineers

(COE) began a detailed site assessment of the Ore Knob mine area. Objectives of the site assessment include:

- Creating a detailed project map of the site including all sampling points for both water, tailings and material around the shaft.
- Conducting a literature search to determine the extent and configuration of the underground mines associated with Ore Knob and assembling the information from previous projects.
- Characterizing the tailings material to determine the potential for establishing vegetation.
- Conducting intensive water sampling to document the water quality and flow rates at the seeps and in Ore Knob Branch.
- Evaluation of stabilization strategies for the tailings dam.
- Evaluation of treatment wetland re-engineering and/or restoration potential.
- Based upon above findings and information, evaluation of the feasibility of site restoration and if determined feasible, development of site restoration plans.

This effort is a multiagency partnership, and no restoration efforts will be undertaken until a Project Cooperation Agreement has been signed by the state (Wetlands Restoration Program) and COE. Other agencies that are involved in this effort include: US Department of Interior – Office of Surface Mining, Environmental Protection Agency, US Department of Agriculture – Natural Resources Conservation Service, NC Division of Water Quality, and a local nonprofit – New River Community Partners (see Part 2.4.1).

New River Christmas Tree BMP Demonstration Project

At the request of the North Carolina Christmas Tree Growers Association and the Cooperative Extension Service, funding was granted for implementation and evaluation of BMPs to reduce: sediment runoff from agricultural land; potential for off-sight movement of pesticides; nutrients in runoff; and diseases. Fraser Fir Christmas tree production is by far the largest and fastest growing agricultural crop in the New River basin. Over 60 percent of the total Christmas trees grown in North Carolina are produced in the New River basin. It has been estimated that there are more than 1000 Christmas tree farmers, growing trees on more than 15,000 acres.

BMP standards for installation will be consistent with established management measures of the NRCS BMP Technical Guide and other BMP practices adopted by North Carolina State University. Water quality monitoring to evaluate the effectiveness of Christmas Tree BMPs will include upstream and downstream stormwater samples before and after BMP implementation. Stormwater samples will be collected using single-stage suspended sediment samplers. Permanent cross-sections will be established on five critical stream reaches to measure changes in channel and bank stability before and after BMP installation. Macroinvertebrate and fish assessments, riparian health assessments, and wetland inventories will also be conducted before and after BMPs.

Educational outreach will include on-farm Christmas tree BMP demonstrations, field days and tours. Christmas tree BMP research results will be published and distributed via newsletters and fact sheets. The targeted educational outreach audience will include Christmas tree farmers, local elected officials, local agency officials, teachers, students, volunteer monitors and other interested parties in Ashe, Alleghany, Watauga and Avery counties.

2.2.2 USDA – NRCS Environmental Quality Improvement Program (EQIP)

Natural Resources Conservation Service (NRCS) districts are able to compete for EQIP incentive funding which is allocated to priority areas where current available funding is identified as inadequate. A team of state agencies reviews new applications and reevaluates the performance of existing priority areas on an annual basis.

The Northwest Blue Ridge USDA-NRCS EQIP Priority area for FY2000 includes the New River basin. The overall priority area includes four counties (Ashe, Alleghany, Avery and Watauga) and parts of two hydrologic units: Upper New (05050001) and Watauga (04010103). Primary resource concerns include soil erosion and sedimentation, pesticide runoff and habitat degradation. The FY99 allocation was $60,404 and targeted practices included establishing an agri-chemical handling facility, alternative watering for livestock, access roads, and conservation cover. The FY2000 allocation (statewide) is approximately $80,000.

NRCS district contacts for the New River basin are included on the Nonpoint Source contact sheet found in Appendix VI or visit the website: http://www.nc.nrcs.usda.gov/Programs/eqip.htm.

2.2.3 American Heritage Rivers Designation

American Heritage Rivers is an initiative designed to more effectively use the federal government's resources. Environmental, economic and social concerns are addressed through a plan that is designed and driven by local communities. The initiative creates no new regulatory requirements for private property owners or for state, tribal or local governments. Participation in the nomination process is voluntary, and a community can decide to withdraw at any time.

Components of the American Heritage Rivers Initiative:

- Designate 10 rivers as American Heritage Rivers by 1998.
- Support local communities' goals for the designated river or river reach.
- Help cut red tape and provide focused federal support to designated rivers.
- Integrate economic, environmental and historic preservation programs of federal agencies to benefit communities engaged in efforts to protect their rivers.

Once a river is chosen, a single contact, called a "River Navigator", is available to facilitate federal assistance to complement existing project resources, helping citizens achieve the goals of their self-designed plan.

In addition, federal agencies make existing field staff available to each American Heritage River to help match community needs with available resources from current programs. For example, the River Navigator could work with the community to address pollution problems, attract small businesses, improve flood protection, protect agricultural land, and restore eroded streambanks.

The New River in North Carolina, along with the rest of the watershed in Virginia and West Virginia, was designated one of fourteen American Heritage Rivers on July 30, 1998. To date, approximately 1,000 agencies, organizations and individuals have participated in 24 meetings throughout Virginia's 11 counties, North Carolina's 3 counties and West Virginia's 7 counties; and 334 priority projects have been identified. A final, integrated watershed-wide work plan was

distributed in July 1999. Part 2.4.1 of this section discusses the efforts of the New River Community Partners (NRCP) in association with this designation.

For more information regarding the American Heritage Rivers Initiative, visit the website: http://www.epa.gov/owow/heritage/rivers.html or call (toll-free) 1-888-40RIVER. For more information regarding the American Heritage River Initiative in the New River basin, you may visit the website: http://www.epa.gov/rivers/98rivers/new.html.

2.3 State Initiatives

2.3.1 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 Best Management Practices (BMPs). These BMPs include vegetative, structural or management systems that can improve the efficiency of farming operations while reducing the potential for surface and ground water 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 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.

Many farmers in the New River basin have taken advantage of funding through the Agriculture Cost Share Program to install BMPs. From 1993 to 1999, more than 25 individual conservation plans have been implemented in the basin. The plans include livestock exclusion from streams, installation of alternative water supplies for livestock, reduction of animal waste, streambank stabilization, repair and stabilization of heavy use areas, and restoration of riparian vegetation.

Helton Creek Water Quality Improvements

Several farmers in the Helton Creek (tributary to North Fork New River) watershed have implemented conservation plans in a focused effort to improve water quality in this mountain trout stream. The benthic macroinvertebrate community received a Good rating in 1989 and an Excellent rating in 1998. This improvement is likely due in part to better habitat resulting from installation of BMPs on farmland in the watershed.

For more information about the NC Agriculture Cost Share Program, contact David Williams with the Division of Soil & Water Conservation at (919) 733-2302. In Ashe County, call Glen Sullivan at (336) 246-5461.

2.3.2 NC Wetlands Restoration Program

The North Carolina Wetlands Restoration Program (NCWRP) is a nonregulatory program responsible for implementing wetland and stream restoration projects throughout the state. The focus of the program is to improve water quality, flood prevention, fisheries, wildlife habitat and

recreational opportunities. The NCWRP is not a grant program. Instead, the program funds wetland, stream and riparian area projects directly through the Wetlands Restoration Fund.

Restoration sites are targeted through the use and development of the Basinwide Wetlands and Riparian Restoration Plans. These plans were developed, in part, using information compiled in DWQ's Basinwide Water Quality Plans. The Basinwide Wetlands and Riparian Restoration Plans are updated every five years on the same schedule as DWQ's Basinwide Water Quality Plans. Subbasin 05-07-01 is the updated priority subbasin listed within the revised 2000 *Basinwide Wetlands and Riparian Restoration Plan for the New River Basin.* As new data and information become available about water quality degradation issues, priority subbasins identified in the NCWRP's plans may be modified.

The NCWRP is also working to develop comprehensive Local Watershed Restoration Plans within the identified Priority Subbasins. These more locally-based plans will identify wetland areas, contiguous reaches of stream, and contiguous strips of buffer vegetation that, once restored, will provide significant water quality and other environmental benefits to watersheds. The NCWRP will coordinate with local community groups, local governments and others to develop and implement these plans.

The NCWRP can perform restoration projects cooperatively with other state or federal programs or environmental groups. For example, the NCWRP's efforts can complement projects funded through the Section 319 Program. Integrating wetlands or riparian area restoration components with 319 funded or proposed projects will often improve the overall water quality benefits of the project. The NCWRP actively seeks landowners within the New River basin who have restorable wetland, riparian and stream sites.

For more information about the NCWRP, please contact Crystal Braswell at (919) 733-5208 or visit the website: http://h2o.enr.state.nc.us/, then click on Wetlands Protection.

2.3.3 Wildlife Resources Commission Fisheries Management Direction

A *Draft Fisheries Management Direction for the New River Basin* was completed by the NC Wildlife Resources Commission (WRC) in May 1998. The document summarizes WRC's general direction for managing fisheries resources in the New River basin. Specific habitat-related problems which impair a stream's ability to support quality fisheries are identified. The focus of the plan is on riparian and wetland areas with the intention of providing input to the Wetlands Restoration Program described above.

WRC fisheries management activities within the New River basin include monitoring the abundance of fish populations, establishing harvest and size limit regulations, stocking fish, and protecting or enhancing habitat. Recently in the New River basin, WRC staff worked with the Department of Transportation (NCDOT) on a project to widen NC Highway 16 through Glendale Springs in Ashe County. Major concerns regarding this project were potential adverse impacts to waters supporting wild brook trout and a mountain bog where WRC staff collected a bog turtle egg in 1990. As a result of an on-site meeting in December 1996, NCDOT staff agreed to examine alternatives to relocating 300 feet of an unnamed tributary to Obids Creek where WRC staff collected wild brook trout in November 1996. Additionally, NCDOT staff planned to

consult an expert on mountain bogs to determine if the project would impact the bog. The permit application (submitted to the US Army Corps of Engineers) is being revised so that this project might incur fewer impacts to streams (and possibly wetlands) in this area. Currently, this section of road is not scheduled for widening work until (at least) 2002.

The *Draft Fisheries Management Direction for the New River Basin* is cited in both Section A, Chapter 4 and individual subbasin chapters in Section B. For additional information regarding local fisheries, contact Kin Hodges by calling (336) 374-6446 or visit the Wildlife Resources Commission website: http://www.state.nc.us/Wildlife/.

2.3.4 Clean Water Management Trust Fund

The Clean Water Management Trust Fund 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 New River basin, six projects have been funded for a total of $2,821,380. The largest amount of funding ($1,033,680) was for restoration of water quality in the Ore Knob Mine area. Table C-1, in Part 2.1 of this section, outlines the projects and provides reference to the location of project descriptions in the plan.

For more information on the CWMTF or these grants, call (252) 830-3222 or www.cwmtf.net.

2.4 Local Initiatives

Protection of the New River by local citizens has gone on for centuries, but is well-documented back to 1965. When the Appalachian Power Company applied for a license to dam the New and build reservoirs in Virginia and North Carolina, citizens in the area banded together in a true grassroots effort to prevent it, and today the river still flows freely and with good water quality. Local initiatives continue, big and small, in the North Carolina portion of the New River basin and many of them are summarized in this section.

2.4.1 New River Community Partners

After the American Heritage Rivers Initiative was announced by President Clinton, citizens living in the headwater counties of the New River basin held community meetings to discuss the needs, issues and opportunities facing them. As a result of these meetings, an application was submitted on behalf of the New River. After the New River was designated, another series of meetings were held to translate their ideas into a detailed, practical work plan. The result was a list of more than fifty programs and projects developed by more than 200 residents of Alleghany, Ashe, Watauga and Grayson (VA) counties in over 20 planning sessions.

New River Community Partners (NRCP) is a grassroots organization founded to oversee the implementation of the American Heritage Rivers Initiative for the New River. In keeping with the grassroots nature of the initiative, NRCP's role is not to implement projects, but to provide support and assistance to the local and regional groups that planned them. This support takes the form of providing regional coordination with the River Navigator, helping create new partnerships, and developing relationships with state and federal agencies.

The New River Headwaters Work Plan is divided into four categories, reflecting the four topics addressed in the New River's American Heritage River application. This discussion will focus primarily on the Natural Resource Protection component. This is the largest section of the plan and contains the projects that will have the biggest effect on water quality in the basin.

Four Components of the New River Headwaters Work Plan:

- Natural Resource Protection
- Economic Revitalization
- Historic and Cultural Preservation
- Training and Education

Many projects in the Natural Resource Protection category are geared toward sustainable agriculture practices and education. Agriculture is a critical part of the economy, history and culture of the New River basin in North Carolina, but these activities can also impact water quality. The importance of best management practices (BMPs) is stressed in one action item geared toward strengthening public education about agricultural activities. Others address grazing of livestock along streams, Christmas tree production and timber harvesting.

Some projects deal with areas of the basin that are discussed by this and/or the 1995 *New River Basinwide Water Quality Management Plan* as having impacts or impairment. NRCP is working with the Town of Boone to ensure that projects the town has planned achieve completion (refer to Part 2.4.3 for project details). Stormwater mitigation, low impact development and floodplain management are all action items that apply to a broader area. Please refer to Section A, Chapter 4 for a discussion of urbanization impacts in the New River basin.

Other action items that address impacts discussed in Section A, Chapter 4 include projects aimed at developing riparian buffers and fish habitat, placing more land in conservation easement, and eliminating straight piping. New River Community Partners is also handling community involvement aspects of remediation efforts in the Ore Knob mine area.

Watershed-Based Hazard Mitigation Plan

The Federal Emergency Management Agency (FEMA) is planning to fund the first-ever watershed-based All-Hazards Mitigation Plan in the New River basin. Key components of this plan include:

a) Development of a reconnaissance-level map and database in GIS format of all 21 counties (in three states -- North Carolina, Virginia and West Virginia) in the New River watershed.
b) Community-level outreach to identify natural hazards (flooding, heavy snows, ice storms, high winds, forest fires, landslides, etc.) and man-made hazards (train wrecks along the river, shipping of hazardous materials, inappropriate development, nonpoint source pollution, etc.).
c) Identification of priority hazard mitigation projects to be implemented in the near future.

This project is the first that has addressed hazard mitigation on a watershed basis and is also the first to integrate conservation priorities (e.g., protected natural areas serving as buffers during flood conditions) as a means of hazard mitigation. New River Community Partners is working with citizens, elected officials, farmers, business owners, landowners, chambers of commerce, economic developers and other organizations to complete this pilot plan.

NRCP Executive Director, Patrick Woodie, can be reached by calling (336) 372-8118 or by email: pwoodie@skybest.com. Many of the New River Community "Partners" are discussed in more detail below.

2.4.2 Conservation Trust for North Carolina

The mission of the Conservation Trust of North Carolina (CTNC) is to conserve land resources through direct action and by helping communities, private land trusts and individual landowners protect lands most important to them for their natural, scenic, historic and recreational values.

CTNC helps government agencies allocate funds to local trusts or districts seeking funding for activities including land acquisition and water quality projects. The organization also acts as a service/resource center for local land trusts, as well as a mentor to help start new local trusts. A Land Trust Council has been established to distribute information to the various land trusts statewide and to represent them at the legislature. Local land trusts pay an annual fee to belong to the Council, receiving legal counsel, trust information and discounts on publications. Organizations associated with CTNC that work in the New River basin and surrounding watersheds include the Southern Appalachian Highlands Conservancy and Blue Ridge Rural Land Trust, the High Country Conservancy, and the National Committee for the New River, Inc.

For more information about CTNC, contact Kathy Drew at (919) 828-4199 or visit the website: http://metalab.unc.edu/ctnc/trusts/.

National Committee for the New River, Inc.

The National Committee for the New River, Inc. (NCNR) works to protect and preserve the unique natural and cultural qualities of the New River and the Watauga River and their watersheds in North Carolina, Virginia and West Virginia. NCNR has worked to obtain conservation easements along the South Fork New River and has helped the state buy property in order to extend the New River State Park system.

River Builder Riparian Restoration Project

The National Committee for the New River received funding from the NC Clean Water Management Trust Fund ($75,000) and the Mary Duke Biddle Foundation for restoration work in the North Carolina portion of the New River basin. This money was used in 1998 and 1999 for a summer youth program and for streambank stabilization. Approximately 52 disadvantaged young people from Ashe and Alleghany counties (Job Training and Partnership Act youth work teams) and AmeriCorps Teams (youth from around the US) worked to clean up 105 miles of stream in the New River basin over the course of the two summers. A New River Scholarship program for local youth participants has been established; the first awards were expected in summer of 1999. In November 1999, the CWMTF awarded an additional $90,200 to continue this restoration work.

Additionally, 42,000 tree seedlings and live stakes were planted along 5.3 miles of streambank. The North Carolina Christmas Tree Association provided 25 workers for a day of planting. As a result of planting on portions of New River State Park land, $17,000 in Wildlife Habitat

Improvement Project (WHIP) funds will be available to be shared by the Park and the River Builder Project. New River State Park and Natural Resources Conservation Service staff have provided technical and logistical support for the River Builder Project.

For additional information regarding the River Builder Project, contact Director, Jim Winfield, by calling (336) 372-5022. The Executive Director of the National Committee for the New River, Inc., Jeffrey Scott, may be reached by calling (336) 246-4871.

2.4.3 Town of Boone

The 1995 *New River Basinwide Water Quality Management Plan* stated that the Middle Fork South Fork New River was "mostly impacted by urban runoff within the Town *(of Boone)* limits". The Town of Boone has been and continues to work toward improving stormwater and floodplain management, including minimization of impervious surfaces and reduction of pollutants. Middle Fork South Fork New River has been removed from the list of impaired waters, but some water quality impacts were still observed during 1998 basinwide sampling (refer to Section B, Chapter 1 for further discussion).

Stormwater and Floodplain Management

The Town of Boone, using primarily Hazard Mitigation Funds from FEMA, relocated 30 homes out of the 100-year floodplain in Boone between May 1997 and September 1998. The homes are being renovated for low and middle-income housing. Six to seven more homes are in various stages of this relocation/renovation process. Additionally, construction is beginning on a new nursing home to replace a current facility that is also in a 100-year floodplain. The new building should be completed by 2001; the old one will then be removed. Once the relocations are complete, the floodplain area will be used as greenway/open space for recreation. No structures will be built and impervious surfaces will be limited.

A draft stormwater management plan is currently before the Town Council. The study looked at impacts of new and existing development on stormwater and flooding through 2002. Many recommendations are outlined in the plan, including a requirement for stormwater detention for new development.

South Fork New River Stream Restoration

This project will restore approximately 1,700 feet of stream adjacent to the floodplain area where homes were relocated under the FEMA sponsored hazard mitigation project described above. Restoration will include streambank stabilization through slope reduction and vegetative planting, and the use of rock cross veins to manage channel slope and reduce pressure on the banks of the channel.

Boone Creek Stream Restoration

The focus of the project is to restore a half-mile section of Boone Creek. The creek is one of many in the Town of Boone that makes up the headwaters of the South Fork New River. Sediment loading during storm events is due to increased bank erosion resulting from

urbanization in Boone and development surrounding Appalachian State University upstream. The restoration effort will employ techniques to restore both function and habitat in the stream. This project will also involve a thorough assessment of other streams within Boone in order to develop a prioritized list for future projects.

For more information regarding stormwater, floodplain management or stream restoration projects in the Town of Boone, contact Resource Director, Jim Byrne, at (828) 265-3206 or by email at jimbyrne@hotmail.com.

2.4.4 Ashe County

Virginia Creeper Trail Extension

The Virginia-Carolina Railway, later known as the Norfolk and Western, ran 79 miles between Abington, Virginia and Todd, North Carolina along the Big Horse Creek. The "Virginia Creeper", as it was known, ran for nearly 80 years, closing in 1977. In Virginia, a 34-mile section was opened as a recreational trail popular for biking, hiking and horseback riding. The CWMTF awarded Ashe County up to $636,000 to acquire easements on this trail. As is still common, the rail line followed the stream, and easements will provide a permanent buffer to the stream which currently has excellent water quality.

Not only will the project extend a popular recreational trail, but the easement acquisition will protect water quality conditions along nearly all 14 miles of Big Horse Creek. The project will be administered through the Region D Council of Governments with the eventual goal of extending the trail and its easement protections to southern Ashe County and the Town of Todd.

2.4.5 The Conservation Fund

The Conservation Fund seeks sustainable conservation solutions for the 21st century, emphasizing the integration of economic and environmental goals. Through real estate transactions, demonstration projects, education and community-based activities, the Fund seeks innovative long-term measures to conserve land and water.

The Conservation Fund works on a premise that economic and environmental returns can be compatible. The Conservation Fund is the first national conservation organization whose charter includes economic development and conservation as primary goals. In some situations, the Fund simply provides or finds funds to buy ecologically or culturally significant land (and water), moving quickly on behalf of public agencies to secure prime acres for conservation. These properties are then set aside as parks, wildlife refuges, greenways or historical areas.

The Conservation Fund works with New River Community Partners, HandMade in America and others to promote programs that will help communities in the New River basin develop in a sustainable manner. Using widely accepted economic development techniques, such as downtown revitalization, heritage tourism, eco-tourism, agricultural tourism and sustainable agriculture, the Fund promotes economic and social improvement while also protecting and showcasing important natural, cultural, historic and community resources.

The Conservation Fund received money from the NC Clean Water Management Trust Fund (CWMTF) to prepare a Geographic Information System (GIS) model that identifies priority areas for water quality protection in Watauga, Ashe and Alleghany counties. The Fund is also working with several local land trusts on outreach to farmers and others to determine landowners' interest in selling conservation easements and planting riparian buffers to protect HQWs and ORWs in the New River basin. The CWMTF also funded a wastewater treatment study that will determine the feasibility of alternative systems to protect the land and water resources in this rural mountain region.

For further information, visit the website: http://www.conservationfund.org/conservation/ or contact Mikki Sager by calling (919) 967-2223.

2.4.6 Environmental Defense

The Environmental Defense (ED) is a not-for-profit environmental advocacy group placing particular emphasis on protecting and restoring the biodiversity of rivers, coastal systems and watersheds, which are especially important ecosystems. ED works with grassroots groups and local communities to create solutions that win lasting political, economic and social support because they are bipartisan, efficient and fair. ED was instrumental in helping to obtain funding for water quality work in the Peak Creek watershed of the New River basin. Please refer to Part 2.2.1 of this section for a more complete project description.

For more information about ED, visit the website: http://www.edf.org or for updates on projects in the New River basin, contact Joe Rudeck at the NCED office in Raleigh: (919) 881-2601.

2.4.7 Western North Carolina Tomorrow

Through a 100-member board of community leaders working as volunteers, Western North Carolina Tomorrow (WNCT) focuses and acts on regional issues that affect the future of North Carolina mountain counties. Although none of the three counties that make up the New River basin are official members of this organization, much of the material provided in terms of educational materials, workshops and conferences is applicable to the basin. The group has been working on regional issues pertaining to planning and sustainable development and has assisted mountain counties in obtaining funding for local land use planning.

Issues addressed by WNCT include straight piping of sewage, erosion and sedimentation, and loss of farmland. A regional sediment workshop is held annually near Boone with funding from the NC Sedimentation Pollution Control Commission. Riparian restoration has also been a focus of a conference conducted by WNCT.

Some language used in Section A, Chapter 4 to describe water quality issues in the New River basin came from Western NC Tomorrow's website: http://www.wnct.org/. For further information, contact Natural Resource Program Manager, Phillip Gibson, by calling (828) 227-7492.

Chapter 3 -
Future Water Quality Initiatives

3.1 Overall DWQ Goals for the Future

The long-term goal of basinwide management is to protect the water quality standards and uses of the surface waters in the state while accommodating reasonable economic growth. Attainment of these goals and objectives will require determined, widespread public support; the combined cooperation of state, local and federal agencies, agriculture, forestry, industry and development interests; and considerable financial expenditure on the part of all involved. With this needed support and cooperation, DWQ believes that these goals are attainable through the basinwide water quality management approach.

In addition to these efforts, DWQ will continue to pursue several programmatic initiatives intended to protect or restore water quality across the state. These include NPDES Program Initiatives, better coordination of basinwide planning, use restoration waters program for nonpoint source pollution, and improving database management and use of GIS capabilities. Summaries of these initiatives are outlined below.

NPDES Program Initiatives

In the next five years, efforts will be continued to:

- improve compliance with permitted limits;
- improve pretreatment of industrial wastes discharged to municipal wastewater treatment plants so as to reduce effluent toxicity;
- encourage pollution prevention at industrial facilities in order to reduce the need for pollution control;
- require dechlorination of chlorinated effluents or use of alternative disinfection methods for new or expanding facilities;
- require multiple treatment trains at wastewater facilities; and
- require plants to begin plans for enlargement well before they reach capacity.

Long-term point source control efforts will stress reduction of wastes entering wastewater treatment plants, seeking more efficient and creative ways of recycling by-products of the treatment process (including reuse of nonpotable treated wastewater), and keeping abreast of and recommending the most advanced wastewater treatment technologies.

DWQ requires all new and expanding dischargers to submit an alternatives analysis as part of its NPDES permit application. Non-discharge alternatives, including connection to an existing WWTP or land-applying wastes, are preferred from an environmental standpoint. If the Division determines that there is an economically reasonable alternative to a discharge, DWQ may deny the NPDES permit.

DWQ will continue to make greater use of discharger self-monitoring data to augment the data it collects. Quality assurance, timing and consistency of data from plant to plant are issues of importance. Also, a system will need to be developed to enter the data into a computerized database for later analysis.

Coordinating Basinwide Planning with Other Programs

The basinwide planning process can be used by other programs as a means of identifying and prioritizing waters in need of restoration or protection efforts and provides a means of disseminating this information to other water quality protection programs. For example, the plan can be used to identify and prioritize wastewater treatment plants in need of funding through DWQ's Construction Grants and Loan Program. The plans can also assist in identifying projects and waters applicable to the goals of the Clean Water Management Trust Fund, Wetlands Restoration Program or Section 319 grants program. Information and finalized basin plans are provided to these offices for their use and to other state and federal agencies.

Use Restoration Waters (URW) Program for Nonpoint Source Impairment

DWQ has developed a conceptual strategy to manage watersheds with nonpoint source impairments as determined through the Use Support designations. In July 1998, the state Environmental Management Commission approved the Use Restoration Waters (URW) program concept which will target all NPS impaired waters in the state using a two-part approach. As envisioned, this classification will apply to all watersheds that are not supporting or partially supporting their designated uses. The program will catalyze voluntary efforts by stakeholder groups in impaired watersheds to restore those waters by providing various incentives and other support. Simultaneously, the program will develop a set of mandatory requirements for NPS pollution categories for locations where local groups choose not to take responsibility for restoring their impairments. This URW concept offers local governments an opportunity to implement site-specific projects at the local level as an incentive ("the carrot"). If the EMC is not satisfied with the progress made towards use restoration by local committees, impairment based rules will become mandatory in those watersheds ("the stick").

These mandatory requirements may not be tailored to specific watersheds but may apply more generically across the state or region. DWQ staff has developed a timeline to accomplish the following within five years from July 1998: work with stakeholder groups to develop mandatory requirements; acquire the resources needed to carry out the program; develop criteria for voluntary local programs and supporting incentive tools; and proceed through formal rule making for the mandatory requirements. The form of the URW program will be strongly influenced by the year-long stakeholder input process.

With more than 400 impaired watersheds or stream segments in the state, it is not realistic for DWQ to attempt to develop watershed specific restoration strategies for nonpoint source pollution. By involving the stakeholders in these watersheds, we believe we can catalyze large-scale restoration of impaired waters. We anticipate that one of the major implementation challenges of this new program will be educating public officials and stakeholders at the local level as to the nature and solutions to their impairments. To address this challenge, the state plans to develop a GIS-based program to help present information at a scale that is useful to local

land management officials. Other incentives that the state might provide include seed grants and technical assistance, as well as retaining the authority to mandate regulations on stakeholders who are not willing to participate.

In cases where incentives and support do not result in effective watershed restoration strategies, mandatory impairment source management requirements would be implemented in the watershed. This is not the state's preferred alternative, as it would add to state monitoring and enforcement workload. However, in areas where it is necessary, DWQ plans to implement such requirements. In the management area, DWQ would be assisted by regulatory staff from the Divisions of Environmental Health and Land Resources and to insure compliance.

Improved Data Management and Expanded Use of Geographic Information System (GIS) Computer Capabilities

DWQ is in the process of centralizing and improving its computer data management systems. Most of its water quality program data (including permitted dischargers, waste limits, compliance information, water quality data, stream classifications, etc.) will be put in a central data center which will then be made accessible to most staff at desktop computer stations. Some of this information is also being submitted into the NC Geographic Data Clearinghouse (Center for Geographic Information and Analysis or CGIA). As this and other information (including land use data from satellite or air photo interpretation) is made available to the GIS system, the potential to graphically display the results of water quality data analysis will be tremendous.

Additional Research and Monitoring Needs

DWQ staff have identified some additional research needs that would be useful for assessing, protecting and restoring the water quality of the New River basin. The following list is not inclusive. Rather, it is meant to stimulate ideas for obtaining more information to better address water quality problems in the basin. With the newly available funding programs (Clean Water Management Trust Fund and Wetlands Restoration Program) and the existing Section 319 grant program, it may be desirable for grant applicants to focus proposals on the following issues:

- *More resources are needed to address nonpoint sources of pollution*. Identifying nonpoint sources of pollution and developing management strategies for impaired waters, given the current limited resources available, is an overwhelming task. Therefore, only limited progress towards restoring NPS impaired waters can be expected unless substantial resources are put towards solving NPS problems.
- *Urban planning (specifically for the Naked, Little Buffalo and Bledsoe Creek drainage areas) are needed*. Increasing population in these areas will demand more water and generate more wastewater. In addition, conversion of land from forests and farms will increase impervious surfaces producing higher than natural streamflows and cause erosion. Streams in these areas will likely remain (or become) impaired unless this growth is planned for and managed properly.

3.2 DWQ Compliance and Enforcement Policy Revisions

DENR began implementing a new two-stage compliance and enforcement policy in 1997. Both stages of the revised policy are in effect as of July 1, 1999. The five major elements of the policy are intended to provide a comprehensive route to strengthen enforcement and heighten compliance for all dischargers and nonpoint sources of water pollution in North Carolina. The five major components of the policy are to:

1. Foster compliance through pollution prevention, technical assistance and training, reevaluate existing grant and loan funding priority criteria, and develop recognition and incentive programs.
2. Enhance enforcement through increased penalties, penalties for sewer collection systems, reduced thresholds for noncompliance, and delegation of civil penalty assessment authority to the DWQ regional office supervisors.
3. Focus on chronic and willful violators through increased use of moratoriums on expanding and additional connections, expansion of notification to the public of violators, clarification of process of determining "noncompliance", and initiation of discussion with stakeholders on possible legislative actions.
4. Assure improvement in compliance and enforcement through development of accountability measures.
5. Find and use all available resources for compliance needs with local, state and nonprofit groups.

DENR is also in the process of conducting an assessment of its enforcement programs. The goal of the assessment is to identify potential areas for improvement in DENR's efforts to enforce environmental laws and ultimately improve compliance. This effort got underway in July 1999 with two focus group meetings. If you would like to see the Scope of Work for the enforcement assessment, see DENR's web page at: http://www.enr.state.nc.us/novs/scope.htm/.

References

Creager, C.S. and J.P. Baker. 1991. *North Carolina's Basinwide Approach to Water Quality Management: Program Description.* Division of Environmental Management. Water Quality Section. Raleigh, NC.

Environmental Defense Fund (EDF). 1998. *Soiled Streams: Cleaning Up Sediment Pollution in North Carolina Waters.* Raleigh, NC.

Karr, J.R. 1981. *Assessment of Biotic Integrity Using Fish Communities.* Fisheries 6:21-27.

____. K.D. Fausch, P.L. Angermeier, P.R. Yant and I.J. Schlosser. 1986. *Assessing Biological Integrity in Running Water: A Method and its Rationale.* Ill. Nat. Hist. Surv. Spec. Publ. 5. 28 pp.

New River Community Partners (NRCP). July 1999. *The American Heritage Rivers New River Work Plan.* Sparta, NC.

____. December 1998. *New River Headwaters Work Plan Extended Version.* Sparta, NC.

North Carolina Department of Environment and Natural Resources (DENR). Division of Land Resources (DLR). Land Quality Section. July-September 1999. *Sediments: Newsletter of the North Carolina Sediment Control Commission.* Vol. 6 No. 3. Raleigh, NC.

____. Division of Land Resources. Land Quality Section. 1998. *What is Erosion and Sedimentation?* Raleigh, NC.

____. Division of Water Resources (DWR). January 2000. *Draft State Water Supply Plan.* Raleigh, NC.

____. Division of Water Quality (DWQ). 2000. *Classifications and Water Quality Standards Assigned to the Waters of the New River Basin.* North Carolina Administrative Code: 15A NCAC 2B .0307. Raleigh, NC.

____. Division of Water Quality. Environmental Sciences Branch. July 1999. *Basinwide Assessment Report New River Basin.* Raleigh, NC.

____. Division of Water Quality. Wetlands Restoration Program. September 1998. *Basinwide Wetlands and Riparian Restoration Plan for the New River Basin.* Raleigh, NC.

North Carolina Department of Environment, Health and Natural Resources (NCDEHNR). 1997. Environmental Sciences Branch. Ecosystems Analysis Unit. Biological Assessment Group. *Standard Operating Procedures: Biological Monitoring.* Raleigh, NC

References (con't)

North Carolina Department of Natural Resources and Community Development (NRCD). Division of Forest Resources. September 1989. *Forestry Best Management Practices Manual.* Raleigh, NC.

North Carolina Wildlife Resources Commission (NCWRC). Division of Inland Fisheries. May 1998. *Draft Fisheries Management Direction for the New River Basin.* Raleigh, NC.

US Department of Agriculture (USDA). Natural Resources Conservation Service. November 1995. *North Carolina Cooperative Hydrologic Unit River Basin Study.* North Carolina State Office. Raleigh, NC.

____. Natural Resources Conservation Service. 1994. *1992 National Resources Inventory.* North Carolina State Office. Raleigh, NC.

____. Soil Conservation Service. 1982. *1982 National Resources Inventory.* Raleigh, NC.

US Environmental Protection Agency (EPA). 1999. Watershed Academy Website: http://www.epa.gov/OWOW/watershed/wacademy/.

____. 1997. *Catalog of Federal Funding Sources for Watershed Protection.* EPA 841-B-97-008. Office of Water (4503F). United States Environmental Protection Agency. Washington, DC. 98 pp.

Western North Carolina Tomorrow (WNCT). 1999. *A Mountain Home Before You Buy.* Cullowhee, NC.

____. 1999. Sediment and Erosion Control Webpage: http://wnct.org/psas/sediment.htr.

Appendix I

NPDES Dischargers in the New River Basin

Permit	Facility	County	Region	Type	Ownership	D1	D2	D3	D4	D5	Qw*	Subbasin	Stream
NC0030848	Jefferson Apparel Co – WWTF / Ashe	Ashe	Winston-Salem	Minor	Non-Municipal	2					0.008	50701	Dog Creek
NC0027286	Blowing Rock, Town - WWTP	Watauga	Winston-Salem	Minor	Municipal	1					0.8	50701	Middle Fork of South Fork New River
NC0032131	Tweetsie Railroad	Watauga	Winston-Salem	Minor	Non-Municipal	13					0.07	50701	Middle Fork of South Fork New River
NC0032158	Roaring River Chalets	Watauga	Winston-Salem	Minor	Non-Municipal	13					0.005	50701	Middle Fork of South Fork New River
NC0021709	Jefferson WWTP, Town of	Ashe	Winston-Salem	Minor	Municipal	1	63				0.3	50701	Naked Creek
NC0044423	Appalachian State University - WTP	Watauga	Winston-Salem	Minor	Non-Municipal	21					0	50701	Norris Branch
NC0020621	Boone, Town – WWTP / Casey Land	Watauga	Winston-Salem	Major	Municipal	1					3.2	50701	South Fork New River
NC0067016	Watauga Co BOE - Parkway Elem	Watauga	Winston-Salem	Minor	Non-Municipal	3					0.005	50701	UT Laxon Creek
NC0039608	Summit Woods I Apartments	Watauga	Winston-Salem	Minor	Non-Municipal	7	40				0.0083	50701	UT Middle Fork New River
NC0083470	Jefferson/West Jefferson, Town - WT	Ashe	Winston-Salem	Minor	Non-Municipal	21					0	50701	UT Naked Creek
NC0066028	Lansing, Town - WWTP	Ashe	Winston-Salem	Minor	Municipal	1					0.05	50702	Big Horse Creek
NC0030325	Buffalo Meadows - Hydrologic	Ashe	Winston-Salem	Minor	Non-Municipal	5					0.01	50702	Buffalo Creek
NC0000019	United Chemi-Con, Inc.	Ashe	Winston-Salem	Major	Non-Municipal	2	10	14	16	59	1.018	50702	North Fork New River
NC0020451	West Jefferson WWTP, Town of	Ashe	Winston-Salem	Minor	Municipal	1	19	27	53		0.369	50702	UT Little Buffalo Creek
NC0081531	Parkway Heritage Inn	Alleghany	Winston-Salem	Minor	Non-Municipal	10	13				0.004	50703	Laurel Branch
NC0084832	High Meadow Inn	Alleghany	Winston-Salem	Minor	Non-Municipal	10	13				0.025	50703	Laurel Branch
NC0026913	Sparta WWTP, Town of	Alleghany	Winston-Salem	Minor	Municipal	1					0.6	50703	Little River
NC0078158	O.B.G.P. Company	Alleghany	Winston-Salem	Minor	Non-Municipal	2					0.02	50703	UT Laurel Branch

Key to Discharge Codes

*Qw = Discharge in million gallons per day (MGD)

1 Domestic Waste – Municipal
2 Domestic Waste – Industrial/Commercial
3 Domestic Waste – Schools
5 Domestic Waste – Subdivisions
7 Domestic Waste – Apartments
10 Domestic Waste – Restaurants
13 Domestic Waste – Lodging (Hotels, Motels, Guest Houses, Campgrounds, etc.)
14 Non-contact Cooling water/Condensate
16 Boiler Blowdown
19 Wood Products
21 Water Plants
27 Beverage Production
40 Laundry Waste
53 Dairy Product Processing
59 Electrical/Electronic Components Production
63 Rubber Processing

Appendix II

Water Quality Data Collected by DWQ

- **Benthic Macroinvertebrate Collections**
- **Fish Community Assessments**

Benthic Macroinvertebrate Sampling Methodology and Bioclassification Criteria

Benthic macroinvertebrates can be collected using two sampling procedures. DWQ's standard qualitative sampling procedure includes 10 composite samples: two kick-net samples, three bank sweeps, two rock or log washes, one sand sample, one leafpack sample, and visual collections from large rocks and logs. The purpose of these collections is to inventory the aquatic fauna and produce an indication of relative abundance for each taxon. Organisms are classified as Rare (1-2 specimens), Common (3-9 specimens), or Abundant (≥10 specimens).

Several data analysis summaries (metrics) can be produced from standard qualitative samples to detect water quality problems. These metrics are based on the idea that unimpaired streams and rivers have many invertebrate taxa and are dominated by intolerant species. Conversely, polluted streams have fewer numbers of invertebrate taxa and are dominated by tolerant species. The diversity of the invertebrate fauna is evaluated using taxa richness counts; the tolerance of the stream community is evaluated using a biotic index.

EPT taxa richness (EPT S) is used with DWQ criteria to assign water quality ratings (bioclassifications). "EPT" is an abbreviation for Ephemeroptera + Plecoptera + Trichoptera, insect groups that are generally intolerant of many kinds of pollution. Higher EPT taxa richness values usually indicate better water quality. Water quality ratings are also based on the relative tolerance of the macroinvertebrate community as summarized by the North Carolina Biotic Index (NCBI). Both tolerance values for individual species and the final biotic index values have a range of 0-10, with higher numbers indicating more tolerant species or more polluted conditions. Water quality ratings assigned with the biotic index numbers are combined with EPT taxa richness ratings to produce a final bioclassification, using criteria for mountain/piedmont/coastal plain streams. EPT abundance (EPT N) and total taxa richness calculations also are used to help examine between-site differences in water quality. If the EPT taxa richness rating and the biotic index differ by one bioclassification, the EPT abundance value is used to determine the final site rating.

Benthic macroinvertebrates can also be collected using the DWQ's EPT sampling procedure. Four composite samples are taken at each site instead of the 10 taken for the qualitative sample: 1 kick, 1 sweep, 1 leafpack and visual collections. Only intolerant EPT groups are collected and identified, and only EPT criteria are used to assign a bioclassification.

The expected EPT taxa richness values are lower in small high quality mountain streams, <4 meters in width or with a drainage area <3.5 square miles. For these small mountain streams, an adjustment to the EPT taxa richness values is made prior to applying taxa richness criteria. Both EPT taxa richness and biotic index values also can be affected by seasonal changes. DWQ criteria for assigning bioclassification are based on summer sampling (June-September). For samples collected in other seasons, EPT taxa richness can be adjusted. The biotic index values can also be seasonally adjusted for samples collected outside the summer season.

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is not assessed as well by a taxa richness analysis. Different criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina.

Benthic Macroinvertebrate Collections in the New River Basin (1983-1998)

New River Subbasin 05-07-01

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT	Bioclass
Middle Fk S Fk New R, US 321 & Blue Ridge Pkwy, Watauga	B-1	10-1-2-(6)	11/89	-/18	-/3.54	Fair
Middle Fk S Fk New R, US 321 & Gold Mine Cr, Watauga	B-2	10-1-2-(6)	11/89	-/32	-/3.39	Good
Middle Fk S Fk New R, SR 1522, Watauga	**B-3**	10-1-2-(15)	08/98	-/31	-/3.13	Good
			07/93	-/37	-/3.10	Excellent
East Fk S Fk New R, SR 1522, Watauga	**B-4**	10-1-3-(8)	08/98	-/32	-/3.46	Good
			07/93	-/37	-/3.49	Excellent
S Fk New R, Hunting Ln, Watauga	B-5	10-1-(3.5)	07/88	-/27	-/4.04	Good-Fair
S Fk New R, US 421/221, Watauga (Perkinsville)	**B-6**	10-1-(3.5)	08/98	71/22	5.70/4.17	Good-Fair
			07/93	69/18	6.22/3.89	Fair
			07/88	72/26	6.30/4.55	Good-Fair
			07/86	70/18	6.92/5.09	Fair
			08/84	49/16	6.27/4.08	Fair
S Fk New R, SR 1355, Watauga	B-7	10-1-(3.5)	07/88	-/33	-/4.46	Good
S Fk New R, SR 1352 Watauga	B-8	10-1-(3.5)	07/88	98/41	5.28/4.03	Good
Winkler Cr, SR 1549, Watauga	**B-9**	10-1-4-(3.5)	08/98	-/34	-/2.96	Good
			07/93	-/37	-/2.19	Excellent
Howard Cr, SR 1306, Watauga	B-10	10-1-9-(6)	03/90	-/36	-/2.15	Good
Howard Cr, SR 1328, Watauga	**B-11**	10-1-9-(6)	08/98	-/40	-/2.77	Excellent
			07/93	102/52	3.91/2.90	Excellent
			07/88	-/38	-/3.34	Excellent
Meat Camp Cr, SR 1335, Watauga	B-12	10-1-10	03/90	-/42	-/2.39	Good
Meat Camp Cr, SR 1333, Watauga	**B-13**	10-1-10	08/98	-/39	-/2.79	Excellent
			07/93	-/31	-/2.68	Good
			03/90	-/37	-/2.63	Good
Grassy Cr, SR 1351, Ashe	B-14	10-1-14	03/90	-/40	-/2.85	Good
Elk Cr, NC 194, Ashe	B-15	10-1-15	04/96	-/39	4.56/3.49	Excellent
S Fk New R, US 221 (Fleetwood), Ashe	B-16	10-1-(20.5)	07/93	116/49	4.72/3.60	Excellent
S Fk New R, SR 1169, Ashe	**B-17**	10-1-(20.5)	08/98	101/48	4.68/3.57	Excellent
Mill Cr, SR 1109, Ashe	B-18	10-1-18	03/90	-/33	-/2.69	Good-Fair
S Fk New R, NC 16/88 (Jefferson), Ashe	**B-19**	10-1-(20.5)	08/98	95/48	4.03/3.27	Excellent
			07/93	104/51	3.42/2.83	Excellent
			07/90	97/50	3.84/3.19	Excellent
			08/87	105//50	4.30/3.43	Excellent
Old Field Cr, SR 1106, Ashe	B-20	10-1-22	04/96	-/44	-/2.13	Excellent
			03/90	-/42	-/2.42	Excellent
W Pr Old Field Cr (Call Cr), SR 1112, Ashe	B-21	10-1-22-1	07/93	83/39	3.66/2.74	Excellent
			05/90	-/42	-/1.98	Excellent
Gap Cr, US 221, Ashe	B-22	10-1-23-(0.5)	04/96	-/29	-/2.98	Good-Fair
Pine Swamp Cr, SR 1179	B-23	10-1-24	03/90	-/31	-/2.55	Good-Fair
Beaver Cr, SR 1181, Ashe	B-24	10-1-25	03/90	-/37	-/2.87	Good
Bear Cr, NC 18, Ashe	B-25	10-1-28	03/90	-/35	-/2.12	Good
Roan Cr, SR 1588, Ashe	**B-26**	10-1-31-(2)	08/98	-/39	-/2.74	Excellent
			07/93	-/39	-/3.14	Excellent
Naked Cr, NC 16/88, ab WWTP, Ashe	**B-27**	10-1-32	08/98	71/32	5.28/4.11	Good-Fair
			07/93	84/36	4.74/3.91	Good
			07/86	78/29	5.33/4.17	Good-Fair
Naked Cr, old SR 1585, be WWTP, Ashe	**B-28**	10-1-32	08/98	49/13	7.53/5.12	Poor
			07/93	54/18	6.79/5.33	Fair
			07/86	41/6	7.94/5.34	Poor
Dog Cr, SR 1592	B-29	10-1-33	03/90	-/32	-/2.92	Good
S Fk New R, US 221 at Scottsville, Ashe	**B-30**	10-1-(33.5)	08/98	111/55	4.27/3.31	Excellent
			07/93	103/46	4.07/2.96	Excellent
			05/90	-/59	-/2.83	Excellent
			03/90	84/48	3.83/2.78	Good
			08/89	95/44	4.26/3.63	Excellent

			08/87	101/45	4.71/3.44	Excellent
New River Subbasin 05-07-01 (cont.)						
Site	**Site #**	**Index #**	**Date**	**S/EPT S**	**BI/BIEPT**	**Bioclass**
			08/85	92/38	5.44/3.61	Good-Fair
			05/85	133/63	3.96/3.15	Excellent
			02/85	102/45	4.32/3.20	Good
			12/84	110/47	4.24/3.12	Good
			08/83	95/42	4.25/3.53	Good
Peak Cr, ab Ore Knob Br, off SR 1599, Ashe	**B-31**	10-1-35	08/98	-/35	-/2.93	Good
			04/96	74/42	3.60/2.59	Excellent
			07/93	-/35	-/2.74	Good
			04/91	101/50	3.43/2.70	Excellent
			03/90	-/38	-/2.46	Good
Peak Cr, be Ore Knob Br, off SR 1599, Ashe	**B-32**	10-1-35	01/99	-/6	-/1.98	Poor
			08/98	-/23	-/3.42	Good-Fair
			04/96	30/19	3.67/2.09	Fair
			07/93	-/4	-/3.75	Poor
			04/91	46/22	4.02/2.96	Fair
			03/90	-/6	-/2.05	Poor
Peak Cr, SR 1599 ab L Peak Cr, Ashe	B-33	10-1-35	01/99	-/9	-/3.53	Poor
			04/96	18/8	3.95/1.96	Poor
			04/91	39/17	3.79/2.07	Fair
Peak Cr, SR 1595 nr mouth, Ashe	B-34	10-1-35	04/96	16/8	4.17/2.55	Poor
			04/91	31/11	4.82/2.16	Fair
L Peak Cr, off SR 1595	**B-35**	10-1-35-4	08/98	-/7	-/2.00	Poor
			04/96	16/7	-/3.11	Poor
			04/91	-/5	-/2.02	Poor
Nathans Cr, SR 1596, Ashe	B-36	10-1-36	03/90	-/24	-/2.72	Good-Fair
Nathans Cr, off US 221, Ashe	B-37	10-1-36	08/98	-/29	-/3.10	Good-Fair
			05/98	-/38	-/3.87	Good
Cranberry Cr, SR 1609 Ashe	B-38	10-1-37	08/98	81/43	4/40/3.21	Good
Cranberry Cr, SR 1603, Ashe	**B-39**	10-1-37	08/98	79/42	3.90/3.13	Excellent
Cranberry Cr, SR 1600, Ashe	B-40	10-1-37	07/93	-/46	-/3.16	Excellent
			03/90	-/37	-/2.89	Good
Meadow Fk, off SR 1193, Ashe	B-41	10-1-37-2	05/98	91/56	2.77/1.68	Excellent
			08/98	64/41	2.57/1.42	Excellent
Meadow Fk, SR 1145, Ashe	B-42	10-1-37-2	05/98	88/50	3.48/2.44	Excellent
Piney Fk, SR 1149/NC 18, Ashe	B-43	10-1-37-3	05/98	72/35	3.47/1.99	Good
Reeves Br, NC 18/13, Ashe	B-44	10-1-37-3-2	08/98	85/40	3.66/2.97	Excellent
			05/98	94/54	3.64/2.96	Excellent
Prathers Cr, SR 1300, Alleghany	B-45	10-1-38	03/90	-/33	-/3.07	Good-Fair

New River Subbasin 05-07-02

Site	**Site #**	**Index #**	**Date**	**S/EPT S**	**BI/BIEPT**	**Bioclass**
N Fk New R, SR 1100, Ashe	**B-1**	10-2-(1)	08/98	96/52	4.11/3.34	Excellent
			07/93	102/50	3.87/2.97	Excellent
			03/89	-/42	-/2.73	Good
Hoskins Fk, off NC 88, Ashe	**B-2**	10-2-7	08/98	-/35	-/3.71	Good
			07/93	-/31	-/3.25	Good
N Fk New R, SR 1340, Ashe	B-3	10-2-(12)	03/89	99/48	4.14/2.97	Good
N Fk New R, SR 1644, Ashe	**B-4**	10-2-(12)	08/98	87/50	3.84/2.96	Excellent
			07/93	93/46	4.02/2.91	Excellent
			03/90	88/52	3.34/2.73	Excellent
			03/89	-/33	-/2.67	Good
N Fk New R, NC 16, Ashe	**B-5**	10-2-(12)	08/98	87/47	4.01/3.01	Excellent
			07/93	116/57	3.89/2.50	Excellent
			08/89	101/45	4.28/3.60	Excellent
			03/89	90/47	3.94/2.72	Good
			08/87	99/45	4.39/3.38	Excellent
			08/85	87/33	4.80/3.23	Good
			08/83	88/41	3.63/2.87	Excellent
Three Top Cr, SR 1100, Ashe	**B-6**	10-2-13	08/98	77/41	4.35/3.56	Good
			07/93	95/48	3.67/2.86	Excellent

New River Subbasin 05-07-02 (con't)

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT	Bioclass
			03/89	-/38	-/2.40	Good
Long Hope Cr, SR 1100, Ashe	B-7	10-2-13-3	03/90	-/32	-/1.62	Good
Big Laurel Cr, SR 1322, Ashe	B-8	10-2-14	03/90	-/32	-/2.44	Good
Big Laurel Cr, SR 1315, Ashe	B-9	10-2-14	12/84	83/35	4.16/2.88	Good-Fair
Big Laurel Cr, NC 88, Ashe	**B-10**	10-2-14	08/98	-/40	-/3.66	Excellent
			07/93	-/48	-/3.26	Excellent
Rich Hill Cr, NC 88, Ashe	B-11	10-2-15	07/93	-/38	-/3.13	Excellent
Buffalo Cr, SR 1125/1133, Ashe	B-12	10-2-20	07/86	82/38	3.18/2.75	Good
			02/85	74/38	4.01/2.98	Good
Buffalo Cr ab L Buffalo Cr, Ashe	B-13	10-2-20	05/85	87/38	4.43/2.80	Good
Buffalo Cr , NC 88/194, Ashe	**B-14**	10-2-20	08/98	-/26	-/3.99	Good-Fair
			07/93	-/38	-/2.76	Excellent
			05/85	88/37	5.45/3.22	Good-Fair
L Buffalo Cr, NC 221, Ashe	B-15	10-2-20-1	05/85	24/4	7.68/3.92	Poor
L Buffalo Cr, nr SR 1153, Ashe	**B-16**	10-2-20-1	08/98	39/14	7.11/5.38	Fair
			07/93	24/0	8.31/0.00	Poor
			05/85	26/5	8.32/1.74	Poor
			02/85	22/5	8.36/2.65	Poor
L Buffalo Cr, 2.6 miles be WWTP, Ashe	B-17	10-2-20-1	02/85	44/16	6.44/4.11	Fair
UT L Buffalo Cr, ab WWTP, Ashe	B-18	10-2-20-1	07/93	27/6	7.83/1.95	Poor
			05/85	27/7	7.87/3.66	Poor
			02/85	22/4	8.18/2.14	Poor
Big Horse Cr, SR 1362, Ashe	B-19	10-2-21-(4.5)	03/90	-/33	-/2.16	Good-Fair
Big Horse Cr, SR 1644/NC 194, Ashe	**B-20**	10-2-21-(7)	08/98	103/56	4.24/3.23	Excellent
			07/93	129/56	3.95/2.64	Excellent
			03/89	-/41	-/2.75	Good
Little Horse Cr, SR 1334, Ashe	**B-21**	10-2-21-8	08/98	-/35	-/3.76	Good
Little Phoenix Cr, SR 1573, Ashe	B-22	10-2-23	05/98	72/41	3.35/2.46	Good
Silas Cr, SR 1544, Ashe	**B-23**	10-2-24	08/98	-/31	-/2.61	Not Rated
			05/98	73/40	3.37/2.15	Not Rated
			07/93	-/39	-/2.59	Not Rated
Old Field Cr, SR 1537, Ashe	B-24	10-2-26	05/98	77/36	3.60/2.31	Good
Helton Cr, SR 1536, Ashe	**B-25**	10-2-27	08/98	-/37	-/3.13	Excellent
Helton Cr, SR 1539, Ashe	B-26	10-2-27	03/89	-/34	-/2.59	Good

New River Subbasin 05-07-03

Site	Site #	Index #	Date	S/EPT S	BI/BIEPT	Bioclass
Little R, be NC 18/SR 1141, Alleghany	B-1	10	05/98	71/40	2.46/1.74	Good
New R, SR 1345, Alleghany	**B-2**	10	08/98	73/37	4.40/3.31	Good
			07/93	102/47	4.76/3.72	Excellent
			07/90	99/49	4.89/3.38	Good
			08/89	97/43	4.20/3.61	Good
			07/88	104/42	5.39/4.10	Good
			08/87	99/41	4.87/3.72	Good
			08/86	123/43	5.43/4.23	Good
			07/85	113/45	5.48/4.05	Good
			08/84	100/45	4.34/3.59	Excellent
			08/83	105/50	4.61/3.84	Excellent
Elk Cr, SR 1344, Alleghany	**B-3**	10-6-(2)	08/98	-34	-/3.55	Good
			07/93	-/36	-/3.60	Excellent
Pine Swamp Cr, SR 1128, Alleghany	**B-4**	10-9-5	08/98	-/34	-/3.58	Good
			07/93	-/33	-/3.62	Good
Little R, SR 1128, Alleghany	**B-5**	10-9-(6)	08/98	72/37	4.01/3.29	Good
			07/93	84/45	3.37/2.62	Excellent
			03/89	-/43	-/2.76	Good
Little R, SR 1424, Alleghany	**B-6**	10-9-(6)	08/98	80/41	4.00/3.07	Excellent
			07/93	98/48	4.02/3.03	Excellent
			03/89	-/19	-/3.26	Fair
Little R, NC 18, Alleghany	**B-7**	10-9-(6)	08/98	84/46	3.62/2.85	Excellent
			07/93	89/49	3.78/2.93	Excellent

New River Subbasin 05-07-03 (con't) Site	Site #	Index #	Date	S/EPT S	BI/BIEPT	Bioclass
			07/90	93/44	4.36/3.23	Excellent
			03/89	106/56	3.75/2.61	Excellent
			07/88	95/45	4.50/3.23	Excellent
			08/86	111/46	4.50/3.10	Excellent
			08/84	109/49	3.98/3.16	Excellent
Bledsoe Cr, SR 1172, Alleghany	**B-8**	10-9-7	08/98	-/21	-/4.78	Good-Fair
			07/93	-/33	-/3.43	Good
Brush Cr, SR 1422, Alleghany	**B-9**	10-9-10	08/98	62/36	4.12/3.69	Good
			07/93	96/40	4.78/3.50	Good
Laurel Br, off NC 21, Alleghany	B-10	10-9-10-2	09/92	-/5	-/6.47	Poor
			08/88	-/8	-/2.77	Poor
Laurel Br, NC 21, Alleghany	B-11	10-9-10-2	08/88	-/15	-/3.43	Fair
Laurel Br, SR 1105, Alleghany	**B-12**	10-9-10-2	08/98	49/28	3.78/2.90	Good
			09/92	-/14	-/4.52	Fair
			08/89	-/11	-/4.00	Fair
			12/88	-/17	-/3.83	Fair
			08/88	-/22	-/2.83	Good-Fair
L Glade Br, at Parkway, Alleghany	B-13	10-9-10-3	09/92	99/46	3.42/2.42	Excellent
L Glade Br, be NC 21, Alleghany	B-14	10-9-10-3	09/92	92/46	3.76/2.71	Excellent

Fish Sampling and Assessment

At each sample site, a 200-meter section of stream is selected and measured. The fish in the delineated stretch of stream are then collected using two backpack electrofishing units and two persons netting the stunned fish. After collection, all readily identifiable fish (usually sport fishes, catfishes and suckers) are examined for sores, lesions, fin damage and skeletal anomalies, measured (total length to the nearest 1 mm), and then released. The remaining fish (i.e., those fish that are not readily identifiable) are preserved in 10% formalin and returned to the laboratory for identification, examination and total length measurement. Young-of-year fish are excluded from all analyses. The resulting data are then analyzed using the NCIBI.

The assessment of biological integrity using the NCIBI is provided by the cumulative assessment of 12 parameters or metrics. The values provided by the metrics are converted into scores on a 1, 3 or 5 scale. A score of 5 represents conditions which would be expected for undisturbed streams in the specific river basin or ecoregion, while a score of 1 indicates that the conditions deviate greatly from those expected in undisturbed streams of the region. 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. Finally, the score (an even number between 12 and 60) is then used to determine the ecological integrity class, as proposed by Karr (1981), of the stream from which the sample was collected.

Scores and attributes for evaluating a wadeable stream using the North Carolina Index of Biotic Integrity are presented in the table below.

NCIBI Scores	Karr's Integrity Classes	Class Attributes[1]
58 or 60	Excellent	Comparable to the best situations without human disturbance. All regionally expected species for the habitat and stream size, including the most intolerant forms are present, along with a full array of size classes and a balanced trophic structure.
54 or 56 48, 50 or 52	Good-Excellent Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant species; some species are present with less than optimal abundances or size distributions; and the trophic structure shows some signs of stress.
46 40, 42 or 44	Fair-Good Fair	Signs of additional deterioration include the loss of intolerant species, fewer species and a highly skewed trophic structure.
36 or 38 28, 30, 32 or 34	Poor-Fair Poor	Dominated by omnivores, tolerant species and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; and diseased fish often present.
24 or 26 12, 14, 16, 18, 20 or 22	Very Poor-Poor Very Poor	Few fish present, mostly introduced or tolerant species; and disease fin damage and other anomalies are regular.
-----	No fish	Repeated sampling finds no fish.

[1] Over-lapping classes share attributes with classes greater than and less than the respective NCIBI score.

The NCIBI has been revised since 1997 Standard Operating Procedures were printed (NCDEHNR, 1997). Recently, the focus of using and applying the NCIBI has been restricted to wadeable streams that can be sampled by a crew of four persons. Further refinements have also been made to many of the criteria of most of the 12 metrics.

In an effort to simplify and standardize the evaluation of a stream's ecological integrity and water quality bioclassification whether using a fish community or benthic invertebrate assessment, the fish community integrity classes were also modified. However, NCIBI ratings were not given to the fish communities in the New River basin because of the small sample size (n = 12) and because 1998 was the first year that the basin had been evaluated using the NCIBI.

Fish community assessments in the New River Basin (1990-1998)

Subbasin/Stream	Road	County	Map F#	Index #	D.A. (mi^2)	Date	NCIBI Score	NCIBI Class[1]
050701								
Middle Fk S Fk New R	SR 1522	Watauga	F-1	10-1-2-(15)	12.0	06/09/98	56	NR
South Fork New River	US 421	Watauga	F-2	10-1-(3.5)	34.2	06/08/98	50	NR
Howard Creek	SR 1306	Watauga	F-3	10-1-9-(6)	7.9	06/08/98	50	NR
Meat Camp Creek	SR 1333	Watauga	F-4	10-1-10	19.7	06/09/98	48	NR
Old Field Creek	SR 1106	Ashe	F-5	10-1-22-(0.7)	13.0	10/02/90	52	NR
Naked Creek	NC 16/88	Ashe	F-6	10-1-32	7.6	06/09/98	42	NR
Cranberry Creek	SR 1600	Ashe	F-7	10-1-37	36.8	06/30/98	48	NR
050702								
North Fork New River	SR 1119	Ashe	F-1	10-2-(1)	23.9	06/29/98	48	NR
Big Horse Creek	SR 1350	Ashe	F-2	10-2-21-(7)	56.2	06/29/98	42	NR
Helton Creek	SR 1536	Ashe	F-3	10-2-27	43.7	06/30/98	50	NR
050703								
Little River	SR 1128	Alleghany	F-1	10-9-(1)	14.1	07/07/98	54	NR
Elk Creek	SR 1341	Alleghany	F-2	10-9-(2)	17.4	06/30/98	50	NR
Glade Creek	SR 1422	Alleghany	F-3	10-9-9	13.6	07/01/98	54	NR

[1] NR = not rated

Appendix III

Use Support Methodology
and
Use Support Ratings

Use Support: Definitions and Methodology

A. Introduction to Use Support

Waters are classified according to their best intended uses. Determining how well a waterbody supports its designated uses (*use support* status) is another important method of interpreting water quality data and assessing water quality. Use support assessments are presented in Section A, Chapter 3 and for each subbasin in Section B.

Surface waters (streams or lakes) are rated as either *fully supporting* (FS), *partially supporting* (PS) or *not supporting* (NS). The terms refer to whether the classified uses of the water (such as water supply, aquatic life protection and swimming) are fully supported, partially supported or are not supported. For instance, waters classified for fishing and water contact recreation (Class C) are rated as fully supporting if data used to determine use support (such as chemical/physical data collected at ambient sites or benthic macroinvertebrate bioclassifications) did not exceed specific criteria. However, if these criteria were exceeded, then the waters would be rated as PS or NS, depending on the degree of exceedence.

An additional use support category, fully supporting but threatened (ST), was used in previous 305(b) reports. In the past, ST was used to identify a water that was fully supporting but had some notable water quality concerns. ST could represent constant, degrading or improving conditions. North Carolina's past use of ST was very different from that of the US Environmental Protection Agency (EPA), which uses it to identify waters that are characterized by declining water quality (EPA Guidelines for Preparation of the Comprehensive State Water Quality Assessments [305(b) Reports] and Electronic Updates, 1997). Given the difference between US EPA's and North Carolina's definitions of ST and the resulting confusion that arises from this difference, North Carolina no longer subdivides the fully supporting category. However, the waterbodies and the specific concerns remain identified in the basin plans so that data, management and the need to address the identified concerns is not lost.

Waters that are either partially supporting or not supporting are considered *impaired* and are rated based on specific criteria discussed more fully below. There must be a specified degree of degradation before a waterbody is considered impaired. This differs from the word impacted, which can refer to any noticeable or measurable change in water quality, good or bad. Waters which have inconclusive or no data to determine their use support were listed as not rated (NR).

B. Interpretation of Data

The assessment of water quality presented in this document involved evaluation of available water quality data to determine a waterbody's use support rating. In addition, an effort was made to determine likely causes (e.g., habitat degradation or nutrients) and sources (e.g., agriculture, urban runoff, point sources) of waterbody degradation. Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data, and shellfish sanitation surveys from the NC Division of Environmental Health (as appropriate). Although there is a general procedure for analyzing the data and determining a waterbody's use support rating, each

waterbody is reviewed individually, and best professional judgment is applied during these determinations.

Interpretation of the use support ratings compiled by DWQ should be done with caution. The methodology used to determine the ratings must be understood, as should the purpose for which the ratings were generated. The intent of use support assessments by basin is to gain an overall picture of the water quality, to describe how well these waters support the uses for which they were classified, and to document the relative contribution made by different pollution sources.

The data are not intended to provide precise conclusions about pollutant budgets for specific watersheds. Since the assessment methodology is geared toward general conclusions, it is important not to manipulate the data to support policy decisions beyond the accuracy of these data.

C. Assessment Methodology – Freshwater Streams

Many types of information are used to determine use support assessments and to determine causes and sources of use support impairment. A use support data file is maintained for each of the 17 river basins. In these files, stream segments are listed as individual records. All existing data pertaining to a stream segment are entered into its record. In determining the use support rating for a stream segment, corresponding ratings are assigned to data values where appropriate. The following data and the corresponding use support ratings are used in the process.

1. Biological Data

Benthic Macroinvertebrate Bioclassification

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample based on the number of taxa present in the intolerant groups Ephemeroptera, Plecoptera and Trichoptera (EPTs) and the Biotic Index (BI), which summarizes tolerance data for all taxa in each collection. The bioclassifications are translated to use support ratings as follows:

Bioclassification	Rating
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting
Fair	Partially Supporting
Poor	Not Supporting

Fish Community Structure

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 index incorporates information about species richness and composition, trophic composition, fish abundance and fish condition. The index is translated to use support ratings as follows:

NCIBI	Rating
Excellent	Fully Supporting
Good	Fully Supporting
Good-Fair	Fully Supporting
Fair	Partially Supporting
Poor	Not Supporting

Phytoplankton and Algal Bloom Data

Prolific growths of phytoplankton, often due to high concentrations of nutrients, sometimes result in "blooms" in which one or more species of alga may discolor the water or form visible mats on top of the water. Blooms may be unsightly and deleterious to water quality, causing fish kills, anoxia, or taste and odor problems. An algal sample with a biovolume larger than 5,000 mm^3/m^3, density greater than 10,000 units/ml, or chlorophyll *a* concentration approaching or exceeding 40 micrograms per liter (the NC state standard) constitutes a bloom. Best professional judgment is used on a case-by-case basis in evaluating how bloom data should be used to determine the use support rating of specific waters. The frequency, duration, spatial extent, severity of blooms, associated fish kills, or interference with recreation or water supply uses are all considered.

2. Chemical/Physical Data

Chemical/physical water quality data are collected through the Ambient Monitoring System as discussed in Section A, Chapter 3. These data are downloaded from the ambient database, the Surface Water Information Management System, to a desktop computer for analysis. Total number of samples and percent exceedences of the NC state standards are used for use support ratings. Percent exceedences correspond to use support ratings as follows:

Standards Violation*	Rating
Criterion exceeded ≤10%	Fully Supporting
Criterion exceeded 11-25%	Partially Supporting
Criterion exceeded >25%	Not Supporting

* Percentages are rounded to the nearest whole number. A minimum of ten samples is needed.

It is important to note that some waters may exhibit characteristics outside the appropriate standards due to natural conditions (e.g., many swamp waters are characterized by low pH). These natural conditions do not constitute a violation of water quality standards.

Data for copper, iron and zinc are not used according to the percent excess scheme outlined above. Because these metals are generally not bioaccumulative and have variable toxicity to aquatic life because of chemical form, solubility and stream characteristics, they have *action level* standards. In order for an action level standard to be violated, there must be a toxicological test that documents an impact on a sensitive aquatic organism. The action level standard is used to screen waters for potential problems with copper, iron and zinc. Best professional judgement is used to determine which streams have metal concentrations at potentially problematic levels.

Streams with high metal concentrations are evaluated for toxicity, and they may be rated as PS or NS if toxicity tests or biomonitoring (e.g., benthic macroinvertebrate communities) indicate problematic metal levels.

Fecal coliform bacteria data are not used alone to determine a partially or not supporting rating. The geometric mean is calculated using monthly samples, and if the geometric mean is above 200 colonies per 100 ml, fecal coliform bacteria are listed as a problem parameter. Because North Carolina's fecal coliform bacteria standard is 200 colonies per 100 ml for the geometric mean of *five samples taken in a thirty-day period*, fecal coliform bacteria are listed as a cause of impairment for the 303(d) list only when the standard is exceeded.

3. Source and Cause Data

In addition to the above data, existing information is documented for potential sources and causes of stream degradation. It is important to note that not all impaired waterbodies have sources and/or causes listed for them. Additionally, fully supporting waterbodies may have sources and/or causes of stream degradation as well. Staff and resources do not currently exist to collect this level of information for all waterbodies. Much of this information is obtained through the cooperation of other agencies (federal, state and local), organizations and citizens.

Point Source Data

Whole Effluent Toxicity Data: Many facilities are required to monitor whole effluent toxicity by their NPDES permit or by administrative letter. Streams that receive a discharge from a facility that has failed its whole effluent toxicity tests may have that facility listed as a potential source of pollution.

Daily Monitoring Reports: Streams which receive a discharge from a facility significantly out of compliance with permit limits may have that facility listed as a potential source of pollution.

Nonpoint Source Data

Nonpoint sources of pollution (i.e., agriculture, urban and construction) are identified by monitoring staff, other agencies (federal, state and local), land use reviews, and public workshops.

Problem Parameters

Causes of stream degradation (problem parameters), such as habitat degradation and low dissolved oxygen, are also identified for specific stream segments where possible. For streams with ambient water quality stations, those parameters which exceed the water quality standard ≥11 percent of the time for the review period are listed as a problem parameter. Zinc, copper and iron are listed as problem parameters if levels are high enough to impact the biological community (see *Chemical/Physical Data* section). Fecal coliform bacteria are listed as a problem parameter if the geometric mean is greater than 200 colonies per 100 ml. For segments without ambient stations, information from reports, other agencies and monitoring staff is used if it is available.

Habitat degradation is identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization, streambed scour, lack of riparian vegetation, loss of pools or riffles, and loss of woody habitat.

4. Outside Data

DWQ actively solicits outside data and information. Data from outside DWQ, such as USGS ambient monitoring data, volunteer monitoring data, and data from academic researchers, are screened for data quality and quantity. If data are of sufficient quality and quantity, they are incorporated into use support assessments. A minimum of ten samples over a period of two years is needed to be considered for use support assessments. The way the data are used depends on the degree of quality assurance and quality control of the collection and analysis of the data. Data of the highest quality are used in the same fashion as DWQ data to determine use support ratings. Data with lower quality assurance may be used to pinpoint causes of pollution and problem parameters. They may also be used to limit the extrapolation of use support ratings up or down a stream 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.

5. Monitored vs. Evaluated

Assessments are made on either a monitored (M) or evaluated (E) basis depending on the level of information that was available. Because a monitored rating is based on more recent and site-specific data, it is treated with more confidence than an evaluated rating.

Refer to the following summary for an overview of assigning use support ratings.

Summary of Basis for Assigning Use Support Ratings to Freshwater Streams

Overall Basis	Specific Basis	Description
Monitored	Monitored (M)	Monitored stream segments[1] with data[2] ≤5[3] years old.
	Monitored/Evaluated (ME)	Stream segment[1] is unmonitored, but is assigned a use support rating based on another segment of same stream for which data[2] ≤5[3] years old are available.
Evaluated	Evaluated (E)	Unmonitored streams that are direct or indirect tributaries to monitored stream segments rated FS. Must share similar land use to the monitored stream segment.
	Evaluated/Old Data (ED)	Monitored stream segments[1] with available data[2] >5[3] years old.
Not Rated	Not Rated (NR)	No data available to determine use support. Includes unmonitored streams that are direct or indirect tributaries to stream segments rated PS or NS.

[1] A stream segment is a stream, or a portion thereof, listed in the Classifications and Water Quality Standards for a river basin. Each segment is assigned a unique identification number (index number).

[2] Major data sources include benthic macroinvertebrate bioclassifications, fish community structure (NCIBI), and chemical/physical monitoring data.

[3] From the year that basin monitoring was done.

6. Assigning Use Support Ratings to Freshwater Streams

At the beginning of each assessment, all data are reviewed by subbasin with the monitoring staff. Discrepancies between data sources are resolved during this phase of the process. For example, a stream may be sampled for both benthic and fish community structure, and the benthic bioclassification may differ from the NCIBI (i.e., the bioclassification may be FS while the NCIBI may be NS). To resolve this, the final rating may defer to one of the samples (resulting in FS or NS), or it may be a compromise between both of the samples (resulting in PS).

After reviewing the existing data, use support ratings are assigned to the streams. If one data source exists for the stream, the rating is assigned based on the translation of the data value as discussed above. If more than one source of data exists for a stream, the rating is assigned according to the following hierarchy:

Benthic Bioclassification/Fish Community Structure
Chemical/Physical Data
Monitoring Data >5 years old
Compliance/Toxicity Data

This is only a general guideline for assigning use support ratings and not meant to be restrictive. Each segment is reviewed individually, and the resulting rating may vary from this process based on best professional judgment, which takes into consideration site-specific conditions.

After assigning ratings to streams with existing data, streams with no existing data are assessed. Streams that are direct or indirect tributaries to streams rated FS receive the same rating (with an evaluated basis) if they have no known significant impacts, based on a review of the watershed characteristics and discharge information. Streams that are direct or indirect tributaries to streams rated PS or NS, or that have no data, are assigned a NR rating.

D. Assessment Methodology – Lakes

The complex and dynamic ecosystem interactions that link chemical and physical water quality parameters and biological response variables must be considered when evaluating use support. In general, North Carolina assesses use support by determining if a lake's *uses*, such as water supply, fishing and recreation, are met; violations of water quality standards are not equated with use impairment unless uses are not met. In following this approach, use support for agriculture, aquatic life propagation, maintenance of biological integrity, wildlife, recreation and water supply can be holistically evaluated.

Nutrient enrichment, or eutrophication, is one of the main causes of lake impairment. Several water quality variables may help to describe the level of eutrophication. These include pH, chlorophyll *a*, dissolved oxygen, phosphorus, nitrogen, turbidity, total dissolved gases, and other quantitative indicators, some of which have specific water quality standards. It is generally agreed that excessive amounts of nitrogen and phosphorus are the principal culprits in eutrophication related use impairment. These variables are important concerns; however, climate, hydrology and biological response factors (chlorophyll, phytoplankton, fish kills, etc.)

are also essential to evaluate because they may control the frequency of episodes related to potential use impairment. In addition, many of North Carolina's lakes are human-made reservoirs that do not mimic natural systems.

North Carolina does not determine eutrophication related use impairment with the quantitative assessment of an individual water quality variable (i.e., chlorophyll *a*). Likewise, North Carolina does not depend on a fixed index composed of several water quality variables, which does not have the flexibility to adapt to numerous hydrological situations, to determine use impairment. The weight of evidence approach is most appropriate to determine use support in terms of nutrient enrichment in lakes. This approach can be flexibly applied depending on the amount and quality of available information. The approach uses the following sources of information:

- multiple quantitative water quality variables (e.g., dissolved oxygen, chlorophyll *a*)
- third party reports
- analysis of water quality complaints
- algal bloom reports
- macrophyte observations
- reports from water treatment plant operators
- reports from lake associations
- fish kill reports
- taste and odor observations
- aesthetic complaints
- frequency of noxious algal activity
- reports/observations of the NC Wildlife Resources Commission

E. Revisions to Methodology Since 1992-1993 305(b) Report

Three significant changes to use support methodology have been made since the 1992-1993 305(b) report pertaining to the use of older information and fish consumption advisories.

Methodology for determining use support has been revised to more accurately reflect water quality conditions. In the 1992-1993 305(b) report, information from older reports and workshops was included in making use support determinations. Streams assessed using this information were rated on an evaluated basis, because the reports were considered outdated, and the workshops relied on best professional judgment since actual monitoring data were not available. In place of these older reports and workshop information, DWQ is now relying more heavily on data from its expanded monitoring network. These changes resulted in a reduction in streams rated on an evaluated basis. The basinwide process allows for concentrating more resources on individual basins during the monitoring phase. See the discussion above for more information on how 'monitored' versus 'evaluated' is defined.

The rating fully supporting but threatened (ST) is no longer used. Instead, three categories are now used, including fully supporting (FS), partially supporting (PS) and not supporting (NS). Waters that are fully supporting but have some notable water quality problems are discussed in the subbasin chapters of the basinwide plan.

Mercury levels in surface waters are primarily related to increases in atmospheric mercury deposition from global/regional sources, rather than from local surface water discharges. As a result, fish consumption advisories due to mercury have been posted in many areas (primarily coastal areas) of the state. Waters with fish consumption advisories (mercury, dioxin, etc.) are no longer considered for use support determination. However, these waters will continue to appear on the 303(d) list, and management strategies will be developed for these waters as required by the Clean Water Act.

USE SUPPORT RATINGS FOR MONITORED STREAMS IN THE NEW RIVER BASIN. FEBRUARY 2000. NC DIVISION OF WATER QUALITY.												
NEW RIVER (North Carolina Portion)	From confluence of North and South Forks New River to the last point at which it crosses the NC/VA line	10.0	50701	SR 1345, Alleghany	S	93:E		G	FS	habitat degradation	NP	ag, cattle
Middle Fork South Fork New River (Chetola Lake)	From source to Brown Branch	5.0	50701	US 321 & Blue Ridge Pkwy, Watauga		89:F		99: G-F	FS		NP	urban
Middle Fork South Fork New River	From Brown Branch to Boone Dam of ASU	3.2	50701	US 321 & Gold Mine Cr., Watauga		90:G			FS		NP	
Middle Fork South Fork New River	From Boone Dam of ASU to a point 0.4 mile downstream of U.S. Hwys. 221 & 321	1.3	50701						FS		NP	
Middle Fork South Fork New River	From a point 0.4 mile be U.S. Hwys. 221 & 321 to South Fork New River	0.6	50701	SR 1522, Watauga		93:E		G	FS		NP	
East Fork South Fork New River	From source to Watauga County SR 1524	2.1	50701						FS	habitat degradation	NP	ag
East Fork South Fork New River	From Watauga County SR 1524 to a point 0.8 mile downstream of Watauga County SR 1524	0.7	50701						FS	habitat degradation	NP	ag, golf course
East Fork South Fork New River	From a point 0.8 mile be Watauga Co. SR 1524 to South Fork New River	0.5	50701	SR 1522, Watauga		93:E		G	FS	habitat degradation	NP	ag, golf course
South Fork New River	From Hunting Lane, to US 221/421, Watauga	2.5	50701	US 421/221, Watauga	S	93:F		G-F	FS	habitat degradation	NP, P	urban, Boone WWTP
South Fork New River	From US 221/421 to Elk Cr.	18.9	50701	SR 1352, Watauga		90:G			FS	habitat degradation	NP	
Winkler Creek	From source to a point 0.2 mile upstream of mouth of Flannery Fork	3.7	50701						FS		NP	
Winkler Creek	From a point 0.2 mile upstream of mouth of Flannery Fork to Boone Water Supply Intake	0.6	50701						FS		NP	

Winkler Creek	From Boone Water Supple Intake to SR 1549, Watauga	4.3	50701	SR 1549, Watauga		93:E		G	FS		NP		
Howard Creek (Potato Hill Lake)	From source to a point 0.3 mile upstream of Doe Fork	5.4	50701						FS		NP		
Howard Creek	From a point 0.3 miles upstream of Doe Fork to the ASU Water Intake Dam	0.6	50701	SR 1306, Watauga		90:G			FS		NP		
Howard Creek	From the ASU Raw Water Supply Intake Dam to South Fork New River	3.5	50701	SR 1328, Watauga		93:E		E	FS		NP		
Meat Camp Creek	From source to South Fork New River	9.9	50701	SR 1335 &1333, Watauga		90/93:G		E	FS		NP		
South Fork New River	From Elk Cr. to a point 0.4 mile upstream of Couches Cr.	10.5	50703						FS	habitat degradation	NP		
Elk Creek	From source to South Fork New River	2.9	50701	NC 194, Ashe			E		FS		NP		
South Fork New River	From a point 0.4 mile upstream of Couches Creek to a point 2.8 mile upstream of Obids Creek	21.8	50701	US 221 (Fleetwood), SR 1169 Ashe		93:E		E	FS	habitat degradation	NP		
Old Field Creek	From source to Call Creek	5.2	50701						FS		NP		
Old Field Creek	From Call Creek to South Fork New R.	0.7	50701	SR 1106, Ashe		90:E	E		FS		NP		
Gap Creek	From source to South Fork New River	6.9	50701	US 221, Ashe			G-F		FS	habitat degradation	NP	cattle	
South Fork New River	From a point 2.8 mile ab Obids Cr. to a point 0.6 mile ab of Roan Cr.	9.4	50701	NC 16/88, Ashe	S	93:E		E	FS	habitat degradation	NP		
South Fork New River	From a point 0.6 mi. ab mouth of Roan Cr. to a point 0.1 mi. ab mouth of Naked Cr.	0.6	50701						FS	habitat degradation	NP		
Roan Creek	From source to Ashe County SR 1624	1.2	50701						FS		NP		
Roan Creek	From Ashe County SR 1624 to a point 0.5 mile upstream of mouth	5.2	50701						FS		NP		

Roan Creek	From a point 0.5 mile upstream of mouth to South Fork New River	0.5	50701	SR 1588, Ashe		93:E		E	FS		NP	
South Fork New River	From a point 0.1 mile upstream of mouth of Naked Creek to Dog Creek	2.4	50701						FS	habitat degradation	NP	
Naked Creek	From source to Jefferson WWTP	3.7	50701	NC 16/88 ab WWTP, Ashe		93:G		G-F	FS	habitat degradation	NP	urban, construction
Naked Creek	From Jefferson WWTP to South Fork New River	2.0	50701	old SR 1585, Ashe		93:F		P	NS	habitat degradation, nutrients	NP, P	Jefferson WWTP, urban, construction, ag
South Fork New River	From Dog Creek to New River	22.1	50701	US 221 at Scottsville, Ashe	S	93:E		E	FS	habitat degradation	NP	
Peak Creek	From source to Water Supply Dam at Appalachian Sulphides, Inc.	5.0	50701						FS		NP	
Peak Creek	From Water Supply Dam at Appalachian Sulphides, Inc. to Ore Knob Branch	2.1	50701	off SR 1599 ab Ore Knob Br., Ashe		93:G	E	G	FS		NP	
Peak Creek	From Ore Knob Branch to South Fork New River	2.9	50701	SR 1599 be Ore Knob Br. & ab L. Peak Cr., SR 1595, Ashe		93:P	F/P/P	G-F; 99:P/ P	NS	low pH, metals	NP	old copper mine
Little Peak Creek	From source to Peak Creek	2.4	50701	off SR 1595, Ashe		91:P	P	P	NS	low pH, Cu, metals, habitat degradation	NP	old copper mine, ag
Nathans Creek	From source to South Fork New River	3.7	50701	SR 1596 & off US 221, Ashe		90:G-F		G-F; G	FS	habitat degradation	NP	cattle
Cranberry Creek (Mulberry Creek)	From source to South Fork New River	13.2	50701	SR 1609, 1603, 1600, Ashe		93:E		G/E/ E	FS	habitat degradation	NP	cattle, Christmas tree farms
Meadow Fork	From source to Cranberry Creek	5.7	50701	SR 1145 & off SR 1193, Ashe				E/E/ E	FS	habitat degradation	NP	
Piney Fork	From source to Cranberry Creek	4.5	50701	SR 1149/NC 18, Ashe				G	FS	habitat degradation	NP	Christmas tree farms

Reeves Branch	From source to Piney Fork	1.2	50701	NC 18/13, Ashe				E/E	FS	habitat degradation	NP	Christmas tree farms
North Fork New River	From source to Three Top Creek	13.7	50702						FS	habitat degradation	NP	
Hoskin Fork	From source to North Fork New River	5.0	50702	off NC 88, Ashe		93:G		G	FS		NP	
North Fork New River	From Three Top Creek to New River	36.2	50702	SR 1100, 1340, & 1644 & NC 16, Ashe	S	93:E/E/E		E/E/E	FS		NP	
Three Top Creek	From source to North Fork New River	7.8	50702	SR 1100, Ashe		93:E		G	FS		NP	
Big Laurel Creek	From source to North Fork New River	15.2	50702	SR 1322 & NC 88, Ashe		90:G, 93:E		E	FS		NP	
Buffalo Creek	From source to North Fork New River	8.8	50702	NC 88/194, Ashe		93:E		G-F	FS		NP	
Little Buffalo Creek	From source to Buffalo Creek	3.8	50702	nr SR 1153, Ashe		93:P		F	PS	nutrients	NP	W.Jefferson WWTP, urban
Big Horse Creek (Horse Creek)	From source to North Carolina-Virginia State Line	0.6	50702			90:G-F, 93:E			FS	habitat degradation	NP	Christmas tree farms, cattle, ag
Big Horse Creek (Horse Creek)	From NC/VA Line to lower Ashe Co. SR 1361	5.0	50702						FS	habitat degradation	NP	Christmas tree farms, ag, cattle
Big Horse Creek	From lower Ashe County SR 1361 to Ashe County SR 1353 at Tuckerdale	5.4	50702	SR 1362, Ashe		90:G-F			FS	habitat degradation	NP	Christmas tree farms, cattle, ag
Big Horse Creek (Horse Creek)	From Ashe Co SR 1353 at Tuckerdale to N Fork New R.	4.1	50702	SR 1644/NC 194, Ashe		93:E		E	FS	habitat degradation	NP	Christmas tree farms, cattle, ag
Little Horse Creek	From source to Big Horse Cr.	10.8	50702	SR 1334, Ashe				G	FS	habitat degradation	NP	ag, cattle
Little Phoenix Creek	From source to North Fork New River	3.8	50702	SR 1573, Ashe				G	FS	habitat degradation	NP	ag
Old Field Creek	From source to North Fork New River	2.5	50702	SR 1537, Ashe				G	FS	habitat degradation	NP	ag
Helton Creek	From North Carolina-Virginia State Line to North Fork New River	10.4	50702	SR 1536 & 1539, Ashe		89:G		E	FS	habitat degradation	NP	
Elk Creek	From source to U.S. Hwy. 221	3.1	50703						FS	habitat degradation	NP	logging, cattle

Elk Creek (North Carolina Portion)	From U.S. Hwy. 221 to New River	7.1	50703	SR 1344, Ashe		93:E		G	FS	habitat degradation	NP	logging, cattle
Little River (Sparta Lake)	From source to Dam at Sparta Lake	11.4	50703	NC 18/SR 1141 & SR 1128, Alleghany		93:E		E/G	FS		NP	
Pine Swamp Creek	From source to Little River	4.5	50703	SR 1128, Alleghany		93:G		G	FS	habitat degradation	NP	Christmas tree farm
Little River	From Dam at Sparta Lake to N.C. Hwy. 18 Bridge	17.1	50703	SR 1424, Alleghany		93:E		E	FS		NP	
Bledsoe Creek	From source to Little River	5.5	50703	SR 1172, Alleghany		93:G		G-F	FS	habitat degradation	NP	urban
Brush Creek	From source to Little River	19.7	50703	SR 1422, Alleghany		93:G		G	FS	habitat degradation	NP	cattle
Laurel Branch (Laurel Creek)	From source to Brush Creek	4.8	50703	off NC 21 & SR 1105, Alleghany		92:P/F		G-F	FS	habitat degradation	NP	Olde Beau golf community
Little River (North Carolina Portion)	From N.C. Hwy. 18 Bridge to NC/VA State Line	3.5	50703	NC 18, Alleghany	S	93:E		E	FS		NP	
ABBREVIATION KEY												
E = Excellent		P = Point Source Pollution (Major source)					ab = above					
G = Good		NP = Nonpoint Source Pollution					nr = near					
G-F = Good-fair		FS = Fully Supporting					be = below					
F = Fair		PS = Partially Supporting										
P = Poor (Benthos/fish ratings)		NS = Not Supporting										
		NR = Not Rated										
NOTES												
"Rating" = Use Support Rating												
"Habitat degradation" is 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, riffles or woody material, and stream bed scour.												
"Ag" denotes agriculture, which could include row crops and animal operations.												
Where "cattle" is noted, cattle were observed on site at the time of sampling, or the watershed hosts many cattle farms.												

Appendix IV

303(d) Listing
and
Reporting Methodology

303(d) LISTING AND REPORTING REQUIREMENTS

What is the 303(d) List?

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters not meeting water quality standards or which have impaired uses. Waters may be excluded from the list if existing control strategies for point and nonpoint source pollution will improve water quality to the point that standards or uses are being met. Listed waters must be prioritized, and a management strategy or total maximum daily load (TMDL) must subsequently be developed for all listed waters. This draft of the 303(d) list will be submitted to EPA for approval in the year 2000. The latest approved 303(d) list was published on May 15, 1998. A summary of the 303(d) process follows. More complete information can be obtained from *North Carolina's 1998 303(d) List* (DENR, 1998), which can be obtained by calling the Planning Branch of DWQ at (919) 733-5083.

303(d) List Development

Generally, there are four steps to preparing North Carolina's 303(d) list. They are: 1) gathering information about the quality of North Carolina's waters; 2) screening those waters to determine if any are impaired and should be listed; 3) determining if a total maximum daily load (TMDL) has been developed; and 4) prioritizing impaired waters for TMDL development. This document also indicates whether the Division of Water Quality (DWQ) intends to develop a TMDL as part of a Management Strategy (MS) to restore the waterbody to its intended use. The following subsections describe each of these steps in more detail.

Sources of Information

For North Carolina, the primary sources of information are the basinwide management plans, 305(b) reports and accompanying assessment documents, which are prepared on a five-year cycle. Basinwide management plans include information concerning permitting, monitoring, modeling and nonpoint source assessment by basin for each of the 17 major river basins within the state. Basinwide management allows the state to examine each river basin in detail and to determine the interaction between upstream and downstream, point and nonpoint pollution sources. As such, more effective management strategies can be developed across the state.

Listing Criteria

Waters whose use support ratings were not supporting (NS) or partially supporting (PS) based on monitored information in the 305(b) report were considered as initial candidates for the 303(d) list. Waters that were listed on the previously approved 303(d) list were evaluated and automatically included if the use support rating was NS, PS or not rated (NR).

Fish consumption advisory information was then reviewed to determine if other waters should be added to the list. Fish consumption advisories are no longer considered when determining use support since a fish advisory for mercury contamination in Bowfin was posted for the entire state in June 1997. While fish consumption advisories do indicate impairment, DWQ did not want to mask other causes and sources of impairment by having the entire state (or an entire basin) listed as impaired due to fish consumption advisories. However, DWQ believes that advisories on specific waters are cause to include the water on the 303(d) list; therefore, advisories other than

the statewide Bowfin posting were considered when developing North Carolina's 303(d) list. Waters listed due to fish consumption advisories may have overall ratings of fully supporting (FS) because fish advisories are not considered in the 305(b) use support process.

Guidance from EPA on developing the 1998 303(d) lists indicated that impaired waters without an identifiable problem parameter should not be included on the 303(d) list. However, DWQ feels that waters listed in the 305(b) report as impaired for biological reasons, where problem parameters have not been identified, should remain on the 303(d) list. The Clean Water Act states that chemical, physical and biological characteristics of waters shall be restored. The absence of an identified cause of impairment does not mean that the waterbody should not receive attention. Instead, DWQ should resample or initiate more intensive studies to determine why the waterbody is impaired. Thus, biologically impaired waters without an identified cause of impairment are on the draft 303(d) list.

Assigning Priority

North Carolina is required to prioritize its 303(d) list in order to direct resources to those waters in greatest need of management. The CWA states that the degree of impairment (use support rating) and the uses to be made of the water (stream classification) are to be considered when developing the prioritization. In addition, DWQ reviews the degree of public interest and the probability of success when developing its prioritization schemes. Waters harboring endangered species are also given additional priority. A method to assign ratings to freshwaters that have recent data indicating impairment has been devised based on these criteria.

The prioritization process results in ratings of high, medium and low. Generally, waters rated with the highest priority are classified for water supply use, rated not supporting, and harbor an endangered species. Waters receiving a high priority are important natural resources for the State of North Carolina and generally serve significant human and ecological uses. High priority waters will be addressed first within their basin cycles when technically feasible. TMDLs are not possible where the pollutant(s) have yet to be identified. TMDLs cannot be attempted without flow data. Collecting physical/chemical data and accumulating flow data are milestones that must precede developing TMDLs of any priority.

EPA recently issued guidance that suggested states should develop TMDLs and management strategies on all of their impaired waters within the next eight to thirteen years. To meet this federal guidance, the DWQ is striving to address all 303(d) listed waters that have a priority of high, medium or low within the next 10 years. Numeric TMDLs, if proper technical conditions exist, and management strategies will be developed for these waters. The DWQ is constantly reviewing its resource allocations in order to meet this aggressive schedule.

Other priorities have also been assigned to waters. A monitor priority indicates that the waterbody is listed based on: 1) data older than 5 years; 2) biological impairment without an identified pollutant; or 3) biological impairment where the criteria used to originally rate the stream as impaired has been deemed inappropriate. Many low flow streams and swamp waters were rated as biologically impaired in the past using inappropriate criteria. These waters will be resampled and rated using specialized criteria currently in development. Until the updated rating criteria is finalized, these waters will continue to be rated NR and will stay on the 303(d) list. Further information on the monitoring approaches that have a monitor priority is provided in the next section.

The final priority listed on the 303(d) list is N/A for not applicable. This priority was assigned to waters that DWQ believes will meet their uses based on the current management strategies. DWQ will not develop a new TMDL or management strategy for these waters unless data continue to indicate impairment, and sufficient time has passed for the waterbody to respond to the management action. An example of this priority is a water impaired by a point source, and the pollutant causing the impairment has been completely removed from the point source.

Additional Guidance on Using the 303(d) List

The column headings in the 303(d) list refer to the following:

Class – The information in this column indicates the classification assigned to the particular waterbody. Stream classifications are based on the existing and anticipated best usage of the stream as determined through studies and information obtained at public hearings. The stream classifications are described in 15A NCAC 2B .0300.

Subbasin – The number in this column refers to the DWQ subbasin in which the waterbody is located. The NRCS 14-digit hydrologic units nest within the DWQ subbasins.

Cause of Impairment – The cause of impairment as identified in the use support rating process. When a chemical problem parameter is identified, the parameter listed exceeded the state's water quality standards for that parameter. Biological impairment is based on data relating to benthic and fish habitat as well as community structure. There may be other unidentified causes contributing to the impairment. Causes included in the 303(d) list are listed below:

Chl *a* – chlorophyll *a*
Cl – chloride
Cu – copper
DO – dissolved oxygen
Fecal – fecal coliform bacteria
Hg – mercury
NH_3 – ammonia
Nutr – nutrients
Pb – lead
pH – pH
Tox – toxicity
Turb – turbidity
Aq. Weeds – aquatic weeds
Biological Impairment – Impairment based on benthic/fish data
Fish Advisory – Fish advisory issued by DEH

Overall Rating – This column lists the overall use support rating. These values may be **NS** (not supporting), **PS** (partially supporting), **FS** (fully supporting) and **NR** (not rated). A rating of not rated is typically assigned to waters that were sampled using biocriteria that may not apply, or there are no data available on the water. These waters appeared on earlier lists, and they continue to be listed for administrative reasons, but no TMDL or management strategy will be developed until we have updated information that the water continues to be impaired. For waters listed solely on the basis of fish consumption advisories, the rating may be fully supporting (FS). The 305(b) report describes these use support ratings further. On the 303(d) list of lakes, the overall use support rating is found in the column entitled "Overall Use Rating." Ratings for specific uses are found in the columns entitled "Fish Consumption", "Aquatic Life and Secondary Contact", "Swimming" and "Drinking Water."

Source – This column indicates which sources are the probable major sources of impairment.

Approach – This column indicates the approach DWQ will take to restore the waterbody. More than one approach may be listed. TMDLs are typically developed for DO, nutrients, fecal coliform, ammonia and metals. Management strategies are typically done for pH, sediment and turbidity. Further information on each approach is provided below.

TMDL – A numeric TMDL (total, maximum, daily, load), as defined by EPA, will be developed.

MS – Management Strategy. These waters are on the list based on data collected within the five years prior to when the use support assessment was completed. A cause of impairment has been identified, but North Carolina cannot develop a numeric TMDL as EPA defines it. A management strategy may contain the following elements: further characterization of the causes and sources of impairment, numeric water quality goals other than TMDLs, and best management practices to restore the water.

RES – Resample. This waterbody was identified as being impaired based on water quality data that were greater than 5 years old or invalid at the time the use support assessment was performed. This waterbody will be resampled prior to TMDL or management strategy development to ensure the impairment continues to exist.

PPI – Problem Parameters Identification. Available chemical data do not show any parameters in violation of applicable standards, but biological impairment has been noted within the five years prior to use support assessment. DWQ will resample these waters for chemical and biological data to attempt to determine the cause of impairment. TMDLs or management strategies will be developed within 2 basin cycles of pollutant identification.

SWMP – Swamp waters. This water may not actually be impaired. Swamp waters previously evaluated using freshwater criteria will continue to be monitored and will be reevaluated when swamp criteria are available.

Priority – Priorities of high, medium and low were assigned for waters identified as being impaired based on data that were not greater than 5 years of age at the time the use support assessment was done and for which a cause of impairment has been identified. All waters assigned a priority of high, medium or low will be addressed within the next two basin cycles. Priorities of monitor and N/A have also been assigned where appropriate. Further explanation on each of these is provided below:

High – Waters rated high are important resources for the state in terms of human and ecological uses. Typically, they are classified as water supplies, harbor federally endangered species, and are rated as not supporting. These waters will be addressed first within their basin cycles when technically feasible.

Medium – Waters rated medium may be classified for water supply or primary recreational use, may have state endangered or other threatened species, and may be rated as partially or not supporting.

Low – Waters rated low generally are classified for aquatic life support and secondary recreation (i.e., Class C waters) and harbor no endangered or threatened species.

Monitor – The waterbody is included on the 303(d) list based on:

1. Data that are greater than 5 years of age when use support assessment is done (denoted by RES in approach column).
2. Biological data collected within 5 years of use support assessment, but no cause of impairment has been identified (available chemical data show full use support denoted by PPI in approach column).
3. Freshwater biological criteria applied to swamp waters.

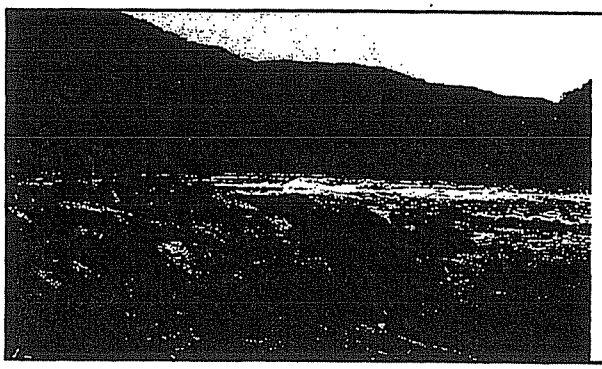
In general, waters given this priority based on recent biological data will be sampled prior to waters listed based on older information. All waters with this priority will be resampled as resources allow. Waters with a monitor priority will not have a management strategy or TMDL developed for it before updated sampling or analyses of the biological criteria is complete. Once updated sampling is done and problem pollutants have been identified, these waters will be addressed by either a management strategy or TMDL within two basin planning cycles (10 years).

N/A – DWQ believes that its current management strategy will address the water quality impairment, but it may take a number of years before standards are met. In this case, DWQ plans to continue monitoring the water to determine if improvements are occurring, but no new management strategy or TMDL will be developed unless sufficient time has passed for improvement to occur, and data indicate the water is still impaired.

The lakes table column entitled "Trophic Status" refers to the trophic status of the lake, a relative description of the biological productivity of the lake. The lake may be hypereutrophic, eutrophic, mesotrophic or oligotrophic. Oligotrophic lakes are nutrient poor and biologically unproductive. Mesotrophic lakes have intermediate nutrient availability and biological productivity. Eutrophic lakes are nutrient rich and highly productive. Hypereutrophic lakes are extremely eutrophic.

Appendix V

New River Basin Workshop Summary



New River Basin Workshop
6-9
June 24, 1999

Group #1

- Streambank degradation due to development close to streams
- Roadway deicing
- Fecal contamination from convenience centers
- Siltation from gravel road maintenance and placement in floodplains
- Nutrient runoff from golf courses/resort areas
- Clear-cut logging operations
- Improper cultivation of farmlands
- Decrease trash generation in households
- Calculate stream loadings based on mass loadings rather than concentration limits

Group #2

Nonpoint Source Pollution

1. Road building – state and private
2. Development – urban and rural
3. Agriculture
4. Septic systems in floodplain
5. Straight-piping

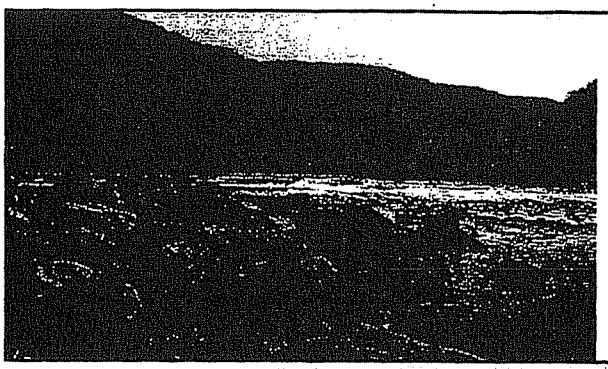
Enforcement Issues of NPS Pollution

County Involvement

1. Sedimentation and erosion control on new development
   → county vs. state – Who is better to enforce?
2. Agriculture – What is the extent of NPS pollution from agriculture practices?
   → education concerning cost sharing
3. Timber harvesting – extent of NPS pollution from timber harvesting?
4. Mining – same question

Specific Issues in New River Basin

1. Ore Knob Mine
2. Stormwater systems in Jefferson and West Jefferson
3. Jefferson Landing Golf Course



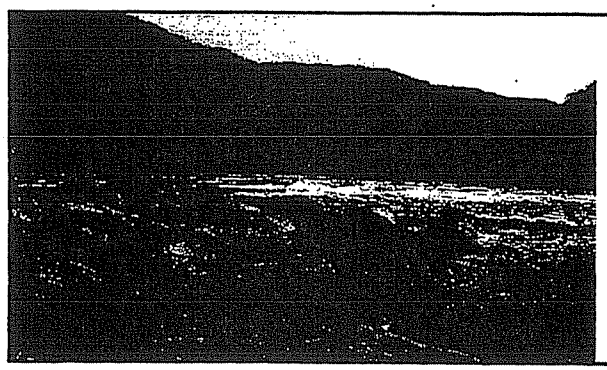
   - → home development
   - → golf course maintenance
4. Future public water supply for towns

Group #3

- Sedimentation
  - → non-urban growth
  - → breakdown of creek/riverbanks from cattle
- Lack of enforcement of existing regulations
  - → appropriate fines
- Public education
  - → unaware of impact
  - → unaware of regulations
- More local regulations
- Beauty of river and reflection on tourism

Group #4

- Better control to prevent sedimentation
- Define enforcement authority and enforce – per each regulations
- Floodplain development
- More funding for wastewater treatment improvement
- More stringent penalties
- Better enforcement of best forest management practices
- More/wider riparian buffers
- Financial assistance to farmers for best management practices
- Fund for improving straight piping sites
- More mitigation checks and balances
- Approved sedimentation plan before development
- Public education component *****
- Continue state involvement in cleaning up Peak Creek
- Funding for citizen water quality monitoring



New River Basin Workshop
6-9
June 24, 1999

Group #5

1. Education on ORW
   - → Planning Board
   - → County Commissioners
2. Stop septic tanks in floodplain
3. No mining of stones in creek (gravel)
4. Development in floodplain
5. Who enforces?
   - → stream relocation
   - → mining
   - → lack of enforcement
   - → "Army Corps"
6. Recalculate floodplain
7. Straight piping
   - → Helton Creek
   - → Big and Little Horse Creek
   - → need to inventory
8. Higher fines for turbidity
9. More closely identify sources of nonpoint pollution
10. Inventory of problem areas
11. Land clearing exemption for agriculture and Christmas tree farming
    - → no enforcement of sediment erosion with land clearing
12. Transportation access accidents
13. Enforcement of BMPs for forest resources

Problem Areas

- Big Horse Creek
- Little Horse Creek
- Laurel Creek
- Peak Creeks (Big and Little)
- Little Buffalo Creek
- Ore Knob Lake
- Laurel Fork Creek (not the trib to Brush Creek) – sedimentation
- Pine Swamp Creek – sedimentation
- Field Creek - sedimentation
  - → relocating the creek
- Tributary to Big Horse Creek – Lansing WWTP, when it floods

New River Basin Workshop
6-9
June 24, 1999

- Glade Creek – sedimentation
- North Fork at Creston – just upstream of Big Laurel
- Ore Knob Mine
- Laurel Branch
- Peak Creek
- Naked Creek
- New River campground (on state line)
  → sewage !!
- Cranberry Creek
- Boone WWTP sludge disposal on pasture
- Little Buffalo Creek

Appendix VI

TMDL

New River Basin Nonpoint Source Program Description and Contacts

Statewide Nonpoint Source Management Program Description

The North Carolina Nonpoint Source Management Program consists of a broad framework of federal, state and local resource and land management agencies. More than 2,000 individuals administer programs that are directly related to nonpoint source pollution management within the state. A range of responsibilities have been delegated to county or municipal programs including the authority to inspect and permit land clearing projects or septic system performance. In the field of agriculture, a well established network of state and federal agricultural conservationists provide technical assistance and program support to individual farmers.

Staff in the DWQ Water Quality Section's Planning Branch lead the Nonpoint Source Management Program, working with various agencies to insure that program goals are incorporated into individual agencies' management plans. The goals include:

1. Coordinate implementation of state and federal initiatives addressing watershed protection and restoration.
2. Continue to target geographic areas and waterbodies for protection based upon best available information.
3. Strengthen and improve existing nonpoint source management programs.
4. Develop new programs that control nonpoint sources of pollution not addressed by existing programs.
5. Integrate the NPS Program with other state programs and management studies (e.g., Albemarle-Pamlico National Estuary Program).
6. Monitor the effectiveness of BMPs and management strategies, both for surface and groundwater quality.

Coordination between state agencies is achieved through reports in the *North Carolina Nonpoint Source Management Program Update*. Reports are intended to keep the program document current and develop a comprehensive assessment identifying the needs of each agency to meet the state nonpoint source program goals. Annual reports are developed to describe individual program priorities, accomplishments, significant challenges, issues yet to be addressed, and resource needs. A copy of the latest Annual Report (FY1998) is available online: http://h2o.enr.state.nc.us/nps/nps_mp.htm.

The nature of nonpoint source pollution is such that involvement at the local level is imperative. Basinwide Water Quality Plans identify watersheds that are impaired by nonpoint sources of pollution. Identification, status reports and recommendations are intended to provide the best available information to local groups and agencies interested in improving water quality. The plans also make available information regarding federal, state and local water quality initiatives aimed at reducing or preventing nonpoint source pollution.

The following table is a comprehensive guide to contacts within the state's Nonpoint Source Management Program. For more information, contact Alan Clark at (919) 733-5083 ext. 570.

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.

Area 1 Conservationist	Jacob Crandall	828-456-6341	PO Box 1109, Waynesville, NC 28786

County	Contact Person	Phone	Address
Alleghany	James Wooten	336-246-5461	PO Box 88, Jefferson, NC 28640
Ashe	James Wooten	336-246-5461	PO Box 88, Jefferson, NC 28640
Watauga	Allen Childers	828-264-3943	971 West King Street, Boone, NC 28607

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
Alleghany	William Edwards	336-372-4645	90 South Main Street, Sparta, NC 28675
Ashe	Arvill Scott	336-246-5258	PO Box 88, Jefferson, NC 28640
Watauga	Doug Clawson	828-264-0842	971 West King Street, Boone, NC 28607

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 & 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	Archdale Bldg., 512 N. Salisbury St., Raleigh, 27626
Winston-Salem Region*	Marlene Salyer	336-771-4600	585 Waughton Street, Winston-Salem, NC 27107

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	PO Box 27647, Raleigh, NC 27611
Region 12	Lynn Howard	828-728-4675	604 Pine Mountain Road, Hudson, NC 28638

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
Alleghany	Bob Edwards	336-372-5597	PO Box 7, Sparta, NC 28675
Ashe	Jim Carey	336-246-1880	PO Box 359, Jefferson, NC 28640
Watauga	Sue Counts	828-264-3061	971 West King Street, Boone, NC 28607

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 2	Roger Miller	828-757-5611	1543 Wilkesboro Blvd. NE, Lenoir, NC 28645-8215
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	Mel Nevills	919-733-4574	512 North Salisbury Street, Raleigh, NC 27626
Winston-Salem Region*	Matthew Gantt	336-771-4600	585 Waughtown St., Winston-Salem, NC 27107

Local Erosion and Sedimentation Control Ordinances:

Several local governments in the basin have qualified to administer their own erosion and sedimentation control ordinances.

Watauga County	Randy Woodrow	828-265-8043	PO Box 7 Courthouse, Boone, NC 28607

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
Winston-Salem Region*	Brent Rockett	336-771-4600	585 Waughton Street, Winston-Salem, NC 27107

General Water Quality

DWQ Water Quality Section:

Coordinate the numerous nonpoint source programs carried out by many agencies; 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.

NPS Planning	Alan Clark	919-733-5083 x570	1617 Mail Service Center, Raleigh 27699-1617
Urban Stormwater	Bradley Bennett	919-733-5083 x525	1617 Mail Service Center, Raleigh 27699-1617
Monitoring	Jimmie Overton	919-733-9960 x204	1621 Mail Service Center, Raleigh 27699-1621
Wetlands	John Dorney	919-733-1786	1621 Mail Service Center, Raleigh 27699-1621
Animal Operations	Dennis Ramsey	919-733-5083 x528	1617 Mail Service Center, Raleigh 27699-1617
Classifications/Standards	Boyd DeVane	919-733-5083 x559	1617 Mail Service Center, Raleigh 27699-1617

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.

Winston-Salem Region*	Larry Coble	336-771-4600	585 Waughton Street, Winston-Salem, NC 27107

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
Central Office	David Cobb	919-733-7291	512 North Salisbury Street, Raleigh, NC 27604

US 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 Chapin	828-271-4014	151 Patton Avenue, Room 143, Asheville, NC 28801

DWQ Groundwater Section:

Groundwater classifications and standards; enforcement of groundwater quality protection standards and cleanup requirements; review of permits for wastes discharged to groundwater; issuance of well construction permits; underground injection control; administration of the underground storage tank (UST) program (including the UST Trust Funds); well head protection program development; and ambient groundwater monitoring.

Central Office	Carl Bailey	919-733-3221	PO Box 29578, Raleigh, NC 27626-0578
Winston-Salem Region*	Sherri Knight	336-771-4600	585 Waughton Street, Winston-Salem, NC 27107

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
Winston-Salem*	Scott Greene	336-771-4600	585 Waughton Street, Winston-Salem, NC 27107
County	**Primary Contact**	**Phone**	**Address**
Alleghany	Danny Staley	336-372-5641	77 Willis Street, Sparta, NC 28675
Ashe	Danny Staley	336-246-9449	PO Box 208, Jefferson, NC 28640
Watauga	Danny Staley	828-264-4995	141 Health Center Drive, Boone, NC 28607

* **DENR Winston-Salem Region Office covers the following counties:** Alamance, Alleghany, Ashe, Caswell, Davidson, Davie, Forsyth, Guilford, Rockingham, Randolph, Stokes, Surry, Watauga, Wilkes and Yadkin.

Appendix VII

Glossary of Terms and Acronyms

Glossary

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.
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.
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.
conductivitiy	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.
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.
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.
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.
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.
sedimentation	The sinking and deposition of waterborne particles (e.g., eroded soil, algae and dead organisms).
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*).
--	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.