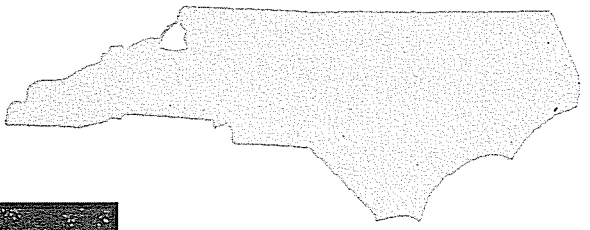
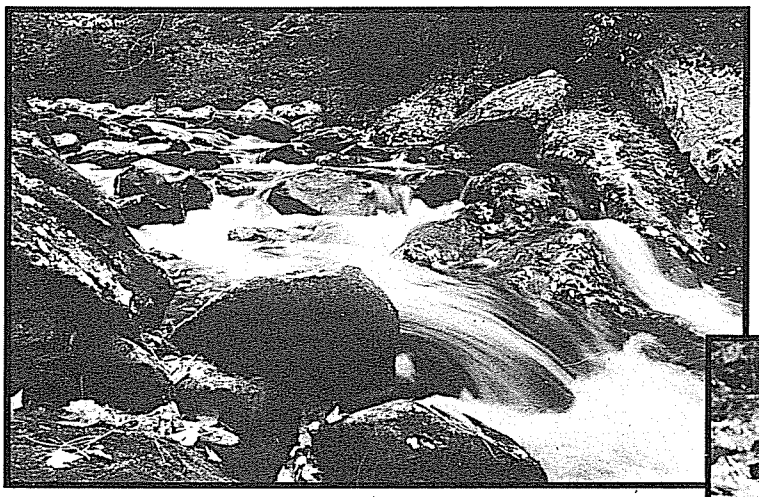
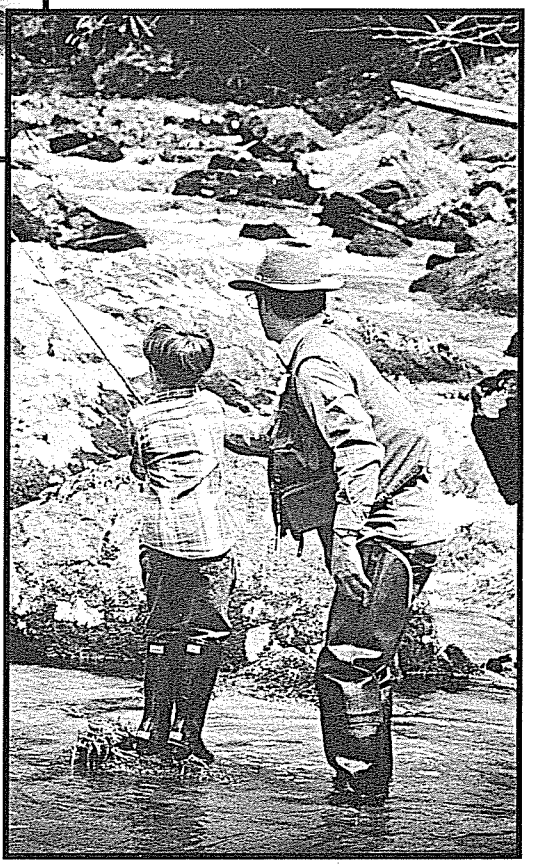
DISPLAY COPY

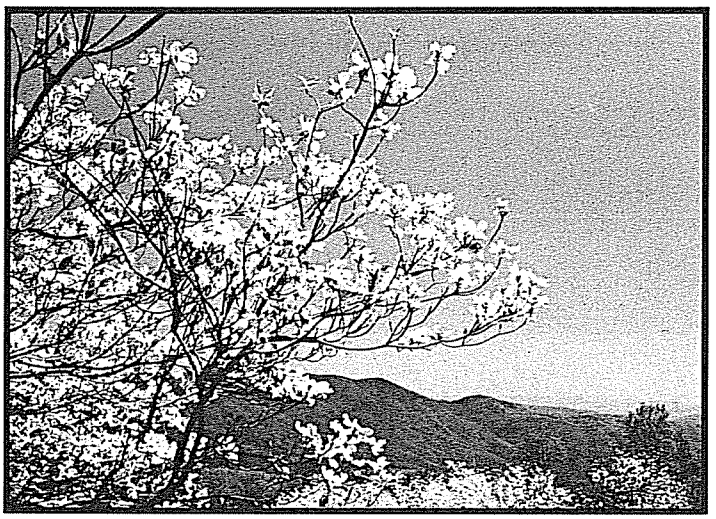
DO NOT REMOVE

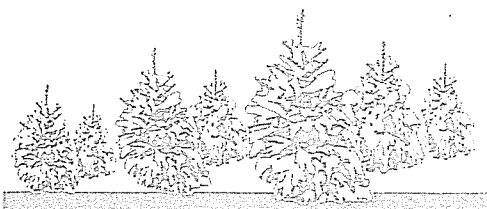
WATAUGA RIVER BASINWIDE WATER QUALITY MANAGEMENT PLAN











North Carolina Department of Environment, Health, and Natural Resources
Division of Water Quality • Water Quality Section • April, 1997

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

ADDENDUM: Use Support Changes for the Watauga River Basin
January 2000

The fully supporting but threatened (support-threatened, ST) category is no longer used as a use support rating. 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 US EPA requires the inclusion of ST waters on the 303(d) list in its proposed revision (August, 1999) to the 303(d) list rules (Appendix IX). Due to the difference between US 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. This change is reflected in the 305(b) report for 2000. Based on this change, use support ratings for all basins have been altered. Revised use support ratings for the Watauga River basin are presented below.

Table 4.16 Use Support Ratings for Monitored Streams in the Watauga River Basin – 1990 to 1994 (*Found on p. 4-24 of this plan.*)

Use Support Status for Freshwater Streams (Miles) (1990-1994)					
Subbasin	**Fully Supporting**	**Partially Supporting**	**Not Supporting**	**Not Evaluated**	**Total Miles**
04-02-01	281.6	0	0	1.3	282.9
Total	281.6	0	0	1.3	282.9
Percent	99.5	0	0	0.5	

WATAUGA RIVER BASINWIDE WATER QUALITY MANAGEMENT PLAN

(with Addendum)

April 1997

Prepared by:

North Carolina
Division of Water Quality
Water Quality Section
P.O. Box 29535
Raleigh, NC 27626-0535

(919) 733-5083

This document was approved and endorsed by the NC Environmental Management Commisssion on April 10, 1997 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 Watauga River Basin.

Cover Photo Credits
All three cover photos were obtained from the U.S. Fish and Wildlife Service

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WATER QUALITY

Addendum to Watauga River Basinwide Water Quality Management Plan - Pond Creek Watershed Reclassification

The Division of Water Quality (DWQ) received a request from Avery County in 1994, and Watauga County in 1995, to reclassify the entire Pond Creek watershed in the Watauga River Basin from Class WS-II to Class WS-III. Staff looked at the drainage patterns and how the waters within the Pond Creek watershed were being used. Staff determined that no water from the East Fork Pond Creek drained to the Town of Beech Mountain's back-up water supply (Lake Coffey), but flowed instead to Santis Lake.. The Town of Beech Mountain informed DWQ that Santis Lake had never been used to supplement water to the Town's backup water supply. Because of this, and the fact that there is no direct flow from East Fork Pond Creek or Santis Lake to Lake Coffey, staff proceeded to public hearing with the proposed reclassification of the East Fork Pond Creek to Class WS-V. Since the West Fork Pond Creek does have flow which enters Lake Coffey via a diversion pipe, staff recommended that it remain Class WS-II.

Since the original reclassification was requested, an additional request and a change to an existing request were submitted. In May 1997, Beech Mountain submitted a resolution requesting the reclassification of the East Fork Pond Creek to Class WS-III. In September 1997, Avery County adopted a resolution which changed their petition for reclassification request for Class WS-III for the entire watershed, to a request for Class WS-V for the East Fork Pond Creek watershed only. Watauga County did not change its request. Beech Mountain, Avery County and Watauga County have jurisdiction over 53%, 33% and 14% respectively of the area to be affected by the proposed reclassification (East Fork Pond Creek Watershed). Beech Mountain, Avery County and Watauga County have jurisdiction over 75%, 17% and 7% respectively of the total Pond Creek watershed.

A public hearing was conducted on September 18, 1997. Of those individuals offering verbal and/or written comments, 28 were in favor of the proposed reclassification of the East Fork Pond Creek to Class WS-V and 201 (includes petition) were opposed. Of those opposed to a reclassification to WS-V, 171 comments were in favor of reclassification to WS-III instead, 15 wanted the watershed to remain WS-II, 13 indicated that either a WS-II or a WS-III would be acceptable and two of the comments opposed to reclassification to WS-V did not state a preferred alternative.

Based on comments received, local government jurisdiction, and consideration of the relevant issues, the Hearing Officer, staff, and Director recommended that: the East Fork Pond Creek, from its source to the backwaters of Santis Lake, be reclassified from Class WS-II Tr to Class WS-III Tr; Santis Lake be reclassified from Class WS-II Tr CA to Class WS-III Tr CA; and the connecting stream, which lies outside of the Pond Creek water supply watershed and flows from Lake Coffey to Pond Creek, be reclassified from WS-II Tr CA to C Tr. The Environmental Management Commission (EMC) adopted this recommendation on February 12, 1998. The effective date is August 1, 1998.

P.O. BOX 29535, RALEIGH, NORTH CAROLINA 27626-0535
PHONE 919-733-5083 FAX 919-733-9919

FOREWORD

Clean water is critical to the health, economic well-being and quality of life of those living or working in the Watauga River basin. Most water users in the basin, including industry, agriculture, tourists, and the residents of the basin, rely on water for basic needs. These basic needs include water supply and/or disposal of treated wastewater. In addition, many businesses and residents of the Watauga River basin rely directly or indirectly on the basin's 283 miles of rivers and streams to meet their recreational needs and to supply a source of living through tourism. To these groups and the public they serve, it is important that the basin's waters support viable fisheries, that the waters be relatively safe (low risk of contracting water-borne disease) and that they be aesthetically desirable (free of objectionable colors, odors and smells). Yet maintaining clean water becomes increasingly difficult and more expensive as the population grows, as land is developed and as competition for its resources heighten.

The majority of the surface waters in the basin are of good quality. The waters of the Watauga River basin are well known for their trout fishing. Over 15% of the waters in the basin are classified as Outstanding Resource Waters or High Quality Waters. The Watauga River basin contains two fish species, one salamander species and one mollusc that are listed by North Carolina as either Endangered, of Special Concern or Significantly Rare. None of the streams monitored by the Division of Water Quality were found to be impaired.

However, there are reasons to be concerned about the quality of some waters in the basin which are rated as Support Threatened. The significant growth rate in the basin between 1982 and 1992 (212% increase in urban land cover) is expected to continue. The construction of roads, driveways, commercial and recreational areas and homes must be undertaken with proper care to prevent sediments from reaching surface waters. Forestry and agricultural activities (including Christmas tree farms) should be done using best management practices to avoid erosion and the resulting sedimentation to streams.

Preserving and enhancing the quality of water in the basin is beyond the capabilities of any one agency or group. State and federal government regulatory programs will play an important part, but much of the responsibility will be at the local level. A Nonpoint Source Team made up of local agency representatives, organizations and individuals has been established for the Watauga River basin. The Team will develop a five year action plan to identify and prioritize water quality problems associated with nonpoint source pollution. Those who live, work and recreate in the basin have the most at stake.

This document provides a summary of the causes and sources of water pollution in the basin, the status of the basin's water quality, a summary of water quality rules and statutes that apply to water quality protection in the basin, and recommended strategies to protect and enhance the quality of the surface waters in the Watauga River basin. The *Watauga River Basinwide Water Quality Management Plan* will be used a guide by the NC Division of Water Quality (formerly Division of Environmental Management) in carrying out its water quality program responsibilities in the basin.

Beyond that, it is hoped that the plan will provide a framework for cooperative efforts between the various stakeholders in the basin toward a common goal of protecting the basin's water resources while accommodating reasonable economic growth.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

APPENDICES

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

WATAUGA RIVER BASINWIDE WATER QUALITY MANAGEMENT PLAN

EXECUTIVE SUMMARY

NORTH CAROLINA'S BASINWIDE APPROACH TO WATER QUALITY MANAGEMENT - PURPOSE OF WATAUGA RIVER BASIN PLAN

The basinwide approach is a watershed-based water quality management initiative being implemented by the North Carolina Division of Water Quality (previously Division of Environmental Management). The *Watauga River Basinwide Water Quality Management Plan* is the eleventh basinwide water quality management plan prepared by the Division of Water Quality (DWQ) in a series of plans being prepared for all seventeen of the state's major river basins. DWQ uses the plan as a guide to carry out its water quality programs in each river basin. the plans are not regulatory documents.

The basinwide water quality management plans are also used to communicate the state's rationale, approaches and long-term water quality management strategies for each basin to policymakers, the regulated community and the general public. Each plan is completed and approved prior to the scheduled date for basinwide NPDES permit renewals. The plans are then evaluated, based on follow-up water quality monitoring, and updated at five year intervals.

The *Watauga River Basinwide Water Quality Management Plan* was approved by the Environmental Management Commission in April 1997 and will be updated in 2002. Basinwide NPDES permitting is scheduled to commence in September 1997.

GOALS OF THE BASINWIDE APPROACH

The primary goals of DWQ's basinwide program are:

1) to identify and restore full use to impaired waters,
2) to identify and protect highly valued resource waters and biological communities of special importance, and
3) to manage the causes and sources of pollution so as to ensure the protection of those waters currently supporting their uses while allowing for reasonable economic growth.

In addition, DWQ uses this approach as a means to better identify water quality problems, develop appropriate management strategies; maintain and protect water quality and aquatic habitat, assure equitable distribution of waste assimilative capacity for dischargers, and improve public awareness and involvement in the management of the state's surface waters.

PUBLIC WORKSHOPS

A public workshop was held in the Watauga River basin in April 1996. The workshop was co-sponsored by the North Carolina Cooperative Extension Service and DWQ. The purpose of the workshop was to familiarize stakeholders in the basin with DWQ's basinwide approach and to solicit comments for the basin plan. Workshop participants were asked to comment on what they see as the priority issues in the basin and how these issues could be addressed. A summary of the comments received from the workshop participants is provided in Chapter 6.

Priority issues identified at the workshop included:
- nonpoint source pollution control,
- need for monitoring,
- stormwater management,
- cost-share funding and technical assistance,
- streambank buffers and restoration,
- planning, and
- education.

WATAUGA RIVER BASIN OVERVIEW

The Watauga River basin is situated between the French Broad River basin to the south and the New River basin to the north. The Watauga River basin includes the Elk and Watauga Rivers and their tributaries. The Watauga River and the Elk River are headwater tributaries of the Holston River, which flows north to northwest from North Carolina into Tennessee. The Watauga River basin is the second smallest basin in the state, encompassing only 184 square miles of watershed and approximately 283 miles of streams and rivers. Figure 1 shows a general view of the Watauga River basin.

Based on 1990 census data, the population of the basin was 16,083 people. The overall population density is 78 persons per square mile versus a statewide average of 123 persons per square mile. While population in the basin is low, there has been significant population growth. The percent population growth was 35.4% over the twenty year period from 1970 to 1990.

The increase in population within municipal boundaries is very high for a few of the municipalities. The most populated area is near Boone, but the other municipalities are also experiencing steady growth. Over half of the land in the basin is forested (56.2%) with another quarter (23.8%) devoted to pastureland. Between 1982 and 1992 the percentage of land cover in urban and built-up lands increased by 212%, while forest land cover decreased by 100%. While most of the watershed is forested, many retirement and second home developments are being built in the area. Most agriculture and development activities occur in river valleys and near streams due to the more level ground found in valleys. Development in or near stream corridors increases the chances for sedimentation and erosion problems and some sedimentation problems are apparent.

The streams and rivers of the Watauga River basin are still generally of high water quality. There are a number of high quality and outstanding resource waters in the basin. The Watauga River basin is well known for its trout fishery waters. The waters of the Watauga River basin support two fish species, one salamander species and one mollusc that are listed by North Carolina as either Endangered, Special Concern, or Significantly Rare. One of the most beautiful river stretches in the basin can be found at the Watauga River gorge, where the river drops in elevation significantly as it enters Tennessee.

ASSESSMENT OF WATER QUALITY IN THE WATAUGA RIVER BASIN

An assessment of water quality information collected by DWQ and other agencies indicate that the Watauga River basin has generally good water quality and that there are no impaired waters. Below is a summary of some key monitoring data that reflect water quality in the basin. A more detailed presentation of this information can be found in Chapter 4.

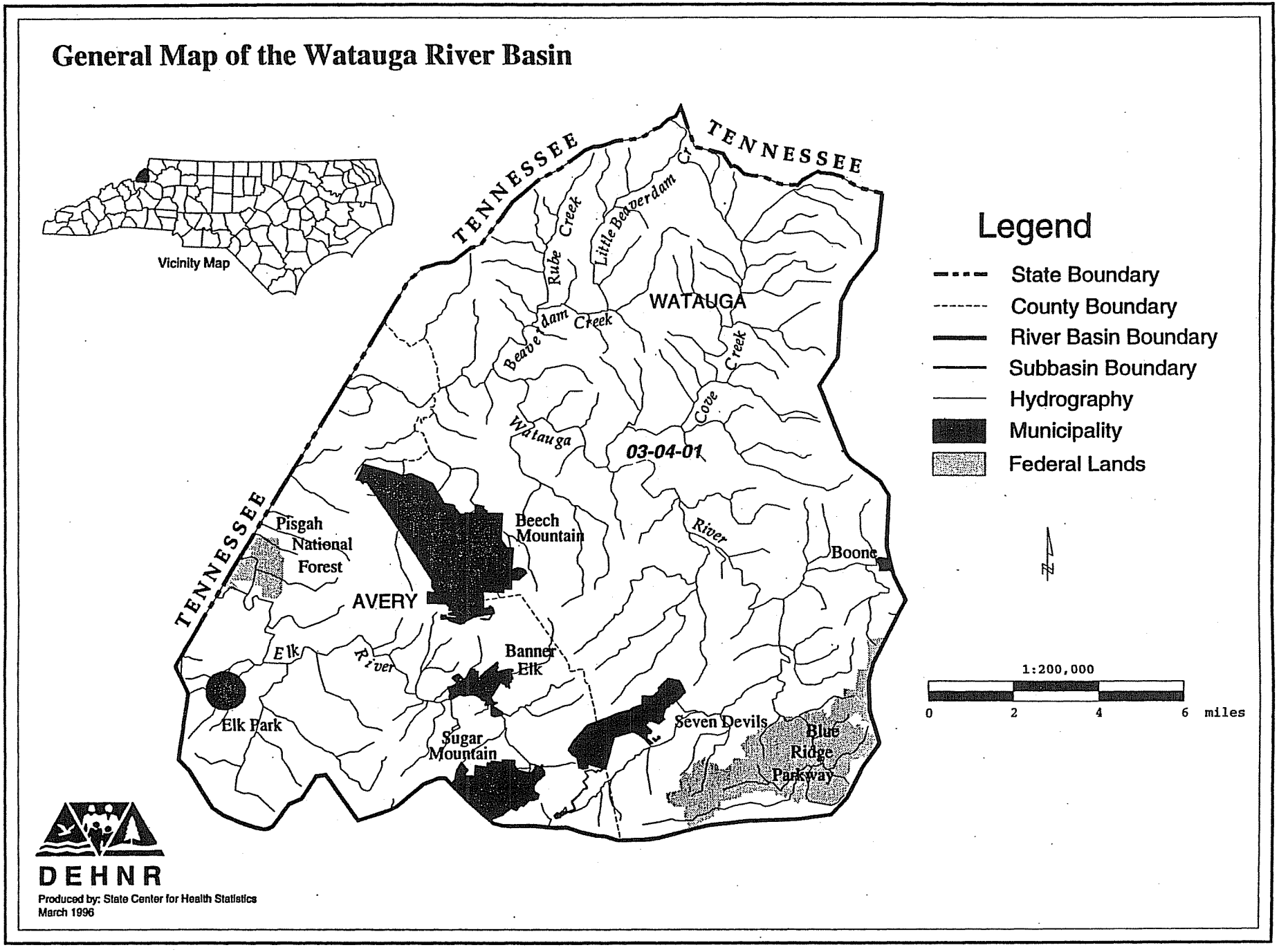


Figure 1. General Map of the Watauga River Basin in North Carolina

Summary of DWQ Monitored Data

Benthic Macroinvertebrates - These are primarily bottom-dwelling aquatic insect larvae such as species of mayflies, stoneflies, and caddisflies that are used as biological indicators of water quality. Measurements of the number and diversity of these organisms at strategic sampling sites is an important means of assessing water quality.

Since 1983, 48 macroinvertebrate samples have been taken at 31 sites in the basin. Of these, 22 were given an Excellent bioclassification, 24 were Good, and 2 were Good-Fair. No Fair or Poor sites were found.

Ambient Monitoring - Monitoring data from 3 ambient stations on the Watauga River (near Shulls Mill, Valle Crucis and Sugar Grove) show there are few excursions of individual parameters.

Use-Support Ratings

Use-support ratings are a method to analyze water quality information and to determine whether the quality is sufficient to support the uses for which the waterbody has been classified by the state. The word *uses* refers to activities such as swimming, fishing and water supply. All surface waters in the state have been assigned a classification (Appendix II).

DWQ has collected chemical and biological water quality monitoring data throughout the basin, some of which is summarized above. Available data for a particular stream segment has been assessed to determine the overall *use support* rating; that is, whether the waters are *fully supporting, support-threatened, partially supporting,* or *not supporting* their uses. Fully supporting and support-threatened streams are not considered impaired. Streams referred to as *impaired* are those rated as either partially supporting or not supporting their uses. Use support ratings in the Watauga River basin, described more fully in Chapter 4, are summarized below.

Of the 283 miles of freshwater streams and rivers in the Watauga basin, use support ratings were determined for almost 100% or 281.6 miles with the following breakdown:

SUPPORTING.....100%
- Fully Supporting: 95%
- Support-Threatened: 5%

IMPAIRED.....0%
- Partially Supporting 0%
- Not Supporting: 0%

NOT EVALUATED.....0%

The majority of the streams have good to excellent bioclassifications and very few standards were violated at the ambient stations. In fact, as noted above, there are no impaired waters in the basin. However, although water quality is high in this basin, nonpoint source effects such as increased sedimentation, were evident at many of the sampling sites. Also, point source discharges pose potential water quality concerns. Those waters considered Support Threatened based on monitored data are discussed below.

Recommended Management Strategies for Addressing Threatened Waters

Laurel Fork

Laurel Fork, a tributary to the Watauga River, is listed as support threatened due to nonpoint and point source impact. Laurel Fork flows along NC 105 and has two existing permitted domestic

dischargers; Four Seasons Apartments (0.0145 MGD) and Discovery Vacations Club (0.030 MGD).

In an effort to minimize the point source inputs to Laurel Fork, a management strategy was implemented for Discovery Vacations Club (then known as Willow Creek Communities) and the lower segment of Laurel Fork. This strategy is discussed further in Chapter 6. Discovery Vacations Club constructed its plant in compliance with this strategy. The facility is required to meet NPDES permit effluent limits of BOD5 = 5 mg/l, NH3N = 2 mg/l, DO = 6 mg/l, TSS = 10 mg/l. The facility is currently in compliance with these limits.

Management strategies to address some of the nonpoint source inputs to Laurel Fork are discussed below.

Hayes Branch and other tributaries to Laurel Fork in the Boone Area

Hayes Branch and other tributaries to the Laurel Fork are rated Support-Threatened. The Watauga River Basin Nonpoint Source Team has identified that development in this area has caused a dramatic increase in the speed and magnitude of streamflows during storm events. Team members see the need for an urban water study to identify and stabilize problem streams before significant problems occur. Presently, stream erosion problems are handled in a piecemeal and reactionary manner.

Many new construction activities have been concentrated in the Boone area, including restaurants, chain stores, and university buildings. This makes the need for an urban water study and plan more pressing. The urban plan should include a provision for the establishment and/or preservation of buffers.

These streams could also be studied using David Rosgen's methods to determine the seriousness of their present condition as well as specifications for restoring them in the future. Rosgen has developed a stream classification system and stream assessment technique based on natural channel stability principles and successfully applied them to the restoration and design of stream channels throughout the United States. The NPS Team members may highlight these streams for conducting Rosgen's methods.

Valley Creek

Valley Creek received a Good-Fair biological rating. While there is no clear indication as to the causes and sources of pollution, degradation appears to result from a combination of package wastewater treatment plants and nonpoint source pollution.

Valley Creek has two existing dischargers - Valley Creek WWTP and Country House Village WWTP. A third discharger is proposed - Hawksnest Sport. Both existing facilities have regularly met the limits of their NPDES permit. Valley Creek WWTP has plans to expand the treatment plant in the future, which may provide an opportunity for regionalization of other treatment plants.

Nonpoint sources of pollution that may contribute to the Support Threatened status of Valley Creek include the Hawksnest Golf Course, located at the headwaters of the creek. Nonpoint sources of pollution from the golf course could include runoff containing fertilizers and chemicals. It may be possible for the golf course to implement best management practices to protect Valley Creek from further degradation.

MAJOR WATER QUALITY ISSUES AND RECOMMENDATIONS

There are presently few major water quality concerns in the Watauga River basin based on monitoring data collected by DWQ biologists and as reported by regional office staff. However, there are reasons to be concerned about the quality of specific waters in the basin which are rated support-threatened (Laurel Fork and its tributaries and Valley Creek). Those issues considered to be most significant in the Watauga River basin are presented below, along with recommended corrective or research actions.

Growth and Development

There has been significant growth in the Watauga River basin and this trend is expected to continue. Growth and development within the basin tends to occur along streams and rivers where lands are less steep. Growth along waterways can have a significant negative impact on water quality if construction activities are not undertaken with proper care. These impacts include sedimentation and stormwater runoff containing a variety of fertilizers, chemicals, and road salts from urban lands. In addition, as the population continues to grow, so will wastewater treatment needs.

Proactive planning efforts at the local level which consider water quality protection is needed to strike a balance between economic growth and natural resource management. Growth management requires planning for the needs of future population increases. These actions are critical to water quality management and the quality of life for the residents of the basin.

Christmas Tree Farms

Other water quality concerns in the basin relate to the growing number of Christmas tree farms. Christmas tree farms can impact water quality when land is cleared for production. The use and maintenance of best management practices on tree farms is essential to protecting waters from sedimentation.

Package Treatment Plants along NC 105

If the growth of wastewater treatment package plants (as seen along NC 105) continues, a regional approach to wastewater treatment should be explored to reduce the impact of these package plants on receiving waters.

Management Strategies for Controlling Erosion And Sedimentation

Sedimentation is the most widespread cause of stream degradation and potential impairment in the Watauga River basin. While no streams in the basin are rated impaired due to sedimentation, there are water quality problems in the basin associated with sediments. Because sedimentation is the primary cause of nonpoint source pollution in the basin, focus on sediment related controls are vital to protecting the waters of the basin from further degradation. Refer to Chapters 3, 5 and 6 for further discussion on nonpoint sources of pollution and sedimentation control.

The following management strategies are recommended for improving sediment control:

Stewardship

- Continue to promote effective implementation and maintenance of erosion and sediment control measures by land owners, contractors, developers, farmers, and foresters. Even the best-designed measures will fail if maintenance responsibilities are not carried out.

- Vegetated streamside buffers should be established, protected, and maintained along streams. These buffers provide a filter for sediment and other nonpoint source pollution. Buffers also stabilize the streambank against erosion problems.

Research
- Although sedimentation and erosion control has improved during the past 20 years, there is still a need to research new and improved technologies for controlling sedimentation on construction sites.

Education
- Promote public education at the state and local level on the impacts of sedimentation and the need for improved sediment control. The cumulative effects of a number of small projects can significantly degrade water quality and habitat downstream.

Training
- Develop joint program with the Division of Land Resources, Division of Forest Resources and the Natural Resource Conservation Service to distribute erosion control requirements and guidelines to all new land owners, developers, and construction contractors.
- Develop a training and certification program for construction contractors that teaches effective sediment control practices.
- Train equipment operators in proper hydraulic practices and construction of access roads as part of the building inspection process. Access road construction creates water quality problems because poorly constructed roads are subject to flooding, thus causing sedimentation problems. Often, the decision about how an access road is constructed is left to equipment operators who are not trained in hydraulic practices. Forestry Practice Guidelines as developed by the Division of Forest Resources should be implemented and maintained.

Strengthen Sediment Control Programs
- Evaluate the effectiveness of current sediment control enforcement.
- Identify staff and resource needs within the Division of Land Resources and Division of Forest Resources.
- Evaluate and strengthen existing sedimentation and erosion controls. Two possible examples are:
    1. Limit the allowable disturbed area on a construction site, and
    2. Reduce the time period for reestablishing vegetation on denuded areas.
- Evaluate weaknesses in interagency efforts to enforce sediment control measures.
- Encourage more widespread adoption of erosion and sediment control programs by local governments, where resources allow, especially in rapidly developing areas. Local governments can become involved through education efforts, maintenance of publicly-owned lands, and coordination with other agencies such as the Soil and Water Conservation Districts and Division of Land Resources.

Planning
- Urban stormwater plans should be completed for the most developed areas of the basin. These plans can identify potential flooding and erosion problems and optimal areas for potential new developments, and the control measures that will be necessary to accommodate new developments. Thus, potential problems can be identified and addressed before they occur. Presently, problems with stream erosion are handled in a piecemeal and reactionary manner after development has already taken place.

Management Strategies For Controlling Toxic Substances

Toxic substances, or toxicants, routinely regulated by DWQ include metals, organics, chlorine, and ammonia, as described in Chapter 3.

In the Watauga River Basin, there are two municipalities (three treatment plants total) that have quarterly chronic toxicity test requirements: Sugar Mountain Utilities and Beech Mountain's Pond Creek and Gap Creek WWTPs. None of these plants discharge to streams with HQW or ORW classifications. All three plants have consistently passed the toxicity tests with no failures since January 1993.

Management Strategies for Controlling Oxygen Consuming Wastes

There are more than thirty point source discharges in the Watauga River Basin that require the management of oxygen consuming wastes. A proliferation of point source discharges exists in the headwaters and upper area of the Watauga River. Eleven discharges are located within four miles of each other and there are no foreseeable plans for the construction of a regional facility that these facilities could connect to. Modeling results predict that no instream violations of the dissolved oxygen standard are caused by the dischargers, although some local fisherman and others have expressed concerns over potential nutrient enrichment and impacts to fishing resources.

The HQW and ORW classification on some streams in the basin will help protect those receiving waters because new discharges and facilities that choose to expand must treat to tertiary levels. No new dischargers, or expansions to existing discharges, will be allowed if the facilities are located on streams that flow into or are classified as ORW. See Chapter 6 for a more detailed discussion.

Management Strategies For Stormwater Control

Industrial Stormwater Management

There are several industries with point source discharges of stormwater that are required to be permitted under the NPDES stormwater program. These include activities related to manufacturing, processing, materials storage areas and construction activities with greater than five acres of disturbance. These dischargers must develop Stormwater Pollution Prevention Plans (SWPPP) to minimize and control pollutants discharged from their stormwater systems. These SWPPPs are subject to review and modification by the permitted facilities and DWQ to assure that management measures are appropriate.

Urban Stormwater Management

Urban stormwater runoff may become a significant contributor to water quality problems. In the Watauga River basin, urban development is relatively limited at present. As more housing developments are constructed and more land is converted to impervious surfaces, careful attention to stormwater control will be important. Stormwater problems are likely to be centered around the Towns of Beech Mountain, Banner Elk, Seven Devils, Elk Park, Sugar Mountain, Boone, and any high density developments that may arise. There are no municipalities in the Watauga River Basin required to obtain permits to manage stormwater runoff within their jurisdiction.

For local governments that are not required to develop stormwater programs but where urban stormwater impacts have been identified and/or where urban water quality is of concern to local citizens, there are several basic steps, listed below, that could be undertaken at relatively low cost to help control urban stormwater pollution. In practice, stormwater management programs represent an area where local governments can develop their own ideas and activities for controlling sources of pollution. In practice, stormwater management programs represent an area where local governments can develop their own ideas and activities for controlling sources of

pollution.

- Mapping of municipal storm sewer systems and outfall points, and developing procedures to update this information.
- Evaluating existing land uses in the local government's jurisdictional area to determine where sources of stormwater pollution may exist. In addition, local government activities and programs could be evaluated to determine where existing activities address stormwater management in some way, or could be modified to do so.
- Developing educational programs to inform citizens of activities that may contribute pollutants to stormwater runoff (dumping oil, paint or chemicals down storm drains) and offering ways of carrying out such activities in an environmentally sound manner. Storm drain stenciling is a good example of a low cost educational tool.
- Reviewing local ordinances pertaining to parking, curb and gutter and open space requirements. Many of these local ordinances could be modified to enhance water quality protection from urban stormwater runoff impacts. Maintaining riparian buffer strips along streams is an example.
- Developing programs to locate and remove illicit connections (illegal discharge of non-stormwater materials) to the storm sewer system. These often occur in the form of floor drains and similar connections.
- Creating wetlands along streams in urbanized areas of the watershed to receive stormwater runoff can be an effective way to remove pollutants by burial, chemical breakdown, and/or assimilation into plant tissue. Careful design of these systems is needed in order to adequately handle the altered hydraulics of urban areas.

DWQ's urban stormwater staff have recently completed a series of stormwater workshops across the state for the benefit of local governments and others on addressing urban stormwater pollution. DWQ can provide additional information to interested local governments or references of other local governments in the state that are undertaking stormwater control programs.

FUTURE INITIATIVES IN THE WATAUGA RIVER BASIN

Nonpoint Source Control Strategies and Priorities/Nutrient Reduction Efforts

Improving knowledge of and controlling nonpoint source pollution will be a high priority over the next five years. Nonpoint source pollution accounts for the threatened waters in the Watauga River basin. The following two initiatives are underway to address the protection of surface waters from nonpoint sources of pollution.

- Establishment of nonpoint source basin teams in each basin. DWQ has begun setting up nonpoint source teams in each of the state's 17 major river basins. Refer to Section 7.2.2 of Chapter 7 for further description.

- Interagency Water Quality Monitoring. DWQ has begun the process of coordinating with other natural resource agencies on the idea of interagency water quality monitoring across the state. Refer to Section 7.2.3 of Chapter 7 for more information.

National Pollutant Discharge Elimination System (NPDES) Program

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

- improve compliance with permitted limits;
- improve pretreatment of industrial wastes to municipal wastewater treatment plants so as to maintain reduced toxicity in effluent wastes;

- encourage pollution prevention at industrial facilities in order to reduce the need for pollution control;
- require dechlorination of chlorinated effluents or the use of alternative disinfectants;
- require multiple treatment trains at wastewater facilities; and
- require plants to begin plans for expansion well before they reach capacity.

Longer-term objectives will include refining overall management strategies after obtaining feedback on current management efforts during the next round of water quality monitoring. Long-term point source control efforts will stress reduction of wastes entering wastewater treatment plants, seeking more efficient and creative ways of recycling byproducts of the treatment process (including nonpotable reuse of treated wastewater), and keeping abreast of and recommending the most advanced wastewater treatment technologies.

Use of Discharger Self-Monitoring Data

DWQ will continue to explore the possibilities of using discharger self-monitoring data to a greater degree to augment the data it collects through the programs described in Chapter 4. Quality assurance, timing and consistency of data from plant to plant would have to be addressed. Also, a system would need to be developed to enter the data into a computerized database for later analysis. One method of data collection that is currently being explored includes developing a comprehensive list of monitoring sites for the basin that would be monitored by an association of NPDES dischargers with data input to STORET. A basinwide sampling program has been established for dischargers in the Neuse River Basin and to date appears to be successful.

Coordinating Basinwide Management With the Construction Grants and Loans Program

The potential exists to use the basinwide planning process to identify and prioritize wastewater treatment plants in need of funding through DWQ's Construction Grants and Loan Program. Completed basin documents are provided to this office for its use.

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, effluent limits, compliance information, water quality data and stream classifications, will be put in a central data center which will be made accessible to most staff at desktop computer stations. Much of this information is also being entered into the state's GIS computer system. As all this information is made available to the GIS system, including land use data from satellite or air photo interpretation, and as the system becomes more user friendly, the potential to graphically display the results of water quality data analysis will be tremendous.

CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this Basinwide Water Quality Management Plan is to report to citizens, policy makers and the regulated community on:

- the current status of surface water quality in the basin,
- major water quality concerns and issues,
- projected trends in development and water quality,
- the long-range water quality goals for the basin, and
- recommended point and nonpoint source management options.

This Plan presents strategies for management of both point and nonpoint sources of pollution. The Division of Water Quality (previously Division of Environmental Managment) is preparing a basinwide water quality management plan for each of the state's 17 major river basin, as shown in Figure 1.1

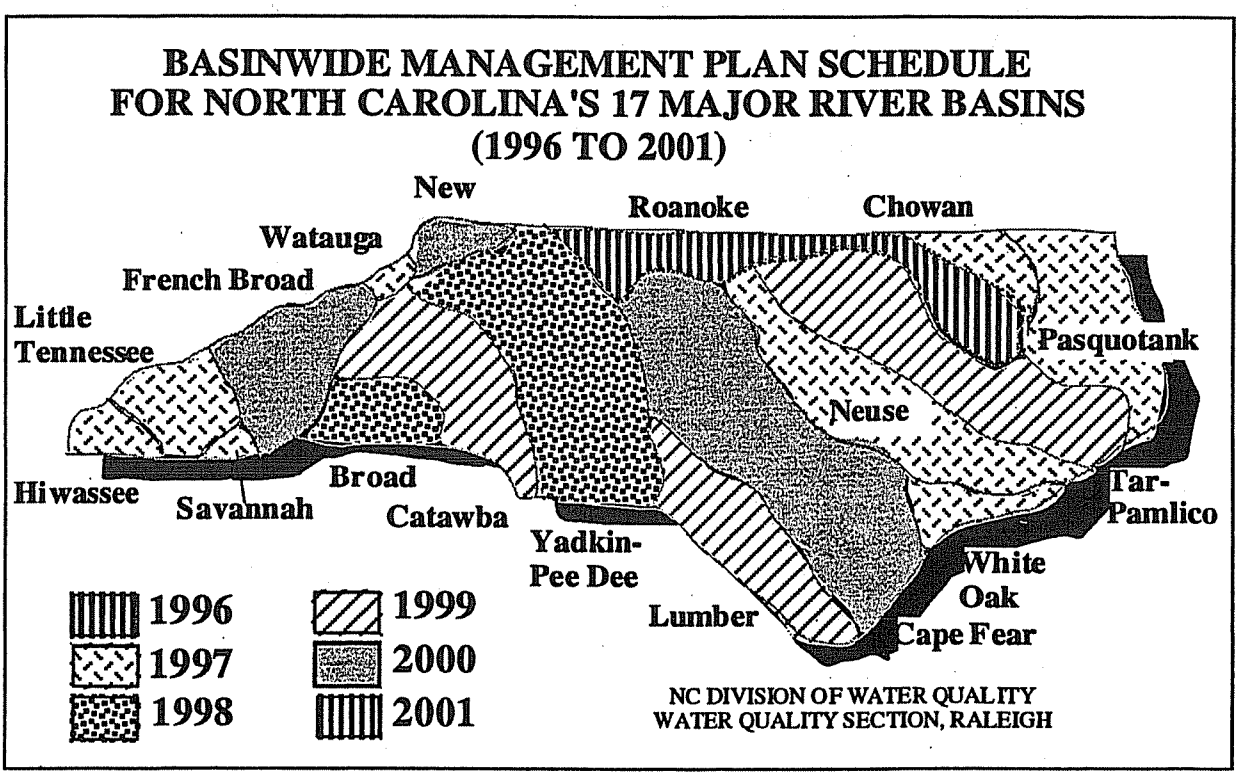


Figure 1.1 Basinwide Management Plan Schedule (1996 to 2001)

1.2 GUIDE TO USE OF THIS DOCUMENT

CHAPTER 1: Introduction - This chapter provides a non-technical description of the purpose of this plan, the basinwide water quality management approach and how this approach will be administered. The description of the basinwide management approach is based primarily on a 54-page framework document entitled *North Carolina's Basinwide Approach to Water Quality Management: Program Description - Final Report/August 1991* (Creager and Baker, 1991).

CHAPTER 2: General Basin Description - Some of the specific topics covered in this chapter include:

- an overview of the major features such as location, rainfall, population, physiography, etc.
- hydrology of the basin and its subbasins
- a summary of land cover within the basin based on results of a 1982 and 1992 Nationwide Resources Inventory (NRI) conducted by the US Department of Agriculture Natural Resources Conservation Service.
- population growth trends and densities by subbasin using 1970, '80 and '90 census data.
- major water uses in the basin and DWQ's program of water quality classifications and standards.

CHAPTER 3: Causes and Sources of Water Pollution - This chapter describes both point and nonpoint sources of pollution. It also describes a number of important causes of water quality impacts including sediment, biochemical oxygen demand (BOD), toxic substances, nutrients, color, fecal coliform bacteria and others. Pollutant loading in the basin and general water quality problem areas are discussed.

CHAPTER 4: Water Quality and Use Support Ratings - This chapter describes the various types of water quality monitoring conducted by DWQ, summarizes water quality in each of the subbasins in the basin and presents a summary of use support ratings for those surface waters that have been monitored or evaluated.

CHAPTER 5: Existing Water Quality Programs and Program Initiatives in the Basin - Chapter 5 summarizes the existing point and nonpoint source control programs available to address water quality problems. These programs are management tools available for addressing the priority water quality concerns and issues that are identified in Chapter 6. Chapter 5 also describes the concept of Total Maximum Daily Loads (TMDLs). TMDLs represent management strategies aimed at controlling point and nonpoint source pollutants. This chapter also describes various program initiatives being implemented in the basin to address water quality problems.

CHAPTER 6: Major Water Quality Concerns and Recommended Management Strategies - Water quality issues identified in Chapters 2, 3 and 4 are evaluated and prioritized based on use-support ratings, degree of impairment, and the sensitivity of the aquatic resources being affected. Recommended management strategies, or TMDLs, are presented that describe how the available water quality management tools and strategies described in Chapter 5 will be applied in the basin. This includes generalized wasteload allocations for dischargers and recommended programs and best management practices for controlling nonpoint sources.

CHAPTER 7: Future Initiatives - This chapter presents future initiatives for protecting or improving water quality in the basin. These may include both programatic initiatives such as improving permit compliance, or basin-specific initiatives such as developing strategies for restoring impaired waters.

1.3 NORTH CAROLINA'S BASINWIDE MANAGEMENT APPROACH

Introduction - Basinwide water quality management is a watershed-based management approach being implemented by DWQ which features basinwide permitting, integrating existing point and nonpoint source control programs, and preparing basinwide management plans. DWQ is applying this approach to each of the seventeen major river basins in the state as a means of better identifying water quality problems, developing appropriate management strategies, maintaining and protecting water quality and aquatic habitat, and assuring equitable distribution of waste assimilative capacity for dischargers.

After conducting public workshops to identify areas of concern and major issues, a basinwide management plan is prepared for each basin. The plans are circulated for public review and are presented at public meetings in each river basin. The management plan for a given basin is completed and approved preceding the scheduled date for basinwide discharge permit renewals in that basin. The plans are then evaluated, based on followup water quality monitoring, and updated at five year intervals.

DWQ began formulating the idea of basinwide management in the late 1980s, established a basin permitting schedule in 1990, began basinwide monitoring activities in 1990, and published a basinwide program description in August 1991. Basinwide management entails coordinating and integrating, by major river basin, DWQ's water quality program activities. These activities, which are discussed further in Section 1.4, include permitting, monitoring, modeling, nonpoint source assessments, and planning.

Water Quality Program Benefits - Several benefits of basinwide planning and management to North Carolina's Water quality program include:

- ***Improved program efficiency.*** By reducing the area of the state covered each year, monitoring, modeling, and permitting efforts can be focused. As a result, *efficiency increases* can be achieved for a given level of funding and resource allocation.
- ***Increased effectiveness.*** The basinwide approach is in consonance with basic ecological watershed management principles, leading to *more effective* water quality assessment and management. Linkages between aquatic and terrestrial systems are addressed (e.g., contributions from nonpoint sources). All inputs to aquatic systems and potential interactive, synergistic and cumulative effects are considered.
- ***Better consistency and equitability*** . By clearly defining the program's long-term goals and approaches, basinwide plans will encourage *consistent* decision-making on permits and water quality improvement strategies. Consistency and greater attention to long-range planning will promote a *more equitable* distribution of assimilative capacity, explicitly addressing the trade-offs among pollutant sources and allowances for economic growth.
- ***Increased public awareness of the state's water quality protection programs.*** The basinwide plans are an educational tool for increasing public awareness on water quality issues within the basin.
- ***Basinwide management promotes 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 prevent overloading of the receiving waters and to allow for a reasonable margin of safety to ensure compliance with water quality standards.

Basinwide Planning Schedule - The following table presents the overall basin schedule for all 17 major river basins in the state. Included are the dates for permit reissuance and the dates by which management plans are to be completed for each basin.

Table 1.1 Basinwide Permitting and Planning Schedule for North Carolina's 17 Major River Basins (1993 through 1998).

Basin	Target Date for Basin Plan Approval	Discharge Permits to be Issued	Basin	Target Date for Basin Plan Approval	Discharge Permits to be Issued
Neuse	2/93(approved)	4/93	Roanoke	9/96(approved)	1/97
			White Oak	1/97(approved)	6/97
Lumber	5/94(approved)	11/94	Watauga	4/97(approved)	9/97
Tar-Pamlico	12/94(approved)	1/95	Savannah	5/97(approved)	9/97
Catawba	2/95(approved)	4/95	Little Tennessee	5/97(approved)	10/97
French Broad	5/95(approved)	8/95	Hiwassee	5/97(approved)	12/97
New	7/95(approved)	11/95	Chowan	8/97	1/98
			Pasquotank	8/97	1/98
Cape Fear	9/95(approved)	1/96	Neuse (2nd cycle)	11/97	4/98
			Yadkin-Pee Dee	1/98	7/98
			Broad	6/98	11/98

The number of plans to be developed each year varies from one to six and is based on the total number of permits to be issued each year. For example, the Cape Fear basin, the state's largest, has about as many dischargers as all six of the small basins in 1997. This has been done in order to balance the permit processing workload from year to year. In years where more than one basin is scheduled to be evaluated, an effort has been made to group at least some of the basins geographically in order to minimize travel time and cost for field studies and public meetings.

Plans to be updated every five years - The earliest basin plans will likely not achieve all of the long-term objectives for basinwide management outlined above. However, plans are updated every 5 years. Updated plans will incorporate additional data and new assessment tools (e.g., basinwide water quality modeling) and management strategies (e.g., for reducing nonpoint source contributions) as they become available.

Basinwide Plan Preparation, Review and Public Involvement - Preparation of an individual basinwide management plan is a five year process which is broken down into four phases as described below.

Year	Activity
Year 1 to 3	Water Quality Data Collection/Identification of Goals and Issues: Year 1 entails identifying sampling needs and canvassing for information. It also entails coordinating with other agencies, the academic community and local interest groups to begin establishing goals and objectives and identifying and prioritizing problems and issues. Biomonitoring, fish community and tissue analyses, special studies and other water quality sampling activities are conducted in Years 2 and 3 by DWQ's Environmental Sciences Branch (ESB). These studies provide information for assessing water quality status and trends throughout the basin and provide data for computer modeling.
Year 3 to 4	Data Assessment and Model Preparation: Modeling priorities are identified early in this phase and are refined through assessment of water quality data from the ESB. Data from special studies are then used by DWQ's Technical Support Branch (TSB) to prepare models for estimating potential impacts of waste loading from point and nonpoint sources using the TMDL approach. Preliminary water quality control strategies are developed based on modeling, with input from local governments, the regulated community and citizen groups during this period.

Year 4 — Preparation of Draft Basinwide Plan: The draft plan, which is prepared by DWQ's Planning Branch, is due for completion by the end of year 4. It is based on support documents prepared by DWQ's Environmental Sciences Branch (water quality data) and the Technical Support Branch (modeling data and recommended pollution control strategies). Preliminary findings are presented at informal meetings through the year with local governments and interested groups, and comments are incorporated into the draft.

Year 5 — Public Review and Approval of Plan: At the beginning of year 5, the draft plan, after approval of the Environmental Management Commission (EMC), is circulated for review and public meetings are held. Revisions are made to the document, based on public comments and the final document is submitted to the EMC for approval midway through year 5. Basinwide permitting begins at the end of year 5.

Implementation - The implementation of basinwide planning and management will occur in phases. Permitting activities and associated routine support activities (field sampling, modeling, wasteload allocation calculations, etc.) have already been rescheduled by major river basin. All National Pollutant Discharge Elimination System (NPDES) permit renewals within a basin occur within a prescribed time period after completion of the final basin plan, and will be repeated at five year intervals.

Nonpoint source management proposals will be implemented by several different avenues. The Water Quality Section is setting up nonpoint source (NPS) teams for each basin. These teams are made up of representatives of nonpoint source agencies, resource agencies, and special interest groups. The NPS teams are responsible for prioritizing specific watersheds for follow-up investigations, educational efforts, and best management practice (BMP) implementation. Funding for BMP implementation will be sought from sources such as existing cost-share monies or from federal Section 319 grants. In addition to projects in specific watersheds, the NPS team will develop programmatic action plans for each category of nonpoint source pollution. The action plans detail voluntary actions that agencies and groups have committed to complete to protect and improve water quality in the basin. Many of the action plan items involve increased educational efforts or enforcement of existing programs.

1.4 BASINWIDE RESPONSIBILITIES WITHIN THE DWQ WATER QUALITY SECTION

The Division of Water Quality is the lead state agency for the regulation and protection of the state's surface waters. The Division is comprised of four sections: Water Quality, Groundwater, Construction Grants and Loans, and the Water Quality Laboratory.

The primary responsibilities of the Division of Water Quality are to maintain or restore an aquatic environment to sufficient quality to protect the existing and best intended uses of North Carolina's surface waters and to ensure compliance with state and federal water quality standards. The Division receives both state and federal allocations as well as funding through permit fee collections. Policy guidance is provided by the Environmental Management Commission. The major areas of responsibility are water quality monitoring, permitting, planning, modeling (wasteload allocations) and compliance oversight.

The Central office is divided into four branches, each branch is subdivided into two units (Figure 1.2 and Appendix I). The Planning Branch is responsible for developing surface water quality standards and classifications, nonpoint source program planning, administering the basinwide management program, modeling nonpoint pollution sources, developing use support ratings and improving the section's GIS capabilities. It also coordinates EPA water quality planning grants, state environmental policy act responsibilities and the implementation of the Comprehensive

Conservation and Management Plan (CCMP) that resulted from the Albemarle-Pamlico Estuarine Study (APES).

The Operations Branch is responsible for permit compliance tracking, the pretreatment program, water supply watershed protection/local government technical support, and the operator training and certification program.

The Technical Support Branch is responsible for reviews and processing of discharge and nondischarge permits, coordinating development of TMDLs and wasteload allocations for dischargers, and providing primary computer modeling support.

The Environmental Sciences Branch is responsible for all biological and chemical water quality monitoring and evaluation including benthic macroinvertebrate monitoring (biomonitoring), fish tissue and fish communities studies, and the wetlands 401 Water Quality Certification program. The Branch is also responsible for effluent toxicity testing and evaluations, algal analyses, long term biochemical and sediment oxygen demand, and lakes assessments.

The seven Regional Offices carry out activities such as wetland reviews, compliance evaluations, permit reviews and facility inspections for both discharging and nondischarging systems, ambient water quality monitoring, state environmental policy act reviews, stream reclassification reviews, pretreatment program support and operator training and certification assistance. In addition, they respond to water quality emergencies such as oil spills and fish kills, investigate complaints and provide information to the public. Figure 1.3 shows the location of the regional offices and the counties that they serve.

REFERENCES CITED: CHAPTER 1

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

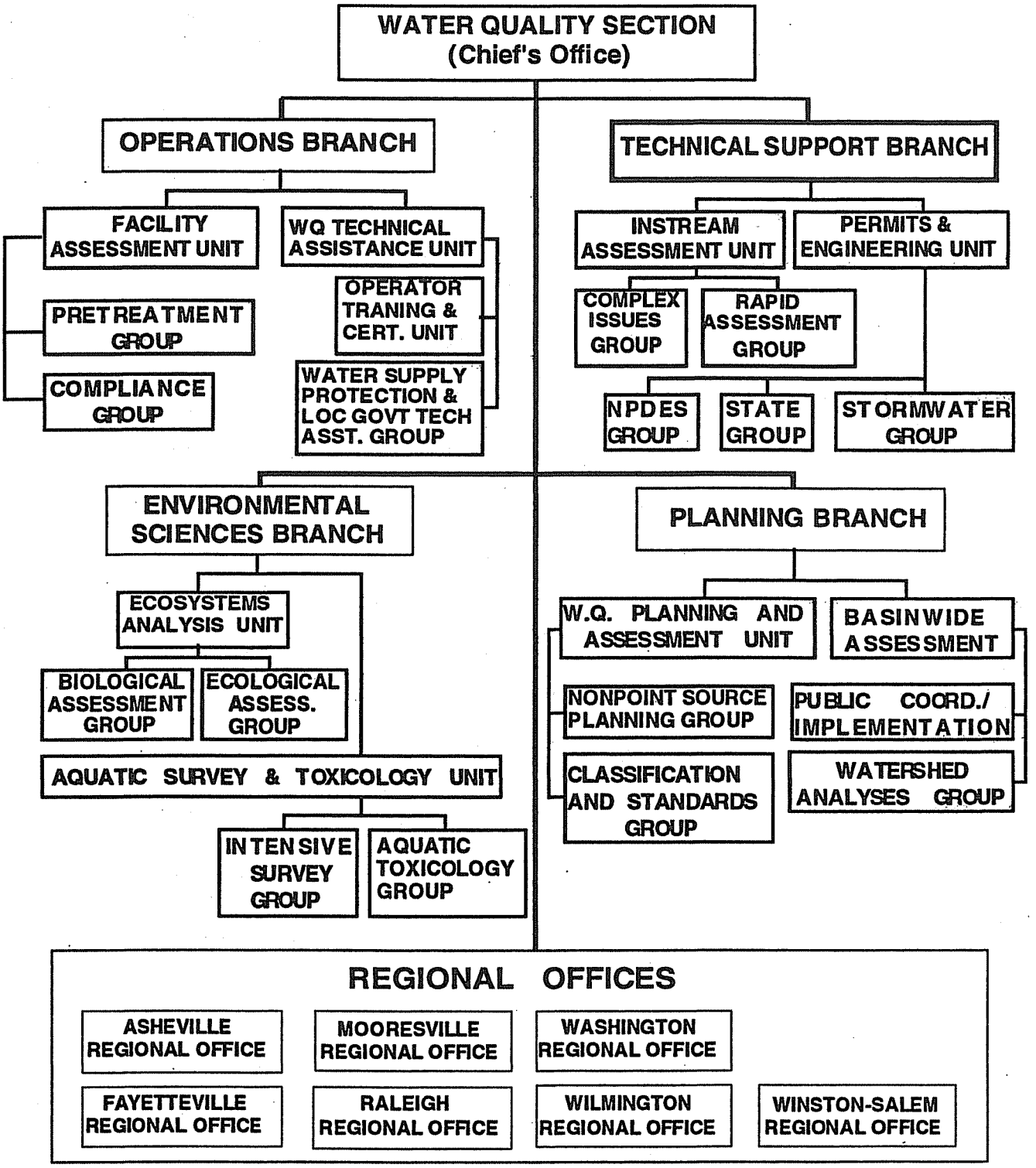
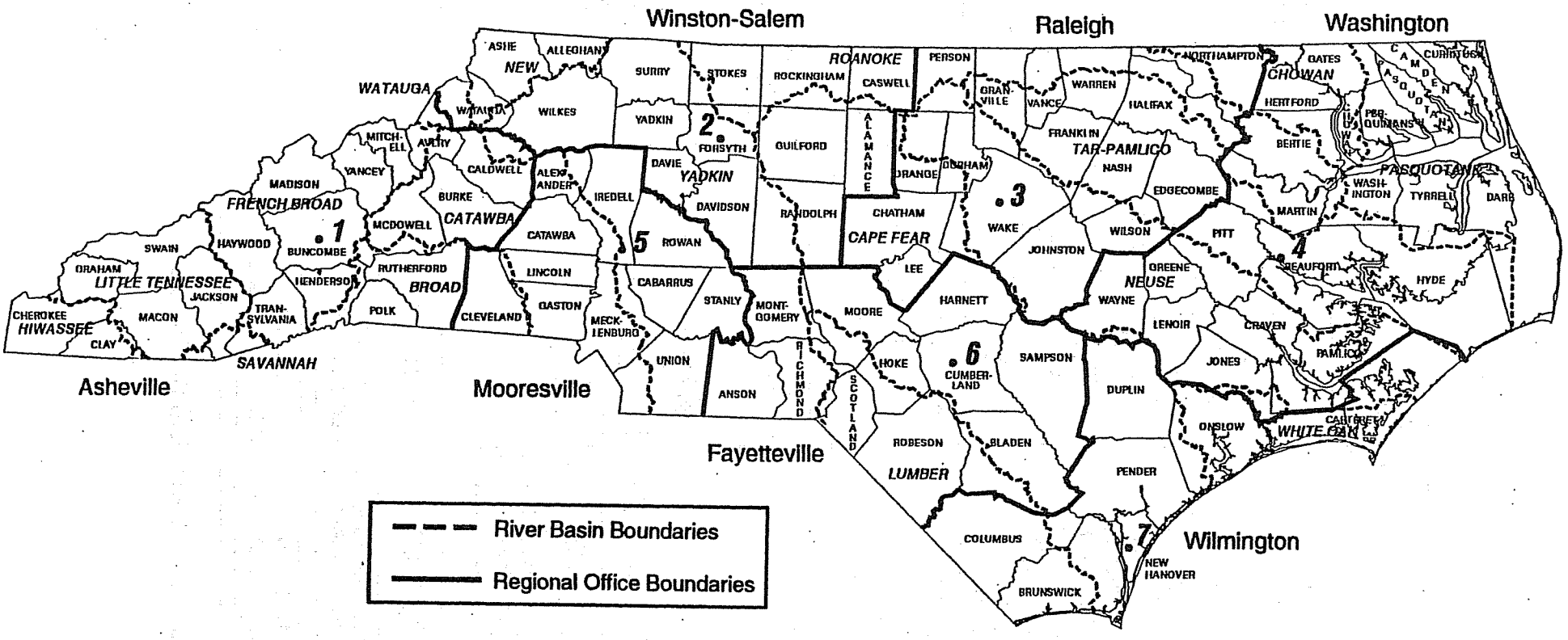


Figure 1.2 Organizational Structure of the DWQ Water Quality Section

DWQ CENTRAL AND REGIONAL OFFICES (WITH RIVERS BASINS)

N.C. Department of Environment, Health, and Natural Resources



1 - ARO

Mr. Roy Davis
Regional Supervisor
59 Woodfin Place
Asheville, NC 28801
(704)251-6208
Fax (704)251-6098

2 - WSRO

Mr. Larry Coble
Regional Supervisor
585 Waughtown Street
Winston-Salem, NC 27107
(919)771-4600
Fax (919)771-4631

3 - CENTRAL OFFICE

DEHNR, DEM
Water Quality Section
P.O. Box 29535
Raleigh, NC 27626-0535
(919)733-5083
Fax (919)733-9919

3 - RRO

Mr. Ken Schuster
Regional Supervisor
3800 Barrett Drive
Raleigh, NC 27609
(919)571-4700
Fax (919)571-4718

4 - WaRO

Mr. Jim Mulligan
Regional Supervisor
1424 Carolina Avenue
Washington, NC 27889
(919)946-6481
Fax (919)975-3716

5 - MRO

Mr. Keith Overcash
Regional Supervisor
919 North Main Street
Mooresville, NC 28115
(704)663-1699
Fax (704)663-6040

6 - FRO

Mr. Tommy Stevens
Regional Supervisor
Wachovia Bldg., Suite 714
Fayetteville, NC 28301
(910)486-1541
Fax (910)486-0707

7 - WIRO

Mr. Rick Shiver
Regional Supervisor
127 Cardinal Drive Extension
Wilmington, NC 28405-3845
(910)395-3900
Fax (910)350-2004

Figure 1.3 Location of Division of Water Quality Regional Offices

CHAPTER 2

GENERAL BASIN DESCRIPTION

2.1 WATAUGA BASIN OVERVIEW

The Watauga River basin is located within the Blue Ridge Province of the Appalachian Mountains of western North Carolina (Figure 2.1). The basin drains portions of Watauga and Avery counties. The Watauga River basin is nestled between the French Broad River basin to the south and the New River basin to the north. The watershed drains north to northwest from North Carolina to Tennessee.

The Watauga River basin is composed of the headwaters and tributaries of the Elk River and the Watauga River. The Elk River, the principal tributary of the Watauga River, and the Watauga River flow into Watauga Lake in Tennessee. The Watauga River and the Elk River are headwater tributaries of the Holston River, which flows into the Tennessee River. Waters from the Watauga River eventually flow into the Mississippi River and the Gulf of Mexico. Figure 2.2 shows a general view of the entire Holston River drainage area.

The basin is the second smallest basin in the state, encompassing only 184 square miles of watershed. The basin contains approximately 283 miles of freshwater streams and rivers. Figure 2.3 illustrates the location of the basin within North Carolina and the municipalities and major streams within the basin.

Based on 1990 census data, the population of the basin was 16,083 people. While population in the basin is low, there has been significant population growth. The percent population growth over the past twenty years (1970 - 1990) was 35.4%.

The land comprising the Watauga River basin is mountainous (elevations to greater than 5,500 feet) and primarily rural. Over half of the land in the basin is forested (56.2%) with another quarter (23.8%) devoted to pastureland. While most of the watershed is forested, many retirement and second home developments are being built in the area. Most agriculture and development activities occur in river valleys and near streams due to the more level ground found in valleys. Development in or near stream corridors increases the chances for sedimentation and erosion problems.

Steep slopes limit the land area suitable for development and crop production. Slopes of less than 12% are desirable for development purposes and, in the absence of public sewer lines, soil depth of three feet or more over bedrock is desirable in order to allow construction of onsite septic systems. It is estimated that just 18% of lands in North Carolina's mountains meet these requirements (Clay et. al., 1975). Statistics provided by the US Department of Agriculture's Natural Resources Conservation Service indicate that cultivated cropland is shrinking as developed lands are increasing. Major industries in the basin include silviculture, agriculture (livestock and Christmas trees), and tourism.

The streams and rivers of the Watauga River basin are still generally of high water quality. The Watauga River basin can still boast of a high number of trout water streams and some waterfalls as an attraction for tourists to the area. However, there are apparent sedimentation problems occurring. These sedimentation problems are associated with nonpoint sources of pollution such as agriculture, construction, and urban growth.

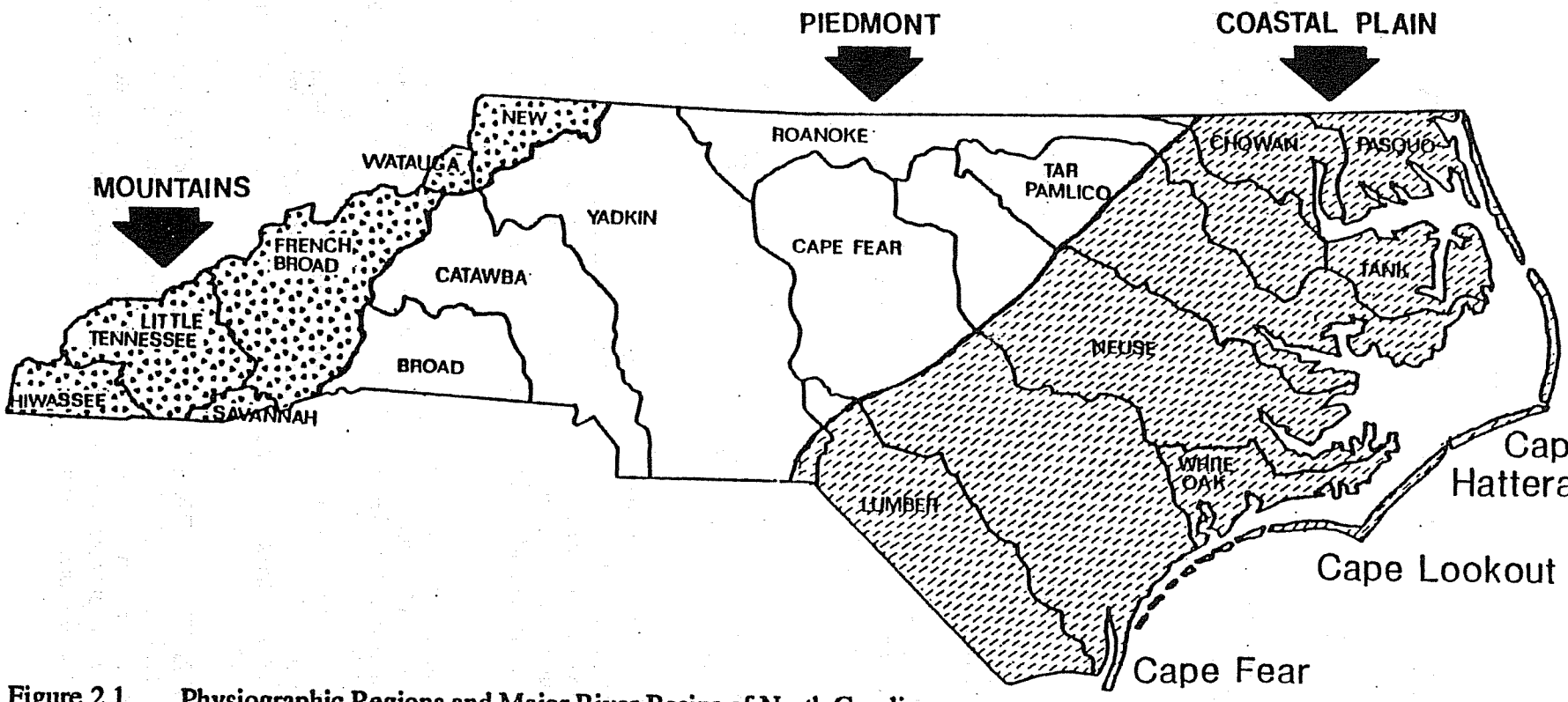


Figure 2.1 Physiographic Regions and Major River Basins of North Carolina

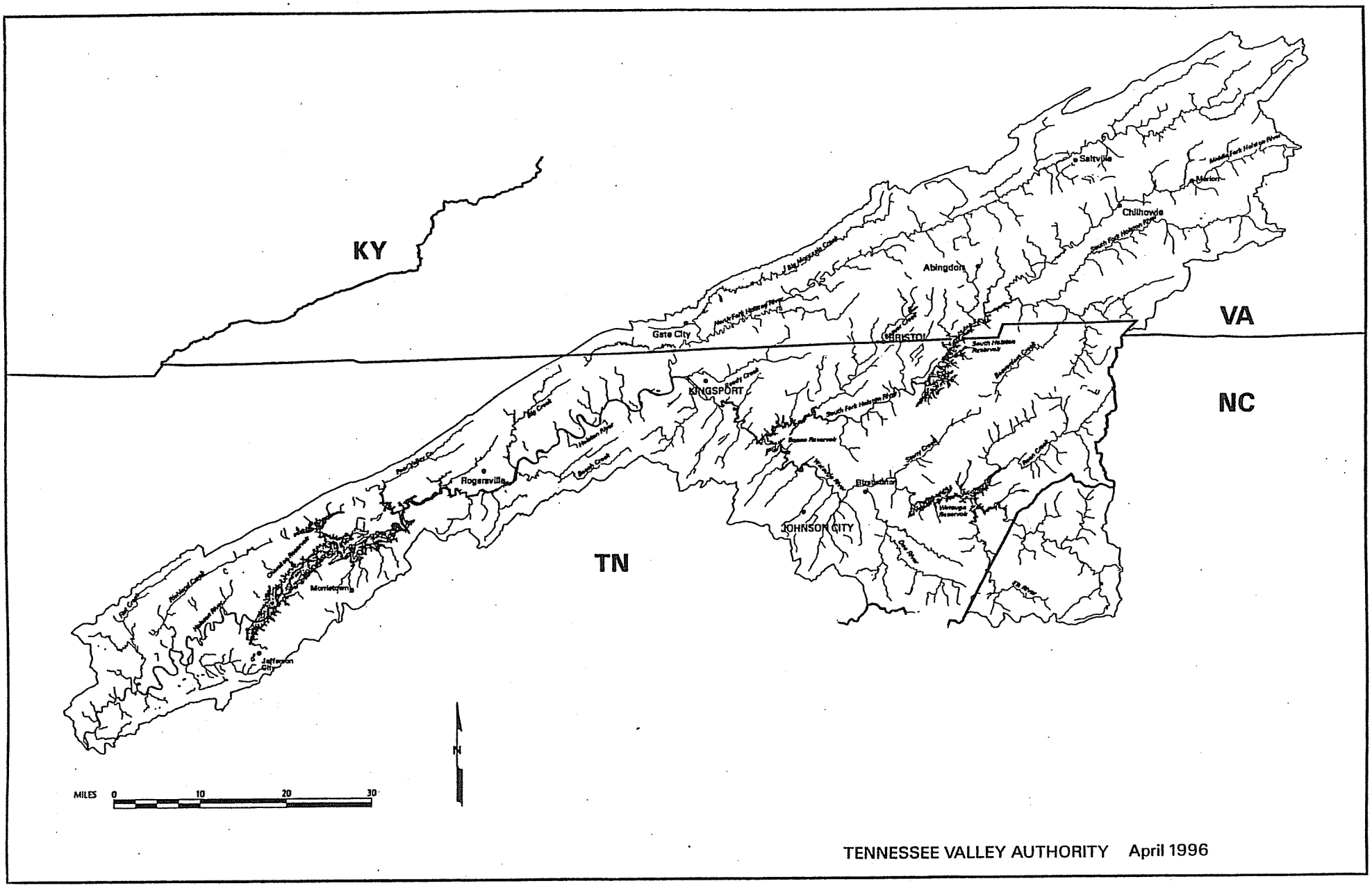


Figure 2.2 General Map of the Watauga River Basin in North Carolina and Tennessee

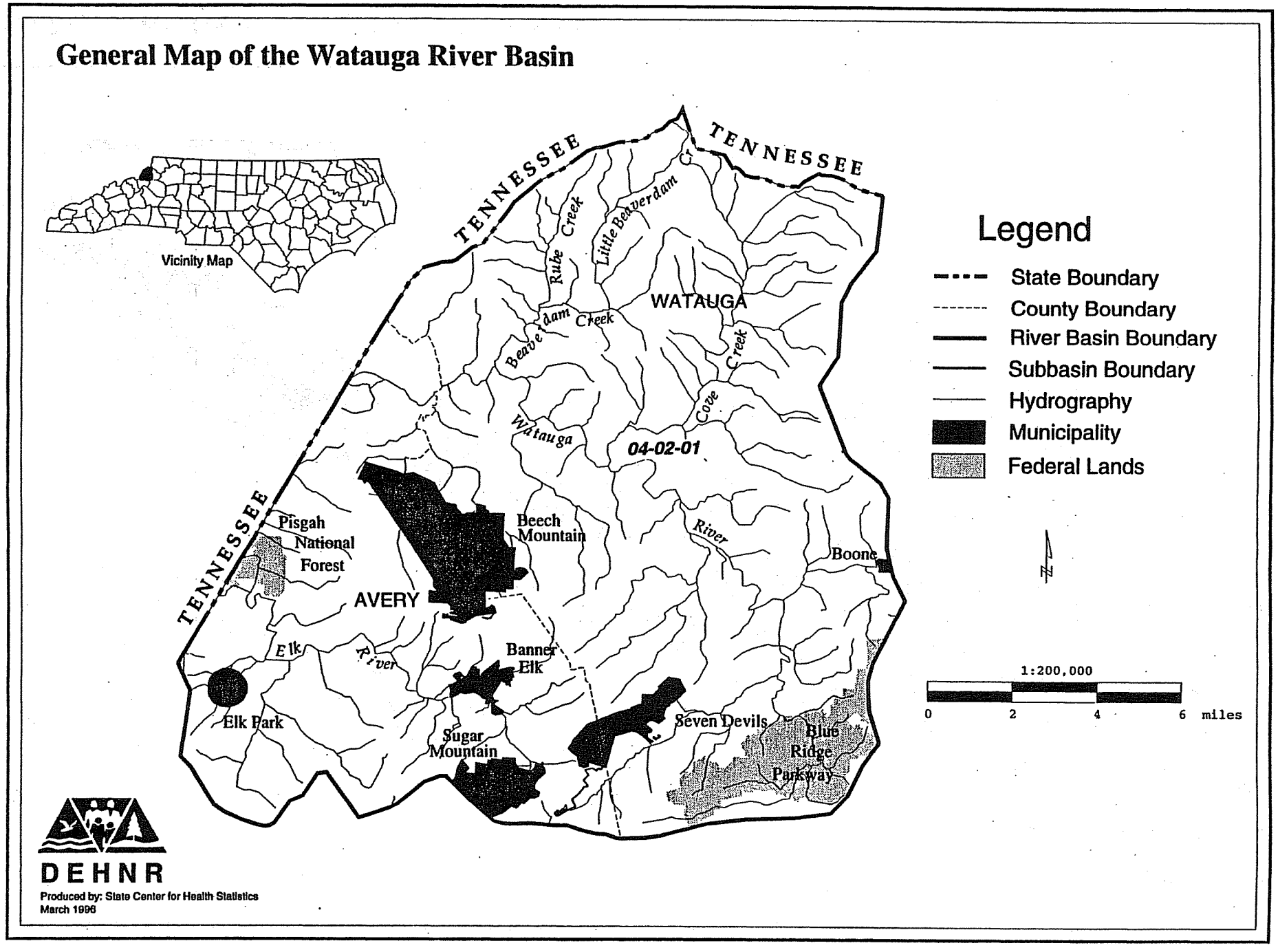
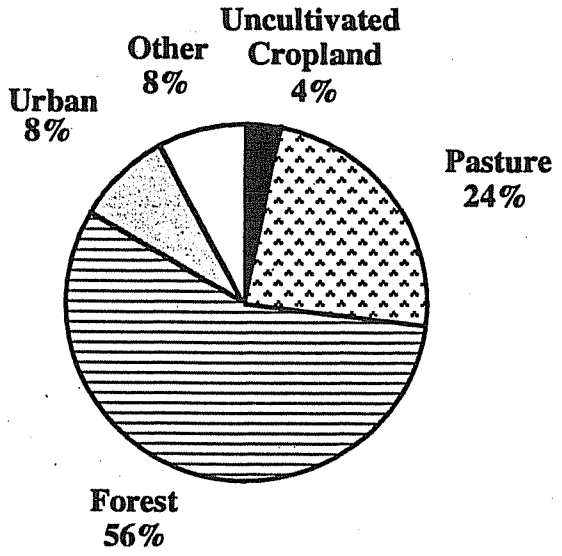
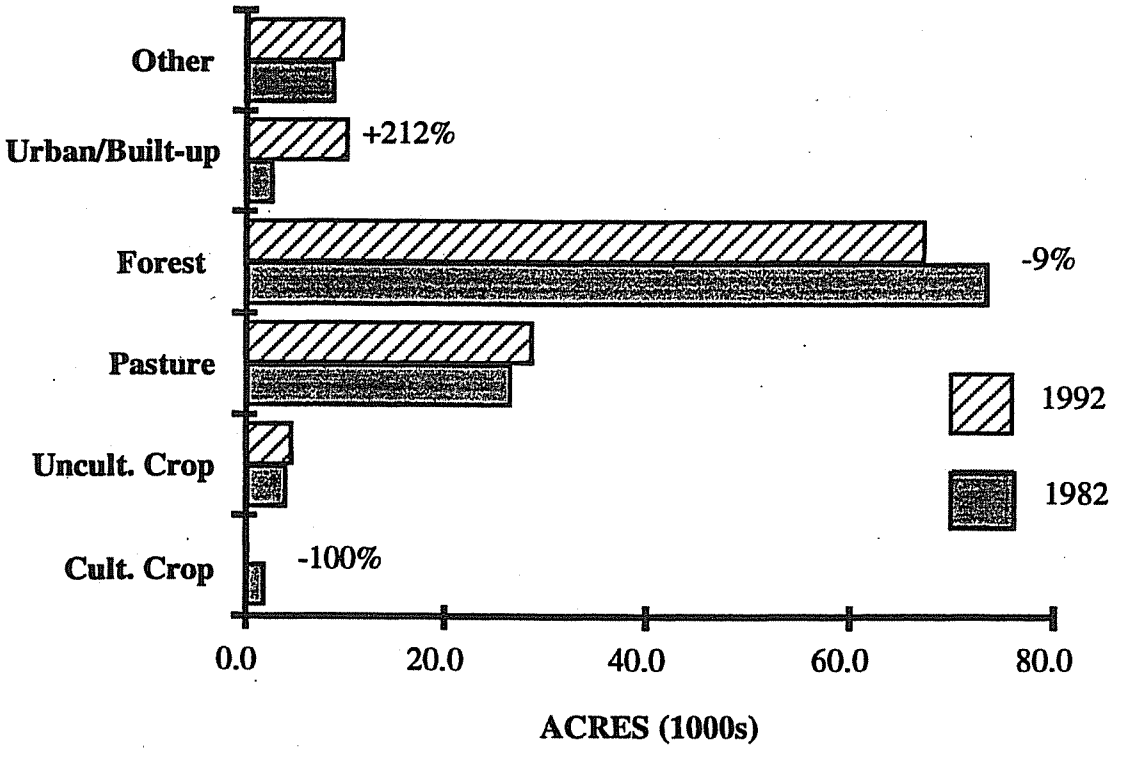


Figure 2.3 General Map of the Watauga River Basin in North Carolina



Source: USDA-NRCS 1992 National Resources Inventory

Figure 2.4 Watauga River Basin Land Cover Pie



Source: USDA-NRCS, 1982 and 1992 National Resources Inventory

Figure 2.5 Land Cover Changes in the Watauga River Basin from 1982 to 1992

Table 2.3 Description of Land Cover Types (Source: USDA- NRCS 1992 NRI)

Land Cover Type (No.)	Land Cover Description
1) Cultivated Cropland	Land used for the production of adapted crops for harvest, including row crops, small-grain crops, hay crops, nursery crops, orchard crops, and other specialty crops. The land may be used continuously for these crops or they may be grown in rotation with grasses and legumes.
2) Uncultivated Cropland	Summer fallow, aquaculture in crop rotation, or other cropland not planted (may include cropland in USDA set-aside or similar short-term program).
3) Pastureland	Land used primarily for production of introduced or native forage plants for livestock grazing. This category includes land that has a vegetative cover of grasses, legumes, and /or forbs, regardless of whether or not it is being grazed by livestock.
4) Forest Land	Land at least 10 percent stocked 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 and not currently developed for non-forest use. Ten percent stocked, when viewed from a vertical direction, is a canopy cover of leaves and branches of 25 percent or greater. The minimum area for classification of forest land is 1 acre, and the area must be at least 1,000 feet wide.
5) 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. Highways, railroads, and other transportation facilities are considered part of this category if surrounded by other urban and built-up areas. Tracts of less than 10 acres that do not meet this category's definitions (e.g., small parks or water bodies) but are completely surrounded by urban and built-up lands are placed in this category.
6) 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). Includes the following three categories Small Water Areas: Water bodies less than 40 acres in size and streams less than one-half mile wide. Census Water: Large water bodies 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 2.4 Descriptions of Southern Appalachian Assessment Landsat Land Cover Types

Cover Type	Description
Forest	Represents all forest types including: hardwood, coniferous, and mixed.
Herbaceous	Represents all areas that are vegetated and contain a crown closure of less than 25% (not forested), and are not classified by USGS land use data as agricultural (cropland or pasture).
Barren	Represents all areas that are greater than 75% non-vegetated, and contain less than 50% synthetic surfaces. Exposed rock surfaces (quarries) fall into this land cover type.
Pasture	Represents all areas defined as agricultural pasture lands.
Cropland	Represents all areas defined as agricultural crop lands.
Wetlands	Represents all areas that are coded as lacrustine or palustrine in the National Wetlands Inventory data, but are not subclassified as open water or forested with bottomland hardwood species.
Developed	Represents all areas that are greater than 75% non-vegetated and contain greater than 50% synthetic surfaces from USGS land use data. Urban land cover falls into this type.
Water	Represents all areas in water.
Indeterminate	Represents all other categories that could not be determined during analysis and includes clouds, shadows, etc.

Table 2.5 Land Cover for the Watauga River Basin portion of the Southern Appalachian Mountain Region (1990 to 1994) based on Landsat Data.

Cover Type	Acres
Forest	105, 865
Herbaceous	4,171
Barren	83
Pasture	18,474
Cropland	1,017
Wetlands	49
Developed	1,578
Water	73
Indeterminate	0
Total	131,314

2.3.2 Population and Growth Trends in the Basin

There are two counties partially within the Watauga River basin. The basin contains all or part of six municipalities. Based on 1990 census data, the population of the basin was 16,083 people. The overall population density is 78 persons per square mile versus a statewide average of 123 persons per square mile (Figure 2.6). Population changes for the period of 1970 - 1990 and Land Area Summaries for the basin can be found in Table 2.6. While population in the basin is low, there has been significant population growth. The percent population growth over the twenty year period from 1970 to 1990 (Figure 2.7) was 35.4%, although growth over the ten year period from 1980 to 1990 was 6.1% (versus a statewide average of 12.7%). The most populated area is near Boone, but the other municipalities are also experiencing steady growth (Figure 2.8).

Growth rates for the municipalities within the Watauga River basin can be found in Table 2.7. When looking at the increase in population within the municipal boundaries it can be seen that growth rates are very high for a few of the municipalities. For those municipalities showing a decrease in population, it is probable that the population is not actually leaving the basin, but moving instead to outside the municipal boundaries. Only 15.5% of the population of Avery county was living in a municipality in 1994. Watauga county had only 38.6% of its population located within a municipality (Office of State Planning). Much of the growth within the basin is occurring along stream and river corridors, which can have a more significant impact on water quality due to a lack of municipal regulations and a dependence on septic systems. As noted earlier, increases in population tend to offset land cover previously held in forest lands.

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 estimating 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. This method assumes 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 each ten years so comparisons between years must be considered approximate.

Table 2.6 Watauga River Basin Population (1970, 1980, and 1990), Percent Population Change and Land Area Summaries

SUBBASIN	POPULATION (Number of Persons)			POPULATION DENSITY (Persons/Square Mile)			LAND AND WATER AREAS			
							Total Land and Water Area		Water Area	Land Area
	1970	1980	1990	1970	1980	1990	(Acres)	(Sq. Miles)	(Sq. Miles)	(Sq. Miles)
04-02-01	11,880	15,164	16,083	58	74	78	131,200	205	0	205
Totals	11,880	15,164	16,083	58	74	78	131,200	205	0	205

Note: Population, land area and water area were derived from 1970, 1980 and 1990 census data.

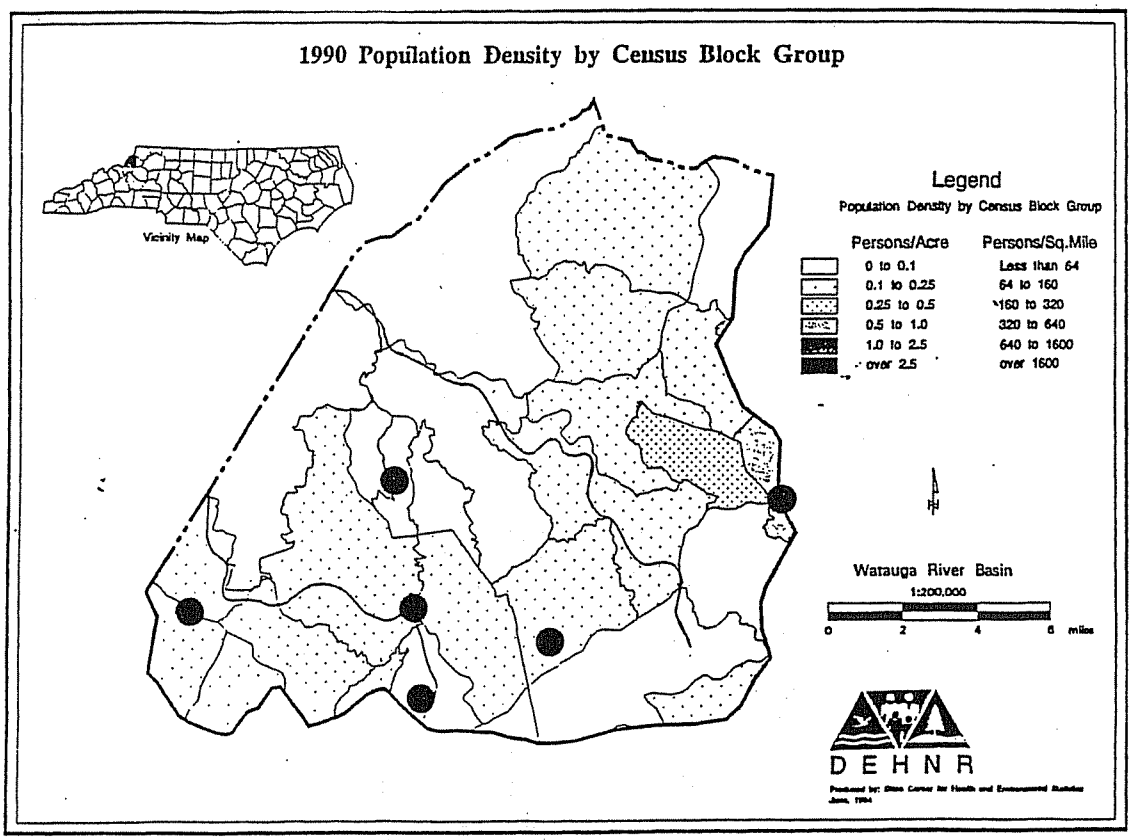


Figure 2.6 1990 Population Density by Census Block Group

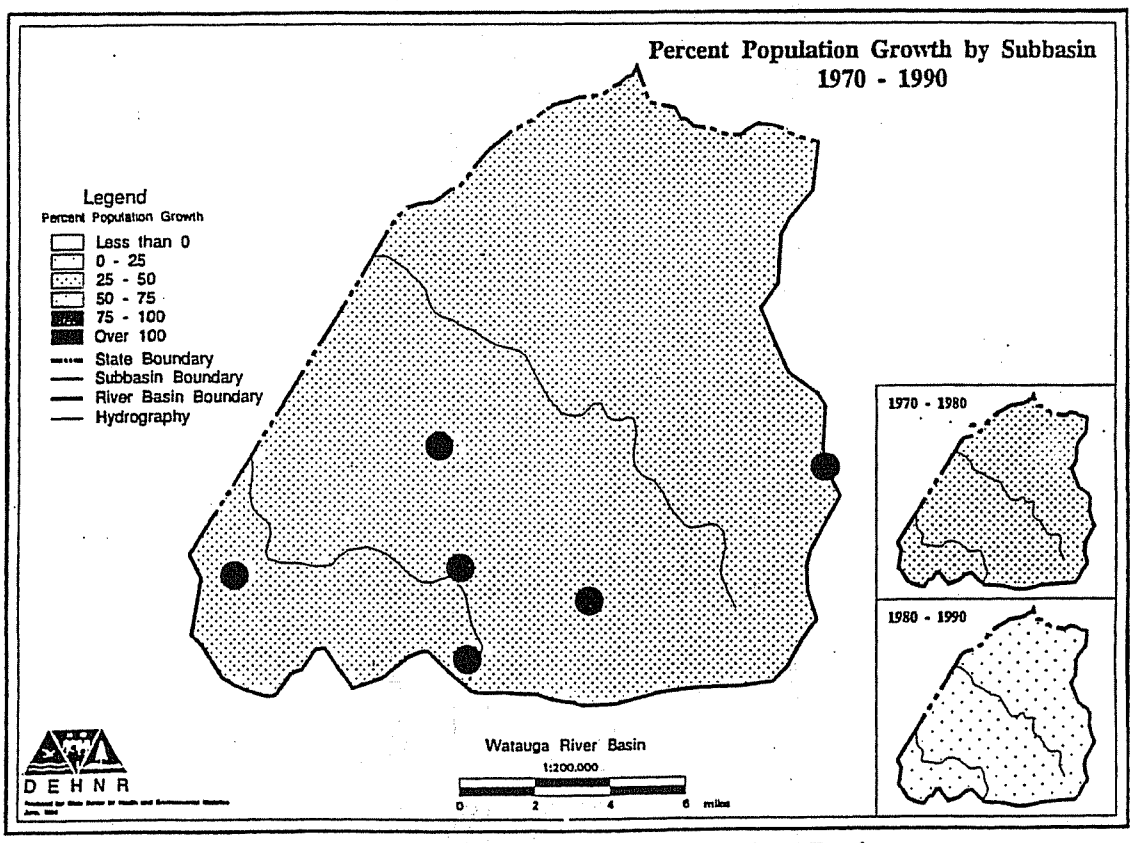


Figure 2.7 Percent Population Growth for Watauga River Basin

Table 2.7 Growth Rates for Watauga River Basin Municipalities

Municipality	April 1980	April 1990	July 1994	% Change (1980-1994)
Banner Elk	1,087	933	614	-43.5%
Beech Mountain	190	239	258	+35.8%
Boone	10,191	12,949	13,554	+33.0%
Elk Park	535	486	495	-7.5%
Seven Devils	54	117	127	+135.2%
Sugar Mountain	188	132	130	-30.9%

Source: North Carolina Municipal Population 94. Office of State Planning, Fall 1995.

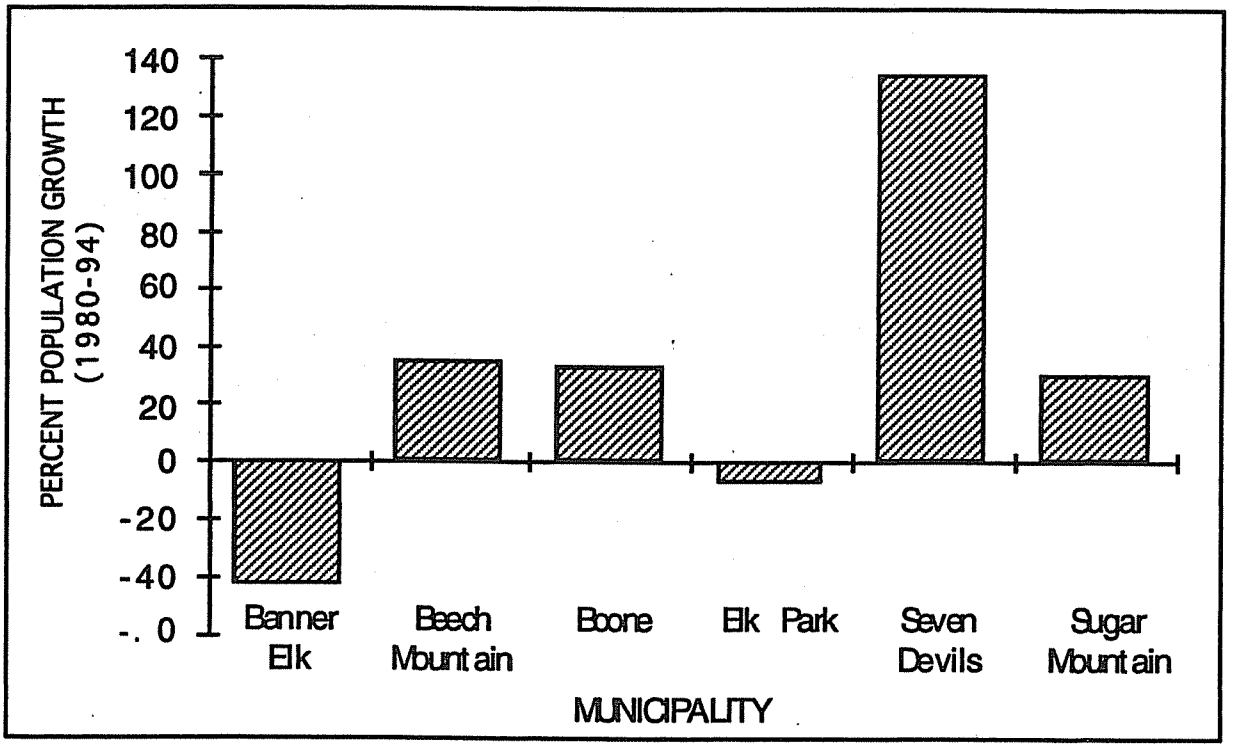


Figure 2.8 Percent Change for Municipalities in Watauga River Basin - 1980 to 1994.

Table 2.8 shows the projected percent change in growth between 1990 and 2020 for the percentage of the county estimated to be within the basin. Projections for Watauga county show a population increase (16.8%), while Avery county is projected to see a slight decrease in population (-4.6%). It should be noted that the municipalities in these counties with the highest growth rates are located within the Watauga River basin.

Table 2.8 Projected Population Changes (1990 to 2020) by Estimated Percentage of County in Subbasin

County	1990	2020	% of County in subbasin	Projected % Change
Avery	9,660	9,214	35 %	-4.6 %
Watauga	18,476	21,580	50 %	+16.8%

Source: North Carolina Municipal Population 94. Office of State Planning, Fall 1995.

2.4 THREATENED AND ENDANGERED AQUATIC FAUNAL SPECIES

In the Watauga River basin, there are three species that are listed by North Carolina as either Endangered, Special Concern, or Significantly Rare (Table 2.9). Threatened species are considered likely to become endangered within the foreseeable future. Endangered species are those species that are in danger of becoming extinct. Species of Special Concern have limited numbers and vulnerable populations and are in need of monitoring. Significantly Rare species are those whose numbers are small and whose populations need monitoring.

The hellbender is a long-lived salamander which inhabits large stream with cool, clean, fast-flowing water. Because they are sensitive to stream pollution, siltation and damming, hellbenders can serve as indicators of stream water quality. Urban development and associated habitat degradation have reduced North Carolina hellbender populations. Forested riparian buffers can reduce pollution and siltation of streams and improve hellbender habitat. The tangerine darter is a colorful fish which lives in deep, swiftly-flowing streams. The green floater is an endangered mussel which lives in smaller, slow-flowing streams. Once common in the Neuse and Cape Fear River basins, green floater populations have declined due to water quality degradation. Clean water will help protect the green floater populations in the Watauga watershed.

Other non-aquatic threatened and endangered species of amphibians, mammals, and plants occur along the streambanks. These non-aquatic species may be affected by water quality degradation in the basin. Significant declines in salamander populations have been noted in portions of the Elk River. It is unclear whether this population decline is due to water quality problems or to over harvesting of salamanders to sell to bait shops (Skeate, pers. comm.)

Table 2.9 Threatened and Endangered Species in the Watauga River Basin (Source: NC Natural Heritage Program, 1996)

Common Name	Scientific Name	Listing Status: State	Federal
Hellbender	*Cryptobranchus alleganiensis*	SC	
Tangerine Darter	*Percina aurantiaca*	SR	
Green Floater	*Lasmigona subviridis*	E	

Listing abbreviations: E = Endangered, SR = Significantly Rare, SC = Species of Concern

2.5 SURFACE WATER CLASSIFICATIONS AND STANDARDS IN THE WATAUGA RIVER BASIN

All surface waters in the state are assigned a primary water classification. They may also be assigned one or more supplemental classifications. Classifications are assigned to protect uses of the waters such as swimming, aquatic life propagation or water supplies. For each classification, there is a set of water quality standards that must be met in order to protect the uses. Appendix II provides a more detailed summary of the state's primary and supplemental classifications including (for each classification) the best usage, water quality standards, stormwater controls and other protection requirements as appropriate. This information is derived from 15A NCAC 2B .0200 - Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina.

The waters of the Watauga River basin have a variety of surface water quality classifications applied to them (Table 2.10). The majority of the waters are classified as C or B (84% and 14% respectively). There are currently 10 waters in the Watauga River basin supplementally classified as Outstanding Resource Waters (ORW), primarily located in Boone Fork and its tributaries (Table 2.11). The entire length of the Watauga River is classified as a High Quality Water (HQW). Water supply watersheds occur in Buckeye Creek and Pond Creek (both water supply headwaters draining to Beech Mountain). The supplemental classification of Tr is applied to many of the waters of the basin. The Watauga River basin is well-known for its trout waters. Figure 2.9 depicts the locations of water supply watersheds, high quality waters, and outstanding resource waters in the basin.

Table 2.10 Percent of Miles per Water Quality Classification in the Watauga River Basin

	HQW	ORW	WS-II	WS-III	Tr	B	C
Length (miles)	32	18	8	0.3	181	45	278
% of Total	10	6	2	<1	55	14	84

Information in Table 2.10 was calculated by the Center for Health Statistics using GIS applications. The above stream length summaries were calculated by first identifying the arcs representing stream segments, and subsequently attributing them by their class. This was an iterative process as many of the arcs were redundantly attributed (e.g. 'HQW' and 'C'), and therefore measured twice. This explains why the sum of the percentages for the various classes is greater than 100 percent.

Stream length summaries do not include the length of arcs representing pond and/or lake shorelines. Therefore, the measurement of the length of a particular stream will stop when entering an impounded area (lake), and begin again where the stream flows out of the impoundment.

A complete listing of classifications for all surface waters in the basin can be found in a DWQ publication entitled "Classifications and Water Quality Standards Assigned to the Waters of the Watauga River Basin". This has been reprinted in Appendix II. Pending reclassifications are discussed in Chapter 6.

Table 2.11 Surface Waters Classified as HQW and ORW in the Watauga River Basin

Stream Name	Stream Segment	Classification
Watauga River	From source to U.S. Hwy. 321 Bridge	B Tr HQW
Watauga River	From U.S. Hwy. 321 to the North Carolina-Tennessee State Line	B HQW
Boone Fork (Price Lake)	From source to Watauga River	C Tr ORW
Cold Prong	From source to Boone Fork	C Tr ORW
Laurel Creek	From source to Price Lake, Boone Fork	C Tr ORW
Sims Creek (Sims Pond)	From source to Boone Fork	C Tr ORW
Hoot Camp Branch	From source to Sims Creek	C ORW
Green Branch	From source to Boone Fork	C ORW
Cannon Branch	From source to Boone Fork	C ORW
Bee Tree Creek	From source to Boone Fork	C ORW
Pond Creek (Pond Branch)	From source to a point 0.6 mile upstream of mouth of West Pond Creek	WS-II Tr
Pond Creek (Pond Branch)	From a point 0.6 mile ups. of mouth of West Pond Creek to West Pond Creek	WS-II Tr CA
West Pond Creek	From source to a point upstream of mouth	WS-II Tr
West Pond Creek	From a point 0.6 mile upstream of mouth to Pond Creek	WS-II Tr CA
Lake Coffey	Entire lake and connecting stream to Pond Creek	WS-II Tr CA
Buckeye Creek	From source to a point 0.2 mile downstream of Bear Branch	WS-II Tr
Buckeye Creek	From a point 0.2 mile downstream of Bear Branch to Beech Mtn. water supply intake located 0.3 mile upstream of mouth of Grassy Gap Creek	WS-II Tr CA
Bear Branch	From source to Buckeye Creek	WS-II
New Branch	From source to a point 0.3 mile upstream of the mouth	WS-II
New Branch	From source to a point 0.3 mile upstream of the mouth to Buckeye Creek	WS-II CA

Notes: **By definition, WS I and WS II streams are a subset of the HQW supplemental classification as per 15 NCAC .0101 (e)(5)**

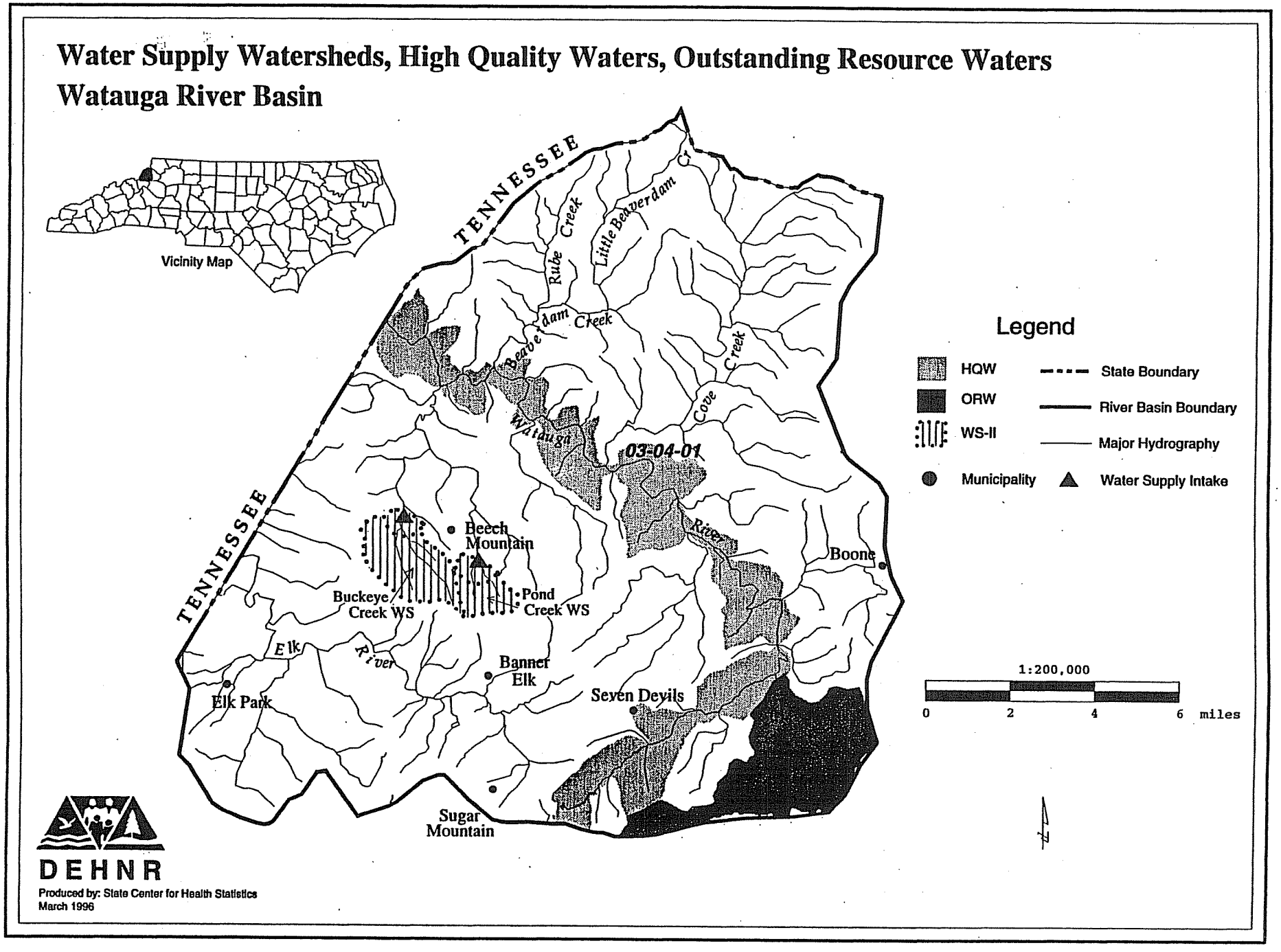


Figure 2.9 Water Supply Watersheds, HQW and ORW Waters in the Watauga River Basin

2.6 WATER USE IN THE WATAUGA RIVER BASIN

2.6.1 Local Government Water Supply Plans and General Water Use

In 1989 the North Carolina General Assembly adopted a law that requires local governments that operate public water supply systems to develop and approve a Local Water Supply Plan (GS 143-355 (l)). In order to assure the availability of adequate supplies of good water quality to protect public health and to support desirable growth, the Division of Water Resources (DWR) is compiling a State Water Supply Plan Database pursuant to GS 143-355 (m). The Database contains information reported in the Local Water Supply Plans. The State Water Supply Plan will identify potential water use conflicts among water suppliers and identify ways to better coordinate water supply programs.

There are four water systems in the study area that are subject to GS 143-355 (l). Two of these systems have approved plans that have been entered into the SWSP database. The following summary of current and future population and water use is based on these two water systems.

Table 2.12 presents the 1992 and projected serviced population for these water systems through the year 2020. Based on this table it may be expected that the population serviced by these systems will increase by 16% over the next few decades.

Table 2.12 1992 and Projected Service Populations. (DWR, 1996, Unpublished)

System Name	1992	2000	2010	2020
Elk Park	487	553	543	525
Banner Elk	1,129	1,241	1,273	1,353
TOTAL	1,616	1,794	1,816	1,878

The 1992 water use profile for these systems is presented in Table 2.13. DWR's data for these systems indicates an average daily use of 0.265 million gallons per day (MGD). It is important to note that these systems reported that their water supply came from ground water sources (wells).

Table 2.13 1992 Water Use and Water Sources Profile in MGD (DWR, 1996, Unpublished)

System Name	Avg.Day	Max. Day	Residential Use	Non-Residential Use	Unaccounted for Water	12-Hour Yield (Groundwater)
Elk Park	0.062	0.113	0.030	0.006	0.027	0.236
Banner Elk	0.203	unknown	0.114	0.011	0.078	0.317
TOTAL	0.265	—	0.144	0.017	0.105	0.553

Although these systems did not report any surface water withdrawals, Banner Elk did report waste water discharges into the Elk River. For 1992 the average daily discharge for this system was 0.193 MGD with a maximum monthly discharge of 0.236 MGD occurring in November and a minimum monthly discharge of 0.146 MGD occurring in July.

The 1992 water use comparison with future water use forecasts is presented in Table 2.14. A 17 percent increase in water use is forecasted by the year 2020. The forecasted water use does not exceed the current 12-hour safe yield. Accordingly, additional water supplies are not expected to be needed to meet forecasted demand.

Table 2.14 1992 and Projected Water Use in MGD. (DWR, 1996, Unpublished)

System Name	1992	2000	2010	2020
Elk Park	0.062	0.070	0.070	0.070
Banner Elk	0.203	0.201	0.219	0.239
TOTAL	0.265	0.271	0.289	0.309

Table 2.15 presents data on the available and surplus supplies for the systems considered here. Neither Elk Park nor Banner Elk is projecting a 2020 water supply deficit based on their current water supply sources.

Table 2.15 Present and Projected Water Supply Profile in MGD. (DWR, 1996, Unpublished)

System Name	Total Available Supply 1992	Total Surplus Supply 1992	Total Available Supply 2020	Total Surplus Supply 2020
Elk Park	0.237	0.175	0.237	0.167
Banner Elk	0.317	0.114	0.317	0.078
TOTAL	0.554	0.289	0.554	0.245

USGS Water Use information for the Watauga River basin (HUC# 06010103) indicates that the total water withdrawals for the basin was 3.78 MGD. Groundwater sources supplied 1.53 MGD and the remaining 2.25 MGD was withdrawn from surface water sources. The water withdrawal profile for these basins is presented in Table 2.16.

Table 2.16 Water Withdrawals for 1990 in MGD. (USGS, 1996, Unpublished)

Withdrawal Category	Ground Water	Surface Water	Total Water
Public Water Supply	0.70	0.32	1.02
Commercial Self Supply	0.33	0.00	0.33
Domestic Self Supply	0.42	0.00	0.42
Industrial Self Supply	0.00	0.00	0.00
Electric Power Self Supply	0.00	0.00	0.00
Mining Self Supply	0.00	0.00	0.00
Livestock Self Supply	0.08	1.31	1.39
Irrigation Self Supply	0.00	0.62	0.62
TOTAL	1.53	2.25	3.78

Consumptive water use for these basins is presented in Table 2.17.

Table 2.17 Consumptive Water Use for 1990 in MGD. (USGS, 1996, Unpublished)

Consumptive Use Category	Consumptive Water Use
Commercial	0.33
Domestic	0.32
Industrial	0.00
Electric Power	0.00
Mining	0.00
Livestock	0.09
Irrigation	0.62
TOTAL	1.36

2.6.2 Water Withdrawal and Transfer Registrations

DWR's Water Withdrawal and Transfer Registration Database for 1991 contains two surface water withdrawals in the Watauga basin. One registered withdrawal was for Vulcan Materials' mining operation with an estimated maximum withdrawal of 0.14 MGD from Laurel Fork. A public water supply withdrawal from Buckeye Creek was registered by Beech Mountain. The average daily withdrawal was 0.18 MGD and a maximum daily withdrawal of 0.90 MGD was recorded on December 30, 1988.

The 1993 Water Withdrawal and Transfer Registrations, pursuant to G.S. 143-215.22H, includes a withdrawal registered by an aquaculture operation operated by Grandfather Trout Farms. This facility's average daily withdrawal from the Watauga River was 1.38 MGD with a maximum daily withdrawal of 2.50 MGD recorded on August 15, 1994.

2.7 MINIMUM STREAMFLOW REQUIREMENTS

The Division of Water Resources (DWR) Instream Flow Unit has been involved with one project in the Watauga River basin. The Instream Flow Unit operates under the rules applied to the Dam Safety Law that require dams to release minimum stream flows to adequately maintain aquatic habitat (G.S. 143-215.24.0500).

Buckeye Creek

DWR's Instream Flow Unit developed a minimum flow requirement for Beech Mountain's reservoir on Buckeye Creek. Beech Mountain was required to establish a minimum flow from the reservoir in 1984 as part of their 404 permit. Beech Mountain contacted DWR in 1988 and asked for a change in the release requirements to be equivalent to inflow when water is four feet below the dam and when water conservation is in effect. Beech Mountain was asked to install weirs and inflow and outflow gauges. The minimum release from the dam is presently 1.5 cfs from January through September and 2.8 cfs from October through December (the spawning period for brook trout). (Jim Mead, pers. comm).

REFERENCES - CHAPTER 2

Adams, Kevin. 1994. North Carolina Waterfalls- Where to Find Them, How to Photograph Them. John F. Blair, Publisher, Winston-Salem, NC.

Clay, J. W., D.O. Orr, Jr., A. W. Stuart. 1975. North Carolina Atlas: Portrait of a Changing Southern State. The University of North Carolina Press, Chapel Hill, NC.

Mead, Jim. North Carolina Department of Environment, Health, and Natural Resources, Division of Water Resources. Personal communication. May 1996.

North Carolina Environmental Management Commission. Amended Effective February 1, 1993, Procedures for Assignment of Water Quality Standards (15 NCAC 2B .0100), and Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina (15A NCAC 2B .0200), Raleigh, NC.

North Carolina Department of Environment, Health and Natural Resources, Division of Water Resources. State Water Supply Plan Database, Unpublished.

North Carolina Department of Environment, Health and Natural Resources. 1995. Natural Heritage Program List of the Rare Animals of North Carolina. Compiled by Harry E. LeGrand, Jr.; Division of Parks and Recreation, Natural Heritage Program.

Office of State Planning. North Carolina Municipal Population. Fall 1995.

Skeate, Stewart. Professor of Biology, Lees-McRae College, Boone, NC. Personal Communication. June 1996.

United States Department of Agriculture, Natural Resources Conservation Service. 1994 and 1992 National Resources Inventory, North Carolina State Office, Raleigh, NC.

United States Geographical Service (USGS) Water Use Database, Not Published, file retrieved from ftp site at... 130.11.144.77 in /var/ftp/pub.

CHAPTER 3

CAUSES AND SOURCES OF WATER POLLUTION IN THE WATAUGA RIVER BASIN

3.1 INTRODUCTION

Water pollution is caused by a number of substances including sediment, nutrients, bacteria, oxygen-demanding wastes, metals, color and toxic substances. *Sources* of these pollution-causing substances are divided into broad categories called *point* sources and *nonpoint* sources. Point sources are typically piped discharges from wastewater treatment plants and large urban and industrial stormwater systems. Nonpoint sources can include stormwater runoff from small urban areas (population less than 100,000), forestry, mining, agricultural lands, rural residential development, and others. **Section 3.2** identifies and describes the major causes of pollution in the basin. **Sections 3.3** and **3.4** describe point and nonpoint source pollution in the basin.

3.2 DEFINING CAUSES OF POLLUTION

The term *causes* of pollution refers to the substances which enter surface waters from point and nonpoint sources and result in water quality degradation. The major causes of pollution discussed throughout the basin plan include biochemical oxygen demand (BOD), sediment, nutrients, toxicants (such as heavy metals, chlorine, pH and ammonia) and fecal coliform bacteria. Each of the following descriptions indicates whether the cause is point or nonpoint source-related (or both).

3.2.1 Sedimentation

Sediment is the most widespread cause of stream degradation and potential impairment in the Watauga River basin. While no streams in the Watauga River basin are classified as impaired due to sedimentation, Laurel Fork has been rated Support-Threatened due to sediments. Several other streams have been determined to be impacted to a lesser degree by sedimentation.

Sedimentation is the most widespread cause of nonpoint source pollution in the state and results from land-disturbing activities including agriculture, construction, urban runoff, streambank erosion, mining and forestry. Sedimentation is often divided into two categories: *suspended load* and *bed load*. Suspended load is composed of small particles that remain in the suspension in the water. Bed load is composed of larger particles that slide or roll along the stream bottom. Suspension of load types depends on water velocity and stream characteristics. Biologists are primarily concerned with the *concentration* of the suspended sediments and the *degree of sedimentation* on the streambed (Waters 1995).

The concentration of suspended sediments affects the availability of light for photosynthesis, as well as the ability of aquatic animals to see their prey. Several researchers have reported reduced feeding and growth rates by fish in waters with high suspended solids. In some cases it was noted that young fish left those stream segments with turbid conditions. Suspended sediments can clog the gills of fish and reduce their respiratory abilities. These forms of stress may reduce the tolerance level of fish to disease, toxicants and chronic turbid conditions. Suspended solids are reported as Total Suspended Solids or as Turbidity. They are measured in parts per million, milligrams per liter (Waters 1995) or NTUs.

The degree of sedimentation affects both the habitat of aquatic macroinvertebrates and the quality and amount of fish spawning and rearing habitat. Degree of sedimentation can be estimated by observing the amount of streambed covered, the depth of sedimentation, and the percent saturation of interstitial space or embeddedness. Eggs and fry in interstitial spaces may be suffocated by the sediments thereby reducing reproductive success (Waters 1995). Effects of sedimentation on macroinvertebrates can be seen in alterations in community density, diversity, and structure (Lenat et al. 1979).

The impact of sedimentation on fish populations depends on both concentration and degree of sedimentation, but impact severity can also be affected by the duration (or dose) of sedimentation. Suspended sediments may occur at high concentrations for short periods of time, or at low concentrations for extended periods of time. The greatest impacts to fish populations will be seen at high concentrations for extended time periods. The use of a dose-response matrix in combination with field investigations can help predict the impact of suspended sediments on various life stages of fish populations (Newcombe 1996).

Sedimentation impacts streams in several other ways. Eroded sediments may gradually fill lakes and navigable waters and may increase drinking water treatment costs. Sediment also serves as a carrier for other pollutants including nutrients (especially phosphorus), toxic metals, pesticides and road salts.

North Carolina does not have a numeric water quality standard for suspended solids. However, all dischargers must meet federal effluent guideline values at a minimum (e.g. 30 mg/l for domestic discharges). Also, most point source BOD limitations require treatment to remove sediments to a level below federal guideline requirements. Discharges to high quality waters (HQW) must meet a total suspended solids (TSS) limit of 10 mg/l for trout waters and primary nursery areas and 20 mg/l for all other HQWs. In addition, the state has adopted a numerical instream turbidity standard for point and nonpoint source pollution. Nonpoint sources are considered to be in compliance with the standard if approved best management practices (BMPs) have been implemented.

Statistics compiled by the US Department of Agriculture, Natural Resource Conservation Service (formerly known as the Soil Conservation Service) indicate a statewide decline in erosion from 1982 to 1992 (USDA, NRCS, 1992) as shown in Table 3.1.

Table 3.1 Overall Erosion Trends in North Carolina

	1982	1987	1992
Area (1,000 acres)	33,708.2	33,708.2	33,708.2
Gross Erosion (1,000 tons/yr)	46,039.5	43,264.6	36,512.9
Erosion Rate (Tons/Yr/Ac)	1.4	1.3	1.1

The NRCS statistics also indicate a statewide reduction per acre on cropland erosion using the Universal Soil Loss Equation (Table 3.2).

Table 3.2 USLE Erosion on Cultivated Cropland in North Carolina

	1982	1987	1992
Cropland Area (1,000 acres)	6,318.7	5956.8	5538.0
Gross Erosion (1,000 tons/yr)	40,921.4	37475.3	30,908.3
Erosion Rate (Tons/Yr/Ac)	6.5	6.3	5.6

However, in the Blue Ridge Mountains region, which encompasses the entire Watauga River basin and several others, the overall erosion picture is less clear. Table 3.3 shows a significant decline in cultivated cropland acreage and a corresponding decline in gross erosion over the past ten years, but the erosion rate per acre increased from 12.7 tons/acre/year in 1982 to 20.8 tons/acre/year in 1987 and then dropped to 18.3 tons/acre/year in 1992. Non-cultivated cropland erosion rates also increased over the ten year period from 1.4 tons/acre/year in 1982 to 1.7 tons/acre/year although pasture land rates dropped from 2.6 to 2.2 tons/acre/year over the same period.

According to the Raleigh NRCS office, several factors may explain the large erosion rate increase from 1982 to 1987. The mountains were the last region of the state to be accurately soil-mapped, and so more recent data may reflect an improved knowledge of soil loss. Secondly, there have been some revisions in soil loss coefficients for individual soil types. And third, Christmas tree farms have been included in the cropland acreage figures. Many farms are located on extremely steep lands and the large increase in the Christmas tree industry could play an important role in these numbers.

Table 3.3 North Carolina Erosion in Blue Ridge Mountain Region

	1982	1987	1992
Cropland Area (1,000 acres)	122.9	97.9	76.2
Gross Erosion (1,000 tons/yr)	1555.6	2035.2	1397.5
Erosion Rate (Tons/Yr/Ac)	12.7	20.8	18.3

Compared with other regions of the state, the overall erosion rate per acre for cultivated cropland in the mountains is very high although it is noted that the rate has dropped since 1987 (Table 3.4).

Table 3.4 North Carolina Erosion on Major Land Resource Areas (MLRA)

	1982	1987	1992
Blue Ridge Mountains	12.7	20.8	18.3
Southern Piedmont	12.3	12.0	10.5
Carolina and Georgia Sand Hills	6.0	5.6	5.1
Southern Coastal Plain	3.9	3.9	4.0
Atlantic Coast Flatwoods	3.2	3.1	3.2
Tidewater Area	1.4	1.5	1.6

Much of this data relates to cropland, including Christmas tree farms, and the need to continue to improve cropland erosion controls in the mountains. It also carries a broader message of the high erosion potential in the mountains, not only from agricultural activities, but for all land-disturbing activities on the steep slopes which are so prevalent in this region. Of particular concern are potential sediment losses from logging operations, Christmas tree farms, streambank erosion, second home development and highway construction.

Streambank erosion is a natural process, but one that is accelerated by human activities. Streambank erosion results from two processes: high flows and bank failures. Growth is associated with an increase in impervious surfaces, resulting in higher volumes and rates of flow into receiving streams. The Watauga River basin, as noted earlier, has seen a 212% increase in urban growth. Bank failures can occur due to these high flows, or from heavy use of streambanks for cattle or vehicle crossings. Loss of buffer strips along streambanks can also greatly contribute to bank erosion. The use of structural techniques such as: bank sloping, use of tree roots for stabilization, buffer strips, and fencing cattle out of streams can greatly reduce streambank erosion.

Average annual soil loss has shown decreases of 40% after cattle were fenced away from streams. This decrease resulted in nearly a 60% reduction in average sediment concentration during stormflow events (Owens, et al 1996).

Most sediment-related impacts are associated with nonpoint source pollution. Programs aimed at addressing sedimentation are listed in Chapter 6 and are briefly described under nonpoint source pollution controls in Chapter 5. Nonpoint sources are considered to be in compliance with the standard if approved best management practices (BMPs) have been implemented.

3.2.2 Oxygen-Consuming Wastes

Oxygen-consuming wastes include decomposing organic matter or chemicals that reduce dissolved oxygen in the water column through chemical reactions or biological activity. Maintaining a sufficient level of dissolved oxygen in the water is critical to most forms of aquatic life, especially trout.

A number of factors affect dissolved oxygen concentrations. Higher dissolved oxygen is produced by *turbulent actions*, such as waves, rapids and waterfalls, which mix air and water. *Lower water temperature* also generally allows for retention of higher dissolved oxygen concentrations. Therefore, the cool swift-flowing streams of the mountains are generally high in dissolved oxygen. Low dissolved oxygen levels tend to occur more often in warm, slow-moving waters that receive a high input of effluent from wastewater treatment plants during low flow conditions. In general, the lowest dissolved oxygen concentrations occur during the warmest summer months and particularly during low flow periods. *Water depth* is also a factor. In deep slow-moving waters, such as reservoirs or estuaries, dissolved oxygen concentrations may be very high near the surface due to wind action and plant (algae) photosynthesis but may be entirely depleted (anoxic) at the bottom.

Sources of dissolved oxygen depletion include wastewater treatment plant effluent, the decomposition of organic matter (such as leaves, dead plants and animals) and organic waste matter that is washed or discharged into the water. Sewage from human and household wastes is high in organic waste matter, as is waste from trout farms. Bacterial decomposition can rapidly deplete dissolved oxygen levels unless these wastes are adequately treated at a wastewater treatment plant. In addition, some chemicals may react with and bind up dissolved oxygen. Industrial discharges with oxygen consuming wasteflow may be resilient instream and continue to use oxygen for a long distance downstream.

Oxygen-Consuming Wastes in the Watauga River Basin

Oxygen-consuming wastes have not been identified as a significant source of water quality impairment in the Watauga River basin.

3.2.3 Nutrients

The term *nutrients* in this document refers to the two major plant nutrients, phosphorus and nitrogen. These are common components of fertilizers, animal and human wastes, vegetation and some industrial processes. Nutrients in surface waters come from both point and nonpoint sources. Nutrients are beneficial to aquatic life in small amounts. However, in overabundance and under favorable conditions, they can stimulate the occurrence of algal blooms and excessive plant growth in quiet waters such as ponds, lakes, reservoirs and estuaries.

Nutrients in the Watauga River Basin

Nutrients have not been identified as a significant source of water quality impairment in the Watauga River basin.

3.2.4 Toxic Substances

Regulation 15A NCAC 2B. 0202(36) defines a toxicant as "any substance or combination of substances ... which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring or other adverse health effects". Toxic substances frequently encountered in water quality management include chlorine, ammonia, organics (hydrocarbons and pesticides) heavy metals and pH. These materials are toxic to different organisms in varying amounts. The effects may be evident immediately, or may only be manifested after long-term exposure or accumulation in living tissue.

North Carolina has adopted standards and *action levels* for several toxic substances. These are contained in 15A NCAC 2B .0200. Usually limits are not assigned for parameters which have action levels unless 1) monitoring indicates that the parameter may be causing toxicity or, 2) federal guidelines exist for a given discharger for an action level substance. This process of determining action levels exists because these toxic substances are generally not bioaccumulative and have variable toxicity to aquatic life because of chemical form, solubility, stream characteristics and/or associated waste characteristics. Water quality based limits may also be assigned to a given NPDES permit if data indicate that a substance is present for which there is a federal criterion but no water quality standard.

Whole effluent toxicity (WET) testing is required on a quarterly basis for major NPDES dischargers and any discharger containing complex (industrial) wastewater. This test shows whether the effluent from a treatment plant is toxic, but it does not identify the specific cause of toxicity. If the effluent is found to be toxic, further testing is done to determine the specific cause. This follow-up testing is called a toxicity reduction evaluation (TRE). WET testing is discussed in Chapter 4 and Appendix III. Other testing, or monitoring, done to detect aquatic toxicity problems include fish tissue analyses, chemical water quality sampling and assessment of fish community and bottom-dwelling organisms such as aquatic insect larvae. These monitoring programs are discussed in Chapter 4.

Toxic substances in the Watauga River Basin
There are no waters in the Watauga River basin known to be impacted by toxic substances.

3.2.5 Fecal Coliform Bacteria

Fecal coliform bacteria has not been identified as a problem parameter in the Watauga River basin at the three ambient monitoring stations in the basin. However, the Valle Crucis and Sugar Grove sites on the Watauga River showed elevated fecal coliform concentrations.

Fecal coliform bacteria are typically associated with the intestinal tract of warm-blooded animals. Common sources of fecal coliform bacteria include leaking or failing septic systems, leaking sewer lines or pump station overflows, runoff from livestock operations and wildlife, and improperly disinfected wastewater effluent.

Fecal coliform bacteria are widely used as indicators of the potential presence of waterborne pathogenic organisms (which cause such diseases as typhoid fever, dysentery, and cholera). Fecal coliform bacteria in treatment plant effluent are controlled through disinfection methods including chlorination (sometimes followed by dechlorination), ozonation or ultraviolet light radiation.

Due to the low number of farm animal operations and limited development in the basin, the chances of bacterial contamination in streams is relatively low. However, failing septic systems, straight

piping of waters to streams and animal operations without appropriate best management practices in place can cause elevated bacterial levels in any of the many unmonitored streams.

3.3 POINT SOURCES OF POLLUTION

3.3.1 Defining *Point* Sources

Point sources refers to discharges that enter surface waters through a pipe, ditch or other well-defined points of discharge. The term most commonly refers to discharges associated with wastewater treatment plant facilities. These include *municipal* (city and county) and *industrial* wastewater treatment plants as well as small *domestic* discharging treatment systems that may serve schools, commercial offices, residential subdivisions and individual homes. In addition, discharges from *stormwater systems* at industrial sites are now considered point source discharges and are being regulated under new urban stormwater runoff regulations being required by the U.S. Environmental Protection Agency (EPA). The urban stormwater runoff program is discussed in more detail in Chapter 5 and in Chapter 6. The primary substances and compounds associated with point source pollution are oxygen-demanding wastes, nutrients, color and toxic substances including chlorine, ammonia and metals.

Point source discharges are not allowed in North Carolina without a permit from the state. Discharge permits are issued under the National Pollutant Discharge Elimination System (NPDES) program delegated to North Carolina from EPA. The amount or loading of specific pollutants that may be allowed to be discharged into surface waters are defined in the NPDES permit and are called *effluent limits*. Under the NPDES permitting program, each NPDES discharger is assigned either *major* or *minor* status. Major facilities are large with greater flows. For municipalities, all dischargers with a flow of greater than 1 million gallons per day (MGD) are classified as major. Most point source discharges, other than urban and industrial stormwater discharges, are continuous and do not occur only during storm events as do nonpoint sources. They generally have the most impact on a stream during low flow conditions when the percentage of stream flow composed of treated effluent is greatest. Permit limits are generally set to protect the stream during low flow conditions. The standard low flow used for determining point source impacts is called the *7Q10*. This is the lowest flow which occurs over seven consecutive days and which has an average recurrence of once in ten years.

Information is collected on NPDES permitted discharges in several ways. The major method of collection is facility self-monitoring data which are submitted monthly to the DWQ by each individual permittee. NPDES facilities are required to monitor for all pollutants for which they have limits as well as other pollutants which may be present in their wastewater. All domestic wastewater dischargers are required to monitor flow, dissolved oxygen, temperature, fecal coliform, BOD, ammonia, and chlorine (if they use it as a disinfectant). In addition, facilities with industrial sources may have to monitor for chemical specific toxicants and/or whole effluent toxicity (see Section 3.2.3); and all dischargers with design flows greater than 50,000 gallons per day (GPD) monitor for total phosphorus and total nitrogen. Minimum NPDES monitoring requirements are provided in 15A NCAC 2B .0500.

Other methods of collecting point source information include effluent sampling by DWQ during inspections and special studies. The regional offices may collect data at a given facility if they believe there may be an operational problem or as a routine compliance check. In addition, the DWQ may collect effluent data during intensive surveys of segments of streams, and extensive discharger data have been collected during onsite toxicity tests.

3.3.2 Point Source Discharges in the Watauga River Basin

In the Watauga River basin, there are 40 permitted NPDES dischargers. All NPDES permit renewals occur within a prescribed time period after completion of the basinwide water quality management plan. Permit renewals are repeated at five year intervals. Permits for the Watauga River basin are scheduled to be renewed in September 1997. A distribution map of the discharge facilities is shown in Figure 3.1. A list of all NPDES dischargers in the basin can be found in Table 3.5. Twenty-nine of these facilities have individual NPDES permits (NC00 facilities), seven are stormwater facilities, and four are general permits (NCG facilities). The total permitted flow for all facilities is 2.28 million gallons per day (MGD). The average actual flow from all facilities is 3.39 MGD. Table 3.6 summarizes the number of dischargers and their total permitted and average 1996 flows for each subbasin. Table 3.7 provides definitions of the NPDES categories.

There are numerous facilities which have permits with no flow limits. Cooling towers, groundwater remediation sites, and other non-process industrial facilities are the most common examples of this. However, due to monitoring requirements, these sites report flow data. Since there are no flow limits for these sites in the database, the sites (and the subbasin) appear to be generating more flow that the permits allow.

There is one trout farm, Grandfather Trout Ponds, in the Watauga River basin near Foscoe in Watauga county. The farm is under an NCG facility permit. Trout farms can be a source of nutrients to surface waters if the farms are not managed properly. The impacts from trout farms are typically found within a short stream length from the farm. In this way, impacts from trout production are localized and can result in lower macroinvertebrate ratings. Changes caused by trout farms can be in the form of algal production and higher than normal nutrients. The effects from trout farms are more often seen during low flows and high water temperatures. Trout farms can also cause water quality problems if there is more than one farm on a stream reach. See Appendix IV for the requirements of a general permit.

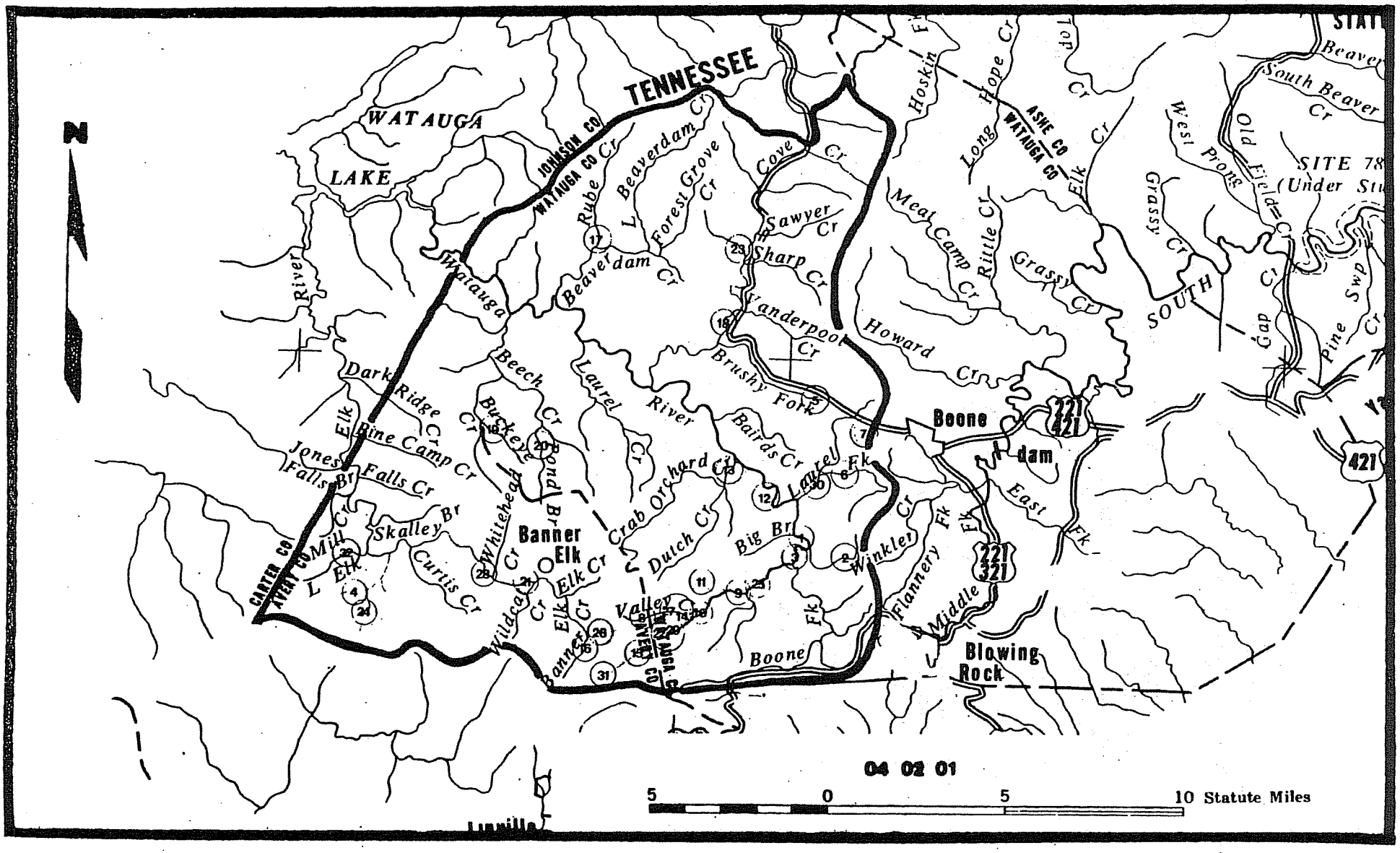


Figure 3.1 Map of NPDES Dischargers in the Watauga River Basin

Table 3.5 NPDES Dischargers in the Watauga River Basin

11/18/93

Map	Facility NPDES #	Receiving Stream County	Latitude	Longitude	CD
1	CWS / Hound Ears WWTP NC0032123	Watauga River (Watauga)	36°10'35"	81°44'45"	
2	Yonahlossee Limited Partnership NC0032212	Lance Creek (Watauga)	36°10'14"	81°43'21"	
3	Hebron Colony & Grace Home, Inc. NC0032191	Watauga River (Watauga)	36°10'12"	81°44'46"	
4	Time Square Inn NC0074683	UT Cranberry Creek (Avery)	36°09'22"	81°58'08"	
5	Woodland Hills Apartments NC0036242	Brushy Fork (Watauga)	36°13'41"	81°43'16"	
5	Sunset Apartments NC0032182	Brushy Fork (Watauga)	36°13'50"	81°43'14"	
6	Four Seasons-Laurel Creek Apartments, Inc. NC0038041	Laurel Fork (Watauga)	36°12'19"	81°43'14"	
7	NCDOC / Watauga County Correctional Center NC0029785	UT Laurel Fork (Watauga)	36°13'13"	81°42'25"	Y
8	Hawksnest Sports, Inc. NC0076422	Valley Creek (Avery)	36°08'41"	81°49'20"	
9	Mill Ridge Development NC0030473	Watauga River (Watauga)	36°09'19"	81°46'24"	
9	Wastewater Services, Inc / The Ponds NC0050610	Watauga River (Watauga)	36°09'19"	81°46'15"	
10	Murrelle's River Property NC0042919	Watauga River (Watauga)	36°08'42"	81°47'38"	
10	Grandfather Trout Ponds Gem Mine NCG530047	Watauga River (Watauga)	36°08'42"	81°47'38"	
10	Clevon Woods Association / Art Plaza NC0070408	Watauga River (Watauga)	36°08'45"	81°47'30"	
10	The Original Art Shoppe & Residence NC0069264	Watauga River (Watauga)	36°08'45"	81°47'30"	Y

Table 3.5 NPDES Dischargers in the Watauga River Basin (continued)

Map	Facility NPDES #	Receiving Stream County	Latitude	Longitude	CD
11	Robert Kent / Seven Devils Resort NC0035149	UT Watauga River (Watauga)	36°09'35"	81°47'25"	
12	Camp Broadstone/Appalachian State University NC0032166	Watauga River (Watauga)	36°11'38"	81°45'33"	
13	Valle Crucis Elementary School NC0067024	Dutch Creek (Watauga)	36°12'37"	81°46'39"	
13	Valle Landing Owners Association, Inc. NC0072559	Dutch Creek (Watauga)	36°12'42"	81°46'46"	
14	Country House Village, Inc. NC0033448	Valley Creek (Watauga)	36°08'39"	81°48'02"	
15	Robert A. Mitchell Property NC0071692	Watauga River (Watauga)	36°07'35"	81°49'25"	Y
15	Adams Apple Homeowners Association NC0042358	Watauga River (Avery)	36°07'48"	81°49'10"	
16	CWS / Sugar Mountain WWTP NC0022900	Flattop Creek (Avery)	36°07'57"	81°51'08"	
17	Bethel Elementary School NC0066991	UT Beaverdam Creek (Watauga)	36°17'41"	81°51'00"	
18	Cove Creek Elementary School NC0067008	Cove Creek (Watauga)	36°15'54"	81°47'05"	
19	Beech Mountain / Grassy Gap Creek WWTP NC0022730	Grassy Gap Creek (Watauga)	36°13'19"	81°54'20"	
20	Beech Mountain / Pond Creek WWTP NC0069761	Pond Creek (Watauga)	36°12'55"	81°52'38"	
21	Banner Elk WWTP NC0032115	Elk River (Avery)	36°09'27"	81°53'09"	
22	Smoketree Lodge (Condominiums) NC0049174	UT Watauga River (Watauga)	36°08'07"	81°48'58"	
23	Florence Bryan Residence NCG550376	Laurel Branch (Watauga)	36°17'28"	81°46'30"	

Table 3.5 NPDES Dischargers in the Watauga River Basin (continued)

Map	Facility NPDES #	Receiving Stream County	Latitude	Longitude	CD
24	Harold Clark Residence NCG550395	Cranberry Creek (Avery)	36°09'10"	81°57'54"	
25	Hidden Valley, Inc. NC0065617	Watauga River (Watauga)	36°09'30"	81°46'05"	
26	Worsley Services, Inc. / Scotchman Store #89 NC0051411	Elk River (Avery)	36°08'09"	81°50'47"	Y
27	Kent & Kent / Valley Creek WWTP NC0058891	Valley Creek (Watauga)	36°08'54"	81°48'28"	
28	Elk River Club NC0058378	Elk River (Avery)	36°09'34"	81°54'05"	
29	Encompass, Inc. / Casey's Gap NC0065919	Watauga River (Watauga)	36°08'18"	81°48'35"	Y
30	Willow Valley Associates, LTD NC0061425	Laurel Fork (Watauga)	36°12'08"	81°44'14"	
31	RCS Properties, Inc / Shoppes of Tynecastle NC0062961	Watauga River (Avery)	36°07'15"	81°50'05"	
32	Elk Park WWTP NC0079561	Little Elk Creek (Avery)	36°10'06"	81°58'26"	

Table 3.6 Summary of Major/Minor NPDES Dischargers and Permitted and Actual Flows for the Watauga River Basin.

FACILITY CATEGORIES	SUBBASIN 01	TOTALS
Total Facilities	**40**	**40**
NC00 Facilities*	29	29
Stormwater Facilities	7	7
NCG General Permit Facilities	4	4
Total Permitted Flow (MGD)	2.28	**2.28**
# of Facilities Reporting	25	**25**
Total Avg. Flow (MGD)	3.39	**3.39**
***Major Discharges**	0	**0**
Total Permitted Flow (MGD)	0	**0**
# of Facilities Reporting	0	**0**
Total Avg. Flow (MGD)	0.00	**0.00**
***Minor Discharges**	29	**29**
Total Permitted Flow (MGD)	2.28	**2.28**
# of Facilities Reporting	25	**25**
Total Avg. Flow (MGD)	3.39	**3.39**
100% Domestic Wastewater	19	**19**
Total Permitted Flow (MGD)	1.11	**1.11**
# of Facilities Reporting	19	**19**
Total Avg. Flow (MGD)	2.89	**2.89**
Municipal Facilities	4	**4**
Total Permitted Flow (MGD)	1.14	**1.14**
# of Facilities Reporting	3	**3**
Total Avg. Flow (MGD)	0.48	**0.48**
Major Process Industrial	0	**0**
Total Permitted Flow (MGD)	0	**0**
# of Facilities Reporting	0	**0**
Total Avg. Flow (MGD)	0.00	**0.00**
Minor Process Industrial	3	**3**
Total Permitted Flow (MGD)	0.02	**0.02**
# of Facilities Reporting	3	**3**
Total Avg. Flow (MGD)	0.01	**0.01**
Nonprocess Industrial	0	**0**
Total Permitted Flow (MGD)	0.00	**0.00**
# of Facilities Reporting	0	**0**
Total Avg. Flow (MGD)	0.00	**0.00**
* **NC00 / Individual permit facilities**		

Table 3.7 Definitions of Categories of NPDES Permits

CATEGORY	DEFINITION	EXAMPLES
Major vs. Minor discharges	For publicly owned treatment works, any facility discharging over 1 MGD is defined as a Major discharge. For industrial facilities, the EPA provides evaluation criteria including daily discharge, toxic pollutant potential, public health impact and water quality factors. Any facilities which do not meet the criteria for Major status are defined as Minor discharges.	There are no major dischargers in the Watauga River basin.
100% Domestic	A system which treats wastewater containing household-type wastes (bathrooms, sinks, washers, etc.).	Housing subdivision WWTPs, schools, mobile home parks.
Municipal	A system which serves a municipality of any size.	NC0069761- Beech Mountain/Pond Creek WWTP
Process Industrial	Water used in an industrial process which must be treated prior to discharge.	NCG530047 - Grandfather Trout Ponds (trout farm and gem mining)
Nonprocess Industrial	Wastewater which requires no treatment prior to discharging[1].	There are no facilities of this type in the basin.
Stormwater Facilities[2]	Discharges of runoff from rainfall or snow melt. NPDES permits are required for "stormwater discharges associated with industrial activity" and from municipal stormwater systems for towns over 100,000 in population.	"Stormwater discharges associated with industrial activity" include most types of manufacturing plants. Light manufacturing is subject only if they process or store materials outdoors. Landfills, mines, junkyards, steam electric plants, transportation terminals and any construction activity which disturbs 5 acres or more during construction.

1. Non-contact cooling water may contain biocides; however, the biocides must be approved by our Aquatic Survey and Toxicology Unit. The approval process verifies that the chemicals involved have no detrimental effect on the stream when discharged with the non-contact cooling water.

2. Stormwater facilities are covered by General Permits NCG010000 through NCG190000. Facilities which do not fit the categories of these permits are covered under individual stormwater permits NCS000000.

3.4 NONPOINT SOURCES OF POLLUTION

Nonpoint source (NPS) pollution refers to runoff that enters surface waters through stormwater, snowmelt or atmospheric deposition (e.g. acid rain). There are many types of land use activities that are a source of nonpoint source pollution including land development, construction, crop production, animal feeding lots, failing septic systems, landfills, roads and parking lots. As noted earlier, stormwater from large urban areas (>100,000 people) and from certain industrial sites is considered a point source since NPDES permits are required for piped discharges of stormwater from these areas. However, a discussion of urban runoff will be included in this section.

Sediment and nutrients are major pollution-causing substances associated with nonpoint source pollution. Others include fecal coliform bacteria, heavy metals, oil and grease, and any other substance that may be washed off the ground or removed from the atmosphere and carried into

surface waters. Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur at random time intervals depending on rainfall events.

Nonpoint source pollution has not been identified as a source of stream impairment in the basin. However, 6.8 miles of streams have been identified as Support-Threatened due to nonpoint sources of pollution. While presently supporting their uses, several other streams have been affected by sedimentation. These waters include the middle Watauga River, most of the Elk River, Spice Bottom Creek, Lance Creek, Dutch Creek, Beaverdam Creek, and Buckeye Creek (DWQ Basinwide Assessment Report). Below is a brief description of major areas of nonpoint sources of pollution in the Watauga River basin.

3.4.1 Agriculture

Many of the watersheds in the Watauga basin are intensively farmed, especially Cove Creek, Beaverdam Creek, and Laurel Creek. These streams carry heavy sediment loads which may affect the quality of the fisheries. Heavy sediment loads also occur in Laurel Fork, Crab Orchard Creek, the Elk River, and portions of the Watauga River (DWQ Basinwide Assessment Report).

There are a number of activities associated with agriculture that can serve as sources of water pollution. Land clearing and plowing make soils susceptible to erosion, which can then cause stream sedimentation. Pesticides and fertilizers (including chemical fertilizers and animal wastes) can be washed from fields, orchards, Christmas tree farms or improperly designed storage or disposal sites. Construction of drainage ditches on poorly drained soils enhances the movement of stormwater into surface waters. Concentrated animal feed lot operations or dairy farms without adequate fencing to keep animals away from streams can be a significant source of BOD, fecal coliform bacteria, and nutrients. Untreated discharge from a large operation can be compared to the nutrient load in the discharge from a secondary waste treatment plant serving a small town.

Sediment production and transport is greatest from row crops and cultivated fields (Waters, 1995; Lenat et al. 1979). Contour plowing, terracing and grassed waterways are several common methods used by most farmers to minimize soil loss. Maintaining a vegetated buffer between fields and streams is another excellent way to minimize soil loss to streams. Fencing cattle and dairy cows from streams protects streambanks from trampling, protects streamside vegetation, and decreases the introduction of nutrients and fecal coliform bacteria from animal waste.

Of particular interest in the Watauga River basin is Christmas tree farming. The steep slopes on which Christmas trees are often grown are highly susceptible to erosion if a vegetative cover is not established and maintained. In the past, it was common practice to minimize weed growth under the trees with mass application of herbicides. Erosion could be severe under these conditions. Reductions in productivity were also observed as topsoil was lost. In addition, herbicides used to control weeds have been detected in some wells and streams in nearby Avery County. Current recommended practices promoted by the NC Cooperative Extension Service (CES), US Natural Resources Conservation Service (NRCS) and Tennessee Valley Authority (TVA) encourage use of ground covers and reduced herbicide use. The CES, in cooperation with TVA, NRCS, and the Avery County Soil and Water Conservation District, has initiated a project in Avery County to promote best management practices. The project, which is being funded by the US Environmental Protection Agency, is aimed at implementing and demonstrating BMPs to limit nonpoint source pollution. Results of the study should be of benefit to Christmas tree growers in the Watauga River basin and elsewhere in the state.

Chapter 5 discusses agricultural nonpoint source control programs. A list of BMPs for addressing agricultural runoff is presented in Appendix V.

3.4.2 Urban

Development in 1990 was found to affect many of the tributaries in the upper portion of the Watauga River catchment, including Valley Creek, Spice Bottom Creek, Lance Creek, and Laurel Creek, though Good ratings were generally found (DWQ Basinwide Assessment Report).

It is commonly known that urban streams are often polluted streams. There are questions concerning what aspects of urbanization cause the degradation, to what extent urbanization alone can be called the cause of degradation, and what can be done about the pollutants and human habits that cause the degradation.

Runoff from urbanized areas, as a rule, is more localized but can often be more severe than agricultural runoff. Any type of excavation activity can result in soil loss and cause sedimentation in the waters in the watershed. The rate and volume of runoff in urban areas is much greater due both to the high concentration of impervious surface areas and to storm drainage systems that rapidly transport stormwater to nearby surface waters.

These drainage systems, including curb and guttered roadways, also allow urban pollutants to reach surface waters quickly and with little or no filtering. Pollutants include lawn care products such as pesticides and fertilizers; automobile-related pollutants such as fuel, lubricants, abraded tire and brake linings; lawn and household wastes (often dumped in storm sewers); road salts, and fecal coliform bacteria (from animals and failing septic systems). The diversity of these pollutants makes it very challenging to attribute water quality degradation to any one pollutant.

Replacement of natural vegetation with pavement and managed lawns reduces the ability of the watershed to filter pollutants before they enter the stream. The chronic introduction of these pollutants into a stream results in degraded waters. Many urban streams are rated as biologically poor.

The population density map presented in Chapter 2 is an indicator of where urban development and potential urban stream impacts are likely to occur. Management strategies for addressing urban runoff are presented in section 6.8 of Chapter 6. A list of BMPs for addressing urban runoff is presented in Appendix V.

3.4.3 Construction

Construction activities that entail excavation, grading or filling (such as road construction or land clearing for development) can produce significant sedimentation if not properly controlled. The major distinction between construction and urban activities is in total acres disturbed. Sedimentation from developing urban areas can be a major source of pollution due to the cumulative number of acres disturbed in a basin. Construction of single family homes in rural areas can also be a source of sedimentation when homes are placed in or near stream corridors. This latter form of development can be seen throughout the Watauga River basin.

As a pollution source, construction activities are typically temporary, but the impacts can be severe and long lasting (see discussion in sediment section above). Construction activities tend to be concentrated in the more rapidly developing areas of the basin. However, road construction is widespread and often involves stream crossings in remote or undeveloped areas of the basin. In addition, resort development in relatively undeveloped areas can be devastating to previously unimpacted streams.

Construction-related sedimentation is addressed through the Sedimentation Pollution Control Act (see Chapter 5). A list of BMPs for controlling erosion and sedimentation is presented in Appendix V.

3.4.4 Forestry

Undisturbed forested areas are an ideal land cover for water quality protection. They stabilize the soil, filter rainfall runoff and produce minimal loadings of organic matter to waterways. In addition, forested stream buffers can filter impurities from runoff from adjoining nonforested areas.

Improper forest management practices can adversely impact water quality in a number of ways. This is especially true in mountainous regions where steep slopes and fragile soils are widespread. Without proper BMPs, large clearcutting operations can change the hydrology of an area and significantly increase the rate and flow of stormwater runoff. This results in both downstream flooding and stream bank erosion. Clearcutting, when compared to selective cutting, can cause a much higher rate of erosion (Waters 1995).

Careless harvesting and road and stream crossing construction can transport sediments to downstream waters. Streams with sedimentation may require many years to restore. Removing riparian vegetation along stream banks can cause water temperature to rise, destabilize the shoreline and minimize or eliminate the runoff protection benefits of the buffer. Sedimentation due to forestry practices is most often associated with the construction and use of logging roads, particularly when roads are built near streams (Waters 1995). Density and length of logging roads can be major factors in the amount of sedimentation produced.

Other adverse effects resulting from forestry operations include: 1) an increase in woody debris clogging stream channels which can alter the stream channel and prevent fish movement; 2) loss of riparian vegetation which can reduce shade cover and raise stream temperatures; 3) loss of canopy which can alter the interface of the aquatic and terrestrial ecosystems. This is especially true where populations of amphibians are concerned.

Timber harvesting is an important industry in the Watauga River basin and is sometimes done at the onset of clearing for site development or agricultural activities such as Christmas tree farming. However, it is critical that all efforts be made to minimize sediment loss and runoff so as to protect other natural resources in this basin. These resources include trout waters, drinking water supplies and aesthetics. This is especially important in light of a trend toward increased logging in North Carolina and in the southeast United States, in general.

The NC Division of Forest Resources (DFR) is implementing various measures for protecting water quality statewide. These measures include the development of the Forest Practice Guidelines (FPGs) Related to Water Quality of 1976 and Best Management Practices (BMPs) of 1987. The FPGs have mandatory performance standards that must be met in order for landowners to remain exempt from all of the requirements associated with the Sedimentation Pollution Control Act enforced by the Division of Land Resources.

The FPG requirements include:
- establishment of a Streamside Management Zone,
- prohibition of debris entering streams,
- access and skid trail stream crossing protection measures,
- access road entrance restriction,
- prohibition of waste entering streams,
- waterbodies, and groundwater,
- pesticide and fertilizer application restrictions, and
- rehabilitation of project site requirements.

Compliance inspections are done by DFR continuously. A recent limited statewide sampling survey (based on 196 site inspections statewide) showed overall compliance rate with forestry BMPs and FPGs was 92% (Henson 1995). A summary of activities and past accomplishments in the Watauga River basin is reported in Chapter 5.

Appendix V describes several programs that are aimed at either encouraging or requiring utilization of forest best management practices at the state and federal level and provides a list of forest BMPs.

3.4.5 Mining

Mining operations can produce high localized levels of stream sedimentation if not properly treated. The North Carolina Mining Act and the state's mining program, along with mining BMPs are listed in Appendix V.

3.4.6 Onsite Wastewater Disposal

Septic tank soil absorption systems are the most widely used method of on-site domestic wastewater disposal in North Carolina. These systems can provide safe and adequate treatment of wastewater if properly constructed and maintained. However, improperly placed, constructed or maintained septic systems can serve as a significant source of pathogenic bacteria and nutrients. These pollutants may enter surface waters both through or over the soil. They may also be discharged directly to surface waters through *straight pipes* (i.e., direct pipe connections between the septic system and surface waters). These types of discharges, if unable to be eliminated, must be permitted under the NPDES program and be capable of meeting effluent limitations specified to protect the receiving stream water quality, including disinfection.

Onsite wastewater disposal is most prevalent in rural portions of the basin and at the fringes of urban areas. Fecal coliform contamination from failing septic systems is of particular concern in waters used for swimming, tubing and other related activities (Table 4.7 in Chapter 4). Best management practices pertaining to onsite wastewater disposal are presented in Appendix V.

3.4.7 Solid Waste Disposal

Solid wastes may include household wastes, commercial or industrial wastes, refuse or demolition waste, infectious wastes or hazardous wastes. Improper disposal of these types of wastes can serve as a source of a wide array of pollutants. The major water quality concern associated with modern solid waste facilities is controlling the leachate and stabilizing the soils used for covering many disposal facilities. Properly designed, constructed and operated facilities should not significantly effect water quality.
Groundwater and surface water monitoring is required at all permitted Municipal Solid Waste Sites (MSW) and all Construction and Demolition landfills. Monitoring efforts have been required since July 1989. All MSW landfills must have a liner system in place by January 1, 1998. All existing unlined landfills must close at this same time.

In the Watauga River basin there are no active or closed landfill sites.

REFERENCES - CHAPTER 3

Henson, Mickey. 1995. Best Management Practices Implementation and Effectiveness Survey on Timber Operations in North Carolina. North Carolina Forest Service, Division of Forest Resources.

Lenat, D.R., D.L. Penrose, and K.W. Eagleson. 1979. Biological evaluation of nonpoint source pollutants in North Carolina streams and rivers. North Carolina Department of Natural Resources and Community Development, Biological Series 102, Raleigh, NC.

Newcombe, Charles P. 1996. Channel Sediment Pollution: A Provisional Fisheries Field Guide for Assessment of Risk and Impact. Ministry of Environment, Lands and Parks, Habitat Protection Branch, Victoria, British Columbia, Canada.

United States Department of Agriculture, Natural Resources Conservation Service. 1992. National Resources Inventory, North Carolina State Office, Raleigh, North Carolina.

Waters, Thomas. 1995. Sediment in Streams: Sources, Biological Effects and Control. American Fisheries Society Monograph 7.

CHAPTER 4

WATER QUALITY IN THE WATAUGA RIVER BASIN

4.1 INTRODUCTION

This chapter provides a detailed overview of water quality and use support ratings in the Watauga River basin.

Water Quality Monitoring and Assessment

- **Section 4.2** presents a summary of seven water quality monitoring programs conducted by DWQ's Environmental Sciences Branch including consideration of information reported by researchers and other agencies (NCDEHNR 1995). This section also presents a summary of other water quality monitoring programs in the basin.
- **Section 4.3** presents a narrative summary of water quality findings for the basin. The summary is based on the monitoring approaches described in Section 4.2. A map showing the locations of monitoring sites in the basin is also included.

Use-Support Ratings

- **Section 4.4** describes the use-support concept and the methodology for developing use-support ratings. Using this approach, surface waters in the basin are assigned one of four ratings: fully supporting, fully supporting but threatened, partially supporting, or not supporting uses.
- **Section 4.5** presents a series of tables, figures, and a color-coded use-support map for many of the streams in the basin.

4.2 WATER QUALITY MONITORING PROGRAMS IN THE WATAUGA RIVER BASIN

DWQ's monitoring program integrates biological, chemical, and physical data assessment to provide information for basinwide planning. Below is a list of the three major monitoring programs from which data is available for this basin. Each of these is briefly described in the following text.

- Benthic macroinvertebrate monitoring (Section 4.2.1 and Appendix III),
- Aquatic toxicity monitoring (Section 4.2.2),
- Ambient water quality monitoring (covering the period 1988-1992) (Section 4.2.3).

In addition, Section 4.2.4 briefly describes the Watauga River basin water quality monitoring program of the Tennessee Valley Authority.

4.2.1 Benthic Macroinvertebrate Monitoring

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable water quality monitoring tool because these organisms are relatively immobile and sensitive to subtle changes in water quality. Since many organisms in a community have life cycles of six months to one year, the effects of short term pollution (such as an oil or chemical spill) will generally not be overcome until the following generation appears. The benthic community also responds to and shows 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 taxa present in the pollution-intolerant groups of Ephemeroptera, Plecoptera and Trichoptera (EPTs). Different criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina. The ratings range from Poor to Excellent. Likewise, ratings can be assigned with a Biotic Index (Appendix III). This index summarizes tolerance data for all taxa in each collection. The two rankings are given equal weight in final site classification. Higher taxa richness values are associated with better water quality. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is poorly assessed by a taxa richness analysis.

Since 1983, 48 benthos samples have been taken at 31 sites in the basin. Of these, 22 were given an Excellent bioclassification, 24 were Good, and 2 were Good-Fair. No Fair or Poor sites were found.

4.2.2 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 Survey and 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 list of all NPDES facilities required to conduct aquatic toxicity testing within the basin is provided in Section 4.3.4.

4.2.3 Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine (saltwater) water quality monitoring stations (about 380 statewide) strategically located for the collection of physical and chemical water quality data. Sampling stations are sited under one or more of the following monitoring designations:

Fixed Monitoring Stations	Rotating Monitoring Stations
Point Source	Basinwide Information
Nonpoint source	HQW & ORW
Baseline	Water Supply

Parametric coverage is tiered by freshwater or saltwater waterbody classification and corresponding water quality standards. Under this arrangement, core parameters are based on Class C waters with additional parameters appended when justified. Parametric coverage is organized by designation as shown in Table 4.1.

There are three ambient monitoring stations in the Watauga River basin on the Watauga mainstem.

Table 4.1. Ambient Monitoring System Parameters

C WATERS (minimum monthly coverage for all stream stations)
- Field Parameters: dissolved oxygen, pH, conductivity, temperature, chlorine
- Nutrients: total phosphorus, ammonia, total Kjeldahl nitrogen, nitrate+nitrite
- Physical Measurements: total suspended solids, turbidity, hardness
- Bacterial: fecal coliform (Millipore Filter Method)
- Metals: aluminum (no present water quality standard), arsenic, cadmium, chromium, copper*, iron*, lead, mercury, nickel, silver*, zinc*

NUTRIENT-SENSITIVE WATERS
- Chlorophyll *a* (where appropriate)

WATER SUPPLY
- chloride, total coliforms, manganese, total dissolved solids

TROUT WATERS
- No changes or additions

PLUS any additional parameters of concern for individual station locations.

* Action level water quality standard

Ambient water quality data are often summarized using box and whisker plots (for example see Figure 4.3). Figure 4.1 provides an explanation of how to interpret the plots.

4.2.4 Water Quality Program Conducted by the Tennessee Valley Authority

TVA has developed a monitoring program that combines the professional expertise of water resource specialists with the volunteer efforts of local citizens. This is the baseline for the concept of River Action Teams (RATs).

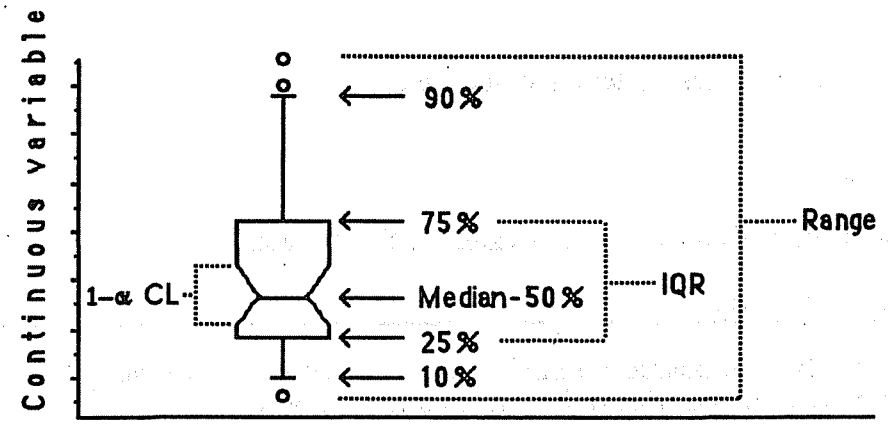
Water quality data is being collected from key locations on streams in the Watauga River basin. The results of the survey are used by the RAT to: 1) decide where to focus efforts to enhance and protect water quality; 2) document ecological recovery at sites where stream restoration management practices have been implemented; and 3) to monitor overall trends in water quality throughout the watershed. Refer to Chapter 5 for further discussion on the RAT concept.

TVA's Holston RAT conducted a survey from 1993 - 1995 in streams throughout the 21-county area of the Holston River Watershed. The Watauga River basin is part of the Holston River watershed (Refer to Chapter 2 for further discussion and a map). The report, entitled Holston Watershed: Biological Condition of Streams, contains the results of 169 biological water quality surveys in the watershed. Twelve of these sites are within the Watauga River basin in North Carolina.

RAT team members and TVA biologists conduct fish community assessment using the Index of Biotic Integrity (IBI) and a macroinvertebrate assessment using the EPT method to family level of identification. A habitat assessment is also conducted using the Rosgen method. Assessments were conducted in 1994 and 1995.

Figure 4.1 Explanation of Box and Whisker Plots

Box and whisker plot are useful for comparing sets of data comprised of a single variable by the visualization of selected order statistics. After the data have been ordered from low to high, the 10th, 25th, 50th, 75th, and 90th percentiles are calculated for plot construction. Box and whisker plots display the following important information: 1) the interquartile range (IQR) which measures the distribution and variability of the bulk of the data (located between the 25th and 75th percentiles), 2) the desired confidence interval (1- CL) for measuring the statistical significance of the median (50th percentile), 3) indication of skew from comparing the symmetry of the box above and below the median, 4) the range of the data from the lowest to highest values, and 5) the extreme values below the 10th percentile and above the 90th percentile (depicted as dots).



Visual comparison of confidence level notches about the medians of two or more box plots can be used to roughly perform hypothesis testing. If the box plots represent data from samples assumed to be independent, then overlapping notches indicate no significant difference in the samples at a prescribed level of confidence. Formal tests should subsequently be performed to verify preliminary conclusions based on visual inspection of the plots.

Survey results on the twelve sites in the Watauga River basin indicate very poor to good IBI ratings for fish community assessments. Macroinvertebrate results indicate ratings of fair to good for all sites. Habitat assessments indicate impacts at each site. IBI and habitat assessments have not been conducted for these same sites by the DWQ biologists, so no comparison of these data can be made at this time.

However, several of the sites have been sampled by DWQ biologists for macroinvertebrates. DWQ macroinvertebrate results show slightly higher ratings than the RAT results. The difference in results can be explained by comparing sampling methodology. For example; 1) TVA does not have an Excellent rating for their EPT methodology, and 2) DWQ biologists identify macroinvertebrate samples to a lower level of taxonomy (to genus and species level). With proper training, it is realistic for volunteers to achieve family level taxonomy. However, it appears that family level identification and the use of a national list of tolerance values may not be sensitive enough to detect subtle water quality changes. It has been further suggested that the use of regionalized data for family tolerance values would improve the quality of volunteer generated data (Penrose and Call 1995) and allow for better comparison between datasets.

In the future, it may be possible for the DWQ biologists to work with TVA and RAT members to coordinate sampling locations on streams within the Watauga River basin. It may also be possible for DWQ to conduct follow-up field work or QA/QC investigations on those TVA stream sites that do not correspond with DWQ findings.

4.3 NARRATIVE WATER QUALITY SUMMARY FOR THE WATAUGA RIVER BASIN

4.3.1 Description

The Watauga River basin is located in the Blue Ridge mountains physiographic region immediately southwest of the New River basin. Although these two river basins are very similar in the composition of their aquatic fauna, they flow in different directions. While the New River flows northeast into Virginia, the Watauga River is a headwater tributary of the Holston River system, flowing northwest into Tennessee. Both are located west of the eastern continental divide and eventually flow into the Gulf of Mexico. The principal tributary of the Watauga River in North Carolina is the Elk River.

The upper portion of the Watauga River and its tributaries support a good trout fishery. This intergrades with a "cool-water" fishery (smallmouth bass) in the middle and lower section of the river. Fishing pressure is heavy in both the Watauga River and Elk River.

4.3.2 Overview Of Water Quality

Overall water quality is very good in the Watauga River basin, with the majority of sites having a bioclassification of Good or Excellent based on macroinvertebrate data (Appendix III). The Watauga River and Boone Fork are classified as High Quality Waters. The major water quality problem in this basin appears to be sedimentation from nonpoint source runoff. Nutrients resulting from nonpoint sources may also be a minor problem. The lower Watauga River, the Elk River, and many small tributaries become very turbid after rainfall. Nonpoint source runoff appears to be the cause of some degradation (Good or Good-Fair rating) in the middle Watauga River, most of the Elk River, Valley Creek, Spice Bottom Creek, Lance Creek, Laurel Fork, Dutch Creek, Beaverdam Creek, and Buckeye Creek. Laurel Fork, draining the western portion of Boone, and Valley Creek are the only benthos sites to receive a Good-Fair rating since 1983. The 13 benthos basin assessment sites sampled in 1994 resulted in 6 Excellent bioclassifications, 6 Good bioclassifications and a Good-Fair bioclassification at Laurel Fork.

Portions of the Watauga basin are being rapidly developed for second homes and recreational activities. Much of this development is focused on stream and river corridors, potentially affecting water quality through both nonpoint source runoff and numerous small point source dischargers. This basin contains 29 permitted dischargers, although only 3 facilities have a design flow > 0.3 MGD: Banner Elk WWTP (0.6 MGD), Sugar Mountain WWTP (0.5 MGD), and Pond Creek WWTP (0.4 MGD).

Many of the watersheds in the Watauga basin are intensively farmed, especially Cove Creek, Beaverdam Creek, and Laurel Creek. These streams often carry heavy sediment loads. Heavy sediment loads also occur in Laurel Fork, Crab Orchard Creek, the Elk River, and portions of the Watauga River (Bonner 1983, DEM field observations 1983-1994).

Watauga River Basin
040201

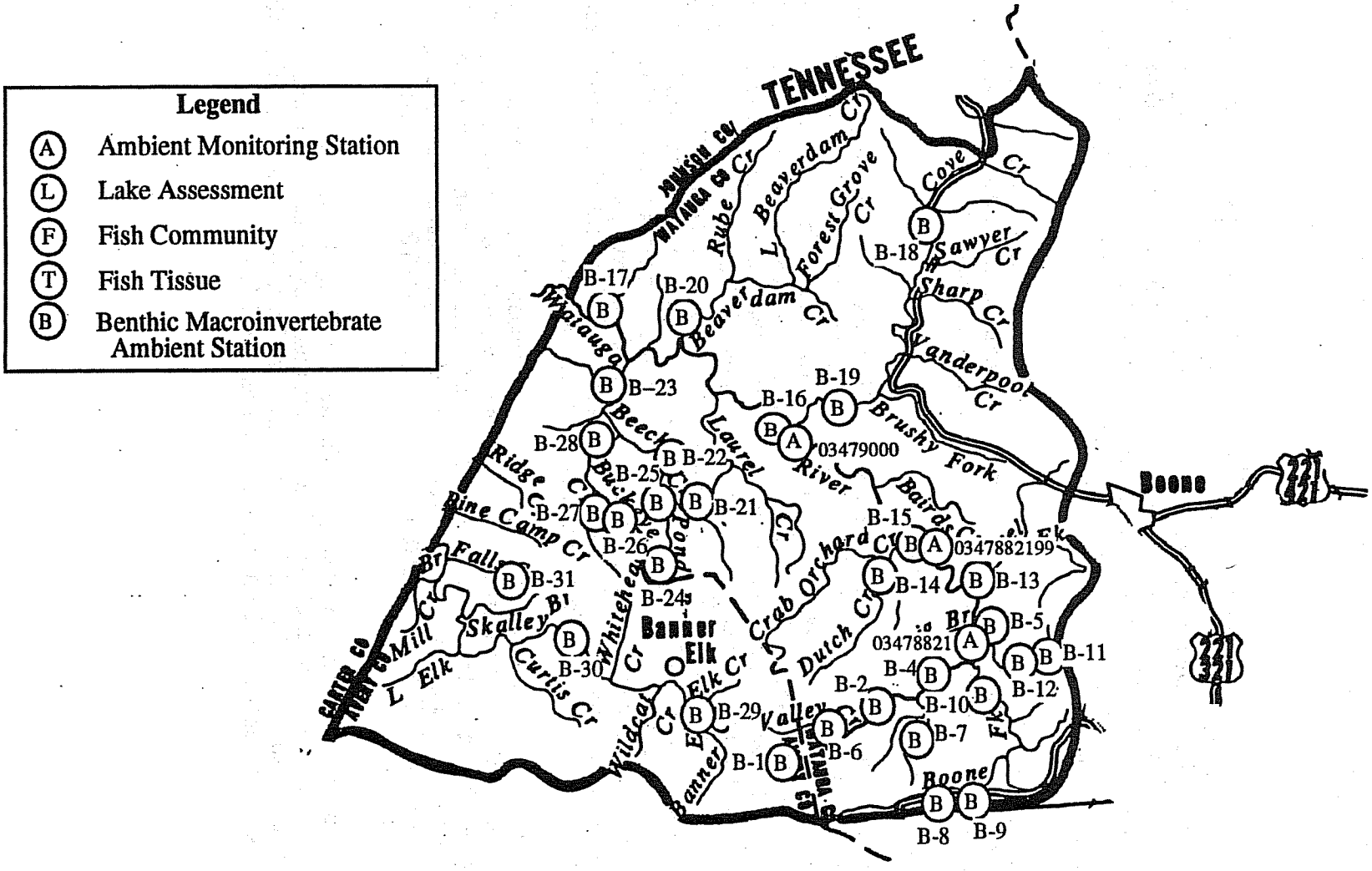


Figure 4.2 Location of Sampling Stations for the Watauga River Basin

4.3.3 Benthic Macroinvertebrates

Eleven locations were sampled for benthic macroinvertebrates in 1994 (Table 4.2). Three mainstem sites have been sampled during the summer months for many years. These sites are discussed in greater detail in the "Long Term" section. However, higher flows occurred just prior to sampling in 1994 than in any previous samples. Benthic macroinvertebrate samples were collected at 31 sites in this basin since 1983.

The Watauga River was sampled at four sites from the headwaters to a site near the state line (near Peoria). The two upstream sites on the Watauga River (SR 1580, NC 105) were found to have Excellent bioclassifications, although heavy growth of periphyton indicated some enrichment at the site near Foscoe (SR 1580). Sand and silt comprise only 15% of the substrate at these sites, although the high gradient may contribute to the rocky nature of this section of river. A slight decline was noted downstream at the SR 1121, Sugar Grove site (to Good), probably due to nonpoint source problems. The amount of sand and silt increases at the two downstream sites, comprising 25% of the substrate. The most downstream site (SR 1200 near Peoria) received an Excellent bioclassification, suggesting some recovery relative to the Sugar Grove site. The downstream sites become very turbid after heavy rainfalls, illustrating the effects of nonpoint source runoff.

A site on Boone Fork above Price Lake (SR 1561) was sampled as a reference site. A high proportion of sand and gravel at this site (40%) appears to be natural, and this stream was very clear, in spite of recent rains. The relatively small size of this stream (width = 7 meters) may have contributed to lower EPT taxa richness (38), but the presence of many intolerant taxa produced a very low biotic index (2.37) and an Excellent bioclassification. A site on Boone Fork below Price Lake (off SR 1558) was sampled to evaluate the effect of this lake, especially the effect of draining and refilling in 1991. This site received a Good rating. The EPT fauna was fairly sparse and the fauna was dominated by fairly tolerant Hydropsychidae.

Laurel Fork drains portions of Boone, receiving both point source dischargers and nonpoint source runoff. This site received a Good-Fair bioclassification. The EPT fauna was fairly sparse, with very low numbers of Plecoptera. However, two intolerant taxa were found to be abundant at this site. A quick reconnaissance at the next upstream bridge (SR 1109 near Vulcan Materials) showed no changes in the dominant taxa.

Two streams were sampled that were located in highly agricultural areas: Beaverdam Creek and Cove Creek. Beaverdam Creek had no prior DWQ data, although samples by TVA fisheries biologists (TVA 1994) suggested some impact and a degraded habitat. DWQ sampling also showed a habitat with a substrate composed of 55% sand and gravel. Rubble-boulder substrate was found in riffle areas, but these areas were embedded with sand and pools were filled-in with sediment. A Good rating was assigned to this stream based on EPT taxa richness (31). Cove Creek had a similar fauna (EPT S = 31) and a substrate composed of 40% sand and gravel. Heavy growths of periphyton suggested some enrichment at this site.

Beech Creek was sampled just above its confluence with Poga Creek. Both the high EPT taxa richness (46) and a high proportion of intolerant taxa (NCBI = 3.08) indicated an Excellent bioclassification. Beech Creek water was relatively clear in spite of recent heavy rainfall, however, abundant periphyton growth suggested some enrichment.

Three sites were sampled on the Elk River: 1) a headwater segment above Banner Elk, 2) a site at SR 1326 (about 2 miles below Banner Elk), and 3) a site near the NC/Tennessee state line. All sites showed evidence of sediment inputs, with sand and gravel comprising 40-60% of the substrate at these three sites. Pool areas were often filled-in with coarse sand. The abundant periphyton growths at all Elk River sites suggests enrichment. The sites above and below Banner

Elk were very similar, with a Good rating for both sites. The most downstream site, however, had an Excellent rating based on EPT taxa richness. High flows prior to sampling may have reduced the abundance of some tolerant species, especially in the Chironomidae.

Table 4.2 Bioclassification Rating for Basin assessment sites in the Watauga River basin (04-02-01), 1994.

Site #	Creek	Date	County	Road	S/SEPT	Rating
B-4	Watauga R	940809	Watauga	SR 1580	-/38	Excellent
B-5	Watauga R	940808	Watauga	NC 105	68/40	Excellent
B-8	Boone Fk	940808	Watauga	SR 1561	58/36	Excellent
B-9	Boone Fk	940808	Watauga	Off SR 1558	-/31	Good
B-13	Laurel Fk	940809	Watauga	SR 1111	-/24	Good-Fair
B-16	Watauga R	940809	Watauga	SR 1121	87/42	Good
B-17	Watauga R	940809	Watauga	SR 1200	97/46	Excellent
B-19	Cove Cr	940809	Watauga	NC 321	-/31	Good
B-20	Beaverdam Cr	940809	Watauga	SR 1201	-/32	Good
B-23	Beech Cr	940811	Watauga	NC 321	95/46	Excellent
B-29	Elk R	940810	Avery	Off NC 184	77/33	Good
B-30	Elk R	940810	Avery	SR 1326	76/33	Good
B-31	Elk R	940810	Avery	SR 1305	-/36	Excellent

Long Term Macroinvertebrate Sites

All long term sites had much higher flows just prior to sampling in 1994 than previous years. This can be seen by the flow data presented in the Watauga River at Sugar Grove discussion below.

Watauga River, SR 1580 near Foscoe

A Good rating was assigned to this site in 1985, but Excellent bioclassifications resulted from subsequent collections in 1988 and 1994 (Table 4.3). Heavy periphyton growths observed in all years suggests some nutrient enrichment in this portion of the Watauga River. The SR 1580 site is located below a cluster of seven small dischargers.

Table 4.3 Long Term Macroinvertebrate Results on Watauga River near Foscoe.

Date	Total S	EPT S	EPT N	BI(BIEPT)	Bioclass	Flow
09 Aug 94	-	38	172	-(2.86)	Excellent	High
27 July 88	-	38	213	-(3.16)	Excellent	Low
18 Aug 85	76	32	165	4.45(3.15)	Good	Low

Watauga River, NC 105 near Shulls Mill

All benthos collections at the Shulls Mill site produced Excellent bioclassifications and water chemistry data have not shown any water quality problems (Table 4.4). Of the six collections at this site, however, the 1994 benthos collections had the lowest total taxa richness, EPT taxa richness, and EPT abundance values. Several intolerant species showed a decline in abundance in 1994, producing an overall decline in EPT abundance. Many of these changes may be related to the higher flows in 1994.

Table 4.4 Long Term Macroinvertebrate Results on Watauga River near Shulls Mill.

Date	Total S	EPT S	EPT N	BI(BIEPT)	Bioclass	Flow
08 Aug 94	74	41	176	3.68(2.99)	Excellent	High
05 Mar 90	99	57	285	3.18(2.42)	Excellent	Normal
09 Aug 89	104	46	246	3.79(2.96)	Excellent	Normal
27 July 88	-	45	215	-(2.62)	Excellent	Low
04 Aug 87	93	45	222	3.98(2.76)	Excellent	Low
02 Aug 85	84	45	222	4.00(2.71)	Excellent	Low

Watauga River, SR 1121 near Sugar Grove

Most collections from this site have produced a Good rating, although an Excellent rating was assigned in 1990 (Table 4.5). Water chemistry data did not indicate any problems, although median conductivity (1990-1994) was slightly higher than at the upstream site at Shulls Mill. The heavy periphyton growths frequently found at this site suggests some enrichment. Field notes also have recorded large amounts of sediment, with sand and gravel usually comprising 50% of the substrate. Finer sediments often settle out near the banks.

While many intolerant taxa can be found at this site, prior collections have suggested some water quality problems by the abundance of tolerant species. Highest EPT taxa richness and EPT abundance values have coincided with low flow (1986-1990), suggesting nonpoint source problems at this site. Some low flow years (1983, 1986-88), however, also were associated with an increase in the abundance of more tolerant species (as measured by the biotic index).

Table 4.5 Long Term Macroinvertebrate Results on Watauga River near Sugar Grove.

Date	Total S	EPT S	EPT N	BI(BIEPT)	Bioclass	Flow	Median*
09 Aug 94	87	42	182	4.10(3.32)	Good	High	151
10 July 90	101	48	257	4.57(3.48)	Excellent	Low	59
28 July 88	105	46	250	4.86(3.34)	Good	Low	37
25 July 86	101	45	217	4.84(3.32)	Good	Low	34
12 Aug 85	88	40	224	4.63(3.38)	Good	Normal	81
08 Aug 84	99	41	175	4.77(3.25)	Good	Normal	110
20 Aug 83	95	40	166	4.92(3.67)	Good	Low	54
09 Aug 83	94	40	148	4.63(3.36)	Good	Low	-

* Median daily flow (cfs) for 3 weeks prior to sampling

Special Studies

Data from all special studies are presented in Table 4.6, with a reference to the Biological Assessment Group report file number, if more detailed information is needed.

Development was found to affect many of the tributaries in the upper portion of the Watauga River catchment, including Valley Creek, Spice Bottom Creek, Lance Creek, and Laurel Creek. This conclusion is supported by fisheries information indicating only marginal wild trout populations in many of these streams (Bonner 1983). All of the above ratings have been adjusted for spring sampling. Areas that qualified for HQW designation included the Watauga River and Boone Fork, both of which support high quality trout populations (B-900719).

Table 4.6 Benthic Macroinvertebrate Special Studies, Watauga River Basin.

Site #	Creek	Date	Study	County	Road	S:Rating
B-2	Watauga R	900305	ORW/HQW evaluation	Watauga	SR 1594	-/40: Good
B-5	Watauga R	900305	ORW/HQW evaluation	Watauga	NC 105	99/57: Excellent
B-6	Valley Cr	900305	ORW/HQW evaluation	Watauga	NC 105	-/29: Good-Fair
B-7	Spice Bottom Cr	900305	ORW/HQW evaluation	Watauga	SR 1559	-/38: Good
B-10	Boone Fk	900305	ORW/HQW evaluation	Watauga	SR 1558	-/45: Excellent
B-11	Lance Cr	900305	ORW/HQW evaluation	Watauga	ab golf course	-/33: Excellent
B-12	Lance Cr	900305	ORW/HQW evaluation	Watauga	at golf course	-/27: Good
B-13	Laurel Cr	900305	ORW/HQW evaluation	Watauga	SR 1111	-/31: Good
B-15	Watauga R	900306	ORW/HQW evaluation	Watauga	NC 194	93/51: Excellent

Nonpoint source runoff, especially sediment, appeared to be the most significant problem in the Watauga River catchment, with some degradation found in both Dutch Creek and the Watauga River (Table 4.7) below NC 105 (B-881024).

Table 4.7 Benthic Macroinvertebrate Watauga River Survey Results

Site #	Creek	Date	Study	County	Road	S:Rating
B-1	Watauga R	880727	Watauga R Survey	Watauga	SR 1339	-/38: Excellent
B-2	Watauga R	880727	Watauga R Survey	Watauga	SR 1594	83/44: Excellent
B-4	Watauga R	880727	Watauga R Survey	Watauga	SR 1580	-/38: Excellent
B-5	Watauga R	880727	Watauga R Survey	Watauga	NC 105	-/45: Excellent
B-14	Dutch Cr	880727	Watauga R Survey	Watauga	Off NC 105	87/38: Good
B-16	Watauga R	880728	Watauga R Survey	Watauga	SR 1121	105/46: Good
B-17	Watauga R	880728	Watauga R Survey	Watauga	SR 1200	86/38: Good

Both fish and benthic macroinvertebrates were sampled in Cove Creek to determine its suitability for reclassification from C to C-Trout (Table 4.8). Erosion in the Cove Creek catchment results in a substrate with large amounts of gravel and sand (65%). This site received a Good rating using the macroinvertebrate data. Fish samples indicated that all trout were stocked brown trout with no natural reproduction, which suggests the supplemental classification of trout would not be appropriate. Cove Creek was not recommended for the reclassification (B-890302).

Table 4.8 Fish and Benthic Macroinvertebrate Sampling- Cove Creek- 1988.

Site #	Creek	Date	Study	County	Road	S:Rating
B-18	Cove Cr	880728	Cove Cr Reclass	Watauga	SR 1305	-/33: Good

A slight decline in water quality was observed in Pond Creek below the Beech Mountain WWTP, but no impact was observed further downstream in Beech Creek (Table 4.9). The headwaters of Beech Creek, however, may be somewhat affected by nonpoint source runoff (sediment) (B-870922).

Table 4.9 Benthic Macroinvertebrate Results for Beech Creek and Pond Creek.

Site #	Creek	Date	Study	County	Road	S:Rating
B-21	Beech Cr	870917	Beech Mtn WWTP	Watauga	ab Beech Cr	53/29: Good
B-22	Beech Cr	870917	Beech Mtn WWTP	Watauga	SR 1126	54/30: Good
B-24	Pond Cr	870917	Beech Mtn WWTP	Watauga	ab WWTP	54/29: Excellent
B-25	Pond Cr	870917	Beech Mtn WWTP	Watauga	be WWTP	41/24: Good

Benthic macroinvertebrate surveys in August 1985 showed some impacts in the Watauga River (Table 4.10) in the most developed area near Foscoe (SR 1580). This area also had the highest

level of fecal coliform bacteria. Recovery was observed at the Shulls Mill site (NC105), but a Good rating was observed further downstream at SR 1121 near Sugar Grove due to nonpoint source inputs (B-850830).

Table 4.10 Benthic Macroinvertebrate Watauga River Survey Results - 1985.

Site #	Creek	Date	Study	County	Road	S:Rating
B-1	Watauga R	850813	Watauga R Survey	Watauga	SR 1339	61/33: Excellent
B-2	Watauga R	850813	Watauga R Survey	Watauga	SR 1594	67/34: Excellent
B-4	Watauga R	850813	Watauga R Survey	Watauga	SR 1580	76/32: Good
B-5	Watauga R	850812	Watauga R Survey	Watauga	NC 105	84/45: Excellent
B-16	Watauga R	850812	Watauga R Survey	Watauga	SR 1121	88/40: Good

A use attainability survey of Buckeye Creek was conducted to determine if the trout classification should be removed from this stream (Table 4.11). Viable populations of both brook trout (upper two sites) and rainbow trout (lower site) were found in this stream and the benthic macroinvertebrate data indicated Good bioclassifications at all sites. Most problems were associated with sediment inputs from residential development, especially in the middle portion of the catchment. It was recommended that the classification remain B-Trout (B-850215).

Table 4.11 Buckeye Creek Use Attainment Survey Results - 1984.

Site #	Creek	Date	Study	County	Road	S:Rating
B-26	Buckeye Cr	840417	Use Attainability	Watauga	Headwaters	48/26: Good
B-27	Buckeye Cr	840417	Use Attainability	Watauga	ab Grassy Cr	50/29: Good
B-28	Buckeye Cr	840417	Use Attainability	Watauga	SR 1312	59/31: Good

4.3.4 Aquatic Toxicity Monitoring

Three facilities in this subbasin currently monitor effluent toxicity as per permit requirements:

Facility	NPDES#	Receiving Stream	County	Flow(MGD)	IWC(%)
Beech Mountain/Pond Creek	NC0069761/001	Pond Cr	Watauga	0.40	51.00
Beech Mtn-Grassy Gap WWTP	NC0022730/001	Grassy Gap Cr	Watauga	0.04	23.00
Sugar Mountain Utilities	NC0022900/001	Flattop Cr	Avery	0.50	52.49

These facilities have consistently met the requirements of their permit limits. Only Sugar Mountain Utilities has ever failed their permit limits (July 1992). None of these facilities has obtained regulatory relief for toxicity limits through a special or judicial order.

4.3.5 Ambient Monitoring System

Tabular summaries of ambient water chemistry data for three Ambient Monitoring System (AMS) stations within the Watauga basin follow the general discussion of water chemistry data given below. These tables summarize data from 1990 through 1994 for common selected chemical parameters and include station summary information, descriptive statistics for parametric data, water quality criteria information for the station's classification, a yearly breakdown of selected parametric data, and descriptive statistics for parametric data from summer months. The April-October months are used in summer modeling applications, June-September months are used in worse-case, lowest-flow analyses.

AMS stations for the basin are listed below in Table 4.12. North Carolina has three stations located on the mainstem of the Watauga River. The Watauga River, at the most upstream site at Shulls Mill, is approximately 10 meters wide and has a substrate dominated by large boulders and rubble. The gradient is relatively high at this monitoring location, resulting in very little deposition of sand. At the most downstream site at Sugar Grove, the river is approximately 15 meters wide and has a

substrate with a greater proportion of sand. There is little shading at this monitoring location, which may account for higher water temperatures relative to the upstream monitoring location at Shulls Mill. Water quality conditions at the Sugar Grove location may be affected by urban areas of Boone.

Table 4.12 Ambient Monitoring System Stations Within the Watauga River Basin.

Primary No	STORETNo	Station Name	Subbasin
Watauga River Drainage			
03478821	L2000000	WATAUGA R AT NC HWY 105 NR SHULLS MILL NC	040201
0347882199	L2350000	WATAUGA R AT SR 1114 NR VALLE CRUCIS NC	040201
03479000	L4700000	WATAUGA R AT SR 1121 NR SUGAR GROVE NC	040201

Table 4.13 summarizes, by parameter, data collected at ambient stations in the Watauga basin. These summaries include the total number of samples for each parameter (by station), the number of samples below the detection level, and the number of samples that were above a water quality criterion. The criteria that are presented are solely numerical and represent instantaneous measurements. The actual standard also may include a narrative (such as the turbidity standard), or may be based on extended exposure at or above the criteria to expect chronic toxicity of the most sensitive species of organism. Therefore Table 4.13 is most useful for relative comparisons between locations and for screening areas where frequent excursions of individual or multiple parameters suggest waters that might be targeted for more detailed evaluations and/or specific management strategies. A more thorough evaluation can include review of temporal and spatial trends, association of concentrations to flow, degree of excursion from the criterion, or use of other analytical methods. Table 4.14 shows totals from Table 4.13 as total samples, total excursions and percent excursions of total samples.

Table 4.13 Summary of Ambient Monitoring System Data by Parameter. Watauga River basin, 1990 - 1994.

Station Number	Station Name	Parameter/Criterion	Samples All	<Det	Excur
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Arsenic (µg/l) [50]	28	28	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Arsenic (µg/l) [50]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Arsenic (µg/l) [50]	29	29	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Cadmium (µg/l) [0.4]	28	28	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Cadmium (µg/l) [0.4]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Cadmium (µg/l) [0.4]	29	29	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Chromium (µg/l) [50]	28	28	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Chromium (µg/l) [50]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Chromium (µg/l) [50]	29	29	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Dissolved Oxygen (mg/l) [6]	29	0	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Dissolved Oxygen (mg/l) [6]	15	0	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Dissolved Oxygen (mg/l) [6]	29	0	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Fecal Coliform (#/100ml) [200]	26	7	1
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Fecal Coliform (#/100ml) [200]	15	3	2
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Fecal Coliform (#/100ml) [200]	26	4	4
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Lead (µg/l) [25]	28	28	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Lead (µg/l) [25]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Lead (µg/l) [25]	29	28	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Mercury (µg/l) [0.012]	27	27	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Mercury (µg/l) [0.012]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Mercury (µg/l) [0.012]	29	29	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Nickel (µg/l) [88]	28	28	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Nickel (µg/l) [88]	15	15	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Nickel (µg/l) [88]	29	29	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	pH (SU) [6-9]	29	0	0
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	pH (SU) [6-9]	15	0	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	pH (SU) [6-9]	29	0	0
O3478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	Turbidity (NTU) [10]	29	6	1
O347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	Turbidity (NTU) [10]	15	3	0
O3479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	Turbidity (NTU) [10]	29	5	1

Table 4.14 Summary of Ambient Monitoring System Station Data by Total Samples. Watauga River basin, 1990 - 1994.

Station Number	Station Name	Total	<Det	Samples Excursions	%Excursions
03478821	WATAUGA RIVER AT NC HWY 105 NEAR SHULLS MILL NC	280	180	2	0.01
0347882199	WATAUGA RIVER AT SR 1114 NEAR VALLE CRUCIS NC	150	96	2	0.01
03479000	WATAUGA RIVER AT SR1121 NEAR SUGAR GROVE NC	287	182	5	0.02
	Grand total	717	458	9	0.01

Box plots (Figure 4.3) show the distribution of dissolved oxygen for the Watauga River for the period of record. The plot (Figure 4.4) of the data show the normal high winter/low summer dissolved oxygen pattern. Two very high data points from December 1989 at Shulls Mills and Sugar Grove may have been from a defective meter reading. Box plots (Figure 4.5) show that the dissolved oxygen distribution is generally about the same through the extent of the mainstem of the Watauga.

Box plots of the pH distribution (Figure 4.6) show pH is generally higher in the downstream sites. The plot of temperature data (Figure 4.7) showed a consistent higher temperature in the Sugar Grove site versus the upstream Shulls Mills site. Temperature and pH are likely due to productivity increases at the downstream sites where the river is wider, with less velocity and less canopy cover.

Conductivity distributions (Figure 4.8) have generally dropped over the period of record as have nitrate/nitrite-nitrogen distributions (Figure 4.9). According to the Asheville and Winston-Salem Regional Office, the wastewater treatment plant at Blowing Rock and several other smaller facilities in the area have improved their treatment processes during this time. These improvements may have contributed to these drops in concentrations. The conductivity increases downstream (Figure 4.10) as do concentrations of copper, turbidity, total suspended residue, hardness, nitrate/nitrite-nitrogen, TKN and total phosphorus.

Fecal Coliform Bacteria

Fecal coliform bacteria are most useful as a screening tool to estimate the cumulative inputs from multiple sources, but in some instances they can be used to locate a single large source of bacteria. Summaries of fecal coliform results were provided to each regional office in May of 1995. These data will be updated in each subsequent Basinwide Assessment Report and will include any additional data collected by staff during the five year cycle.

Summary fecal coliform information is listed in Table 4.15. The primary screening tool used in establishing priority is the geometric mean. Sites with 10 or more fecal coliform samples within the last 5 years, that have a geometric mean exceeding 200 /100ml, are considered highest priority. This information will be reflected in the Use Support Rating for that stream or river.

In the Watauga River, there were no stations with a geometric mean greater than 200/100ml, however the Valle Crucis and Sugar Grove sites did have 13.3% and 15.4% of total samples greater than 200/100ml.

Table 4.15 Fecal Coliform summary data for the Watauga River Basin - 1990 to 1995.

Site	Total Samples	Geometric Mean	Samples >200/100ml	Percent >200/100ml	First Sample	Last Sample
Shulls Mill	26	20.96	1	3.8	01/29/91	12/20/94
Valle Crucis	15	45.91	2	13.3	03/14/93	12/20/94
Sugar Grove	26	51.65	4	15.4	01/29/91	12/20/94

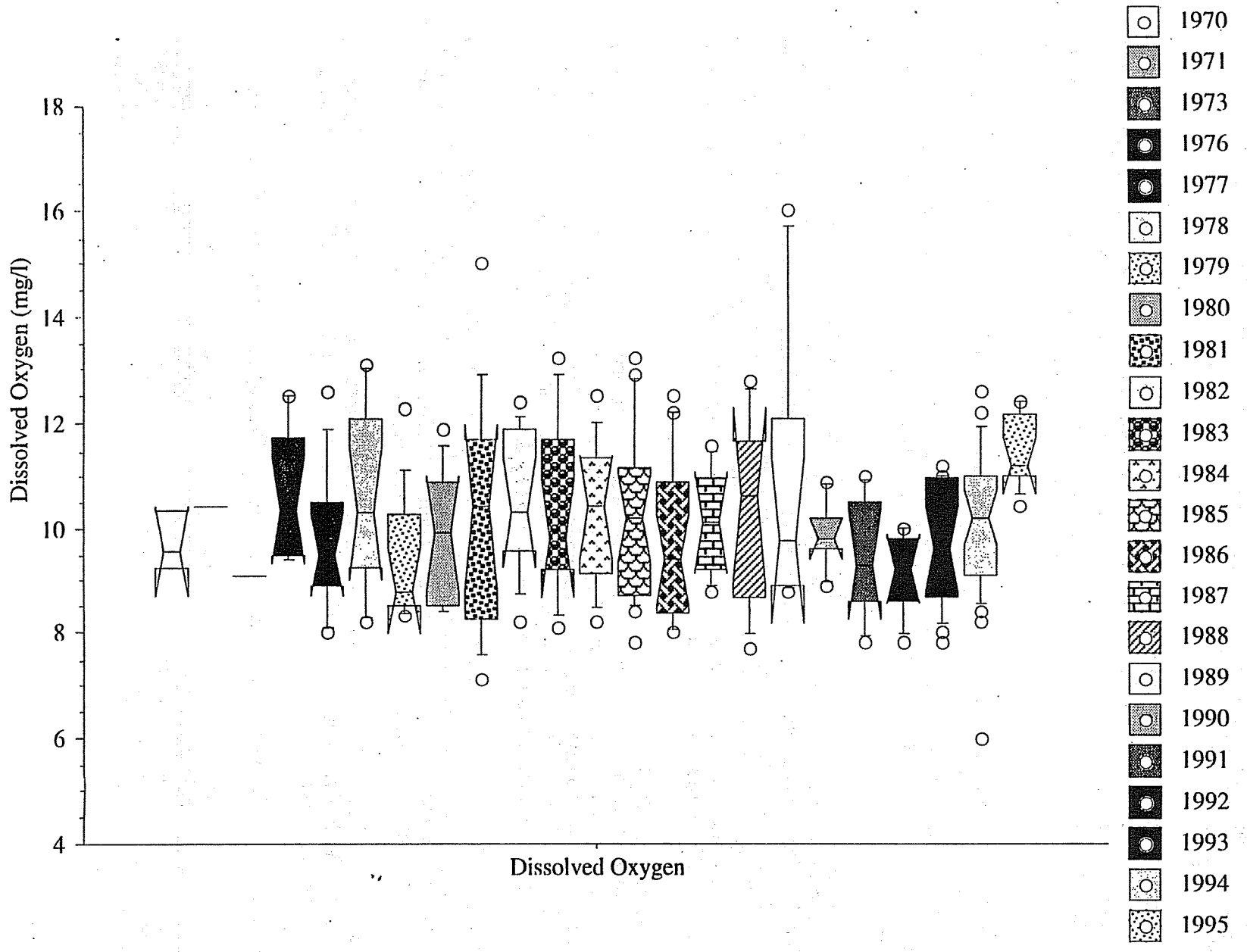


Figure 4.3 Dissolved oxygen distributions for the Watauga River, split by year for the period of record.

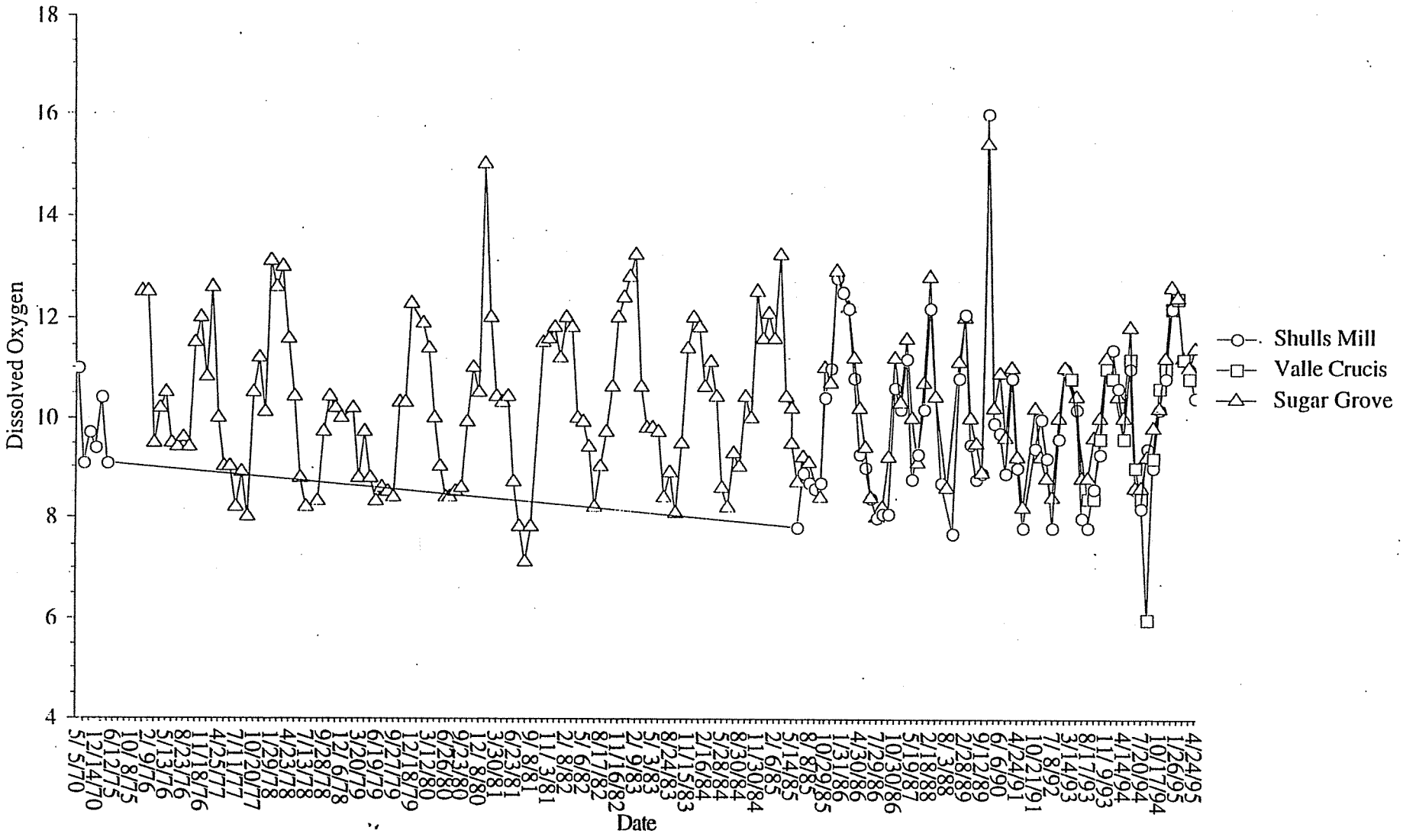


Figure 4.4 Dissolved oxygen concentrations for the Watauga River for the period of record.

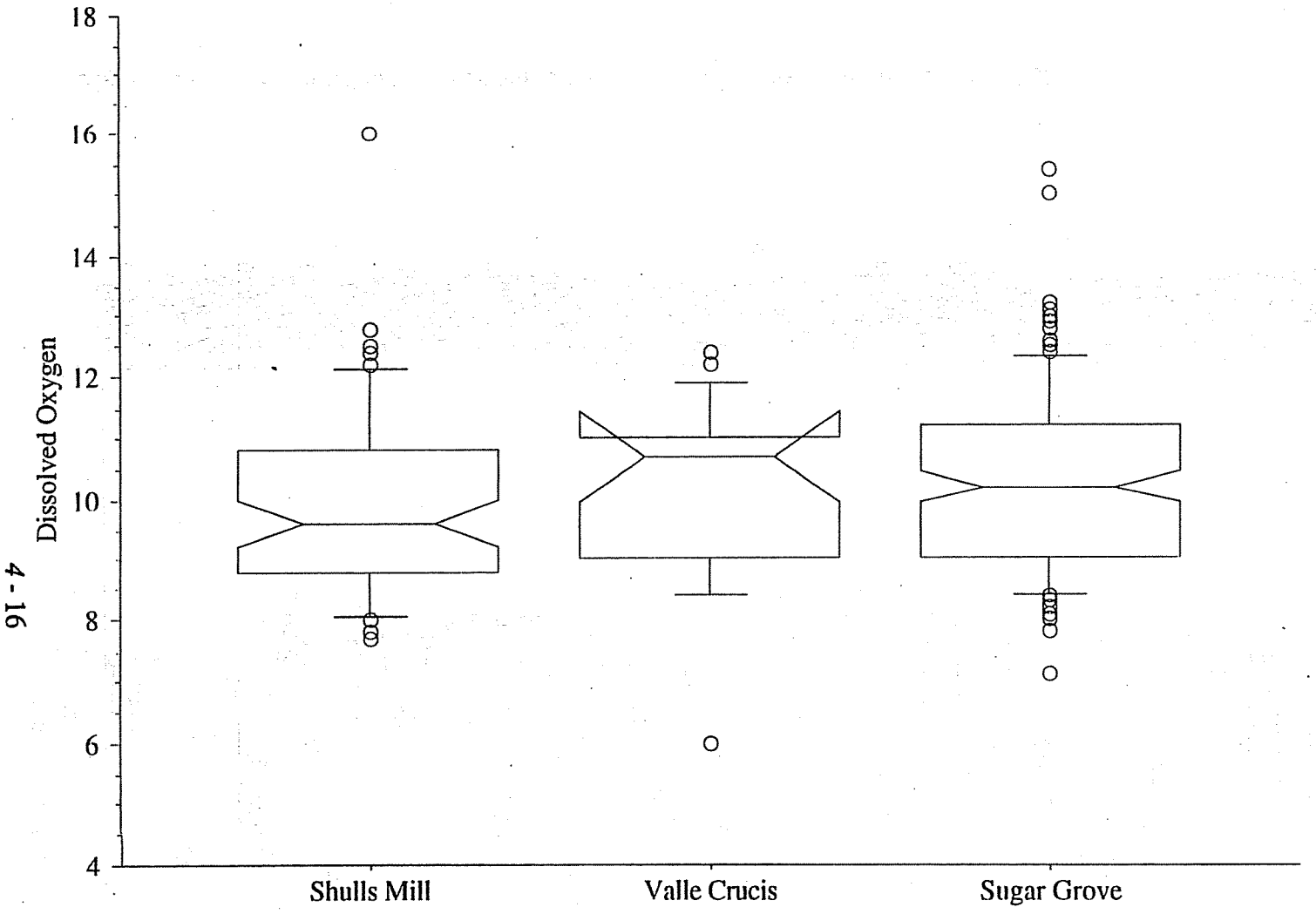


Figure 4.5 Dissolved oxygen distributions for the Watauga River, split by site for the period of record.

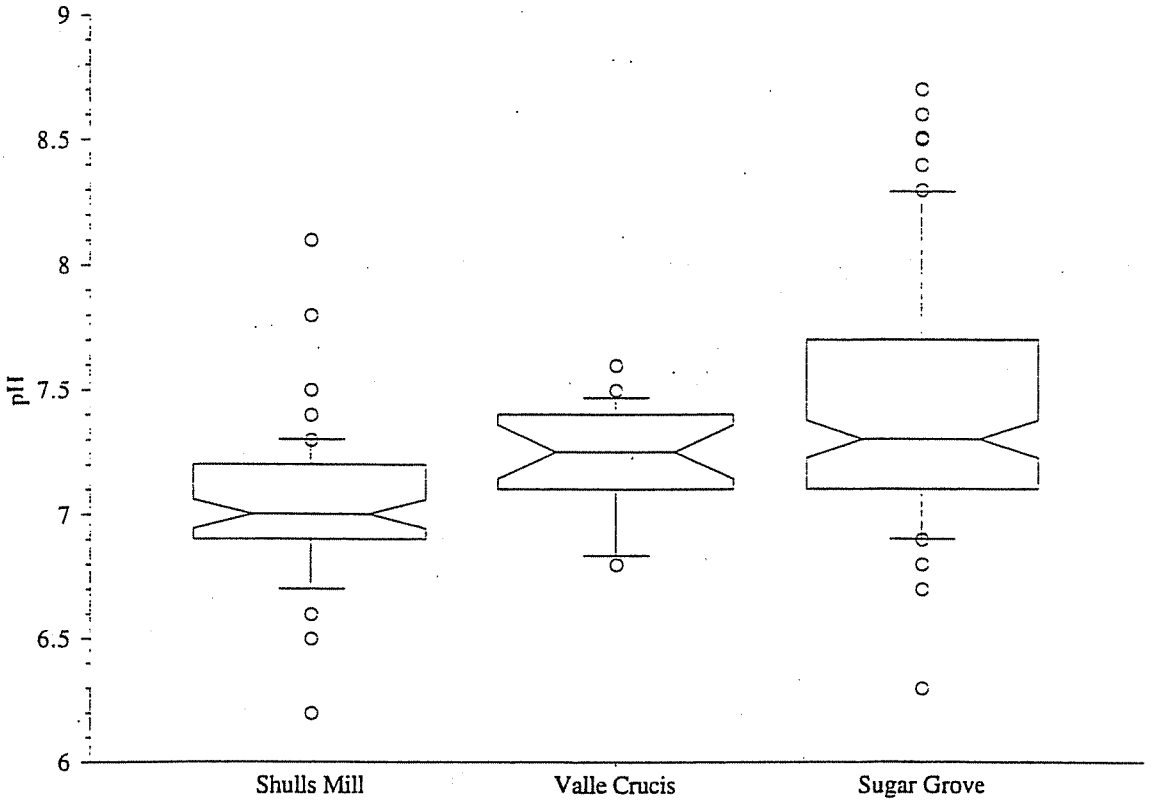


Figure 4.6 pH distributions for the Watauga River, split by site for the period of record.

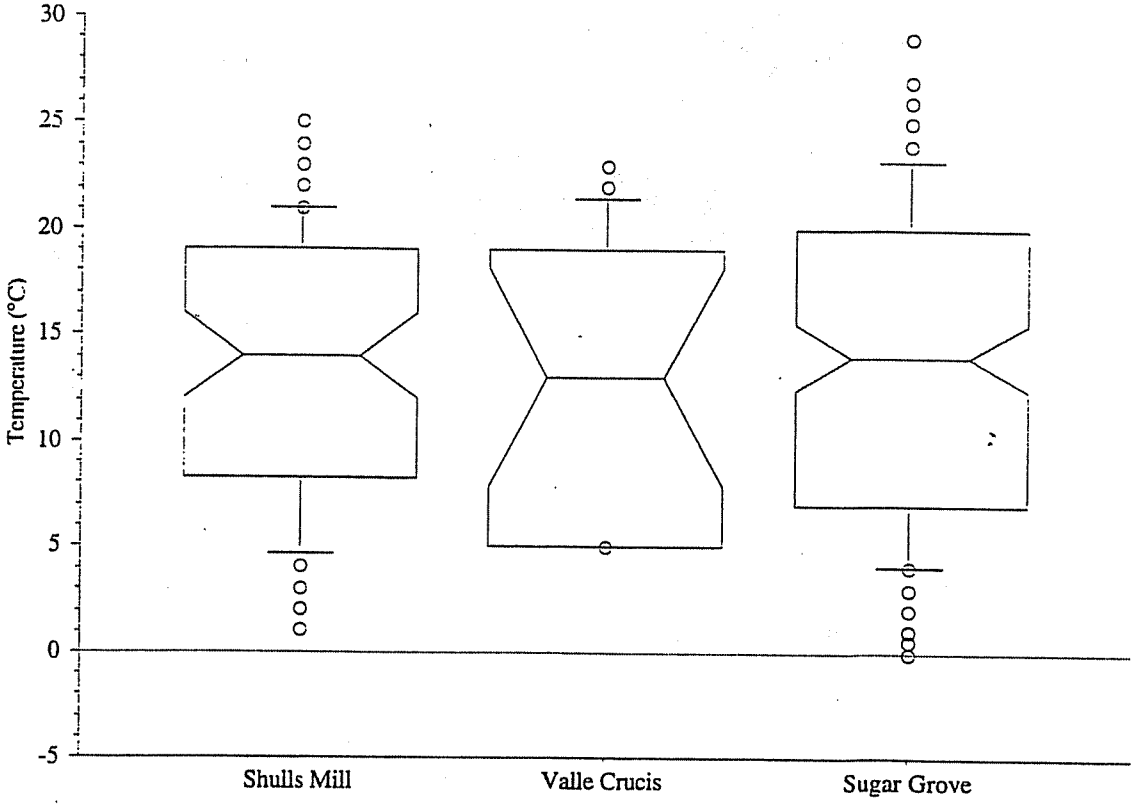


Figure 4.7 Temperature distributions for the Watauga River, split by site for the period of record.

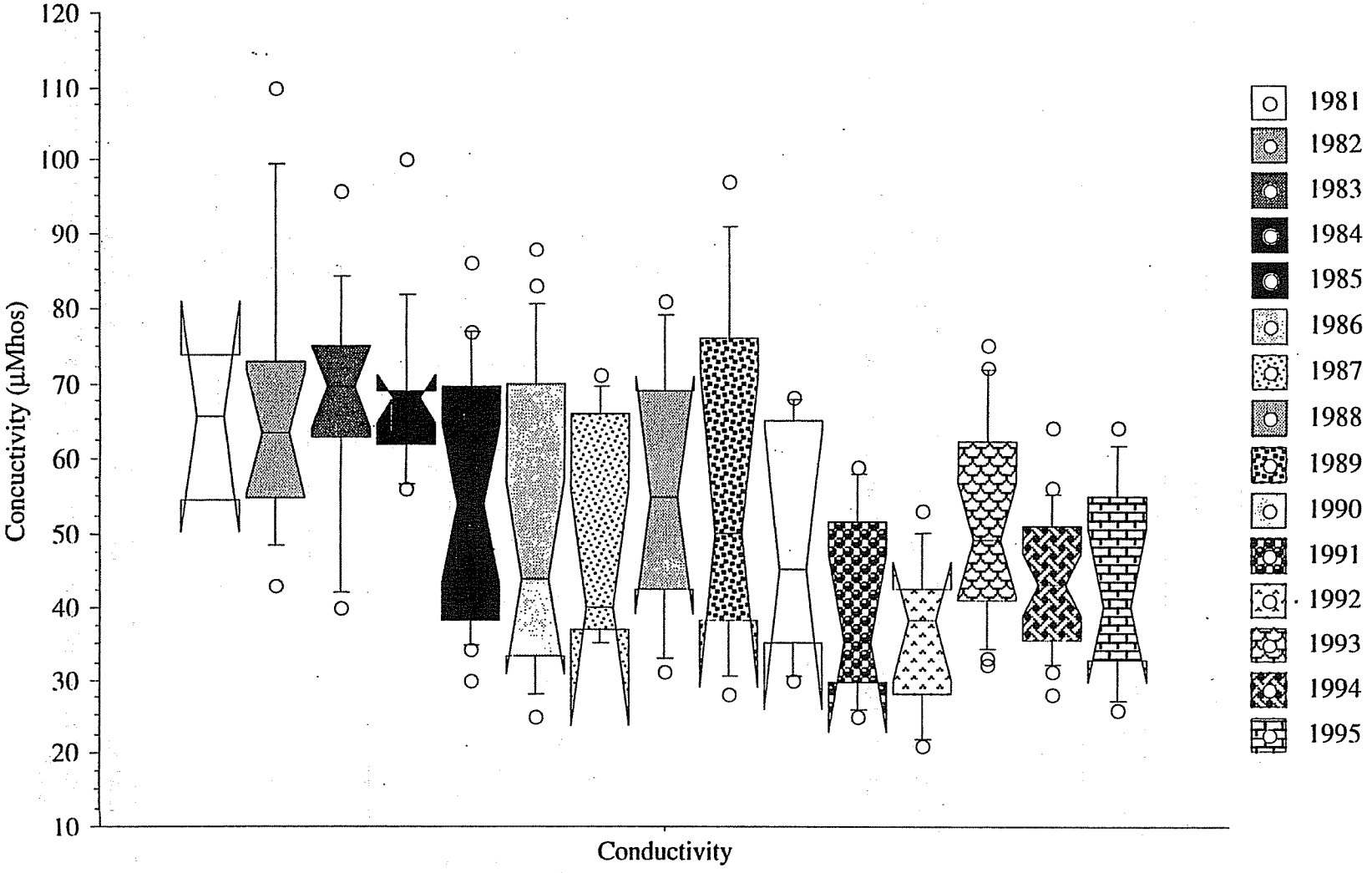


Figure 4.8 Conductivity distributions for the Watauga River, split by year for the period of record.

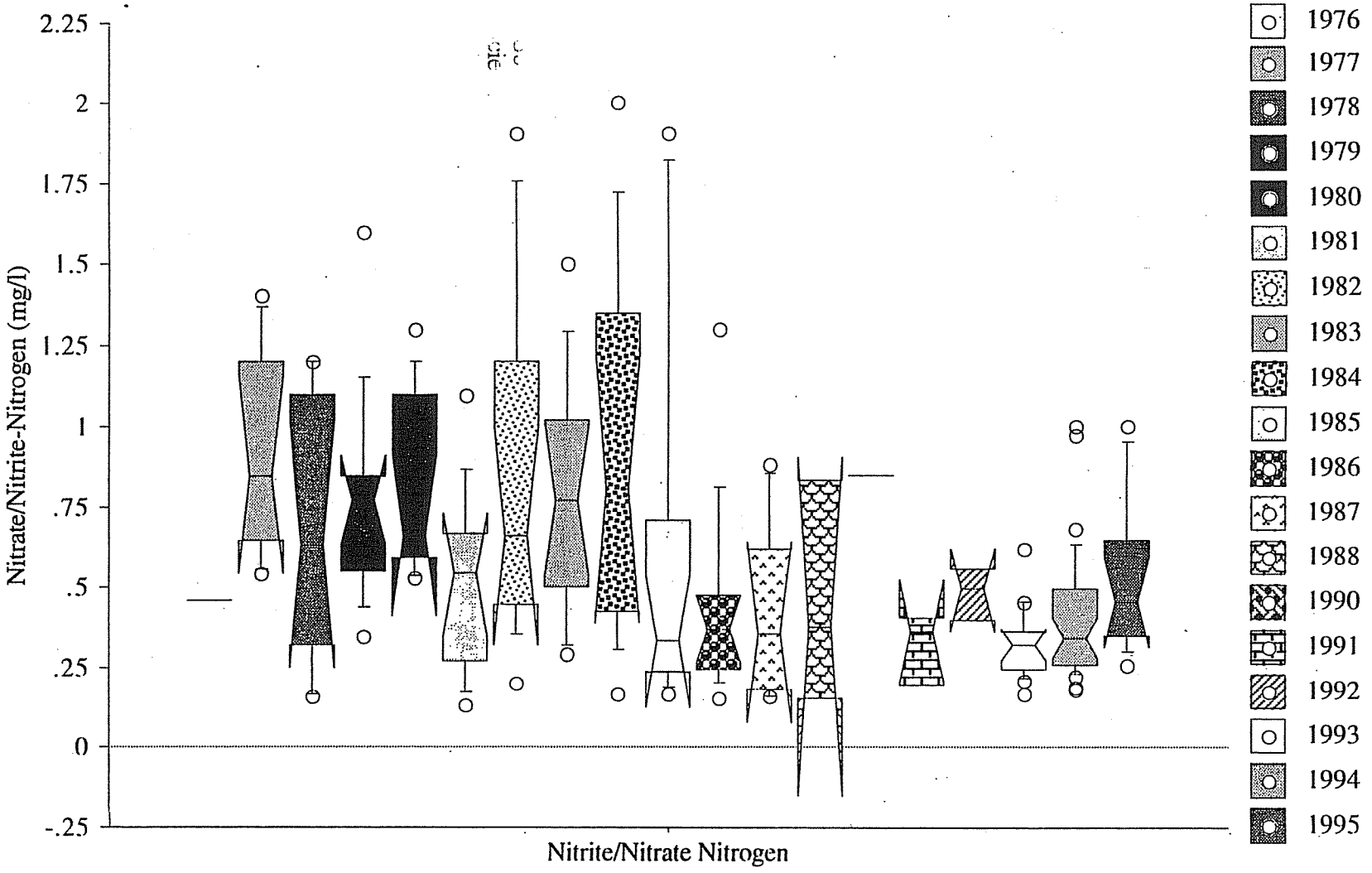


Figure 4.9 Nitrate/Nitrite-Nitrogen distributions for the Watauga River split by year for the period of record.

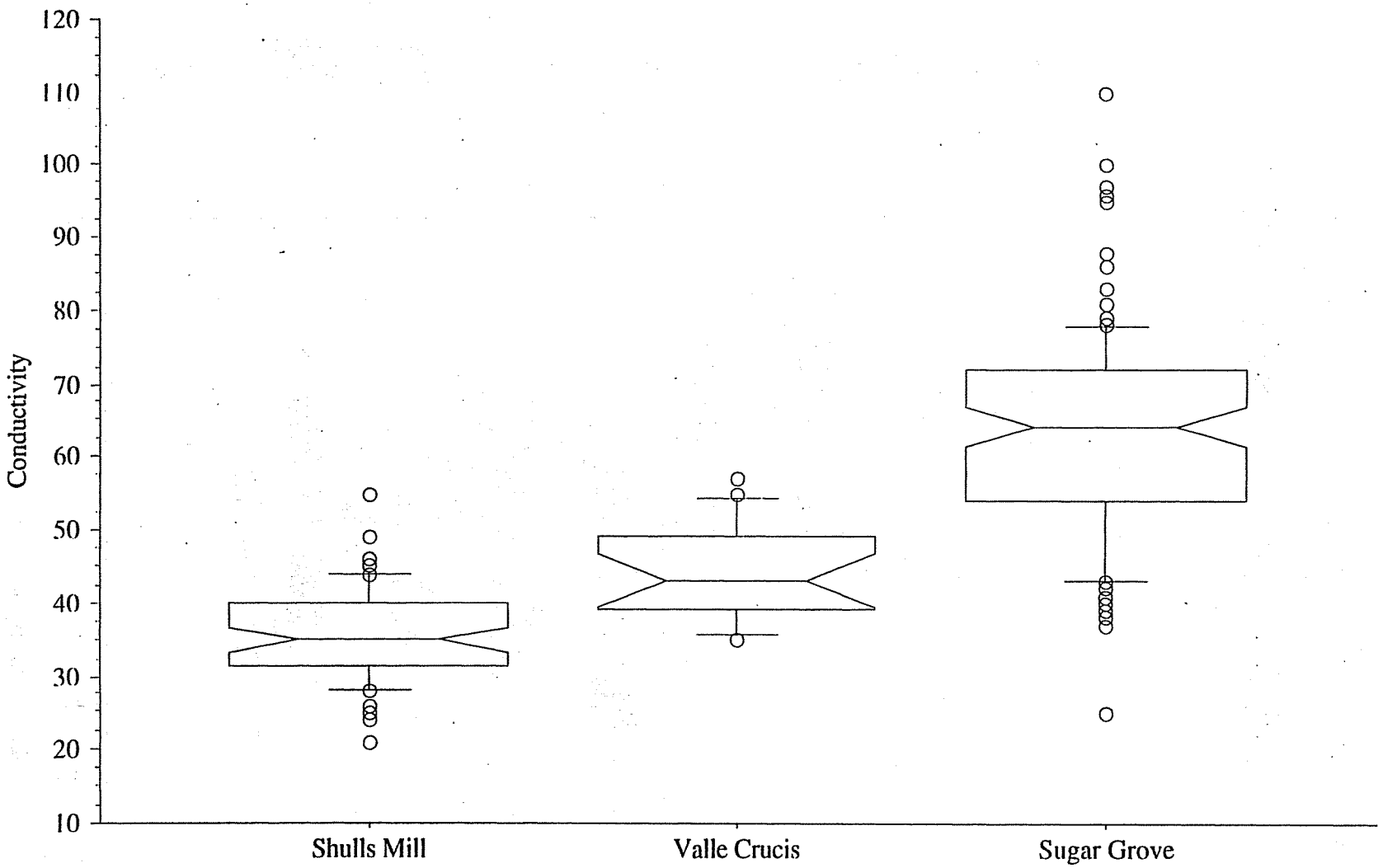


Figure 4.10 Conductivity distributions for the Watauga River split by site for the period of record.

4.4 USE-SUPPORT: DEFINITIONS AND METHODOLOGY

4.4.1 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 for the Watauga River basin are presented in Section 4.5.

Surface waters (streams, lakes or estuaries) are rated as either *fully supporting* (S), *support-threatened* (ST), *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 ST, PS or NS, depending on the degree of exceedence.

Streams rated as either partially supporting or nonsupporting are considered *impaired.* A waterbody is fully supporting but threatened (ST) for a particular designated use when it fully supports that use now, but may not in the future unless pollution prevention or control action is taken. This rating also describes waters for which actual monitored or evaluated data indicate an apparent declining trend (i.e., water quality conditions have deteriorated, compared to earlier assessments, but the waters still support uses). Although these waters are currently supporting uses, they are treated as a separate category from waters fully supporting uses. Streams which had no data to determine their use support were listed as non-evaluated (NE).

For the purposes of this document, the term *impaired* refers to waters that are rated either partially supporting or not supporting their uses based on specific criteria discussed more fully below. There must be a specified degree of degradation before a stream is considered impaired. This differs from the word impacted, which can refer to any noticeable or measurable change in water quality, good or bad.

4.4.2 Interpretation of Data

The assessment of water quality presented below involved evaluation of available water quality data to determine a water body's use support rating. In addition, an effort was made to determine likely causes (e.g., sediment or nutrients) and sources (e.g., agriculture, urban runoff, point sources) of pollution for impaired waters. Data used in the use support assessments include biological data, chemical physical data, lakes assessment data, and monitoring data. Although there is a general procedure for analyzing the data and determining a waterbodys use support rating, each stream segment 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 this use-support assessment was to gain an overall picture of the water quality, how well these waters support the uses for which they were classified, and the relative contribution made by different categories of pollution within the basin. In order to comply with guidance received from EPA to identify likely sources of pollution for all impaired stream mileage, DWQ used the data mentioned above.

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 to not manipulate the data to support policy decisions beyond the accuracy of these data. For example, according to this report, nonpoint source pollution is the greatest source of water quality degradation. However, this does not mean that there should be no point source control measures. All categories of point and nonpoint source pollution have the potential to cause significant water quality degradation if proper controls and practices are not utilized.

The threat to water quality from all types of activities heightens the need for point and nonpoint source pollution control. It is important to consider any source (or potential source) of pollution in developing appropriate management and control strategies. The potential for further problems remains high as long as the activity in question continues carelessly. Because of this potential, neglecting one pollution source in an overall control strategy can mask the benefits achieved from controlling all other sources.

4.4.3 Assessment Methodology - Freshwater Bodies

Many types of information were 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 (from the above list) is recorded. In determining the use support rating for a stream segment, corresponding ratings are assigned to data values where this is appropriate. The following data and the corresponding use support ratings are used in the process: (note: The general methodology for using this data and translating the values to use support ratings corresponds closely to the 305(b) guidelines with some minor modifications.)

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 (EPT S) and a biotic Index Value. The bioclassifications are translated to use support ratings as follows:

Bioclassification	Rating
Excellent	Supporting
Good	Supporting
Good-Fair	Support Threatened
Fair	Partially Supporting
Poor	Not Supporting

Chemical/Physical Data

Chemical/physical water quality data is collected through the Ambient Monitoring System as discussed in section 4.2.7. This data is downloaded from STORET 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
Criteria exceeded < 10%	Fully Supporting
Criteria exceeded 11-25%	Partially Supporting
Criteria exceeded >25%	Not Supporting

Sources and Cause Data

In addition to the above data, existing information was entered for potential sources of pollution (point and nonpoint). 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 have failed its whole effluent toxicity test may be rated ST (unless water quality data indicated otherwise), and have that facility listed as a Point Source potential source of impairment.

Daily Monitoring Reports

Streams which received a discharge from a facility significantly out of compliance with permit limits may be rated ST (unless water quality data indicated otherwise), and have that facility listed as a Point Source potential source of impairment.

Nonpoint Source Data

Information related to nonpoint source pollution (i.e., agricultural, urban and construction) was obtained from monitoring staff, other agencies (federal, state and local), land-use reviews, and workshops held at the beginning of each basin cycle.

Problem Parameters

Causes of use support impairment such as sedimentation and low dissolved oxygen (problem parameters), were also identified for specific stream segments. For ambient water quality stations, those parameters which exceeded the water quality standard > 10% of the time for the review period were listed as a problem parameter. For segments without ambient stations, information from reports, other agencies, and monitoring staff were used if it was available.

Monitored vs. Evaluated

Assessments were made on either monitored (M) or evaluated (E) basis depending on the level of information that was used. A monitored basis represents monitored data which are less than five years old. An evaluated basis refers to monitored data older than five years, and/or the use of best professional judgment.

4.4.4 Assigning Use Support Ratings

At the beginning of each assessment, all data is reviewed by subbasin with the monitoring staff. This data is adjusted where necessary based on best professional judgment. Discrepancies between data sources are resolved during this phase of the process. For example, a stream may be sampled for both benthos and fish community structure, and the bioclassification may differ from the NCIBI (i.e. the bioclassification may be S while the NCIBI may be PS). To resolve this, the final rating may defer to one of the samples (resulting in S or PS), or, it may be a compromise between both of the samples (resulting in ST).

After reviewing the existing data, 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:

Fish Consumption Advisories
Benthic Bioclassification / Fish Community Structure
Chemical/Physical Data
Monitored 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 were assessed. Streams that were direct or indirect tributaries to streams rated S or ST received the same rating (with an evaluated basis) if they had no known significant impacts. This was based on a review of the watershed characteristics and discharge information. Streams that were direct or indirect tributaries to streams rated PS or NS were assigned a Not Evaluated (NE) rating.

4.5 USE SUPPORT RATINGS FOR THE WATAUGA RIVER BASIN

Of the 283 miles of freshwater streams and rivers in the Watauga basin, use support ratings were determined for almost 100% or 281.6 miles with the following breakdown:

Fully Supporting: 95%
Support-Threatened: 5%
Partially Supporting 0%
Not Supporting: 0%
Not Evaluated: 0%

The majority of the streams have good to excellent bioclassifications and very few standards were violated at the ambient stations. Although water quality is high in this basin, nonpoint source effects such as increased sedimentation, were evident at many of the sampling sites. Table 4.16 provides use support ratings and background information on streams and stream segments that were monitored. This includes bioclassification and collection date for macroinvertebrate samples, ambient monitoring station information, problem parameters such as sediment, potential sources of pollution (point or nonpoint), and the overall use support rating. Table 4.17 and Figure 4.11 show use support determinations for the basin.

Table 4.16 Use Support Ratings for Monitored Streams in the Watauga River Basin - 1990 to 1994.

Use Support Status For Freshwater Streams (Miles) (1990-1994)						
Subbasin	S	ST	PS	NS	NE	Total Miles
04-02-01	268.3	13.3	0	0	1.3	282.9
Percentage	95	5	0	0	0	

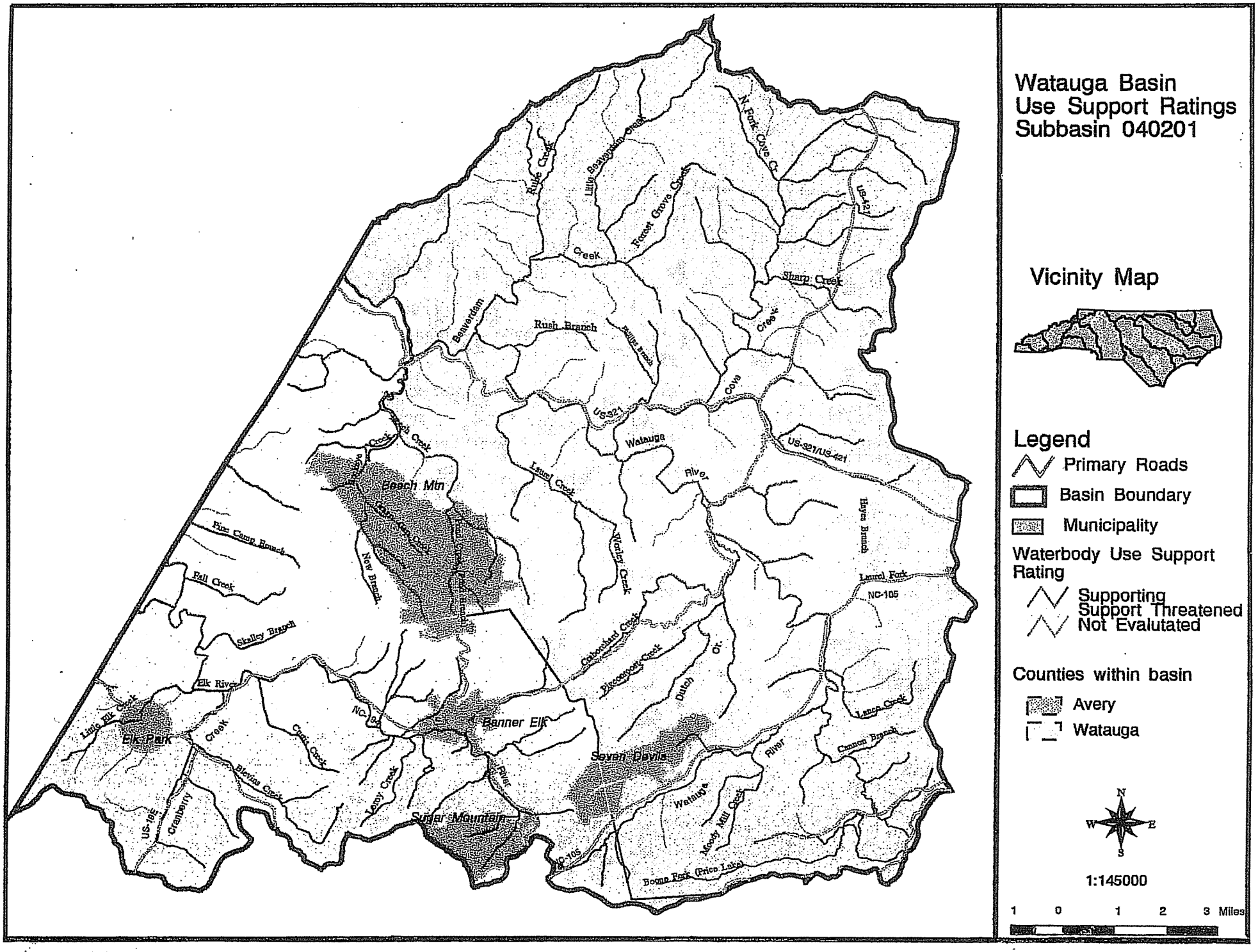


Figure 4.11 Use Support Map for the Watauga River Basin

Table 4.17 Use Support Determinations for the Watauga River Basin

Station Number	Station Location	Classification	Index Number	Miles	Chemical Rating 90-94	<----Biological Rating----> 1990	1991	1992	1993	1994	Fish Comm.	Problem Parameters	OVERALL RATING Use Support	Major Source
Subbasin 40201														
	Watauga R at SR-1594, Watauga Co.	B Tr HQW	8-(1)b	2.3		Excellent						Sed	S	NP
	Watauga R at SR-1580, Watauga Co.	B Tr HQW	8-(1)c	2.2						Excellent		Sed	S	NP,P
03478821	Watauga River near Shulls Mill, NC Hwy. 105, Watauga	B Tr HQW	8-(1)d	3.9	S	Excellent				Excellent			S	NP
0347882199	Watauga River at NC 194, amb at SR 1114, Watauga	B Tr HQW	8-(1)e	3.8	S	Excellent							S	NP
03479000	Watauga River at SR 1121 near Sugar Grove, Watauga	B Tr HQW	8-(1)f	4.3	S	Excellent				Good			S	NP
	Valley Creek at NC 105, Watauga	C Tr	8-4	1.8		Good-Fair							ST	NP
	Spice Bottom Creek, Watauga	C Tr	8-5-1	1.9		Good							S	NP
	Boone Fork at SR 1561, off SR1558 be lake & SR 1558, Watauga	C Tr ORW	8-7	8.7		Excellent				Excellent			S	NP
	Lance Creek above & in golf course, Watauga	C Tr	8-8-(2)	2.5		Excellent/Good							S	NP
	Laurel Fork, SR 1111, Watauga	C Tr	8-10	5.0		Good				Good-Fair		Sed	ST	NP,P
	Watauga R. SR 1200, nr Peoria, Watauga	B Tr HQW	8-(16)	6.9						Excellent			S	NP
	Beaverdam Cr, SR 1201, Watauga	C Tr	8-19	6.0						Good		Sed	S	NP,P
	Beech Cr, ab Pond Cr, SR 1126, NC 321, Watauga	C Tr	8-20	7.7						Excellent			S	NP
	Elk R off Nc 184 be SR 1337, Avery	C	8-22-(1)	2.4						Good		Sed	S	NP
	Elk R SR 1326 below Banner Elk, Avery	C Tr	8-22-(3)	4.2						Good		Sed	S	NP
	Elk R SR 1305 nr Horseshoe Bend, Avery	B Tr	8-22-(14.5)	8.2						Excellent		Sed	S	NP

REFERENCES - CHAPTER 4

Bonner, W.R. 1983. Survey and Classification of the State-Managed Trout Streams, Districts 7 and 8. North Carolina Wildlife Resources Commission, Division of Inland Fisheries.

Menhinick, E. F. 1991. The Freshwater Fishes of North Carolina. North Carolina Wildlife Resources Commission. Raleigh, NC. 227 p.

NCAC. 1993. Classifications and Water Quality Standards Assigned to the Waters of the Little Tennessee River Basin and Savannah River Drainage Area. Division of Environmental Management, North Carolina Department of Environment, Health, and Natural Resources. Raleigh, NC.

NCDEHNR. January 1995. Standard Operating Procedures Biological Monitoring. Environmental Sciences Branch, Ecosystems Analysis Unit, Biological Assessment Group. North Carolina Department of Environment, Health and Natural Resources. Raleigh, NC.

North Carolina Division of Environmental Management. 1996. Basinwide Assessment Report Document for the Watauga River basin (Draft). Water Quality Section, Environmental Sciences Branch, Raleigh, NC.

Penrose, David and S.M. Call. 1995. Volunteer monitoring of benthic macroinvertebrates: regulatory biologists' perspectives. J.N. Am. Benthol. Soc, 14(1):203-209.

Rohde, F. C., Arndt, R. G., Lindquist, D. G., and J. F. Parnell. 1994. Freshwater Fishes of the Carolinas, Virginia, Maryland, and Delaware. The University of North Carolina Press. Chapel Hill, NC. 222p.

Tennessee Valley Authority. 1994. Holston Watershed 1994 Stream Assessment.

CHAPTER 5

EXISTING WATER QUALITY PROGRAMS AND PROGRAM INITIATIVES IN THE BASIN

5.1 INTRODUCTION

This chapter summarizes the point and nonpoint source control programs available for addressing water quality problems in the Watauga River Basin and a number of important initiatives being implemented by federal, state, local and private interests. **Section 5.2** summarizes the state and federal legislative authorities developed to protect water quality. **Section 5.3** presents the water quality standards and classifications program. **Sections 5.4 and 5.5**, respectively, present existing point and nonpoint source pollution control programs. A more complete description of these programs can be found in Appendix VI. Application of these programs to specific water quality problems and water bodies is presented in Chapter 6. **Section 5.6** presents water quality program initiatives that have been implemented within the basin. **Section 5.7** discusses integration of point and nonpoint source control management strategies and introduces the concept of *total maximum daily loads* (TMDLs).

5.2 STATE AND FEDERAL LEGISLATIVE AUTHORITIES FOR NORTH CAROLINA'S WATER QUALITY PROGRAM

Authorities for some of the programs and responsibilities carried out by the Water Quality Section are derived from a number of federal and state legislative mandates outlined below. The major federal authorities (Section 5.2.1) for the state's water quality program are found in sections of the Clean Water Act (CWA). State authorities listed in Section 5.2.2 are from state statutes.

5.2.1 Federal Authorities for NC's Water Quality Program

- **Section 301** - Prohibits the discharge of pollutants into surface waters unless permitted by EPA.
- **Section 303(c)** - States are responsible for reviewing, establishing and revising water quality standards for all surface waters.
- **Section 303(d)** - Each state shall identify those waters within its boundaries for which the effluent limits required by section 301(b)(1) A and B are not stringent enough to protect any water quality standards applicable to such waters.
- **Section 305(b)** - Each state is required to submit a biennial report to the EPA describing the status of surface waters in that state.
- **Section 319** - Each state is required to develop and implement a nonpoint source pollution management program.
- **Section 402** - Establishes the National Pollutant Discharge Elimination System (NPDES) permitting program. Allows for delegation of permitting authority to qualifying states (includes North Carolina).
- **Section 404/401** - Section 404 regulates the discharge of fill materials into navigable waters and adjoining wetlands unless permitted by the US Army Corps of Engineers. Section 401 requires the Corps to receive a state Water Quality Certification prior to issuance of a 404 permit.

5.2.2 State Authorities for NC's Water Quality Program

- **G.S. 143-214.1** - Directs and empowers the NC Environmental Management Commission (EMC) to develop a water quality standards and classifications program.
  G.S. 143-214.2 - Prohibits the discharge of wastes to surface waters of the state without a permit.
- **G.S. 143-214.5** - Provides for establishment of the state Water Supply Watershed Protection Program.
- **G.S. 143-214.7** - Directs the EMC to establish a Stormwater Runoff Program.
- **G.S. 143-215** - Authorizes and directs the EMC to establish effluent standards and limitations.
- **G.S. 143-215.1** - Outlines methods for control of sources of water pollution (NPDES and nondischarge permits, statutory notice requirements, public hearing requirements, appeals, etc.).
- **G.S. 143-215.1** - Empowers the EMC to issue *special orders* to any person whom it finds responsible for causing or contributing to any pollution of the waters of the state within the area for which standards have been established.
- **G.S. 143-215.3(a)** - Outlines additional powers of the EMC including provisions for adopting rules, charging permit fees, delegating authority, investigating fish kills and investigating violations of rules, standards or limitations adopted by the EMC.
- **G.S. 143-215.6A, 143-215.6B and 143-215.6C** - Includes enforcement provisions for violations of various rules, classifications, standards, limitations, provisions or management practices established pursuant to G.S. 143-214.1, 143-214.2, 143-214.5, 143-215, 143-215.1, 143-215.2. 6A describes enforcement procedures for civil penalties. 6B outlines enforcement procedures for criminal penalties. 6C outlines provisions for injunctive relief.
- **G.S. 143-215.75** - Outlines the state's Oil Pollution and Hazardous Substances Control Program.

5.3 Surface Water Classifications and Standards

North Carolina has established a water quality classification and standards program pursuant to G.S. 143-214.1. Classifications and standards are developed pursuant to 15A NCAC 2B .0100 - Procedures for Assignment of Water Quality Standards. Waters were classified for their "best usage" in North Carolina beginning in the early 1950's, with classification and water quality standards for all the state's river basins adopted by 1963. The effort to accomplish this included identification of water bodies (which included all named water bodies on USGS 7.5 minute topographic maps), studies of river basins to document sources of pollution and appropriate best uses, and formal adoption of standards/classifications following public hearings.

The Water Quality Standards program in North Carolina has evolved over time and has been modified to be 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. Classifications and standards have been broadly interpreted to provide protection of uses from both point and nonpoint source pollution.

Some of the classifications, particularly for HQW, ORW and WS waters, outline protective management strategies aimed at controlling point and nonpoint source pollution. Special HQW protection management strategies are presented in 15A NCAC 2B .0224(d), which is included in its entirety in Appendix II. These measures are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater facilities and for existing facilities which expand beyond their currently permitted

loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances. For oxygen-consuming wastes, for example, effluent limitations for new or expanding facilities are as follows: BOD_5 = 5 mg/l; NH_3-N = 2 mg/l; DO = 6 mg/l (except for those expanding discharges which expand with no increase in permitted pollutant loading).

For nonpoint source pollution, development activities which require an Erosion and Sedimentation Control Plan in accordance with rules established by the NC Sedimentation Control Commission or local erosion and sedimentation control program approved in accordance with 15A NCAC 4B .0218, and which drain to and are within one mile of High Quality Waters will be required to control runoff from the one-inch design storm using either a low density or high density option described in the rules.

The requirements for ORW waters are more stringent than those for HQWs. Special protection measures that apply to North Carolina ORWs are set forth in 15A NCAC 2B .0225 (most of which is included in Appendix II). At a minimum, no new discharges or expansions of existing discharges are permitted, and stormwater controls for most development needing an Erosion and Sedimentation Control Plan are required.

The requirements for WS waters vary significantly from WS-I to WS-V. The WS-I classification carries the most stringent requirements for dischargers and surrounding land use activities while WS-V carries the least.

5.4 NORTH CAROLINA'S POINT SOURCE CONTROL PROGRAM

Point source discharges, which are also described in Chapter 3, are not allowed in North Carolina without a permit from the state. Discharge permits are issued under the authority of North Carolina General Statute (NCGS) 143.215.1 and the National Pollutant Discharge Elimination System (NPDES) program which was delegated to North Carolina from the US Environmental Protection Agency (EPA). These permits serve as both state and federal permits. NPDES permits contain effluent limitations which establish the maximum level of various wastes, or pollutants, that may be discharged into surface waters. North Carolina has a very comprehensive NPDES program which includes the following major components. Refer to Appendix VII for a full program description and Appendix I for the Organizational Duties Flow Chart for the DWQ Water Quality Section.

NPDES Permit Review and Processing

Under the basinwide approach, all discharge permits within a given basin are set to be renewed at about the same time at five year intervals. New discharge permits issued during an interim period will be given a shorter cycle in order to coincide with the next basin permitting schedule.

All applications must include a summary of waste treatment and disposal options that were considered, and why the proposed system and point of discharge were selected. The summary should have sufficient detail to assure that the most environmentally sound alternative was selected from the reasonably cost effective options. An assessment report describing the impact on waters in the area must be submitted for all applications of new discharges in excess of 500,000 gallons per day or 10 million gallons per day of cooling water or any other proposed discharge of 1 million gallons per day or more.

DWQ reviews all applications and a wasteload allocation is performed in order to establish waste limits.

Wasteload Allocation Modeling

Waste limits under the NPDES process are used to establish the amount of wastes that are allowed to be discharged into surface waters. The evaluation is conducted to determine the impact of a discharge on the receiving waters. The method is usually based on computer modeling which considers many factors including streamflow, stream gradient and decay rates. Modeling can be used to determine the fate and transport of pollutants, reduction goals for point and nonpoint sources of contaminants, and to derive effluent limits for NPDES permits.

Compliance Monitoring and Enforcement

Most dischargers are required to periodically sample treated effluent from their discharge. Larger and more complex dischargers are required to sample both upstream and downstream of the discharge point. This process is called self-monitoring. Sampling results are submitted to DWQ each month for compliance evaluations. If limits are not being met, various legal actions can be taken against the discharger to ensure future compliance.

Aquatic Toxicity Testing

Whole effluent toxicity (WET) limitations were established in 1987 as a means of establishing limits to allow protection against predicted impacts of toxicants through measurement of those impacts in the laboratory. These limitations are developed to protect aquatic life from the discharge of toxic substances in toxic amounts.

Pretreatment

The pretreatment program is aimed at protecting municipal wastewater treatment plants and the environment from the adverse impacts that may occur when hazardous or toxic wastes are discharged into a public system. The program requires that businesses and other entities that use or produce toxic wastes pretreat their wastes prior to discharging to a public system.

Operator Certification and Training

Wastewater treatment, collection and non-discharge systems must be operated by a certified operator. Training and certification of operators is conducted by DWQ. It is the goal of the program to provide competent and conscientious professionals that will protect both the environment and public health.

Nondischarge and Regional Wastewater Treatment Alternatives

There are many types of nondischarge wastewater treatment systems. These systems include spray irrigation, rapid infiltration, land application of sludge, and trickling and underground injection systems. These nondischarge systems require permits for operation.

Regional wastewater treatment alternatives, or regionalization, is the process of connecting to an existing wastewater treatment system. Where possible, DWQ is encouraging smaller dischargers to connect to municipal systems. Regionalization has the following advantages:

1) Since municipal facilities are manned most of the time (unlike smaller package plants), the potential for plant malfunctions is greatly reduced. Where malfunctions do occur, they can be caught and remedied more quickly.
2) Larger facilities can provide a higher level of treatment more economically and more consistently than smaller plants.
3) Larger plants are monitored daily.

4) Centralizing discharges reduces the number of streams receiving effluent. In evaluating future permit expansion requests by regional facilities, DWQ will take into consideration the amount of flow received by the streams from the smaller dischargers.

5.5 NONPOINT SOURCE CONTROL PROGRAMS

Nonpoint source pollution occurs when rainfall or snowmelt runs off the ground or impervious surfaces like buildings and roads and drains into waterways. Some of the most common nonpoint source pollutants and their causes can be found in Table 5.1.

Table 5.1 Causes and Sources of Nonpoint Source Pollution

Cause of Pollution	Source of Pollution
Sediment	Construction sites, disturbed areas, streambank erosion and alterations, cultivated farmland
Nutrients	Fertilizer on agricultural, residential, commercial and recreational grassed areas, animal wastes, leaky sewers and septic tanks, atmospheric deposition
Bacteria	Failing septic tanks, animal waste, urban runoff, wildlife
Oxygen Demanding Substances	Animal wastes, leaking sewers and septic tanks, gas stations
Oil and Grease	Leaky automobiles, industrial areas, illegal dumping
Trace Metals	Automobile wear and tear, exhaust, industrial areas
Road Salt	Applications to snow and ice
Toxic and Synthetic Chemicals	Pesticide applications, automobile fluids, accidental spills, illegal dumping
Thermal Impacts	Heated landscape/impervious areas, tree removal, shallow ponds

The two approaches that are used to address nonpoint source pollution are prevention and engineered controls. Some of the methods of pollution prevention include optimum site planning, use of natural drainage systems rather than curb and gutter, nutrient management plans, public/farmer education, storm drain stenciling, and hazardous waste collection sites. It is generally more cost-effective to prevent and minimize pollution than to build engineered controls. For example, developers who are subject to stormwater requirements often choose to build low density developments rather than bearing the expense of building engineered BMPs. Engineered BMPs also have on-going expenses associated with long-term operation and maintenance.

Engineered BMPs generally work by capturing, retaining, and treating runoff before it leaves an area. Some commonly used BMPs include stormwater wetlands, wet detention ponds, water control structures, bioretention areas, and infiltration basins. Often higher levels of pollutant removal can be achieved by using a combination of different control systems. The main advantage of engineered controls is that they can treat runoff from high density developments.

The current trend is toward a more comprehensive "systems approach" to managing nonpoint source pollution. This involves using an integrated system of preventive and control practices to accomplish nonpoint pollution reduction goals. This approach emphasizes site planning, protecting important natural areas such as wetlands, and finding the most cost-effective engineered controls for high density areas. Programs which are currently using the systems approach include the animal waste regulations and the regulations for coastal stormwater management and water

supply watersheds. In general, the goals of the nonpoint source management program include the following:

- Continue to build and improve existing programs,
- Develop new programs to control nonpoint pollution sources that are not addressed by existing programs,
- Continue to target geographic areas and waterbodies for protection,
- Integrate the NPS Program with other state programs and management studies (e.g., Albemarle-Pamlico Estuarine Study), and
- Monitor the effectiveness of BMPs and management strategies, both for surface and groundwater quality.

Table 5.2 lists a number of federal and state programs that address nonpoint source pollution. These programs are listed by category based on the type of activity. A complete program description can be found in Appendix VII for nonpoint source control programs. Refer to Table 5.3 for a brief description of each program and the contact persons within the basin for each program. Refer to Section 5.7 for sources of funding for controlling nonpoint sources of pollution.

Clean Water Act Section 319 (h)

Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies in the state that deal with NPS problems submit proposals to DWQ each year for use of these funds in various projects. Projects that have been funded in the past include BMP demonstrations, watershed water quality improvement projects, data management, educational activities, modeling, stream restoration efforts, riparian buffer establishment, and others. Refer to Section 5.7 for a complete program description.

5.6 PROGRAM INITIATIVES IN THE WATAUGA RIVER BASIN

5.6.1 Federal Initiatives

The Southern Appalachian Assessment

The Southern Appalachian Assessment (SAA) is a cooperative effort among many federal and state agencies and was conducted through the coordination of the Southern Appalachian Man and Biosphere program. The SAA began in the summer of 1994 and was completed in May 1996. Public meetings were conducted in the SAA study area (Figure 5.1) to get input from the public on specific issues. Several teams of professionals were formed to gather and interpret information about terrestrial and aquatic ecosystems, and social/cultural/economic status, and atmospheric conditions for the SAA area. Full reports have been published on each of these categories (SAMAB 1996). The Watauga River basin is included in the SAA area.

The findings of the SAA are based on information to be used on a larger scale than a single river basin, however, some of the key findings of the SAA pertaining to water quality are notable here. Streams within the SAA area show a sensitivity to acid deposition, especially at high elevations with aged forests (SAMAB1996). Stream of the Watauga River basin are not as vulnerable to acid deposition as other river basins in western North Carolina, however there appears to be some reason for concern due to the continued input of sulfates and nitrogen and the diminished ability of the streams to buffer these acidic inputs.

Table 5.2 List of Nonpoint Source Programs

PROGRAM	LOCAL	STATE	FEDERAL
AGRICULTURE:			
Agriculture Cost Share Program	SWCD	SWCC, DSWC	
N.C. Pesticide Law of 1971		NCDA	
Pesticide Disposal Program		NCDA	
Animal Waste Management	SWCD	DWQ,DSWC, CES	NRCS
Laboratory Testing Services		NCDA	
Watershed Protection (PL-566)			NRCS
1985 ,1990 and 1995 Farm Bills			USDA
- Conservation Reserve Program			
- Conservation Compliance			
- Sodbuster			
- Swampbuster			
- Conservation Easement			
- Wetland Reserve			
- Water Quality Incentive Program			
URBAN			
Coastal Stormwater Program		DWQ	
ORW, HQW, NSW Management Strategies		DWQ	
Water Supply Watershed Protection Program	city, county	DWQ	
Stormwater Control Program	city, county	DWQ	EPA
CONSTRUCTION			
Sedimentation and Erosion Control	ordinance	DLR, DOT	
Coastal Area Management Act	ordinance	DCM	
Coastal Stormwater Program		DWQ	
ON-SITE WASTEWATER DISPOSAL			
Sanitary Sewage Systems Program	county	DEH	
SOLID WASTE DISPOSAL			
Resource Conservation and Recovery Act			EPA
Solid Waste Management Act of 1989	city, county	DSWM	
FORESTRY			
Forest Practice Guidelines		DFR	
National Forest Management Act			NFS
Forest Stewardship Program		DFR	
MINING			
Mining Act of 1971			DLR
HYDROLOGIC MODIFICATION			
Clean Water Act (Section 404)		DCM, DWQ	COE
Rivers and Harbors Act of 1899			COE
Dam Safety Permit		DLR	
WETLANDS:			
Clean Water Act (Sections 401 and 404)		DWQ	COE
Wetland Reserve Program			USDA

COE: US Army Corps of Engineers
DCM: Division of Coastal Management
NCDA: NC Department of Agriculture
DWQ: Division of Water Quality
DLR: Division of Land Resources
NRCS: Natural Resources Conservation Service
DFR: Division of Forest Resource
DOT: Department of Transportation
SWCC: Soil and Water Cons. Commission
DSW: Division of Soil and Water
DSWM: Division of Solid Waste Mgt.
SWCD: Soil and Water Conservation District
USDA: US Department of Agriculture

The Southern Appalachian Assessment Area

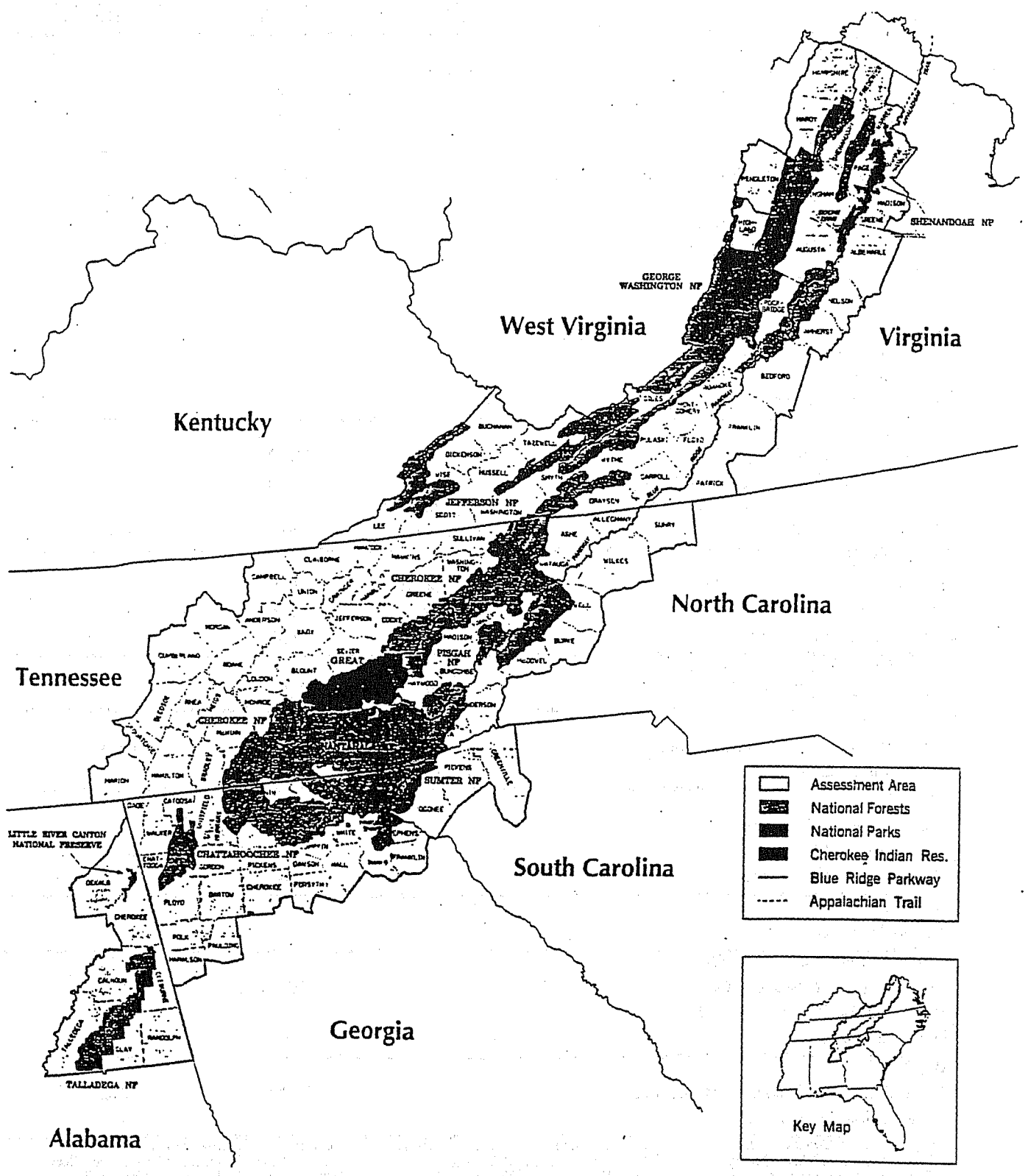


Figure 5.1 Southern Appalachian Assessment Study Area (Source: SAMAB 1996)

U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS)

Since February 1995, NRCS has been continuously working on flood damage in the Watauga Basin (the working budget is approximately $200,000). Currently, 98 sites have been addressed, including debris removal, channel restoration, stream bank stabilization, and planting.

Other NRCS activities in the basin include assisting farmers in obtaining Agriculture Cost Share funds for installing BMPs to exclude cattle from streams and for grass-based rotation on tobacco farms. The NRCS also operates three facilities for handling horse manure.

5.6.2 State Agency Initiatives

Cooperative Extension Service

The Cooperative Extension Service provides the following on-going services within the Watauga River basin:

- Provides pesticide education to certify and recertify farmers and commercial applicators on the safe and proper use of pesticides. There are approximately 300 farmers participating in these education efforts.
- Conducts an on-going Integrated Pest Management Program on Fraser fir trees. This program has reduced the total amount of pesticides applied to Fraser firs by 25%. The IPM Programs emphasize establishing a ground cover in order to significantly reduce the off-site movement of soil and agricultural chemicals.
- Provides technical and educational assistance to water treatment operators. There are approximately 20 water treatment plants in the Watauga River basin.
- Works in cooperation with the Natural Resource Conservation Service in providing information to tobacco and livestock producers regarding proper erosion control practices. The Cooperative Extension Service has also implemented several on-farm demonstrations on no-till tobacco and five best management practices for beef cattle management.
- Has purchased dragline mats in 1992 for loggers to use in crossing streams. A set of three is located in Lenoir District and available to loggers in the Watauga basin.

NC Division of Forest Resources

The NC Division of Forest Resources plays an active role with privately held forest lands in the Watauga River basin. The following is a sampling of some of the programs of the Division.

- Teach Forestry Practices Guidelines/BMP Workshops: one in October 1992 in Wilkes County and one in August 1994 in Ashe County. Although these workshops were not held in the basin, several foresters from the Watauga basin attended them.
- Teach Pro-Logger Course at Wilkes Community College.
- Track compliance with the Forest Practices Guidelines. For Watauga County, the compliance rate has been 68% with no referrals to enforcement agencies. For Avery County, the compliance rate has been 98% with no referrals to enforcement agencies.

Table 5.3 Watauga River Basin Nonpoint Source Program Description and Contacts

Agriculture

USDA Natural Resources Conservation Service:

Formerly the Soil Conservation Service; provides technical specialist for certifying waste management plans; certified trainers for swine applicators training sessions works with landowners on private lands to conserve natural resources helping farmers and ranchers develop conservation systems uniquely suited to their land and individual ways of doing business; provides assistance to rural and urban communities to reduce erosion, conserve and protect water, and solve other resource problems; conducts site evaluations and soil surveys; administers the Wetlands Reserve Program; offers planning assistance for local landowners for installing best management practices; offers technical assistance for the determination of wetlands on agricultural lands.

Watauga and Avery Counties	Allen Childers	704-264-3943	971 W. King St. Boone, NC 28607

Soil & Water Conservation Districts:

The local Soil and Water Conservation District Boards function under the administration of the North Carolina Soil and Water Conservation Commission (SWCC). The districts are responsible for administer the Agricultural Cost Share Program, identifying treatment areas, allocating resources, signing contractual agreements with landowners, providing technical assistance for the planning and implementation of BMPs and generally encouraging the use of appropriate BMPs to protect water quality

Watauga County	Carol Turner	704-264-0842	971 W. King St. Boone, NC 28607
Avery County	Eddie Storey	704-246-5461	P.O. Box 88 Jefferson, NC 28640

NC Division of Soil and Water Conservation:

Provides administrative and technical assistance to the Soil & Water Conservation Districts in areas pertaining to soil science and engineering; distributes Wetlands Inventory maps for a small fee. Administers the Agriculture Cost Share Program (ACSP).

Central Office	Donna Moffitt (ACSP)	919-715-6108	512 N. Salisbury St. Raleigh NC 27626
Regions II and III	Jerry Dorsett	910-771-4600	585 Waughton St. Winston-S, NC 27107
Regions I and VIII	Ralston James	704-251-6208	59 Woodfin Pl. Asheville, NC 28801

NC Department of Agriculture Regional Agronomists:

Provides technical specialists for certifying waste management plans. Provides certified trainers for animal waste applicators training sessions. Tracks, monitors, and accounts for use of nutrients on agricultural lands. Identifies and evaluates the use of nutrient management plans.

Central Office	Tom Ellis	919-733-7125	Box 27647 Raleigh, NC 27611

Education

NC Cooperative Extension Service:

Provides practical, research-based information and programs to help individuals, families, farms, businesses and communities.

Watauga County	Mike Pittman	704-264-3061	971 W. King St. Boone, NC 28607
Avery County	Mike Pittman	704-733-8270	Box 280 Newland, NC 28657

Table 5.3 Watauga River Basin Nonpoint Source Program Description and Contacts (Cont'd)

Forestry			
NC 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.			
Central Office	Moreland Gueth	919-733-2162	P.O. Box 29581 Raleigh, NC 27626-0581
General Water Quality			
DWQ Water Quality Section: Control of water pollution from point sources such as municipal and industrial wastewater discharges, and from nonpoint sources that originate from agricultural drainage, urban runoff, land clearing, construction, mining, forestry, septic tanks and land application of waste; issues permits for both discharging and on-site wastewater treatment systems, conducts compliance inspections, operates an ambient water quality monitoring program, and performs a wide variety of special studies on activities affecting water quality; administers the 319 projects statewide.			
Central Office	Linda Hargrove (319 Projects)	919-733-5083	DWQ - Planning Branch, P.O. Box 29535 Raleigh NC 27626
Winston-Salem Region	Steve Mauney	910-771-4600	585 Waughton St. Winston-S, NC 27107
Asheville Region	Forrest Westall	704-251-6208	59 Woodfin Pl. Asheville, NC 28801
Wildlife Resources Commission: To manage, restore, develop, cultivate, conserve, protect, and regulate the wildlife resources of the State, and to administer the laws relating to game, game and freshwater fishes, and other wildlife resources enacted by the General Assembly to the end that there may be provided a sound, constructive, comprehensive, continuing, and economical game, game fish, and wildlife program.			
Central Office	Frank McBride	919-528-9886	P.O. Box 118 Northside, NC 27564
Local Office	Stephanie Goudreau	704-652-4257	320 S. Garden St. Marion, NC 28752
U.S. Army Corps of Engineers: Responsible for: investigating, developing and maintaining the nation's water and related environmental resources; constructing and operating projects for navigation, flood control, major drainage, shore and beach restoration and protection; hydropower development; water supply; water quality control, fish and wildlife conservation and enhancement, and outdoor recreation; responding to emergency relief activities directed by other federal agencies; and administering laws for the protection and preservation of navigable waters, emergency flood control and shore protection. Responsible for wetlands and 401 Water Quality certifications.			
Asheville Office	Steve Chapin	704-271-4854	151 Patton Ave., Rm. 141 Asheville, NC 28801-5006

Note: The DWQ Winston-Salem Regional Office serves Watauga County and the Asheville Regional Office serves Avery County.

Table 5.3 Watauga River Basin Nonpoint Source Program Description and Contacts (Cont'd)

Groundwater

NC 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	P.O. Box 29578 Raleigh, NC 27626-0578
Winston-Salem Region	Sherri Knight	910-771-4600	585 Waughton St. Winston-S, NC 27107
Asheville Region	Don Link	704-251-6208	59 Woodfin Pl. Asheville, NC 28801

Construction/Mining

DEHNR Division of Land Resources:

Conducts land surveys and studies, produces maps, and protects the state's land and mineral resources. Administers the NC Sedimentation and Erosion Control Program.

Central Office	Mel Nevills	919-733-4574	512 N. Salisbury St. Raleigh NC 27626
Town of Boone	John Vilas	704-262-4540	1510 Moreland Rock Boone, NC 28607
Watauga County	Joe Furman	704-265-8043	842 W. King St. #7 Boone, NC 28607
Winston-Salem Region	Sherri Moore	910-771-4600	585 Waughton St. Winston-S, NC 27107
Asheville Region	Dennis Owenby	704-251-6208	59 Woodfin Pl. Asheville, NC 28801

Solid Waste

NC DWQ Solid Waste Management:

Management of solid waste in a way that protects public health and the environment. The District includes three sections and one program -- Hazardous Waste, Solid Waste, Superfund, and the Resident Inspectors program.

Winston-Salem Region	Julian Foscoe	910-771-4600	585 Waughton St. Winston-S, NC 27107
Asheville Region	Jim Patterson	704-251-6208	59 Woodfin Pl. Asheville, NC 28801

On-Site Wastewater Treatment

Division of Environmental Health:

Safeguards life, promotes human health, and protects 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 - DEH	Steve Steinbeck	919-715-3273	2728 Capital Blvd. Raleigh, NC 27604
Watauga County	Env. Health Specialist	704-264-2995	141 Health Center Boone, NC 28607
Avery County	Sanitarian	704-733-6031	Box 325 Newland, NC 28657

Note: The DWQ Winston-Salem Regional Office serves Watauga County and the Asheville Regional Office serves Avery County.

NC Division of Land Resources

The NC Division of Land Resources (DLR) is responsible for administering the Sedimentation Pollution Control Act of 1973 (SPCA). Since the inception of the SPCA, the Sedimentation control Commission has funded extensive workshops and educational programs aimed at children throughout the state. During fiscal year 1996, the DLR conducted workshops and symposiums, funded research and intern programs, reprinted manuals and developed video modules and produced newsletters on a budget of over $270,000 for the entire state. The DLR has the following materials available.

- *Erosion and Sediment Control Field Manual*
- *Erosion and Sediment Control Practices: Video Modules*
- *Erosion and Sediment Control "Inspector's Guide"*
- *Erosion and Sediment Control Planning and Design Manual*
- *"Erosion Patrol" Package for Grade 3*

NC Division of Soil and Water Conservation

- The NC Division of Soil and Water Conservation administers the NC Agricultural Cost Share Program. This program provides incentives to farmers to install best management practices (BMPs) by offering to pay up to 75% of the average cost of approved BMPs. The NC Agricultural Cost Share Program funding totals for the Watauga River basin from 1985 through 1995 is $226,911. Farmers in the basin have spent up to $28,000 in matching funds for Cost Share money. The cost share figures include BMPs for sod-based rotation and livestock exclusion.

5.6.3 Local Government Initiatives

Watauga County

- Administers a local program under the Sedimentation Pollution Control Act, and as such enforces a local ordinance.
- Administers zoning ordinances in the Valle Crucis and Foscoe-Grandfather communities. Both ordinances contain stormwater control provisions.
- Implements a Water Supply Watershed Protection Program for Pond Creek (currently a WS-II). Pond Creek is being reviewed for reclassification pending request.

Town of Beech Mountain

- Implements a Water Supply Watershed Protection Program for Pond Creek and Buckeye Creek (both currently a WS-II). Pond Creek is being reviewed for reclassification pending request.

Town of Boone

The majority of the Town of Boone's jurisdiction drains into the South Fork of the New River. However, annexations into the Watauga Basin are likely in the not too distant future and such action will significantly increase the influence of the Town's policies on nonpoint loading to the Watauga River.

- The Town of Boone administers a local Erosion and Sedimentation Control Program. The Town ordinance requires that measures be implemented on all projects (regardless of size) and which have the potential to result in either off-site sedimentation or sedimentation of any waterbody.

- The Town's Floodplain Ordinance prohibits most types of development within the mapped floodway. This ordinance also requires setbacks along smaller unmapped streams; these setbacks are five times the width of the stream measured at the top of the bank.
- The Town has adopted an Alternative Transportation Plan which includes several miles of Greenway Trail. The Greenway Trails along streams help insure the permanence of certain riparian buffer zones and also stimulate awareness of the beneficial values of healthy aquatic systems.
- The Town has adopted specific Grading Regulations which are intended to insure that graded steep slopes do not develop significant erosion problems.

Town of Banner Elk

- Administers a Water Supply Watershed Program. The Town of Banner Elk has gone beyond state standards by requiring grading permits for land disturbances of one-half acre rather than one acre.
- Requires a 25-foot buffer between cleared land and streams (many of the streams in Banner Elk's jurisdiction are trout streams).
- The Town is fighting to retain the WS-II classification for the headwaters of Pond Creek in an area outside of its jurisdiction. Citizens have requested to change the classification to the less protective WS-III.
- The Town spent $10,000 in 1995 removing sediment from Lake Coffey.
- The Town uses sand and chad rather than salt on its roads in the winter.

Avery County

- Administers a local program under the Sedimentation Pollution Control Act, and as such enforces a local ordinance.
- Implements a Water Supply Watershed Protection Program for Pond Creek (currently a WS-II). Pond Creek is being reviewed for reclassification pending request.

Sugar Mountain

- Administers a local program under the Sedimentation Pollution Control Act, and as such enforces a local ordinance.

5.6.4 Corporate Initiatives

Tennessee Valley Authority Clean Water Initiative

The goal of the Tennessee Valley Authority (TVA) Clean Water Initiative is to develop a partnership approach to preventing and cleaning up pollution on the Tennessee River and its watershed. In North Carolina, the Watauga, French Broad, Little Tennessee and Hiwassee River basins make up portions of the Tennessee River basin watershed. TVA is working with other agencies to identify pollution problems and implement solutions. TVA is looking for answers to key questions such as: Is the water safe for swimming? Are the fish safe to eat? What is the health of the lake? Answers to these questions are provided to the public in the form of an annual report called, RiverPulse.

TVA has developed a very comprehensive monitoring program that combines the professional expertise of water resource specialists with local citizens, interest groups, business and industry, and other governmental agencies. This is the baseline for the concept of River Action Teams (RAT's). Water quality data collected from key locations on lakes and streams in the Tennessee River watershed is used to draw attention to pollution problems, set cleanup goals, and measure

the effectiveness of water quality improvements over time. Measurements on water quality are based on physical, chemical, and biological variables.

The strategy of the RAT is to build a coalition of information exchange with stakeholders in the watershed and seek their support in developing and implementing protection and mitigation plans. The emphasis of these plans is to provide long-term protection to the resource by balancing human use of the resource with ecological protection. Twelve teams are being formed for the Tennessee Valley under the Clean Water Initiative.

TVA's Holston RAT conducted a survey from 1993 - 1995 in streams throughout the 21 county area of the Holston River Watershed. The Watauga River basin is part of the Holston River watershed (Refer to Chapter 2 for further discussion and a map). The report, entitled Holston Watershed: Biological Condition of Streams, contains the results of 169 biological water quality surveys in the watershed. The results of the survey are used by the RAT to: decide where to focus efforts to enhance and protect water quality; document ecological recovery at sites where stream restoration management practices have been implemented; and to monitor overall trends in water quality throughout the watershed. Refer to Chapter 4 for discussion on survey results.

For more information on the Holston River Action Team contact: Dave Tomljanovich at (423) 632-1784 or Don Anderson at (423) 751-7329.

5.6.5 Regional Organizations and Commissions

Year of the Mountains Commission

The Year of the Mountains Commission was created and organized under an Executive Order in March 1995 by Governor James B. Hunt. The work plan of the Commission was fashioned after the work of the "Year of the Coast" Commission. The objective of the Commission were to: 1) Educate, promote and celebrate the distinctive natural and cultural heritage of the WNC communities and region; and 2) Develop and market public policy goals which can address the issues of quality growth and development, natural resource protection, and preservation of the cultural identity of the WNC mountain region. The recommendations of the Commission were presented to the Governor at the final conference of the Commission in June 1996. The Commission was dissolved as of June 30, 1996.

The following recommendations relating to natural resource protection and specifically to water quality issues were made by the Commission .

- The establishment and/or expansion of sound planning capabilities throughout the 29 counties involved in The Year of the Mountains. The State should provide direct financial assistance to the counties of Haywood, Jackson, Swain, and Macon to assist in planning and preparing for development pressures as direct or indirect consequences from gaming on the Cherokee Indian Reservation.
- The State should encourage local governments to implement capital improvement planning in WNC. Encourage a system of long-term capital improvements planning through project grants or loans to local governments, perhaps through a baseline capital improvements financing fund; encourage congressional delegates to reconfigure and increase federal payments to local governments that have a lot of public lands.
- Protect and Enhance Water Quality. Establish a state and regional partnership to aggressively pursue a program to eliminate "straight-piping"; increase funding to the N.C. Agricultural Cost Share Program; increase funding and personnel for inspections of mines, dams and development sites; increase funding to the Governor's Task Force on Forest Sustainability to ensure inspection and mitigation of any negative forest impacts on water quality.

- Improve the air quality in WNC to reduce adverse effects on human health and the environment. Encourage support of SAMI and SAMAB initiatives; seek and support federal and state regulations to limit air pollutants and to monitor the effects of air pollutants on ecosystems.
- Improve integration of environmental education into school curricula. Increase appropriations to the N.C. Environmental Education Plan and establish an Environmental Education Trust Fund for education grants to schools and communities.

5.7 Integrating Point And Nonpoint Source Pollution Control Strategies

Integrating point and nonpoint source pollution controls and determining the amount and location of the remaining assimilative capacity in a basin are key long-term objectives of basinwide management. The information is used for a number of purposes including: determining if and where new or expanded municipal or industrial wastewater treatment facilities can be allowed, setting the recommended treatment level at these facilities and identifying where point and nonpoint source pollution controls must be implemented to restore capacity and maintain water quality standards.

Total Maximum Daily Loads

The U.S. Environmental Protection Agency (USEPA) has developed the means to help accomplish these objectives. The approach, called *total maximum daily loads (TMDL)*, uses the concept of determining the total waste (pollutant) loading from point and nonpoint sources that a waterbody (such as a stream, lake or estuary) can assimilate while still maintaining its designated uses. USEPA requires the TMDL approach pursuant to Section 303(d) of the Clean Water Act.

Under the TMDL approach, waterbodies that do not meet water quality standards are identified. States establish priorities for action, and then determine reductions in pollutant loads or other actions needed to meet water quality goals. The approach is flexible and promotes a watershed approach driven by local needs and States' priorities. The overall goal in establishing the TMDL is to establish the management actions on point and nonpoint sources of pollution necessary for a waterbody to meet water quality standards. Since there are no waterbodies that do not meet water quality standards within the basin, the TMDL approach is not being used at this time.

5.8 POTENTIAL SOURCES OF FUNDING FOR WATER QUALITY PROJECTS

Section 319(h) Grants:

Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies in the state that deal with NPS problems submit proposals to DWQ each year for use of these funds in various projects. Projects that have been funded in the past include BMP demonstrations, watershed water quality improvement projects, data management, educational activities, modeling, stream restoration efforts, riparian buffer establishment, and others. DWQ established a Workgroup process in 1995 for prioritizing and selecting projects from the pool of cost-share proposals and includes this list in its annual application to EPA. The Workgroup consists of representatives from the state and federal agencies that deal with NPS issues, including agricultural, silvicultural, on-site wastewater, mining, solid waste and resource protection.

DWQ staff first reviews proposals for minimum 319 eligibility criteria such as:

- Does it support the state NPS Management Program milestones?
- Does the project address targeted, high priority watersheds?
- Is there sufficient nonfederal cost-share match available (40% of project costs)?
- Is the project period adequate?
- Are measurable outputs identified?
- Is monitoring required? Is there a QA/QC plan for monitoring?
- If GIS is used, is it compatible with those of the state?
- Is there a commitment for educational activities and a final report?

Workgroup members separately review and rank each proposal which meets the minimum 319 eligibility criteria. In their review, members consider such factors as: technical soundness; likelihood of achieving water quality results; degree of balance lent to the statewide NPS Program in terms of project type; and competence/reliability of contracting agency. They then convene to discuss individual projects' merits, to pool all rankings and to arrive at final rankings for the projects. The Workgroup seeks a balance between geographic regions of the state and types of projects. All proposals that rank above the funding target are included in the annual grant application to EPA, with DWQ reserving the right to make final changes to the list. Actual funding depends on approval from EPA and yearly Congressional appropriations.

While it is preferable that 319(h) proposals address high or medium priority watersheds, it is not necessary.

All proposals that rank above the annual funding target are included in the grant application to EPA, with DWQ reserving the right to make final changes to the list. Obtaining the funding depends on approval from EPA and yearly Congressional appropriations. To obtain more information about applying for section 319(h) grants, contact:

Linda Hargrove, DWQ - Planning Branch
P.O. Box 29535, Raleigh, NC 27626-0535
(919) 733-5083 ext. 352

Other Sources of Funding:

Besides Section 319(h) funding, there are numerous sources of funding for all types of water quality projects. The sources of funding include federal and state agencies, nonprofits, and private funding. Funds may be loans, cost-shares, or grants.

If a local government, environmental group, university researcher, or other individual or agency wants to find funding to address a local water quality problem, it is well worth the time to prepare a thorough but concise proposal and submit it to applicable funding agencies. The list of goals for Section 319(h) proposals can be used as a guideline for other funding agencies. Even if a project is not funded, persistence may be beneficial when funding agencies observe several consecutive proposals from the same group.

Tables 5.4 and Appendix VII provide summaries of the agencies that are potential sources of funds for point sources of pollution. Table 5.5 and Appendix VIII provide summaries of the agencies that are potential funding sources for nonpoint sources of pollution.

Table 5.4 Funding Agencies for Assistance With Point Sources

Source	Agency and Name of Funding Source
Federal	U.S. Rural Utilities Service: Water and Wastewater Loan and Grant Program Rural Business and Cooperative Service: Rural Business Enterprise Grants Appalachian Regional Commission: Supplements to Other Federal Grants in Aid U.S. Economic Development Administration: Public Works and Development Facilities Grant Program
State	NC Division of Water Quality: Construction Grants and Loans Program NC Division of Community Assistance: Small Cities Community Development Block Grant NC Commerce Finance Center: Industrial Development Fund
Private	Rural Economic Development Center, Inc.: Supplemental and Capacity Grants Program

Table 5.5 Funding Agencies for Assistance with Nonpoint Sources

NPS Assistance Needed	Name of Funding Source
Agriculture	NC Agriculture Cost Share Program for NPS Pollution Control (NCACSP) Environmental Quality Incentives Program (EQIP) Conservation Reserve Program (CRP) Wetland Reserve Program (WRP) Small Watershed Program, PL-566 Conservation Easement Soil and Water Conservation Loan Program
Education	GTE Foundation Toyota TAPESTRY Grants National Environmental Education and Training Foundation (NEETF)
Water Quality Planning	Section 205(j) Water Quality Planning Grants
Stream Restoration	NC Division of Water Resources Stream Repair Funding
Forestry	Forestry Stewardship Incentive Program Forestry Incentives Program
Land Conservation	National Wetland Priority Conservation Plan NC Conservation Tax Credit Program Federal Wild and Scenic Rivers Program Emergency Wetlands Resources Act of 1986

REFERENCES - CHAPTER 5

Southern Appalachian Man and the Biosphere (SAMAB). 1996. The Southern Appalachian Assessment Report. Report 1 of 5. Atlanta: U.S. Department of Agriculture, Forest Service, Southern Region.

CHAPTER 6

MAJOR WATER QUALITY CONCERNS AND RECOMMENDED MANAGEMENT STRATEGIES FOR THE WATAUGA RIVER BASIN

6.1 MAJOR WATER QUALITY CONCERNS AND PRIORITY ISSUES

6.1.1 Overview

There are presently no waters with significant water quality impairment problems in the Watauga River basin based on monitoring data collected by DWQ biologists and as reported by regional office staff. Many of the waters within the basin are still of high quality. However, there are reasons to be concerned about the quality of specific waters in the basin. Sedimentation is the major water quality problem identified in the basin.

There have been significant growth trends in the Watauga River basin and it is expected for these trends to continue. As an example, land cover information provided by the USDA Natural Resources Conservation Service indicates the acreage of urban and built-up areas has increased by over 200% from 1982 to 1992. Growth and development within the basin tends to occur along streams and rivers where lands are less steep. Growth along waterways can have a significant negative impact on water quality if construction activities are not undertaken with proper care. These impacts include sedimentation and a variety of fertilizers, chemicals, and road salts from urban lands. Proactive planning efforts at the local level which consider water quality protection are needed to strike a balance between economic growth and natural resource management. Growth management requires planning for the needs of future population increases. These actions are critical to water quality management and the quality of life for the residents of the basin.

Other water quality concerns in the basin relate to the growing number of Christmas tree farms and the many small wastewater treatment package plants along NC 105. Christmas tree farms can impact water quality when land is cleared for production. The use and maintenance of best management practices on tree farms is essential to protecting waters from sedimentation. If the growth of wastewater treatment package plants continues, a regional approach to wastewater treatment should be explored to reduce the impact of these package plants on receiving waters.

The long range goal 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 Watauga River basin's surface waters. In striving towards this mission, DWQ's highest priority near-term goals are as follows:

- To identify and restore impaired waters in the basin. Section 6.2 discusses impaired waters (there are no impaired waters in the basin). Section 6.3 discusses threatened waters and recommended strategies for protecting these waters.
- To identify and protect high value resource waters and biological communities of special importance. Section 6.4 discusses management strategies for protecting the HQW/ORW's in the basin.
- To manage the causes and sources of pollution so as to ensure the protection of those waters currently supporting their uses while allowing for reasonable economic growth. Major water

quality issues addressed under this topic include sedimentation (Section 6.5), management of toxics (Section 6.6), management of oxygen-consuming wastes (Section 6.7), and management of urban stormwater runoff (Section 6.8).

6.1.2 Priority Issues and Recommended Actions Identified by Workshop Participants

A public workshop was conducted in the Watauga River basin in Boone, NC on April 8, 1996. Participants were asked to identify what they saw as the priority issues for the Watauga River basin (Table 6.1). After issues were identified, participants were asked to recommend management actions to address the priority issues (Table 6.2). Issues and actions were grouped into major categories by DWQ.

While each identified issue may not be directly responded to in the plan, an effort has been made to consider these issues within the framework of the basinwide approach. Where there has been some discussion about the category or specific comments within the plan, the table provides this reference.

Solutions to the identified priority issues were presented by workshop participants (Table 6.2). Some of these solutions have likewise been recommended within this plan (Refer to Chapter 6 and Table 6.1). Other recommendations by workshop participants will require further discussion with other agencies over the five year planning cycle of the Watauga River basin. These recommendations should also be considered by local governments where applicable.

6.1.3 Priority Issues and Recommended Actions Identified by the Nonpoint Source (NPS) Team Members

DWQ has begun setting up nonpoint source teams in each of the state's 17 major river basins. These teams will have representatives from agriculture, urban stormwater, construction, mining, on-site wastewater disposal, forestry, solid waste, wetlands, groundwater, the League of Municipalities and wildlife organizations. These teams will provide descriptions of NPS activities within a basin, conduct assessments of NPS controls in targeted watersheds, identify future monitoring sites, develop five-year action plans for NPS pollutants, and develop Section 319 project proposals for targeted watersheds.

At their first meeting in 1996, the Watauga River basin NPS team described their vision of priority issues and recommended actions for water quality problems in the basin. A summary of these issues and recommendations are presented in Table 6.3. Issues and recommendations presented by the NPS team members will be incorporated into the five-year action plan being developed by the team. DWQ will continue to work with the NPS teams to clarify the water quality issues of the Watauga River basin and formulate implementable strategies to deal with these issues.

Table 6.1 Priority Issues Identified by Workshop Participants and Reference Sections in Watauga River Basinwide Water Quality Management Plan

Category	Comments	Reference Section in Plan
Monitoring	Establish stream watch on entire stream lengths Monitor disturbed land sites Consider monitoring salamander populations as indicators of river health	Chapter 7, Section 7.2.3
Stormwater Management	Concerned with inputs of increased volume runoff on stream erosion and water quality	Chapter 6, Section 6.3.1 (Hayes Br.) & 6.8
Cost-Share and Technical Assistance	Support cost-share for farmers and technical assistance to put in BMPs Have State cost-share funds for streambanks	Chapter 5, Section 5.7; Chapter 6, Section 6.2.2
Buffers and Streambank Protection	Have wide streamside buffers; recommend implementation scheme Wetlands protection and restoration Plant willows, trees, along exposed streambanks	Chapter 6, Section 6.5
Planning	Encourage local planning and zoning efforts	Chapter 5, Section 5.6.3
Education	Developers, contractors and land owners should be aware of proper road building techniques Educate people about Allen Rd culvert and bridge Broad education programs implemented by local government and others are needed to inform citizens on causes and sources of pollution and ways to protect water quality Incentives for local govt. to increase enforcement Educational efforts targets: Developers, Contractors, Realtors, Local Government	Chapter 6, Section 6.5; Chapter 7, Section 7.2.4
Air Quality	What are impacts of air quality (atmospheric deposition) on water quality of streams and lakes?	The direct impacts of air quality on water quality in this basin have not been determined
Nonpoint Source Pollution	Consider modifying erosion control law for mountain region Identification of nonpoint sources Need better understanding of amount and impact of nutrient loading Provide data on water quality trends What bacteria limit is put on nonpoint discharge?	Chapter 5, Section 5.5, 5.7; Chapter 6, Section 6.2.2, 6.5, 6.8, 6.9
Other	Town of Beech Mountain wants to keep WS II Watershed Protection Classification Garbage disposal needs to be better addressed Foot traffic erosion Package wastewater treatment plants	Public hearings will be held in Sept., 1997. Not addressed in plan. Not addressed in plan. The effects of package treatment plants on water quality in the basin were considered during plan preparation.

Table 6.2 Recommended Solutions of Workshop Participants

Category	Comments
Planning	Improve flood control planning Establish stream water network on all streams Surface water control
Water Quality Related to Development	Reduce Septic Effluent Improve Development Techniques on construction sites to keep sedimentation out of streams
Streambank Erosion	Need to establish 40- 50' buffer undisturbed strips on stream banks Need wider stream buffers Reduce Loss of Wetlands Need Streambank Stabilization Need Construction Site Monitoring Erosion control regulations and enforcement needs to be stricter Need technical assistance and cost-share dollars to assist farmers with nonpoint source pollution control
Wastewater Discharge	Stop issuing NPDES permits What are the chances of stricter NPDES than other basins?

Table 6.3 Nonpoint Source Team Member Priority Issues and Recommended Actions

Category	Comments
Development	Increased development in the basin is leading to problems with sedimentation and wastewater treatment. Package plants are a particular problem in the north end of Avery County.
Flooding	Brushy Fork is very "flashy." Amory Drive has flooding problems. A lot of streambanks have erosion problems.
Road Construction	There should be more education about proper construction of access roads and driveways. Bulldozer operators may need training, economic incentives and/or regulatory measures to improve their practices. Private landowners need more information about sizing culverts and bridges.
Golf Courses	Fertilizer and pesticide use may be impacting water quality.
Land Use Planning	Currently, Foscoe and Valle Crucis have land use plans. Other municipalities in the Watauga River Basin may want to utilize land use planning.
Agriculture	We need to expand the use of BMPs. Agricultural ditches may be causing water quality problems. Some farm roads are not properly designed.

6.1.4 Priority Issues and Recommended Actions Identified by the Year of the Mountains Commission

The Year of the Mountains Commission was organized under an Executive Order of the Governor in 1995. The objectives of the Commission were to: 1) Educate, promote and celebrate the distinctive natural and cultural heritage of the WNC communities and region; and 2) Develop and market public policy goals which can address the issues of quality growth and development, natural resource protection, and preservation of the cultural identity of the WNC mountain region.

The following recommendations relating to natural resource protection and specifically to water quality issues were made by the Commission .

- The establishment and/or expansion of sound planning capabilities throughout the 29 counties involved in The Year of the Mountains. The State should provide direct financial assistance to the counties of Haywood, Jackson, Swain, and Macon to assist in planning and preparing for development pressures as direct or indirect consequences from gaming on the Cherokee Indian Reservation.
- The State should encourage local governments to implement capital improvement planning in WNC. Encourage a system of long-term capital improvements planning through project grants or loans to local governments, perhaps through a baseline capital improvements financing fund; encourage congressional delegates to reconfigure and increase federal payments to local governments that have a lot of public lands.
- Protect and Enhance Water Quality. Establish a state and regional partnership to aggressively pursue a program to eliminate "straight-piping"; increase funding to the N.C. Agricultural Cost Share Program; increase funding and personnel for inspections of mines, dams and development sites; increase funding to the Governor's Task Force on Forest Sustainability to ensure inspection and mitigation of any negative forest impacts on water quality.
- Improve the air quality in WNC to reduce adverse effects on human health and the environment. Encourage support of SAMI and SAMAB initiatives; seek and support federal and state regulations to limit air pollutants and to monitor the effects of air pollutants on ecosystems.
- Improve integration of environmental education into school curricula. Increase appropriations to the N.C. Environmental Education Plan and establish an Environmental Education Trust Fund for education grants to schools and communities.

6.2 IDENTIFICATION AND RESTORATION OF IMPAIRED WATERS

6.2.1 What Are the Impaired Waters?

Impaired waters are those waters identified in Chapter 4 as partially supporting or not supporting their designated uses. There are no waterbodies in the basin identified as impaired based upon biological or chemical monitoring data collected between 1990 and 1994. Some impaired waterbodies may not have been identified by DWQ due to the unavailability of chemical or biological monitoring data for those areas, so it cannot be assumed that there are no impaired waters in the Watauga River basin. See Chapter 4 for explanation of use support ratings.

6.2.2 What are the Support-Threatened Waters?

The following waters have notable water quality problems (Table 6.4) but the impact of the problem is not severe enough to cause the stream to be considered impaired under the state use support designation described in Chapter 4. These waters are rated support-threatened. These support-threatened waters may require additional monitoring to follow any changes in water quality over time. The identification of support-threatened waters can be useful to determine the sources

and causes of degradation and determine if management strategies can be used to reduce or eliminate the causes of pollution.

Table 6.4 Threatened Waterbodies in the Watauga River Basin

Stream Name	Support Status	Number of Miles
Laurel Fork	Support-Threatened	5.0
Valley Creek	Support-Threatened	1.8

6.2.3 How are Waters Prioritized for Restoration or Protection?

Priority Ratings for Nonpoint Source Control Federal Grant Spending

NPS (319) Priority ratings for nonpoint source controls are recommended by DWQ for waters that are impaired by nonpoint source pollution. Pursuant to Section 319, federal funding is made available to the state for both restoring waters impaired by nonpoint source pollution and for protecting high value resource waters from nonpoint source degradation. Grants are awarded on a competitive basis across the state. The ratings will be used to establish a priority rating system for awarding Section 319 funds. The ratings may also be useful to other federal, state and local agencies involved in addressing nonpoint source pollution problems in their efforts to target their resources and activities. The NPS Team for the Little Tennessee River basin will evaluate these lists for further prioritization.

The priority ratings are defined in Table 6.5 as follows (surface water classifications referred to below are discussed in Chapter 2). A list of waters in the Watauga River basin that have high and medium Section 319 priority ratings can be found in Table 6.6.

Table 6.5 Nonpoint Source (NPS) 319 Priority Ratings for Non-Coastal Waters

High priority waters:

- monitored waters that have an overall use support rating of non-supporting,
- monitored waters that have a use support rating of partially supporting but have a high predicted loading for one or more pollutants,
- highly valued resource waters as documented by special studies
  - High Quality Waters
  - Outstanding Resource Waters
  - Water Supply I, Water Supply II, Critical areas of WS-II, WS-III or WS-IV

Medium priority waters:

- monitored waters that have an overall use support rating of partially supporting,

Low priority waters:

- All other waters not considered high or medium priority

Table 6.6 Waters in the Watauga River Basin with Section 319(h) Priority

Section 319(h) Priority	Criteria	Waters in the Basin Meeting the Criteria
High	Monitored waters that have an overall use support rating of non-supporting. Monitored waters that have a use support rating of partially supporting but have a high predicted loading for one or more pollutants. Highly valued resource waters as documented by special studies, including HQW and Water Supplies I-IV.	• Boone Fork (Price Lake) • Cold Prong • Laurel Creek • Sims Creek • Hoot Camp Branch • Cannon Branch • Bee Tree Creek • Watauga River (Source to TN Line) • Pond Creek • Buckeye Creek • Lake Coffey • New Branch
Medium	Monitored waters that have an overall use support rating of partially supporting.	none

Section 303(d) of the Clean Water Act (CWA)

States are required to develop a list of waters not meeting water quality standards or which have impaired uses (Partially Supporting or Not Supporting) under Section 303(d) of the Clean Water Act. Waters may be excluded form the list if existing control strategies are expected to achieve the standards or uses. control strategies may be both point or nonpoint programs. Waterbodies which are listed must be prioritized and a management strategy or Total Maximum Daily Load (TMDL) must be developed.

Use support ratings for the 303(d) list are based on monitoring data collected in the last five years. Further information on the 303(d) program can be found in Appendix IX. Since there are no impaired waters in the Watauga River basin, there are no waters from this basin on the 303(d) list

6.3 RECOMMENDED MANAGEMENT STRATEGIES FOR ADDRESSING THREATENED WATERS IN THE WATAUGA RIVER BASIN

6.3.1 Management Strategies for Support Threatened Waters

Laurel Fork

Laurel Fork is listed as support threatened due to nonpoint and point source impact. Laurel Fork is a tributary to the Watauga River with two existing permitted domestic dischargers; Four Seasons Apartments (0.0145 MGD) and Discovery Vacations Club (0.030 MGD). The Four Seasons Apartments are located approximately one mile upstream of Discovery Vacations Club.

In 1989, a management strategy was implemented for Discovery Vacations Club (then known as Willow Creek Communities) and the lower segment of Laurel Fork. The management strategy was developed because the facility had not been built and because of its proximity to the B Tr HQW waters of the Watauga. With the proposed discharge point located 0.9 miles from the mouth of Laurel Fork, Discovery Vacations Club was considered a new discharger and the following management practice was implemented in December 1989.

1) Water quality based limits for Discovery Vacations Club would be applied per 15A NCAC 2B .0203 "... such that the water quality standards and best usage of the receiving waters and all downstream waters will not be impaired."

2) Per the Antidegradation Policy 15 NCAC 2B.0201(c)(1), the applicant will document an effort to consider non-discharge alternatives pursuant to 15A NCAC 2H .0105 (c)(2).

3) If it is determined that non-discharge is not feasible, then the allocation for Discovery Vacations Club will be recommended corresponding to the standards for new discharges to HQW waters:

- BOD5 = 5 mg/l, NH3 = 2 mg/l, DO = 6 mg/l, TSS = 10 mg/l for trout waters.
- Alternative methods to chlorination shall be required for discharges to trout streams.
- Emergency requirements: Fail-safe treatment designs shall be employed, including stand-by power capability for entire treatment, dual train design for all treatment components, or equivalent fail-safe treatment designs.
- Volume: The total volume of treated wastewater for all discharges combined shall not exceed 50% of the total instream flow under 7Q10 conditions.

4) The dischargers must file an erosion control plan for control of nonpoint source runoff per 15A NCAC 2B.0224 (2). (Note: This regulation was 2B.0201(d)(2) in 1989.)

5) An engineering report must be completed before an authorization to construct is issued by DWQ.

Discovery Vacations Club complied with the above regulations given its permit status in 1989. Once constructed, the facility was required to meet NPDES permit effluent limits of BOD5 = 5 mg/l, NH3N = 2 mg/l, DO = 6 mg/l, TSS = 10 mg/l. The facility is currently in compliance with these limits.

Hayes Branch and other tributaries to Laurel Fork in the Boone Area

Hayes Branch and other tributaries to the Laurel Fork are rated Support-Threatened. Development in this area has caused streamflows to dramatically increase in speed and magnitude during storm events. There is a need for an urban water study to identify problem streams and stabilize them before problems occur. Presently, problems with stream erosion are handled in a piecemeal and reactionary manner.

Many new construction activities have been concentrated in the Boone area, including restaurants, chain stores, and university buildings. This makes the need for an urban water study and plan more pressing. The urban plan should include a provision for the establishment and/or preservation of buffers.

These streams should also be studied using David Rosgen's methods to determine the seriousness of their present condition as well as specifications for restoring them in the future. Rosgen has developed a stream classification system and stream assessment technique based on natural channel stability principles and successfully applied them to the restoration and design of stream channels throughout the United States.

Stream restoration efforts based on principles of natural stream stability are especially pertinent in improving outdated engineering practices which may de-emphasize natural stream geometry,

sediment conveyance, and energy relations and overemphasize floodwater conveyance and shoreline stabilization with "hard" structures which are not ecologically sound nor cost-effective.

Valley Creek

Valley Creek has two existing dischargers - Valley Creek WWTP (0.010 MGD) and Country House Village WWTP (0.005 MGD). A third discharger is proposed - Hawksnest Sport (0.030 MGD). Both existing facilities have regularly met the limits of their NPDES permit. Valley Creek WWTP treats the domestic sewage from the Hawksnest Golf course. Valley Creek WWTP has plans to expand the treatment plant in the future, which may provide an opportunity for regionalization of other treatment plants.

The Support-Threatened use-support status of Valley Creek is probably due to nonpoint sources of pollution. The Hawksnest Golf Course is located at the headwaters of this creek. Impacts may be due to the use of fertilizers and chemicals on the greenways. It may be possible for the golf course to begin implementing best management practices to protect Valley Creek from further degradation.

6.3.2 General Management Strategies For Protecting Water Quality in the Basin

Improved Enforcement

Since nonpoint sources are the major contribution to degradation of waters in the basin, changes to, or better enforcement of, present stormwater and sedimentation/erosion control regulations may be necessary to ensure that waters are adequately protected from runoff from developed areas.

Changes in regulations which may be worth investigating include:

- modification of the size or nature of vegetative buffers for low density development;
- lowering the allowable built upon area for low density development draining to HQW and ORW waters;
- requiring vegetative buffers for high density development; and
- increasing the size of vegetative filters for outflows from stormwater management devices.

Enforcement activities should be reexamined to ensure that efforts are being made to bring about compliance with all existing animal waste, sedimentation/erosion, and stormwater regulations.

Improved Information

At this time, adequate information is not available to determine which specific changes to the stormwater and sedimentation/erosion control regulations, if any, may be appropriate. In order to provide this information, DWQ will investigate the feasibility of conducting a study of how current stormwater and sedimentation/erosion control programs are implemented. It is hoped this study could include the DWQ stormwater program and the sedimentation and erosion control program administered by the DLR.

Investigation of On-Site Wastewater Systems

While DWQ has no direct responsibility for the regulation of on-site wastewater systems, the Water Quality Section could initiate a collaborative effort with other agencies to assure that these systems do not contribute to further contamination. Several approaches are possible, which could include:

- discussions with DEH and local governments about the need to assure compliance with construction and siting standards,

- work with the Groundwater Section of DWQ to evaluate the extent of contamination from systems which have been installed and maintained as designed and discuss with DEH the need to revise siting regulations,
- review of NC regulations which require property owners to inspect and maintain septic systems, but provide no mechanism to ensure that this occurs for conventional single family systems (Center for Watershed Protection, 1995),
- discuss with DEH the need for a more formal inspection and maintenance program. Currently there are no minimum inspection or maintenance requirements for these systems

Assistance to Local Governments

Over the past several years DWQ has been involved in a number of projects to encourage and assist local governments in carrying out wastewater planning and growth management activities. DWQ will continue to work with local governments to encourage them to take steps to manage the effects of growth.

6.4 IDENTIFICATION AND PROTECTION OF HIGH RESOURCE VALUES OR BIOLOGICALLY SENSITIVE WATERS

Waters considered to be biologically sensitive or of high resource value may be given protection through reclassification to HQW (high quality waters), ORW (outstanding resource waters), Tr (trout) or WS (water supply), or they may be protected through more stringent NPDES permit conditions. Waters eligible for reclassification to HQW or ORW may include native trout waters, designated critical habitat for threatened or endangered species (as designated by the NC Wildlife Resources Commission), waters having Excellent water quality or those classified for domestic water supply purposes (WS I and II). The HQW, ORW and WS classifications generally require more stringent point and nonpoint source pollution controls than do basic water quality classifications such as C or SC (see Appendix II for comparisons).

The Watauga River basin contains a large number of streams that have either ORW or HQW classifications, as well as trout (Tr) status. Data from a DWQ special study in 1990 found the Watauga River and Boone Fork both qualify for HQW designation. At present, there are no new HQW or ORW classifications pending and no HQW waters in the basin have been recommended for reclassification to ORW status. There is a request pending analysis and/or review for the Beech Mountain water supply at East Fork Pond Creek. The request is from the public to change the water supply classification from Class WS-II Tr to Class WS-V Tr. Public hearings are expected to take place on this reclassification in the fall of 1997.

There are three species listed by the NC Natural Heritage Program as Special Concern, Significantly Rare, or Endangered in the Watauga River basin. These species are given special protection status by the North Carolina State Endangered Species Act (G.S. 113-331 to 113-337). The species and the status of each can be found in Section 2.5.

Where waters are known to support state or federally listed endangered or threatened species or species of concern, consideration will be given during the NPDES permitting process to minimize impacts to habitat areas consistent with the requirements of the federal Endangered Species Act and North Carolina's endangered species statutes. Possible protection measures may include but are not limited to dechlorination or alternative disinfection, tertiary or advanced tertiary treatment, outfall relocation, and backup power provisions to minimize accidental plant spills. The need for special provisions will be determined on a case - by - case basis during review of individual permit applications and take into account the degree of impact and the costs of protection.

6.5 MANAGEMENT STRATEGIES FOR CONTROLLING SEDIMENTATION

6.5.1 Strategies being implemented in the Watauga River Basin

Sedimentation has been identified as a source of water quality degradation in the Watauga River basin, resulting in the classification rating of Support-Threatened of some waters. The activities most likely to contribute excess nonpoint source pollution loads to the waters of the Watauga River basin are residential and commercial developments.

Since the mountain counties are increasingly popular areas for home and golf course construction, more land area will contribute sediment loads during land clearing and construction activities. After construction is complete, poorly designed roads, trails, and driveways may continue to erode into water bodies. In addition, large, intensively managed land areas, such as golf courses, may contribute significant nonpoint source nutrient loads in the form of chemical fertilizer applications. As more land is converted to impervious area (as housing development), stormwater control will be increasingly important. Agricultural sediment pollution is not a major concern in the basin due to the lack of significant crop acres.

Sedimentation is a widespread nonpoint source-related water quality problem that results from land-disturbing activities. The most significant of these activities include agriculture and land development (e.g., highways, shopping centers, and residential subdivisions). For each of these major types of land-disturbing activities, there are programs being implemented by various government agencies at the state, federal and/or local level to minimize soil loss and protect water quality.

Some control measures, principally for construction or land development activities of 1 acre or more, are required by law under the state's Sedimentation and Erosion Control Act administered by the NC Division of Land Resources. In the Watauga River basin, development pressure is likely to increase. In order to match the pace of land disturbing activity, more staff hours will be needed within the Division of Land Resources in order to effectively administer and fully enforce the provisions of the Sedimentation and Erosion Control Act. At present, planning and inspection staff are stretched thinly across large geographic areas and a wide variety of projects. Careful planning prior to construction, perhaps the most important part of erosion control, may often be neglected due to lack of available staff time. The Watauga and Elk Rivers and their tributaries may continue to incur sediment impairment if the Sedimentation and Erosion Control Act is not effectively applied to future developments.

No sediment control measures are 100% effective so some level of sedimentation will occur with land-disturbing activities. Education and promotion of stewardship are keys to reducing sedimentation, along with judicious strengthening of regulations and enforcement.

For activities not subject to the act, such as agriculture, erosion and sediment controls are carried out on a voluntary basis through programs administered by several different agencies. Some of these agencies are:

NC Division of Soil and Water
The NC Agricultural Cost Share Program is administered by the NC Division of Soil and Water Conservation. This program provides incentives to farmers to install best management practices (BMPs) by offering to pay up to 75% of the average cost of approved BMPs.

USDA Natural Resource Conservation Service
At the Federal level, the Natural Resource Conservation Service administers agricultural management programs, such as voluntary cost sharing under section 319 of the Clean Water Act.

A federal Farm Bill program administered by the Natural Resource Conservation Service provides an incentive not to farm on highly erodible land (HEL) by taking away federal subsidies to a farmer that fails to comply with the provision.

NC Division of Land Resources
Construction or development activities that affect land areas of 1 acre or larger must meet the requirements of the state Sedimentation and Erosion Control Act. Generally, a land owner must install acceptable Best Management Practices (BMPs) when the land is disturbed by construction or development activities. Management practices may include barriers, filters, or sediment traps to reduce the amount of sediment that leaves a site.

The Division of Land Resources administers the erosion control program, and has the primary responsibility for inspection and enforcement of Best Management Practices.

NC Division of Water Quality
The Division of Water Quality works cooperatively with the state and Federal Agencies that administer sediment control programs and can give assistance by identifying waters that are impaired by sediments.

6.5.2 Recommendations for Improving Sediment Control

- Continue to promote effective implementation and maintenance of erosion and sediment control measures by contractors, developers, farmers, foresters, Christmas tree growers and other land owners. Even the best-designed plans will fail if maintenance responsibilities are not carried out.
- Although sedimentation and erosion control has improved during the past 20 years, there is still a need to research new and improved technologies for controlling sedimentation on construction sites.
- Evaluate the effectiveness of current sediment control enforcement.
- Develop joint program with the Division of Land Resources, Division of Forest Resources and the Natural Resource Conservation Service to distribute erosion control requirements and guidelines to all new land owners, developers, and construction contractors.
- Develop a training and certification program for construction contractors that teaches effective sediment control practices.
- Identify staff and resource needs within the Division of Land Resources and Division of Forest Resources.
- Evaluate and strengthen existing sedimentation and erosion controls. Two possible examples are:
    1. Limit the allowable disturbed area on a construction site
    2. Reduce the time period for reestablishing vegetation on denuded areas
- Evaluate weaknesses in interagency efforts to enforce sediment control measures.
- Promote public education at the state and local level on the impacts of sedimentation and the need for improved sediment control. The cumulative effects of a number of small projects can significantly degrade water quality and habitat downstream.
- Train equipment operators in proper hydraulic design and construction of access roads as part of the building inspection process. Access road construction creates water quality problems because poorly constructed roads are subject to flooding, thus causing sedimentation problems. Often, the decision about how an access road is constructed is left to equipment operators who are not trained in hydraulic design. Forest Practice Guidelines as developed by the Division of Forest Resources should be implemented and maintained.
- Establish, protect, and maintain vegetated streamside buffers. These buffers provide a filter for sediment and other nonpoint source pollution. Buffers also stabilize the streambank against erosion problems.

- Complete urban water plans for the most developed areas of the basin. These plans can identify potential flooding and erosion problems and optimal areas for potential new developments, and the control measures that will be necessary to accommodate new developments. Thus, potential problems can be identified and addressed before they occur. Presently, problems with stream erosion are handled in a piecemeal and reactionary manner after development has already taken place.

Appendix VII provides a list of agencies and corresponding contacts that can be used to obtain technical assistance to implement the above recommendations.

6.6 MANAGEMENT STRATEGIES FOR CONTROLLING TOXIC SUBSTANCES

6.6.1 Assimilative Capacity

Toxic substances, or toxicants, routinely regulated by DWQ include metals, organics, chlorine, and ammonia, as described in Chapter 3.

The waters of the Watauga River basin need to be protected from immediate acute effects and the residual chronic effects of toxic substances. Toxic limitations for point source discharges are based on the volume of the effluent released and the 7Q10 flow condition of the receiving stream. Toxics from nonpoint sources of pollution typically enter stream only when storm events wash surfaces such as roads, parking lots, or golf courses. In the Watauga River Basin, there are two municipalities that have quarterly chronic toxicity test requirements: Sugar Mountain Utilities and Beech Mountain's Pond Creek and Grassy Gap Creek WWTPs. None of these plants discharge to streams with HQW or ORW classifications. All three plants have consistently passed the toxicity tests with no failures since January 1993.

6.6.2 Strategies for Controlling Discharges of Toxic Substances to High Quality Waters (HQWs)

Management strategies adopted by DWQ to limit the discharge of toxic wastes into HQW streams are presented below. The toxic control strategies, adopted in accordance with 15A NCAC 2B .0224 (1)(b)(vii), will apply to all new facilities and expanding facilities with increased loads.

In cases where complex wastes (those containing or potentially containing toxicants) may be present in a discharge, a safety factor will be applied to any chemical or whole effluent toxicity allocation. The limit for a specific chemical constituent will be allocated at one half of the normal standard at design conditions. Whole effluent toxicity will be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90 percent. Ammonia toxicity shall be evaluated according to DWQ's agreement with EPA. This agreement is based on EPA guidelines promulgated in "Ambient Water Quality Criteria for Ammonia - 1984"; EPA document number 440/5-85-001; NTIS number PB85-227114; July 29, 1985 (50 FR 30784).

HQW streams to which these strategies apply are presented in Chapter 2.

6.6.3 Strategies for Controlling Discharges of Toxic Substances to Outstanding Resource Waters (ORWs) or Waters that Drain into ORWs

No new discharges or expansions of existing discharges directly to waters classified as ORW are permitted in accordance with 15 NCAC 2B .0225 (c)(1).

ORW streams to which these strategies apply are presented in Chapter 2.

6.7 MANAGEMENT STRATEGIES FOR OXYGEN CONSUMING WASTES

There are more than thirty point source discharges in the Watauga River Basin that require the management of oxygen consuming wastes. A proliferation of point source discharges exists in the headwaters and upper area of the Watauga River. Eleven discharges are located within four miles of each other and there are no foreseeable plans for the construction of a regional facility that these facilities could connect to. Fortunately, modeling results predict that no instream violations of the dissolved oxygen standard are caused by the dischargers.

The existence of the HQW and ORW classification on some streams in the basin will protect those receiving waters because new discharges and facilities that choose to expand will have to treat to tertiary levels.

6.7.1 Strategies for Controlling Oxygen Consuming Wastes from Direct Discharges to High Quality Waters (HQW)

In the Watauga River Basin, Boone Fork and its tributaries and the Watauga River are classified as high quality waters. For HQWs, a distinct set of management strategies applies to any oxygen consuming wastes discharged from a facility. New discharges and expanding discharges that have an increase in pollutant load to HQW streams are subject to the following management strategies adopted by DWQ pursuant to 15A NCAC 2B .0224 (1):

- Discharges from new single family residences will be prohibited. Those that must discharge must install a septic tank, dual or recirculating sand filters, disinfection and step aeration. (15A NCAC 2B.0224 (1)(a)).

- All new or expanded wastewater discharges (except single family residences) will be required to meet effluent limitations for oxygen consuming wastes as follows: BOD5 = 5 mg/l, NH3-N = 2 mg/l, and DO = 6 mg/l. More stringent limitations will be set, if necessary, to ensure that the cumulative pollutant discharge of oxygen consuming wastes will not cause the DO of the receiving water to drop more that 0.5 mg/l below background levels, and in no case below the standard. Where background information is not readily available, evaluations will assume a percent saturation determined by staff to be generally applicable to that hydroenvironment. (15A NCAC 2B rules .0224 (1)(b)(i)).

- Emergency Requirements: Fail-safe treatment designs will be employed (except single family residences), including stand-by power capability for entire treatment works, dual train design for all treatment components, or equivalent fail-safe treatment designs. (15A NCAC 2B.0224 (1)(b)(iv).
- Volume: The total volume of treated wastewater for all discharges combined will not exceed 50 percent of the total instream flow under 7Q10 conditions. (15A NCAC 2B 0.224 (1)(b)(v)).

- All expanded NPDES wastewater discharges in HQW waters shall be required to provide the treatment described above, except for those existing discharges which expand with no increase in permitted pollutant loading.

6.7.2 Strategies for Controlling Oxygen Consuming Wastes from Direct Discharges to Outstanding Resource Waters (ORW) and from Discharges to Waters Upstream and Draining to ORW Waters (except HQWs)

No new discharges or expansions of existing discharges directly to waters classified as ORW are permitted in accordance with 15 NCAC 2B .0225 (c)(1) (See Appendix II).

6.8 MANAGEMENT STRATEGIES FOR URBAN AND INDUSTRIAL STORMWATER CONTROL

6.8.1 Recommendations for Controlling Industrial Stormwater

Throughout the Watauga River Basin, various types of industrial activities with point source discharges of stormwater are required to be permitted under the NPDES stormwater program. These include activities related to manufacturing, processing, materials storage areas and construction activities with greater than five acres of disturbance. These dischargers must develop Stormwater Pollution Prevention Plans (SWPPP) to minimize and control pollutants discharged from their stormwater systems. These SWPPPs are subject to review and modification by the permitted facilities and DWQ to assure that management measures are appropriate.

6.8.2 Recommendations for Controlling Urban Stormwater

Although urban development is relatively limited at present, urban stormwater runoff appears to be a significant contributor to water quality problems as evidenced by degradation seen in Laurel Fork and its tributaries. As more housing developments are constructed and more land is converted to impervious surfaces, careful attention to stormwater control will be important. Stormwater problems are likely to be centered around the Towns of Beech Mountain, Banner Elk, Seven Devils, Elk Park, Sugar Mountain, Boone, and any high density developments that may arise. There are no municipalities in the Watauga River Basin required to obtain permits to manage stormwater runoff within their jurisdiction.

For local governments that are not required to develop stormwater programs but where urban stormwater impacts have been identified and/or where urban water quality is of concern to local citizens, there are several basic steps, listed below, that could be undertaken at relatively low cost to help control urban stormwater pollution. In practice, stormwater management programs represent an area where local governments can develop their own ideas and activities for controlling sources of pollution.

- Mapping of municipal storm sewer systems and outfall points, and developing procedures to update this information.
- Evaluating existing land uses in the local government's jurisdictional area to determine where sources of stormwater pollution may exist. In addition, local government activities and programs could be evaluated to determine where existing activities address stormwater management in some way, or could be modified to do so.
- Developing educational programs to inform citizens of activities that may contribute pollutants to stormwater runoff (dumping oil, paint or chemicals down storm drains) and offering ways of carrying out such activities in an environmentally sound manner. Storm drain stenciling is a good example of a low cost educational tool.
- Developing programs to locate and remove illicit connections (illegal discharge of non-stormwater materials) to the storm sewer system. These often occur in the form of floor drains and similar connections.
- Reviewing local ordinances pertaining to parking, curb and gutter and open space requirements. Many of these local ordinances could be modified to enhance water quality

protection from urban stormwater runoff impacts. Maintaining riparian buffer strips along streams is an example.

- Creating wetlands along streams in urbanized areas of the watershed to receive stormwater runoff can be an effective way to remove pollutants by burial, chemical breakdown, and/or assimilation into plant tissue. Careful design of these systems is needed in order to adequately handle the altered hydraulics of urban areas.

DWQ's urban stormwater staff have recently completed a series of stormwater workshops across the state for the benefit of local governments and others on addressing urban stormwater pollution. DWQ can provide additional information to interested local governments or references of other local governments in the state that are undertaking stormwater control programs.

Below is a list of literature prepared by the NC Cooperative Extension Service and the Land-of-Sky Regional Council under federal grants administered by DWQ. The last item is a document prepared by DWQ.

- *Stormwater Management Guidance Manual,* 1993, Cooperative Extension Service (NCSU)

- *Stormwater Management in North Carolina: A Guide for Local Officials*, 1994, Land-of-Sky Regional Council, Asheville, NC (Eaker, 1994)

- Stormwater Fact Sheets by Land-of-Sky Regional Council, 1994

    1) *Stormwater Problems and Impacts: Why all the Fuss?*
    2) *Stormwater Control Principles and Practices*
    3) *Stormwater Management Roles and Regulations*
    4) *Local Stormwater Program Elements and Funding Alternatives*
    5) *Municipal Pollution Prevention Planning*
    6) *Managing Stormwater in Small Communities: How to Get Started*
    7) *Maintaining Wet Detention Ponds*
    8) *Plan Early for Stormwater in Your New Development*
    9) *How Citizens can Help Control Stormwater Pollution*

- *Stormwater Best Management Practices*, 1995, NC Division of Environmental Management

CHAPTER 7

FUTURE INITIATIVES

7.1 OVERVIEW OF WATAUGA RIVER BASINWIDE GOALS AND OBJECTIVES

Near-term objectives, or those achievable at least in part during the next five years, include coordinating with various agencies to implement the strategies for control strategies outlined in Chapter 6 to reduce point and nonpoint source loadings of sedimentation, nutrients and other pollutants. These steps are necessary to progress towards restoring impaired and threatened waters, protecting high resource value and biologically sensitive waters and maintaining the quality of other waters currently supporting their uses.

The long-term goal of basinwide management is to protect the water quality standards and uses of the basin's surface waters 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 parts of all involved. However, with the needed support and cooperation, DWQ believes that these goals are attainable through the basinwide water quality management approach.

7.2 FUTURE ACTIVITIES IN THE WATAUGA RIVER BASIN

7.2.1 Nonpoint Source Control Strategies and Priorities/Nutrient Reduction Efforts

Improving our knowledge of and controlling nonpoint source pollution will be a high priority over the next five years. Nonpoint source pollution accounts for the threatened waters in the Watauga River Basin. The following initiatives (described in Section 7.2.2, 7.2.3 and 7.2.4) are underway to address the protection of surface waters from nonpoint sources of pollution.

7.2.2 The Watauga River Basin Nonpoint Source Team

In April 1996, DWQ contacted potential NPS Team Members in the Watauga Basin. NPS Team Members met to describe what is known about nonpoint sources in the basin and to obtain local input on issues and recommendations for addressing nonpoint source pollution. The responsibilities of the NPS Team members can be summarized as follows. A complete description of the NPS Team process can be found in Appendix VI.

- Describe existing programs for nonpoint source pollutant control.
- Assess whether existing BMPs in the Watauga Basin are successfully improving water quality.
- Identify where additional water quality monitoring sites may be needed.
- Develop five-year "Action Plans" for improving water quality in targeted watersheds.
- Estimate the costs and potential pollutant reductions resulting from implementing the Action Plans.
- Define each agency's responsibility for carrying out the Action Plans.
- Create a schedule for completion of the Action Plans.

- Develop project proposals for Section 319 and other funding sources for targeted watersheds to be coordinated with other members of the NPS Team.

The team has submitted a proposal for Section 319 funding for a streambank and riparian Best Management Practice Demonstration Project for their five-year Action Plan. The proposal consists of voluntary commitments made by the various agencies represented on the Team to address nonpoint source pollution in the Elk River and Shawneehaw watersheds. The project will include the use of bioengineering methods to repair eroding streambanks, livestock exclusion, urban control structures, wetland restoration, and various educational workshops, meetings, field days and newsletters. A list of agencies which comprise the NPS Team is presented in Table 7.1. The Action Plans will be evaluated and updated every five years as part of the basinwide planning process.

Table 7.1 Watauga NPS Team Members

Category	Agency/Group
Agriculture	USDA - Natural Resources Conservation Service NCSU - Cooperative Extension Service NC Division of Soil and Water Conservation Watauga and Avery County Soil and Water Conservation District NC Farm Bureau
Surface water	NC Wildlife Resources Commission NC Division of Water Quality Tennessee Valley Authority
Urban	NC Division of Water Quality NC Department of Transportation
Local Government	Town of Boone Town of Beech Mountain Town of Banner Elk Town of Sugar Mountain
Academic	Lee-McRae College

7.2.3 Improved Monitoring Coverage and Coordination with Other Agencies

Monitoring of the chemical and biological status of receiving waters will provide critical feedback on the success of the basin management strategy. As discussed in Chapter 4, monitoring data will be collected from (1) ambient water chemistry, (2) sediment chemistry, (3) biological communities, (4) contaminant concentrations in fish and other biota, (5) ambient toxicity, and (6) facility self-monitoring data. The specific parameters measured will relate directly to the long-term water quality goals and objectives defined within the basinwide management strategy. Biological indicators include species where pollution response is well understood. This includes aquatic insect larvae and some fish species. Other aquatic organisms, such as molluscs and salamanders, are less understood and are not used at this time.

DWQ and other environmental agencies have been discussing the potential for coordination of field resources. If individuals from another environmental agency are visiting certain waterbodies to investigate fish populations or wetland areas, they could also collect water quality data from these areas. The coordination of these activities should help to better blend the activities of the various agencies.

DWQ supports the concept of citizen monitoring programs and activities provided good quality control measures are used. The 1997 legislature contains a support bill that would fund a statewide citizen monitoring program.

7.2.4 Possible Future Initiatives for Federal, State and Local Agencies

Region D Council Of Governments (COG)

The Region D COG will become involved with future education efforts in the basin. Efforts will focus on educating the public and county and municipal officials about the sources, causes and impacts of nonpoint source pollution and how to prevent nonpoint pollution in the future.

NC Division of Forest Resources (DFR)

The DFR will conduct the following activities in the basin in the near future:

- Acquire a second set of three dragline mats for use in the Lenoir District using Section 319 Grant monies.
- Produce fact sheet/leaflet on advantages of properly using dragline mats for water quality protection using Section 319 Grant monies.
- Conduct a Logging Road Layout and Construction Workshop targeted to the mountain region One workshop will likely be held in or near the Watauga River Basin. (Extension Forest Resources will coordinate through Continuing Education.)
- Pro-Logger Courses will be taught as interest/need is expressed.

USDA: Natural Resources Conservation Service (NRCS)

The NRCS will create pilot projects for testing David Rosgen's Fluvial Geomorphology methods on sites at Valle Crucis school, Aldrige Road, Laurel Creek, and Calloway Bridge.

7.3 PROGRAMMATIC INITIATIVES

7.3.1 NPDES Program Initiatives

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

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

Longer-term objectives will include refining overall management strategies after obtaining feedback on current management efforts during the next round of water quality monitoring. Long-term point source control efforts will stress reduction of wastes entering wastewater treatment plants, seeking more efficient and creative ways of recycling byproducts of the treatment process (including nonpotable reuse of treated wastewater), and keeping abreast of and recommending the most advanced wastewater treatment technologies.

7.3.2 Use of Discharger Self-Monitoring Data

DWQ will continue to explore the possibilities of using discharger self-monitoring data to a greater degree to augment the data it collects through the programs described in Chapter 4. Quality

assurance, timing and consistency of data from plant to plant would have to be addressed. Also, a system would need to be developed to enter the data into a computerized database for later analysis. One method of data collection that is currently being explored includes developing a comprehensive list of monitoring sites for the basin that would be monitored by an Association of NPDES dischargers with data input to STORET. A basinwide sampling program has been established for dischargers in the Neuse River Basin and to date appears to be successful.

7.3.3 Promotion of Non-Discharge Alternatives/Regionalization

DWQ requires all new and expanding dischargers to submit an alternatives analysis as part of its NPDES permit application. Non-discharge alternatives, including tying on 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 recommend denial of the NPDES permit.

7.3.4 Coordinating Basinwide Management With the Construction Grants and Loans Program

The potential exists to use the basinwide planning process to identify and prioritize wastewater treatment plants in need of funding through DWQ's Construction Grants and Loan Program. Completed basin documents are provided to this office for their use.

7.3.5 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, effluent limits, compliance information, water quality data and stream classifications will be put in a central data center which will be made accessible to most staff at desktop computer stations. Much of this information is also being entered into the state's GIS computer system (Center for Geographic Information and Analysis or CGIA). As this information, including land use data from satellite or air photo interpretation, is made available to the GIS system and as the system becomes more user friendly, the potential to graphically display the results of water quality data analysis will be tremendous.

Research Triangle Institute performed a pilot study in the Tar-Pamlico River Basin in which high priority waterbodies for nonpoint source control programs were mapped. These maps were used by the various nonpoint source agencies for planning purposes. As resources become available, this tool will be developed for other basins.

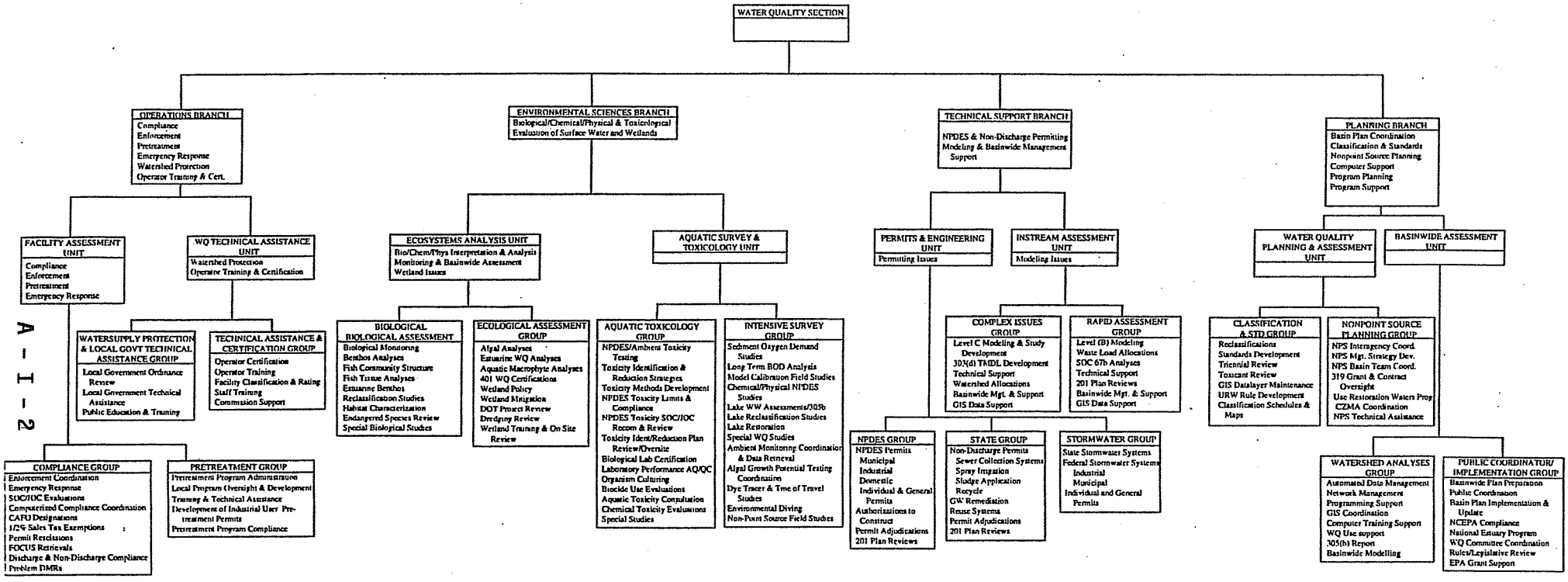
APPENDIX I

Division of Water Quality, Water Quality Section
Organizational Duties Chart

WATER QUALITY SECTION

ORGANIZATIONAL DUTIES CHART

Date: September 21, 1995



ASHEVILLE REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

FAYETTEVILLE REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

MOORESVILLE REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

RALEIGH REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

WASHINGTON REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

WILMINGTON REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

WINSTON-SALEM REGIONAL OFFICE

- Permitting Support
- Compliance Evaluations
- Inspections
- Pretreatment Support
- Wetlands Evaluation
- Emergency Response
- Technical Assistance
- Complaint Investigations
- Ambient Monitoring
- Stream Reclassifications
- EA/EIS Reviews
- Public Information
- Operator Training & Certification

ADMINISTRATION

- Administrative Support

Co

APPENDIX II

- Summary of North Carolina's Water Quality Classifications and Standards
- Antidegradation Policy
- High Quality Waters
- Outstanding Resource Waters
- Classifications and Water Quality Standards Assigned to the Waters of the Watauga River Basin

SUMMARY OF NORTH CAROLINA'S WATER QUALITY CLASSIFICATIONS AND STANDARDS

PRIMARY CLASSIFICATIONS	BEST USAGE	DISCHARGE RESTRICTIONS[1]	STORMWATER MANAGEMENT	OTHER REQUIREMENTS[2]
Freshwater:				
C (standards apply to all freshwaters, unless pre-empted by more stringent standard for more protective classification)	Secondary recreation (including swimming on an unorganized or infrequent basis); wildlife; fish and other aquatic life propagation and survival; agriculture and any other usage, except for primary recreation, water supply or other food-related ruses	Domestic and industrial wastewater dischargers allowed	Stormwater Management Rules apply in the 20 coastal counties as described in 15A NCAC 2H .1000	
B	Primary recreation (swimming on an organized or frequent basis) and all uses specified for Class C (and not water supply or other food-related uses)	Same as for Class C; wastewater treatment reliability requirements (dual train design; backup power capability) may apply to protect swimming uses (15A NCAC 2H .0124)	Same as for Class C	
WS-I Water Supply	Water supplies in natural and undeveloped watersheds	No point source discharges	Not applicable since watershed is undeveloped	No landfills; residual or petroleum contaminated soils application not allowed in the watershed
WS-II Water Supply	Water supplies in predominantly undeveloped watersheds	Only general permit wastewater discharges allowed in watershed	Local land management program required as per 15A NCAC 2B .0214; 6% built upon area in Critical Area; 12% built upon area in the Balance of the Watershed; up to 24% built upon area in the Critical Area and 30% in the Balance of the Watershed allowed with engineered stormwater controls for the 1" storm[3]	Buffers required along perennial waters; no new landfills allowed in the Critical Area and no new discharging landfills outside of Critical Area; no new residual or petroleum contaminated soils application allowed in the Critical Area
WS-III Water Supply	Water supplies in low to moderately developed watersheds	General permits allowed throughout watershed; domestic and non-process industrial discharges allowed outside of the Critical Area	Local land management program required as per 15A NCAC 2B .0215; 12% built upon area in Critical Area; 24% built upon area outside of Critical Area; up to 30% in Critical Area and 50% built upon area outside Critical Area allowed with engineered stormwater controls for the 1" storm[3]	Buffers required along perennial waters; no new landfills allowed in the Critical Area and no new discharging landfills outside of the Critical Area; no new residual or petroleum contaminated soils application allowed in the Critical Area

SUMMARY OF NORTH CAROLINA'S WATER QUALITY CLASSIFICATIONS AND STANDARDS (continued)

PRIMARY CLASSIFICATIONS	BEST USAGE	DISCHARGE RESTRICTIONS[1]	STORMWATER MANAGEMENT	OTHER REQUIREMENTS[2]
WS-IV Water Supply	Water supplies in moderately to highly developed watersheds	General permits, domestic and industrial discharges allowed throughout watershed[4]	Local land management program required as per 15A NCAC 2B .0216: 24% built upon area in Critical Area and Protected Area [5,6]; up to 50% in Critical Area and 70% built upon area outside Critical Area with engineered stormwater controls for the 1" storm[3]	Buffers required along perennial waters; no new landfills allowed in the Critical Area; no new residual or petroleum contaminated soils application allowed in the Critical Area
WS-V Water Supply	Former or industrial use water supplies	No categorical restrictions on development or wastewater dischargers	Stormwater Management Rules apply in the 20 coastal counties as described in 15A NCAC 2H .1000	Instream water quality standards for water supply waters are applicable

NOTES: Please refer to 15A NCAC 2B .0101, .0104, .0202, .0211 and .0301 for more specific requirements for surface water supply protection.

1 Groundwater remediation discharges allowed when no alternative exists.

2 See attached tables: *Water Quality Standards for Freshwater Classes* and *Water Quality Standards for Saltwater Classes* for numeric standards associated with specific classes.

3 If the high density option is utilized engineered stormwater control systems must be designed for 85% TSS removal. Refer to Stormwater Management Rules (15 A NCAC 2H .1000) for specific design information.

4 New industrial process wastewater discharges in the Critical Area are allowed but must meet additional treatment requirements.

5 Applies to projects requiring an Erosion/Sedimentation Control Plan.

6 36% built-upon area is allowed for projects without a curb and gutter street system in the Protected Area.

- Critical area is 1/2 mile and draining to water supplies from normal pool elevation of reservoirs, or 1/2 mile and draining to a river intake.
- Protected Area is 5 miles and draining to water supplies from normal pool elevation of reservoirs, or 10 miles upstream of and draining to a river intake.
- Agricultural activities are subject to provisions of the Food Security Act of 1985 and the Food, Agriculture, Conservation and Trade Act of 1990. In WS-I watersheds and Critical Areas of WS-II, WS-III and WS-IV areas, agricultural activities must maintain a 10 foot vegetated buffer or equivalent control as determined by the Soil and Water Conservation Commission.
- Silviculture activities are subject to the provisions of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1I .0101-.0209).
- The Department of Transportation must use BMPs as described in their document, "Best Management Practices for Protection of Surface Waters".

SUMMARY OF NORTH CAROLINA'S WATER QUALITY CLASSIFICATIONS AND STANDARDS (continued)

PRIMARY CLASSIFICATIONS	BEST USAGE	DISCHARGE RESTRICTIONS	STORMWATER MANAGEMENT	OTHER REQUIREMENTS
Saltwater:				
SC	Saltwaters protected for secondary recreation, aquatic life propagation and survival and other uses as described for Class C	Domestic and industrial wastewater discharges allowed	Stormwater Management Rules (15A NCAC 2H .1000) apply to all waters in the 20 coastal counties; low density option: 30% built upon area or structural stormwater controls with higher density, as specified	
SB	Saltwaters protected for primary recreation and all Class SC uses (similar to Class B)	Same as Class SC; wastewater treatment reliability requirements (dual train design; backup power capability) may apply to protect swimming uses (15A NCAC 2H .0124)	Same as for Class SC	
SA	Shellfishing and all Class SC and SB uses	No domestic discharges and only non-process industrial discharges such as seafood packing houses or cooling water discharges	Same as for Class SC except low density option is 25% built upon area	

Supplemental Classifications are added to the primary classifications as appropriate (Examples include Class C-NSW, Class SA-ORW, Class B-Trout, etc.) and impose additional requirements.

SUPPLEMENTAL CLASSIFICATIONS	BEST USAGE	DISCHARGE RESTRICTIONS	STORMWATER MANAGEMENT	OTHER REQUIREMENTS
HQW High Quality Waters	Waters rated as Excellent by DEM; Primary Nursery Areas; Native or Special Native Trout Waters; WS-I, WS-II and SA waters are HQW by definition	For new or expanded discharges advanced treatment requirements are: BOD_5=5 mg/l; NH_3-N= 2 mg/l; DO=6 mg/l	For projects requiring Erosion/ Sedimentation Control Plan and that are within 1 mile and draining to HQW waters: 12% built upon area or higher density with engineered structural controls allowed; WS-I, WS-II and 20 coastal counties exempt since stormwater control requirements already apply	Other treatment requirements may apply, dependent upon type of discharge and characteristics of receiving waters (see Antidegradation Policy: Rule 15A: NCAC 2B .0201)

SUMMARY OF NORTH CAROLINA'S WATER QUALITY CLASSIFICATIONS AND STANDARDS (continued)

SUPPLEMENTAL CLASSIFICATIONS	BEST USAGE	DISCHARGE RESTRICTIONS	STORMWATER MANAGEMENT	OTHER REQUIREMENTS
ORW Outstanding Resource Waters	Unique and special waters having exceptional water quality and being of an exceptional state or national ecological or recreational significance; must meet other conditions and have 1 or more of 5 outstanding resource value criteria as described in Rule 15A NCAC 2B .0225	Water quality must clearly maintain and protect uses, including outstanding resource values; management strategies must include at a minimum: no new or expanded discharges to freshwater ORWs; some discharges may be allowed in coastal areas	Same as for High Quality Waters for Freshwater ORWs; for Saltwater ORWs, development activities within a 575' buffer must comply with the low density option of the Stormwater Management Rules (generally 25% built upon area around SA waters and 30% around other waters)	Other management strategy components as described in 15A NCAC 2B .0225
TR Trout Waters	Protected for natural trout propagation and survival of stocked trout	Domestic and industrial wastewater discharges allowed with stricter treatment requirements		More protective standards for cadmium, total residual chlorine, chlorophyll-a, dissolved oxygen, turbidity and toluene to protect these sensitive species
NSW Nutrient Sensitive Waters	Waters needing additional nutrient management due to their being subject to excessive growth of microscopic and macroscopic vegetation	No increase of nutrients over background levels permitted; domestic and industrial wastewater discharges allowed	Nutrient management strategies developed on a case-by-case basis	Nutrient management strategies developed on a case-by-case basis
SW Swamp Waters	Waters with low velocities and other characteristics different from other waterbodies (generally, low pH, DO, high organic content)			pH as low as 4.3 and DO less than 5 mg/l allowed if due to natural conditions
FWS Future Water Supply	Waters designated for future water supply use	Discharge restrictions will be reflective of those of primary water supply classification	Stormwater management options will be reflective of those of primary water supply classification; not required until after FWS supplemental classification is removed	Requirements for landfill permits, NPDES wastewater discharges, land application of residuals and road construction activities in Critical Area and Balance of Watershed or Protected Area as appropriate (15A NCAC 2H .0101)

Water Quality Standards For Freshwater Classifications

April 1, 1996

Parameters (ug/l unless noted)	Standards for All Freshwater * Aquatic Life	Human Health[1]	Standards to Support Additional Uses WS Classes[2]	Trout Waters	HQW	Swamp Waters
Arsenic	50					
Barium			1000			
Benzene		71.4	1.19			
Beryllium	6.5	0.117	0.0068			
Cadmium	2.0			0.4		
Carbon tetrachloride		4.42	0.254			
Chloride	230000 (AL)		250000			
Chlorinated benzenes			488 (N)			
Chlorine, total residual	17 (AL)			17		
Chlorophyll a, corrected	40 (N)			15 (N)		
Chromium, total	50					
Coliform, total (MFTCC/100ml)[3]			50 (N)[4]			
Coliform, fecal (MFFCC/100ml)[3]		200 (N)				
Copper, total	7 (AL)					
Cyanide	5.0					
Dioxin		0.000000014	0.000000013			
Dissolved gases	(N)					
Dissolved oxygen (mg/l)	5.0[5]			6.0		(N)[6]
Fluoride	1800					
Hardness, total (mg/l)			100			
Hexachlorobutadiene		49.7	0.445			
Iron (mg/l)	1 (AL)					
Lead	25 (N)					
Manganese			200			
MBAS (Methylene-Blue-Active-Substances)	500					
Mercury	0.012					
Nickel	88		25			
Nitrate nitrogen			10			
Pesticides						
Aldrin	0.002	0.000136	0.000127			
Chlordane	0.004	0.000588	0.000575			
DDT	0.001	0.000591	0.000588			
Demeton	0.1					
Dieldrin	0.002	0.000144	0.000135			
Endosulfan	0.05					
Endrin	0.002					
Guthion	0.01					
Heptachlor	0.004	0.000214	0.000208			
Lindane	0.01					
Methoxychlor	0.03					
Mirex	0.001					
Parathion	0.013					
Toxaphene	0.0002					
2,4-D			100			
2,4,5-TP (Silvex)			10			
pH (units)	6.0-9.0					(N)[6]
Phenolic compounds		(N)	1.0 (N)			
Polychlorinated biphenyls[7]	0.001	0.000079				
Polynuclear aromatic hydrocarbons [8]		0.0311	0.0028			
Radioactive substances		(N)				
Selenium	5					
Silver	0.06 (AL)					
Solids, total dissolved (mg/l)			500			
Solids, total suspended (mg/l)					10 Tr, 20 other	
Solids, settleable	(N)					
Sulfates			250000			
Temperature	(N)					
Tetrachloroethane (1,1,2,2)		10.8	0.172			
Tetrachlorethylene			0.8			
Toluene	11			0.36		
Toxic substances	(N)				(N)	
Trialkyltin	0.008					
Trichloroethylene		92.4	3.08			
Turbidity (NTU)	50; 25 (N)			10 (N)		
Vinyl chloride		525	2.0			
Zinc	50 (AL)					

* These standards apply to all freshwater classifications. For the protection of WS and supplemental classifications, standards listed under Standards to Support Additional Uses should be used unless standards for aquatic life or human health are listed and are more stringent.

(AL) Values represent action levels as specified in 2B .0211. WS Classes - Water Supply Classifications, same standards for all WS Classes.

(N) See 2B .0211 for narrative description of limits. HQW - High Quality Waters, standards for HQW areas only. Tr - Trout Waters.

1 Human health standards are based on consumption of fish only unless dermal contact studies available. See 2B .0208 for equation.

2 Water Supply standards are based on consumption of fish and water. See 2B .0208 for equation.

3 MFTCC/100ml means membrane filter total coliform count per 100 ml of sample. MFFCC/100ml means membrane filter fecal coliform count per 100 ml of sample.

4 Applies only to unfiltered water supplies.

5 An instantaneous reading may be as low as 4.0 mg/l, but the daily average must be 5.0 mg/l or more.

6 Designated swamp waters may have a dissolved oxygen less than 5.0 mg/l and a pH as low as 4.3, if due to natural conditions.

7 Applies to total PCBs present and includes PCB 1242, 1254, 1221, 1232, 1248, 1260, and 1016. See 2B .0208 & .0211.

8 Applies to total PAHs present and includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. See 2B .0208, .0212, .0214, .0215, .0216, & .0218.

dmr/Macintosh HD:Desktop Folder:rules word:Old WQ Standards Table

Water Quality Standards For Saltwater Classifications

April 1, 1996

	Standards for All Saltwater		Standards to Support Additional Uses		
Parameters (ug/l unless noted)	Aquatic Life	Human Health[1]	Class SA	HQW	Swamp Waters
Arsenic	50				
Benzene		71.4			
Beryllium		0.117			
Cadmium	5.0				
Carbon tetrachloride		4.42			
Chlorophyll *a*	40 (N)				
Chromium, total	20				
Coliform, fecal (MFFCC/100ml)[2]		200 (N)	14 (N)		
Copper	3 (AL)				
Cyanide	1.0				
Dioxin		0.000000014			
Dissolved gases	(N)				
Dissolved oxygen (mg/l)	5.0			6.0	(N)[3]
Hexachlorobutadiene		49.7			
Lead	25 (N)				
Mercury	0.025				
Nickel	8.3				
Pesticides					
Aldrin	0.003	0.000136			
Chlordane	0.004	0.000588			
DDT	0.001	0.000591			
Demeton	0.1				
Dieldrin	0.0002	0.000144			
Endosulfan	0.009				
Endrin	0.002				
Guthion	0.01				
Heptachlor	0.004	0.000214			
Lindane	0.004				
Methoxychlor	0.03				
Mirex	0.001				
Parathion	0.178				
Toxaphene	0.0002				
pH (units)	6.8-8.5				(N)[3]
Phenolic compounds		(N)			
Polychlorinated biphenyls[4]	0.001	0.000079			
Polynuclear aromatic hydrocarbons[5]	0.0311				
Radioactive substances		(N)			
Salinity	(N)				
Selenium	71				
Silver	0.1 (AL)				
Solids, total suspended (mg/l)				10 PNA, 20 other	
Solids, settleable (mg/l)	(N)				
Temperature	(N)				
Tetrachloroethane (1,1,2,2)		10.8			
Toxic substances	(N)			(N)	
Trialkyltin	0.002				
Trichloroethylene		92.4			
Turbidity (NTU)	25 (N)				
Vinyl chloride		525			
Zinc	86 (AL)				

(AL) Values represent action levels as specified in 2B .0220.
(N) See 2B .0220 for narrative description of limits.
HQW - High Quality Waters, standards for HQW areas only.
Class SA - shellfishing waters see 2B .0101 for description.
PNA - Primary Nursery Areas

1 Human health standards are based on consumption of fish only unless dermal contact studies are available. See 2B .0208 for equation.

2 MFFCC/100ml means membrane filter fecal coliform count per 100 ml of sample.

3 Designated swamp waters may have a dissolved oxygen less than 5.0 mg/l and a pH as low as 4.3, if due to natural conditions.

4 Applies to total PCBs present and includes PCB 1242, 1254, 1221, 1232, 1248, 1260, and 1016. See 2B .0208 & .0220.

5 Applies to total PAHs present and includes benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. See 2B .0208.

dmr/Macintosh HD:Desktop Folder:rules word:old WQ Standards Table sw

WATER SUPPLY WATERSHED PROTECTION RULES REVISIONS 6/8/95

Classification		Dischargers	Allowable Development W/O Stormwater, Low Density Opt.	Allowable Development W/ Stormwater, High Density Opt.	Required Control with High Density Opt.	10%/70% (5) Provision	Residuals Appl.	Landfills	Agriculture BMPs
WS-I	Watershed	None	None	None	None	None	None	None	(6) Required
WS-II	Critical Area	General Permits	(2) 1du/2ac or 6% built upon	6-24% built upon area	Control the 1" storm	Not allowed	No new sites	No new landfills	(6) Required
	Watershed	General Permits	1du/ac or 12% built upon	12-30% built upon area	Control the 1" storm	Allowed	Allowed	No new discharging landfills	(6) Not Required
WS-III	Critical Area	General Permits	1du/ac or 12% built upon	12-30% built upon area	Control the 1" storm	Not allowed	No new sites	No new landfills	(6) Required
	Watershed	Domestic & non-process industrial	2du/ac or 24% built upon	24-50% built upon area	Control the 1" storm	Allowed	Allowed	No new discharging landfills	(6) Not Required
WS-IV	Critical Area	Domestic & (1) industrial	(3) 2du/ac or 24% built upon	(3) 24-50% built upon area	Control the 1" storm	Not allowed	No new sites	No new landfills	(6) Required
	Protected Area	Domestic & industrial	(3,4) 2du/ac or 24% built upon	(3,4) 24-70% built upon area	Control the 1" storm	Allowed	Allowed	Allowed	(6) Not Required
WS-V	Watershed or River Segment	Domestic, Industrial	No categorical restrictions other than instream water quality standards applicable to all surface water supply waters.						

NOTE: Critical area is one-half mile and draining to water supplies from the normal pool elevation of reservoirs, or one-half mile and draining to a river intake.
Protected area is five miles and draining to water supplies from the normal pool elevation of reservoirs, or ten miles upstream of and draining to a river intake.
Municipal with pretreatment program (2H .0904) is considered industrial discharge.
Discharges qualifying for a General Permit pursuant to 2H .0127 will also be allowed in all areas of WS-III and WS-IV watersheds along with the allowed discharges noted in the table.
Buffers will be maintained around all perennial waters with a minimum width of thirty feet for low density development and a minimum one hundred foot buffer for high density development.
Groundwater remediation discharges may be allowed when no other practicable alternative exists.
Local governments will assume ultimate responsibility for operation and maintenance of stormwater controls.
(1) New industrial process wastewater discharges are allowed but will require additional treatment requirements.
(2) Residential development may apply dwelling units per acre or use percent built-upon surface area. Non-residential development must use percent built-upon surface area.
(3) Applies only to projects requiring a Sedimentation/Erosion Control Permit.
(4) One third acre lot or 36% built-upon area is allowed for projects without curb and gutter street systems.
(5) Allowed; can use 10% of jurisdiction for new development and expansions to existing development up to 70% built-upon area, without stormwater controls, if using low density option throughout remainder of water supply.
(6) In WS-I watersheds and critical areas of WS-II, WS-III and WS-IV watersheds, agricultural operations must maintain a 10 foot vegetated buffer, or equivalent control along all perennial streams. Animal operations deemed permitted and permitted are allowed in all water supply watersheds.

.0201 ANTIDEGRADATION POLICY

(a) It is the policy of the Environmental Management Commission to maintain, protect, and enhance water quality within the State of North Carolina. Pursuant to this policy, the requirements of 40 CFR 131.12 are hereby incorporated by reference including any subsequent amendments and editions. This material is available for inspection at the Department of Environment, Health, and Natural Resources, Division of Water Quality, Water Quality Section, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402-9325 at a cost of thirteen dollars ($13.00). These requirements shall be implemented in North Carolina as set forth in Paragraphs (b), (c), (d), (e) and (f) of this Rule.

(b) Existing uses, as defined by Rule .0202 of this Section, and the water quality to protect such uses shall be protected by properly classifying surface waters and having standards sufficient to protect these uses. In cases where the Commission or its designee determines that an existing use is not included in the classification of waters, a project which shall affect these waters shall not be permitted unless the existing uses are protected.

(c) The Commission shall consider the present and anticipated usage of waters with quality higher than the standards, including any uses not specified by the assigned classification (such as outstanding national resource waters or waters of exceptional water quality) and shall not allow degradation of the quality of waters with quality higher than the standards below the water quality necessary to maintain existing and anticipated uses of those waters. Waters with quality higher than the standards are defined by Rule .0202 of this Section. The following procedures shall be implemented in order to meet these requirements:

(1) Each applicant for an NPDES permit or NPDES permit expansion to discharge treated waste shall document an effort to consider non-discharge alternatives pursuant to 15A NCAC 2H .0105(c)(2).

(2) Public Notices for NPDES permits shall list parameters that would be water quality limited and state whether or not the discharge shall use the entire available load capacity of the receiving waters and may cause more stringent water quality based effluent limitations to be established for dischargers downstream.

(3) The Division may require supplemental documentation from the affected local government that a proposed project or parts of the project are necessary for important economic and social development.

(4) The Commission and Division shall work with local governments on a voluntary basis to identify and develop appropriate management strategies or classifications for waters with unused pollutant loading capacity to accommodate future economic growth.

Waters with quality higher than the standards shall be identified by the Division on a case-by-case basis through the NPDES permitting and waste load allocation processes (pursuant to the provisions of 15A NCAC 2H .0100). Dischargers affected by the requirements of Paragraphs (c)(1) through (c)(4) of this Rule and the public at large shall be notified according to the provisions described herein, and all other appropriate provisions pursuant to 15A NCAC 2H .0109. If an applicant objects to the requirements to protect waters with quality higher than the standards and believes degradation is necessary to accommodate important social and economic development, the applicant may contest these requirements according to the provisions of General Statute 143-215.1(e) and 150B-23.

(d) The Commission shall consider the present and anticipated usage of High Quality Waters (HQW), including any uses not specified by the assigned classification (such as outstanding national resource waters or waters of exceptional water quality) and shall not allow degradation of the quality of High Quality Waters below the water quality necessary to maintain existing and anticipated uses of those waters. High Quality Waters are a subset of waters with quality higher than the standards and are as described by 15A NCAC 2B .0101(e)(5). The procedures described in Rule .0224 of this Section shall be implemented in order to meet the requirements of this part.

(e) Outstanding Resource Waters (ORW) are a special subset of High Quality Waters with unique and special characteristics as described in Rule .0225 of this Section. The water quality of waters classified as ORW shall be maintained such that existing uses, including the outstanding resource values of said Outstanding Resource Waters, shall be maintained and protected.

(f) Activities regulated under Section 404 of the Clean Water Act (33 U.S.C. 1344) which require a water quality certification as described in Section 401 of the Clean Water Act (33 U.S.C. 1341) shall be evaluated according to the procedures outlined in 15A NCAC 2H .0500. Activities which receive a water quality certification pursuant to these procedures shall not be considered to remove existing uses. The evaluation of permits issued pursuant to G.S. 143-215.1 that involve the assimilation of wastewater or stormwater by wetlands shall incorporate the criteria found in 15A NCAC 2H .0506(c) (1)-(5) in determining the potential impact of the proposed activity on the existing uses of the wetland per 15A NCAC 2H .0231.

History Note: *Authority G.S. 143-214.1; 143-215.1; 143-215.3(a)(1);*
Eff. February 1, 1976;

Amended Eff. October 1, 1995; February 1, 1993; April 1,1991; August 1, 1990; RRC Objection Eff. July 18, 1996 due to lack of statutory authority and ambiguity; Amended Eff. October 1, 1996.

.0223 NUTRIENT SENSITIVE WATERS

(a) In addition to existing classifications, the Commission may classify any surface waters of the state as nutrient sensitive waters (NSW) upon a finding that such waters are experiencing or are subject to excessive growths of microscopic or macroscopic vegetation. Excessive growths are growths which the Commission in its discretion finds to substantially impair the use of the water for its best usage as determined by the classification applied to such waters.

(b) NSW may include any or all waters within a particular river basin as the Commission deems necessary to effectively control excessive growths of microscopic or macroscopic vegetation.

(c) For the purpose of this Rule, the term "nutrients" shall mean phosphorous or nitrogen. When considering the assignment of this classification, the Commission may specify as a "nutrient" any other chemical parameter or combination of parameters which it determines to be essential for the growth of microscopic and macroscopic vegetation.

(d) Those waters additionally classified as nutrient sensitive shall be identified in the appropriate schedule of classifications as referenced in Section .0300 of this Subchapter.

(e) For the purpose of this Rule, the term "background levels" shall mean the concentration(s), taking into account seasonal variations, of the specific nutrient or nutrients upstream of a nutrient source.

(f) Quality standards applicable to NSW: no increase in nutrients over background levels unless it is shown to the satisfaction of the Director that the increase:

(1) is the result of natural variations; or

(2) will not endanger human health, safety or welfare and that preventing the increase would cause a serious economic hardship without equal or greater benefit to the public.

History Note: Authority G.S. 143-214.1; Eff. October 1, 1995.

.0224 HIGH QUALITY WATERS

High Quality Waters (HQW) are a subset of waters with quality higher than the standards and are as described by 15A NCAC 2B .0101(e)(5). The following procedures shall be implemented in order to implement the requirements of Rule .0201(d) of this Section.

(1) New or expanded wastewater discharges in High Quality Waters shall comply with the following:

(a) Discharges from new single family residences shall be prohibited. Those existing subsurface systems for single family residences which fail and must discharge shall install a septic tank, dual or recirculating sand filters, disinfection and step aeration.

(b) All new NPDES wastewater discharges (except single family residences) shall be required to provide the treatment described below:

(i) Oxygen Consuming Wastes: Effluent limitations shall be as follows: BOD_5= 5 mg/l, NH_3-N = 2 mg/l and DO = 6 mg/l. More stringent limitations shall be set, if necessary, to ensure that the cumulative pollutant discharge of oxygen-consuming wastes shall not cause the DO of the receiving water to drop more than 0.5 mg/l below background levels, and in no case below the standard. Where background information is not readily available, evaluations shall assume a percent saturation determined by staff to be generally applicable to that hydroenvironment.

(ii) Total Suspended Solids: Discharges of total suspended solids (TSS) shall be limited to effluent concentrations of 10 mg/l for trout waters and PNA's, and to 20 mg/l for all other High Quality Waters.

(iii) Disinfection: Alternative methods to chlorination shall be required for discharges to trout streams, except that single family residences may use chlorination if other options are not economically feasible. Domestic discharges are prohibited to SA waters.

(iv) Emergency Requirements: Failsafe treatment designs shall be employed, including stand-by power capability for entire treatment works, dual train design for all treatment components, or

equivalent failsafe treatment designs.

(v) Volume: The total volume of treated wastewater for all discharges combined shall not exceed 50 percent of the total instream flow under 7Q10 conditions.

(vi) Nutrients: Where nutrient overenrichment is projected to be a concern, appropriate effluent limitations shall be set for phosphorus or nitrogen, or both.

(vii) Toxic substances: In cases where complex wastes (those containing or potentially containing toxicants) may be present in a discharge, a safety factor shall be applied to any chemical or whole effluent toxicity allocation. The limit for a specific chemical constituent shall be allocated at one-half of the normal standard at design conditions. Whole effluent toxicity shall be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration of 90 percent. Ammonia toxicity shall be evaluated according to EPA guidelines promulgated in "Ambient Water Quality Criteria for Ammonia - 1984"; EPA document number 440/5-85-001; NTIS number PB85-227114; July 29, 1985 (50 FR 30784) or "Ambient Water Quality Criteria for Ammonia (Saltwater) - 1989"; EPA document number 440/5-88-004; NTIS number PB89-169825. This material related to ammonia toxicity is hereby incorporated by reference including any subsequent amendments and editions and is available for inspection at the Department of Environment, Health, and Natural Resources Library, 512 North Salisbury Street, Raleigh, North Carolina. Copies may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161 at a cost of forty-seven dollars ($47.00).

(c) All expanded NPDES wastewater discharges in High Quality Waters shall be required to provide the treatment described in Sub-Item (1)(b) of this Rule, except for those existing discharges which expand with no increase in permitted pollutant loading.

(2) Development activities which require an Erosion and Sedimentation Control Plan in accordance with rules established by the NC Sedimentation Control Commission or local erosion and sedimentation control program approved in accordance with 15A NCAC 4B .0218, and which drain to and are within one mile of High Quality Waters (HQW) shall be required to follow the stormwater management rules as specified in 15A NCAC 2H .1000. Stormwater management requirements specific to HQW are described in 15A NCAC 2H .1006.

If an applicant objects to the requirements to protect high quality waters and believes degradation is necessary to accommodate important social and economic development, the applicant may contest these requirements according to the provisions of G.S. 143-215.1(e) and 150B-23.

History Note: *Authority G.S. 143-214.1; 143-215.1; 143-215.3(a)(1);*
Eff. October 1, 1995;
Amended Eff. April 1, 1996.

.0225 OUTSTANDING RESOURCE WATERS

(a) General. In addition to the existing classifications, the Commission may classify certain unique and special surface waters of the state as outstanding resource waters (ORW) upon finding that such waters are of exceptional state or national recreational or ecological significance and that the waters have exceptional water quality while meeting the following conditions:

(1) there are no significant impacts from pollution with the water quality rated as excellent based on physical, chemical or biological information;

(2) the characteristics which make these waters unique and special may not be protected by the assigned narrative and numerical water quality standards.

(b) Outstanding Resource Values. In order to be classified as ORW, a water body must exhibit one or more of the following values or uses to demonstrate it is of exceptional state or national recreational or ecological significance:

(1) there are outstanding fish (or commercially important aquatic species) habitat and fisheries;

(2) there is an unusually high level of water-based recreation or the potential for such recreation;

(3) the waters have already received some special designation such as a North Carolina or National Wild and Scenic River, Native or Special Native Trout Waters, National Wildlife Refuge, etc, which do not provide any

water quality protection;

(4) the waters represent an important component of a state or national park or forest; or

(5) the waters are of special ecological or scientific significance such as habitat for rare or endangered species or as areas for research and education.

(c) Quality Standards for ORW.

(1) Freshwater: Water quality conditions shall clearly maintain and protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values shall be developed on a site specific basis during the proceedings to classify waters as ORW. At a minimum, no new discharges or expansions of existing discharges shall be permitted, and stormwater controls for all new development activities requiring an Erosion and Sedimentation Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an appropriate local erosion and sedimentation control program shall be required to follow the stormwater provisions as specified in 15A NCAC 2H .1000. Specific stormwater requirements for ORW areas are described in 15A NCAC 2H .1007.

(2) Saltwater: Water quality conditions shall clearly maintain and protect the outstanding resource values of waters classified ORW. Management strategies to protect resource values shall be developed on a site-specific basis during the proceedings to classify waters as ORW. At a minimum, new development shall comply with the stormwater provisions as specified in 15A NCAC 2H .1000. Specific stormwater management requirements for saltwater ORWs are described in 15A NCAC 2H .1007. New non-discharge permits shall meet reduced loading rates and increased buffer zones, to be determined on a case-by-case basis. No dredge or fill activities shall be allowed where significant shellfish or submerged aquatic vegetation bed resources occur, except for maintenance dredging, such as that required to maintain access to existing channels and facilities located within the designated areas or maintenance dredging for activities such as agriculture. A public hearing is mandatory for any proposed permits to discharge to waters classified as ORW.

Additional actions to protect resource values shall be considered on a site specific basis during the proceedings to classify waters as ORW and shall be specified in Paragraph (e) of this Rule. These actions may include anything within the powers of the commission. The commission shall also consider local actions which have been taken to protect a water body in determining the appropriate state protection options. Descriptions of boundaries of waters classified as ORW are included in Paragraph (e) of this Rule and in the Schedule of Classifications (15A NCAC 2B .0302 through .0317) as specified for the appropriate river basin and shall also be described on maps maintained by the Division of Environmental Management.

(d) Petition Process. Any person may petition the Commission to classify a surface water of the state as an ORW. The petition shall identify the exceptional resource value to be protected, address how the water body meets the general criteria in Paragraph (a) of this Rule, and the suggested actions to protect the resource values. The Commission may request additional supporting information from the petitioner. The Commission or its designee shall initiate public proceedings to classify waters as ORW or shall inform the petitioner that the waters do not meet the criteria for ORW with an explanation of the basis for this decision. The petition shall be sent to:

Director
DEHNR/Division of Environmental Management
P.O. Box 29535
Raleigh, North Carolina 27626-0535

The envelope containing the petition shall clearly bear the notation: RULE-MAKING PETITION FOR ORW CLASSIFICATION.

(e) Listing of Waters Classified ORW with Specific Actions. Waters classified as ORW with specific actions to protect exceptional resource values are listed as follows:

(1) Roosevelt Natural Area [White Oak River Basin, Index Nos. 20-36-9.5-(1) and 20-36-9.5-(2)] including all fresh and saline waters within the property boundaries of the natural area shall have only new development which complies with the low density option in the stormwater rules as specified in 15A NCAC 2H .1005(2)(a) within 575 feet of the Roosevelt Natural Area (if the development site naturally drains to the Roosevelt Natural Area).

(2) Chattooga River ORW Area (Little Tennessee River Basin and Savannah River Drainage Area): the following undesignated waterbodies that are tributary to ORW designated segments shall comply with Paragraph (c) of this Rule in order to protect the designated waters as per Rule .0203 of this Section. However, expansions of existing discharges to these segments shall be allowed if there is no increase in pollutant loading:

(A) North and South Fowler Creeks,
(B) Green and Norton Mill Creeks,
(C) Cane Creek,
(D) Ammons Branch,
(E) Glade Creek, and
(F) Associated tributaries.

(3) Henry Fork ORW Area (Catawba River Basin): the following undesignated waterbodies that are tributary to ORW designated segments shall comply with Paragraph (c) of this Rule in order to protect the designated waters as per Rule .0203 of this Section:
(A) Ivy Creek,
(B) Rock Creek, and
(C) Associated tributaries.

(4) South Fork New and New Rivers ORW Area [New River Basin (Index Nos. 10-1-33.5 and 10)]: the following management strategies, in addition to the discharge requirements specified in Subparagraph (c)(1) of this Rule, shall be applied to protect the designated ORW areas:
(A) Stormwater controls described in Subparagraph (c)(1) of this Rule shall apply within one mile and draining to the designated ORW areas;
(B) New or expanded NPDES permitted wastewater discharges located upstream of the designated ORW shall be permitted such that the following water quality standards are maintained in the ORW segment:
(i) the total volume of treated wastewater for all upstream discharges combined shall not exceed 50 percent of the total instream flow in the designated ORW under 7Q10 conditions;
(ii) a safety factor shall be applied to any chemical allocation such that the effluent limitation for a specific chemical constituent shall be the more stringent of either the limitation allocated under design conditions (pursuant to 15A NCAC 2B .0206) for the normal standard at the point of discharge, or the limitation allocated under design conditions for one-half the normal standard at the upstream border of the ORW segment;
(iii) a safety factor shall be applied to any discharge of complex wastewater (those containing or potentially containing toxicants) to protect for chronic toxicity in the ORW segment by setting the whole effluent toxicity limitation at the higher (more stringent) percentage effluent determined under design conditions (pursuant to 15A NCAC 2B .0206) for either the instream effluent concentration at the point of discharge or twice the effluent concentration calculated as if the discharge were at the upstream border of the ORW segment;
(C) New or expanded NPDES permitted wastewater discharges located upstream of the designated ORW shall comply with the following:
(i) Oxygen Consuming Wastes: Effluent limitations shall be as follows: BOD = 5 mg/l, and NH3-N = 2 mg/l;
(ii) Total Suspended Solids: Discharges of total suspended solids (TSS) shall be limited to effluent concentrations of 10 mg/l for trout waters and to 20 mg/l for all other waters;
(iii) Emergency Requirements: Failsafe treatment designs shall be employed, including stand-by power capability for entire treatment works, dual train design for all treatment components, or equivalent failsafe treatment designs;
(iv) Nutrients: Where nutrient overenrichment is projected to be a concern, appropriate effluent limitations shall be set for phosphorus or nitrogen, or both.

(5) Old Field Creek (New River Basin): the undesignated portion of Old Field Creek (from its source to Call Creek) shall comply with Paragraph (c) of this Rule in order to protect the designated waters as per Rule .0203 of this Section.

(6) In the following designated waterbodies, no additional restrictions shall be placed on new or expanded marinas. The only new or expanded NPDES permitted discharges that shall be allowed shall be non-domestic, non-process industrial discharges. The Alligator River Area (Pasquotank River Basin) extending from the source of the Alligator River to the U.S. Highway 64 bridge including New Lake Fork, North West Fork Alligator River, Juniper Creek, Southwest Fork Alligator River, Scouts Bay, Gum Neck Creek, Georgia Bay, Winn Bay, Stumpy Creek Bay, Stumpy Creek, Swann Creek (Swann Creek Lake), Whipping Creek (Whipping Creek Lake), Grapevine Bay, Rattlesnake Bay, The Straits, The Frying Pan, Coopers Creek, Babbitt Bay, Goose Creek, Milltail Creek, Boat Bay, Sandy Ridge Gut (Sawyer Lake) and Second Creek, but excluding the Intracoastal Waterway (Pungo River-Alligator River Canal) and all other

tributary streams and canals.

(7) In the following designated waterbodies, the only type of new or expanded marina that shall be allowed shall be those marinas located in upland basin areas, or those with less than 30 slips, having no boats over 21 feet in length and no boats with heads. The only new or expanded NPDES permitted discharges that shall be allowed shall be non-domestic, non-process industrial discharges.

(A) The Northeast Swanquarter Bay Area including all waters northeast of a line from a point at Lat. 35° 23′ 51″ and Long. 76° 21′ 02″ thence southeast along the Swanquarter National Wildlife Refuge hunting closure boundary (as defined by the 1935 Presidential Proclamation) to Drum Point.

(B) The Neuse-Southeast Pamlico Sound Area (Southeast Pamlico Sound Section of the Southeast Pamlico, Core and Back Sound Area); (Neuse River Basin) including all waters within an area defined by a line extending from the southern shore of Ocracoke Inlet northwest to the Tar-Pamlico River and Neuse River basin boundary, then southwest to Ship Point.

(C) The Core Sound Section of the Southeast Pamlico, Core and Back Sound Area (White Oak River Basin), including all waters of Core Sound and its tributaries, but excluding Nelson Bay, Little Port Branch and Atlantic Harbor at its mouth, and those tributaries of Jarrett Bay that are closed to shellfishing.

(D) The Western Bogue Sound Section of the Western Bogue Sound and Bear Island Area (White Oak River Basin) including all waters within an area defined by a line from Bogue Inlet to the mainland at SR 1117 to a line across Bogue Sound from the southwest side of Gales Creek to Rock Point, including Taylor Bay and the Intracoastal Waterway.

(E) The Stump Sound Area (Cape Fear River Basin) including all waters of Stump Sound and Alligator Bay from marker Number 17 to the western end of Permuda Island, but excluding Rogers Bay, the Kings Creek Restricted Area and Mill Creek.

(F) The Topsail Sound and Middle Sound Area (Cape Fear River Basin) including all estuarine waters from New Topsail Inlet to Mason Inlet, including the Intracoastal Waterway and Howe Creek, but excluding Pages Creek and Futch Creek.

(8) In the following designated waterbodies, no new or expanded NPDES permitted discharges and only new or expanded marinas with less than 30 slips, having no boats over 21 feet in length and no boats with heads shall be allowed.

(A) The Swanquarter Bay and Juniper Bay Area (Tar-Pamlico River Basin) including all waters within a line beginning at Juniper Bay Point and running south and then west below Great Island, then northwest to Shell Point and including Shell Bay, Swanquarter and Juniper Bays and their tributaries, but excluding all waters northeast of a line from a point at Lat. 35° 23′ 51″ and Long. 76° 21′ 02″ thence southeast along the Swanquarter National Wildlife Refuge hunting closure boundary (as defined by the 1935 Presidential Proclamation) to Drum Point and also excluding the Blowout Canal, Hydeland Canal, Juniper Canal and Quarter Canal.

(B) The Back Sound Section of the Southeast Pamlico, Core and Back Sound Area (White Oak River Basin) including that area of Back Sound extending from Core Sound west along Shackleford Banks, then north to the western most point of Middle Marshes and along the northwest shore of Middle Marshes (to include all of Middle Marshes), then west to Rush Point on Harker's Island, and along the southern shore of Harker's Island back to Core Sound.

(C) The Bear Island Section of the Western Bogue Sound and Bear Island Area (White Oak River Basin) including all waters within an area defined by a line from the western most point on Bear Island to the northeast mouth of Goose Creek on the mainland, east to the southwest mouth of Queen Creek, then south to green marker No. 49, then northeast to the northern most point on Huggins Island, then southeast along the shoreline of Huggins Island to the southeastern most point of Huggins Island, then south to the northeastern most point on Dudley Island, then southwest along the shoreline of Dudley Island to the eastern tip of Bear Island.

(D) The Masonboro Sound Area (Cape Fear River Basin) including all waters between the Barrier Islands and the mainland from Carolina Beach Inlet to Masonboro Inlet.

(9) Black and South Rivers ORW Area (Cape Fear River Basin) [Index Nos. 18-68-(0.5), 18-68-(3.5), 18-68-(11.5), 18-68-12-(0.5), 18-68-12-(11.5), and 18-68-2]: the following management strategies, in addition to the discharge requirements specified in Subparagraph (c)(1) of this Rule, shall be applied to protect the designated ORW areas:

(A) Stormwater controls described in Subparagraph (c)(1) of this Rule shall apply within one mile and

draining to the designated ORW areas;

(B) New or expanded NPDES permitted wastewater discharges located one mile upstream of the stream segments designated ORW (upstream on the designated mainstem and upstream into direct tributaries to the designated mainstem) shall comply with the following discharge restrictions:

(i) Oxygen Consuming Wastes: Effluent limitations shall be as follows: BOD = 5 mg/l and NH3-N = 2 mg/l;

(ii) Total Suspended Solids: Discharges of total suspended solids (TSS) shall be limited to effluent concentrations of 20 mg/l;

(iii) Emergency Requirements: Failsafe treatment designs shall be employed, including stand-by power capability for entire treatment works, dual train design for all treatment components, or equivalent failsafe treatment designs;

(iv) Nutrients: Where nutrient overenrichment is projected to be a concern, appropriate effluent limitations shall be set for phosphorus or nitrogen, or both.

(v) Toxic substances: In cases where complex discharges (those containing or potentially containing toxicants) may be currently present in the discharge, a safety factor shall be applied to any chemical or whole effluent toxicity allocation. The limit for a specific chemical constituent shall be allocated at one-half of the normal standard at design conditions. Whole effluent toxicity shall be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under flow design criteria (pursuant to 15A NCAC 2B .0206).

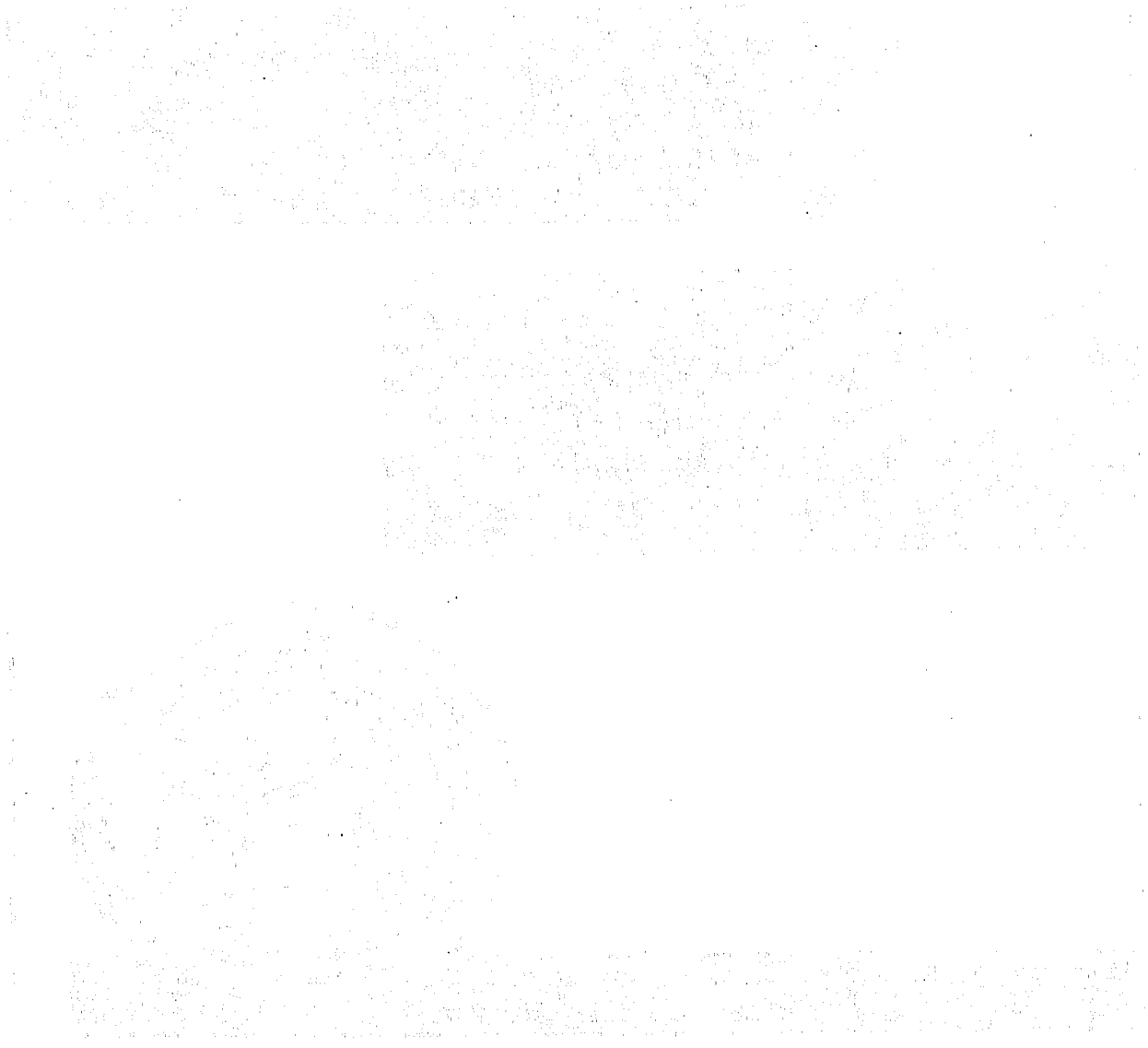
History Note: *Authority G.S. 143-214.1;*
Eff. October 1, 1995;
Amended Eff. April 1, 1996; January 1, 1996.

STATE OF
NORTH CAROLINA
DEPARTMENT OF
ENVIRONMENT, HEALTH,
AND NATURAL RESOURCES

Classifications and Water Quality Standards Assigned to The Waters of the Watauga River Basin

Division of Environmental Management
Raleigh, North Carolina

Reprint from North Carolina Administrative Code: 15A NCAC 2B .0305
Current through: February 1, 1993



SECTION .0300 - ASSIGNMENT OF STREAM CLASSIFICATIONS

.0301 CLASSIFICATIONS: GENERAL

(a) Schedule of Classifications. The classifications assigned to the waters of the State of North Carolina are set forth in the schedules of classifications and water quality standards assigned to the waters of the river basins of North Carolina, 15A NCAC 2B .0302 to .0317. These classifications are based upon the existing or contemplated best usage of the various streams and segments of streams in the basin, as determined through studies and evaluations and the holding of public hearings for consideration of the classifications proposed.

(b) Stream Names. The names of the streams listed in the schedules of assigned classifications were taken as far as possible from United States Geological Survey topographic maps. Where topographic maps were unavailable, U.S. Corps of Engineers maps, U.S. Department of Agriculture soil maps, and North Carolina highway maps were used for the selection of stream names.

(c) Classifications. The classifications assigned to the waters of North Carolina are denoted by the letters WS-I, WS-II, WS-III, WS-IV, WS-V, B, C, SA, SB, and SC in the column headed "class." A brief explanation of the "best usage" for which the waters in each class must be protected is given as follows:

Fresh Waters

Class WS-I:	waters protected as water supplies which are in natural and undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-II:	waters protected as water supplies which are generally in predominantly undeveloped watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-III:	waters protected as water supplies which are generally in low to moderately developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-IV:	waters protected as water supplies which are generally in moderately to highly developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211 of this Subchapter; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all Class C uses;
Class WS-V:	waters protected as water supplies which are generally upstream and draining to Class WS-IV waters; no categorical restrictions on watershed development or treated wastewater discharges are required, however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters (15A NCAC 2B .0203); suitable for all Class C uses;
Class B:	primary recreation and any other usage specified by the "C" classification;
Class C:	aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.

Tidal Salt Waters

Class SA:	shellfishing for market purposes and any other usage specified by the "SB" and "SC" classification;
Class SB:	primary recreation and any other usage specified by the "SC" classification;
Class SC:	aquatic life propagation and survival, fishing, wildlife, and secondary recreation.

Supplemental Classifications

Trout Waters:	Suitable for natural trout propagation and maintenance of stocked trout;
Swamp Waters:	Waters which have low velocities and other natural characteristics which are different from adjacent streams;
NSW:	Nutrient Sensitive Waters which require limitations on nutrient inputs;
HQW:	High Quality Waters which are waters that are rated as excellent based on biological and physical/chemical characteristics through division monitoring or special studies, native and special native trout waters (and their tributaries) designated by the Wildlife Resources Commission, primary nursery areas (PNA) designated by the Marine Fisheries Commission and other functional nursery areas designated by the Wildlife Resources Commission, critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture, all water supply watersheds which are either classified as WS-I or WS-II or those for which a formal petition for reclassification as WS-I or WS-II has been received from the appropriate local government and accepted by the Division of Environmental Management and all Class SA waters.
ORW:	Outstanding Resource Waters which are unique and special waters of exceptional state or national recreational or ecological significance which require special protection to maintain existing uses.

(d) Water Quality Standards. The water quality standards applicable to each classification assigned are those established in 15A NCAC 2B .0200, Classifications and Water Quality Standards Applicable to the Surface Waters of North Carolina, as adopted by the North Carolina Environmental Management Commission.

(e) Index Number.

(1) Reading the Index Number. The index number appearing in the column so designated is an identification number assigned to each stream or segment of a stream, indicating the specific tributary progression between the main stem stream and the tributary stream.

(2) Cross-Referencing the Index Number. The inclusion of the index number in the schedule is to provide an adequate cross reference between the classification schedules and an alphabetic list of streams.

(f) Classification Date. The classification date indicates the date on which enforcement of the provisions of Section 143-215.1 of the General Statutes of North Carolina became effective with reference to the classification assigned to the various streams in North Carolina.

(g) Reference. Copies of the schedules of classifications adopted and assigned to the waters of the various river basins may be obtained at no charge by writing to:

Director
Division of Environmental Management
Department of Environment, Health, and Natural Resources
Post Office Box 29535
Raleigh, North Carolina 27626-0535

(h) Places where the schedules may be inspected:

Division of State Library
Archives -- State Library Building
109 E. Jones Street
Raleigh, North Carolina.

(i) Unnamed Streams.

(1) Any stream which is not named in the schedule of stream classifications carries the same classification as that assigned to the stream segment to which it is tributary except:

(A) unnamed streams specifically described in the schedule of classifications; or

(B) unnamed freshwaters tributary to tidal saltwaters will be classified "C"; or

(C) after November 1, 1986, any newly created areas of tidal saltwater which are connected to Class SA waters by approved dredging projects will be classified "SC" unless case-by-case reclassification proceedings are conducted.

(2) The following river basins have different policies for unnamed streams entering other states or for specific areas of the basin:

Hiwassee River Basin (Rule .0302); Little Tennessee River Basin and Savannah River Drainage Area (Rule .0303); French Broad River Basin (Rule .0304); Watauga River Basin (Rule .0305); Broad River Basin (Rule .0306); New River Basin (Rule .0307); Catawba River Basin (Rule .0308); Yadkin-Pee Dee River Basin (Rule .0309); Lumber River Basin (Rule .0310); Roanoke River Basin (Rule .0313); Tar-Pamlico River Basin (Rule .0316); Pasquotank River Basin (Rule .0317).

History Note: *Statutory Authority G.S. 143-214.1; 143-215.1; 143-215.3(a)(1);*
Eff. February 1, 1976;
Amended Eff. August 3, 1992; August 1, 1990; October 1, 1989; November 1, 1986.

.0305 WATAUGA RIVER BASIN

(a) Places where the schedule may be inspected:

(1) Clerk of Court:
Avery County
Watauga County

(2) North Carolina Department of Environment, Health, and Natural Resources
Asheville Regional Office
Interchange Building
59 Woodfin Place
Asheville, North Carolina

(b) Unnamed Streams. Such streams entering the State of Tennessee are classified "C."

.0305 WATAUGA RIVER BASIN

Name of Stream	Description	Class	Classification Date	Index No.
WATAUGA RIVER	From source to U.S. Hwy. 321 Bridge	B Tr HQW	8/1/90	8-(1)
Shanty Spring Branch	From source to Watauga River	C	5/15/63	8-2
Green Ridge Branch	From source to Watauga River	C	5/15/63	8-3
Valley Creek	From source to Watauga River	C Tr	7/1/73	8-4
Unnamed Tributary to Watauga River (Seven Devils Resort Lake)	From source to dam at Seven Devils Resort Lake	B Tr	10/1/87	8-4.5-(1)
Unnamed Tributary to Watauga River	From dam at Seven Devils Resort Lake to Watauga River	C Tr	7/1/73	8-4.5-(2)
Moody Mill Creek	From source to Watauga River	C Tr	7/1/73	8-5
Spice Bottom Creek	From source to Moody Mill Creek	C Tr	7/1/73	8-5-1
Unnamed Tributary at Camp Rainbow	From source to Watauga River	C Tr	5/15/63	8-6
Boone Fork (Price Lake)	From source to Watauga River	C Tr ORW	2/1/93	8-7
Cold Prong	From source to Boone Fork	C Tr ORW	2/1/93	8-7-1
Laurel Creek	From source to Price Lake, Boone Fork	C Tr ORW	2/1/93	8-7-2
Sims Creek (Sims Pond)	From source to Boone Fork	C Tr ORW	2/1/93	8-7-3
Hoot Camp Branch	From source to Sims Creek	C ORW	2/1/93	8-7-3-1
Green Branch	From source to Boone Fork	C ORW	2/1/93	8-7-4
Cannon Branch	From source to Boone Fork	C ORW	2/1/93	8-7-5
Bee Tree Creek	From source to Boone Fork	C ORW	2/1/93	8-7-6
Lance Creek	From source to Dam at Camp Yonahlossee Bathing Lake	B Tr	7/1/73	8-8-(1)
Lance Creek	From Camp Yonahlossee Bathing Lake to Watauga River	C Tr	7/1/73	8-8-(2)
Big Branch	From source to Watauga River	C	5/15/63	8-9
Laurel Fork	From source to Watauga River	C Tr	5/15/63	8-10
Harrison Branch	From source to Laurel Fork	C	5/15/63	8-10-1
Unnamed Tributary at N.C. Prison Unit # 116	From source to Laurel Fork	C	5/15/63	8-10-2
Upper Laurel Fork	From source to Laurel Fork	C	5/15/63	8-10-3
Hayes Branch	From source to Upper Laurel Fork	C	5/15/63	8-10-3-1
Lost Branch	From source to Watauga River	C Tr	5/15/63	8-11
Dutch Creek	From source to Clark Creek	B Tr	7/1/89	8-12-(0.5)
Pigeonroost Creek	From source to Dutch Creek	B	7/1/89	8-12-1
Dutch Creek	From Clark Creek to Watauga County SR 1112	C Tr	5/15/63	8-12-(1.5)
Clark Creek	From source to Dutch Creek	C	5/15/63	8-12-2
Craborchard Creek	From source to Dutch Creek	C Tr	5/15/63	8-12-3
Dutch Creek	From Watauga County SR 1112 to Watauga River	B Tr	7/1/89	8-12-(3.5)
Baird Creek	From source to Watauga River	C	5/15/63	8-13
Mirefield Creek	From source to Baird Creek	C	5/15/63	8-13-1
Big Branch	From source to Watauga River	C	5/15/63	8-14
Cove Creek	From source to Watauga River	C	5/15/63	8-15
Ellison Branch	From source to Cove Creek	C Tr	7/1/73	8-15-1
North Fork Ellison Branch	From source to Ellison Branch	C	5/15/63	8-15-1-1

.0305 WATAUGA RIVER BASIN

Name of Stream	Description	Class	Classification Date	Index No.
South Fork Ellison Branch	From source to Ellison Branch	C	5/15/63	8-15-1-2
North Fork Cove Creek	From source to Cove Creek	C	5/15/63	8-15-2
Long Branch	From source to Cove Creek	C	5/15/63	8-15-3
Kirby Branch	From source to Cove Creek	C	5/15/63	8-15-4
Sawyer Creek	From source to Cove Creek	C	5/15/63	8-15-5
North Fork Sawyer Creek	From source to Sawyer Creek	C	5/15/63	8-15-5-1
Sharp Creek	From source to Cove Creek	C	5/15/63	8-15-6
Laurel Branch	From source to Cove Creek	C	5/15/63	8-15-7
Vanderpool Creek	From source to Cove Creek	C	5/15/63	8-15-8
George Gap Branch	From source to Cove Creek	C	5/15/63	8-15-9
Brushy Fork	From source to Cove Creek	C	5/15/63	8-15-10
Linville Creek	From source to Brushy Fork	C	5/15/63	8-15-10-1
George Branch	From source to Brushy Fork	C	5/15/63	8-15-10-2
Phillips Branch	From source to Cove Creek	C	5/15/63	8-15-11
East Fork Phillips Branch	From source to Phillips Branch	C	5/15/63	8-15-11-1
WATAUGA RIVER	From U.S. Hwy. 321 to North Carolina-Tennessee State Line	B HQW	12/1/90	8-(16)
Laurel Creek	From source to Watauga River	C Tr	5/15/63	8-17
Worley Creek	From source to Laurel Creek	C Tr	5/15/63	8-17-1
Spice Branch (Creek)	From source to Laurel Creek	C	5/15/63	8-17-2
Rush Branch	From source to Watauga River	C	5/15/63	8-18
Beaverdam Creek	From source to Watauga River	C Tr	5/15/63	8-19
Forest Grove Creek	From source to Beaverdam Creek	C	5/15/63	8-19-1
Little Beaverdam Creek	From source to Beaverdam Creek	C Tr	7/1/73	8-19-2
Jones Branch	From source to Little Beaverdam Creek	C	5/15/63	8-19-2-1
Fork Branch	From source to Little Beaverdam Creek	C	5/15/63	8-19-2-2
Rube Creek	From source to Beaverdam Creek	C	5/15/63	8-19-3
Cornett Branch	From source to Rube Creek	C	5/15/63	8-19-3-1
West Fork Rube Creek	From source to Rube Creek	C	5/15/63	8-19-3-2
Beech Creek	From source to Watauga River	C Tr	5/15/63	8-20
Sawmill Branch	From source to Beech Creek	C Tr	5/15/63	8-20-1
Pond Creek (Pond Branch)	From source to a point 0.6 mile upstream of mouth of West Pond Creek	WS-II Tr	8/3/92	8-20-2-(0.3)
Pond Creek (Pond Branch)	From a point 0.6 mile upstream of mouth of West Pond Creek to West Pond Creek (Town of Beech Mountain, Beech Mountain Resort, Inc. water supply intake)	WS-II Tr CA	8/3/92	8-20-2-(0.4)
Pond Creek (Pond Branch)	From West Pond Creek to Beech Creek	C Tr	8/3/92	8-20-2-(0.7)
West Pond Creek	From source to a point 0.6 mile upstream of mouth	WS-II Tr	8/3/92	8-20-2-1-(1)
West Pond Creek	From a point 0.6 mile upstream of mouth to Pond Creek	WS-II Tr CA	8/3/92	8-20-2-1-(2)
Lake Coffey	Entire lake and connecting stream to Pond Creek	WS-II Tr CA	8/3/92	8-20-2-2
Buckeye Creek	From source to a point 0.2 mile downstream of Bear Branch	WS-II Tr	8/3/92	8-20-3-(0.5)
Bear Branch	From source to Buckeye Creek	WS-II	8/3/92	8-20-3-1

.0305 WATAUGA RIVER BASIN

Name of Stream	Description	Class	Classification Date	Index No.
Buckeye Creek	From a point 0.2 mile downstream of Bear Branch to Town of Beech Mountain water supply intake located 0.3 mile upstream of mouth of Grassy Gap Creek	WS-II Tr CA	8/3/92	8-20-3-(1.5)
New Branch	From source to a point 0.3 mile upstream of mouth	WS-II	8/3/92	8-20-3-2-(1)
New Branch	From a point 0.3 mile upstream of mouth to Buckeye Creek	WS-II CA	8/3/92	8-20-3-2-(2)
Buckeye Creek	From Town of Beech Mountain water supply intake to Beech Creek	C Tr	7/1/73	8-20-3-(2.5)
Grassy Gap Creek (Grassy Gap Branch)	From source to Buckeye Creek	C	5/15/63	8-20-3-3
Cannon Branch	From source to Buckeye Creek	C	5/15/63	8-20-3-4
Clingman Mine Branch	From source to Buckeye Creek	C	5/15/63	8-20-3-5
Phillips Branch	From source to Beech Creek	C	5/15/63	8-20-4
Poga Creek (Flat Springs Creek)	From North Carolina-Tennessee State Line to Beech Creek	C Tr	7/1/73	8-20-5
Flat Springs Branch	From source to Poga Creek	C	5/15/63	8-20-5-1
Stone Mountain Branch	From source to Watauga River	C	5/15/63	8-21
Elk River (Banner Elk Creek)	From source to Sugar Creek	C	5/15/63	8-22-(1)
Flattop Creek	From source to Elk River	C	5/15/63	8-22-2
Bee Branch	From source to Flattop Creek	C	5/15/63	8-22-2-1
Elk River (Mill Pond)	From Sugar Creek to Peavine Creek	C Tr	5/15/63	8-22-(3)
Sugar Creek	From source to Elk River	C Tr	5/15/63	8-22-4
Hanging Rock Creek (Elk Creek)	From source to Elk River	C Tr	7/1/73	8-22-5
Horse Bottom Creek	From source to Hanging Rock Creek	C Tr	7/1/73	8-22-5-1
Unnamed Tributary to Elk River at Grandfather Home	From source to Elk River	C	5/15/63	8-22-6
Shawneehaw Creek	From source to Mill Pond, Elk River	C Tr	7/1/73	8-22-7
Wildcat Creek (Wildcat Lake)	From source to Dam at Wildcat Lake	B	5/15/63	8-22-8-(1)
Wildcat Creek	From Dam at Wildcat Lake to Elk River	C	5/15/63	8-22-8-(2)
Leroy Creek	From source to Elk River	C	5/15/63	8-22-9
Whitehead Creek	From source to Elk River	C Tr	7/1/73	8-22-10
Clear Branch	From source to Elk River	C	5/15/63	8-22-11
Ramp Branch	From source to Elk River	C	5/15/63	8-22-12
Horney Branch (Whitehead Creek)	From source to Elk River	C Tr	5/15/63	8-22-13
Lee Branch (Hickory Branch)	From source to Horney Branch	C	5/15/63	8-22-13-1
Puckett Branch	From source to Lee Branch	C	5/15/63	8-22-13-1-1
Peavine Branch	From source to Elk River	C Tr	5/15/63	8-22-14
Elk River	From Peavine Branch to North Carolina-Tennessee State Line	B Tr	4-1-94	8-22-(14.5)
Curtis Creek	From source to Elk River	C Tr	5/15/63	8-22-15
Cranberry Creek	From source to Elk River	C Tr	5/15/63	8-22-16
Cooper Branch	From source to Cranberry Creek	C	5/15/63	8-22-16-1

.0305 WATAUGA RIVER BASIN

Name of Stream	Description	Class	Classification Date	Classification Index No.
Blevins Creek	From source to Cranberry Creek	C Tr	5/15/63	8-22-16-2
Greenbrier Creek	From source to Blevins Creek	C Tr	5/15/63	8-22-16-2-1
Miller Branch	From source to Cranberry Creek	C	5/15/63	8-22-16-3
Little Elk Creek	From source to Elk River	C Tr	5/15/63	8-22-17
Skalley Branch	From source to Elk River	C Tr	7/1/73	8-22-18
Mill Creek	From North Carolina-Tennessee State Line to Elk River	C Tr	7/1/73	8-22-19
Fall Creek	From source to Elk River	C Tr	7/1/73	8-22-20
Jones Branch (Jones Falls Branch)	From North Carolina-Tennessee State Line to Elk River	C	5/15/63	8-22-21
Pine Camp Branch	From source to North Carolina-Tennessee State Line	C	5/15/63	8-22-22
Nowhere Branch (Stony Creek)	From source to North Carolina-Tennessee State Line	C	5/15/63	8-22-23
Trivett Branch (Dark Ridge Branch)	From source to North Carolina-Tennessee State Line	C	5/15/63	8-22-23-1
Buck Creek	From source to North Carolina-Tennessee State Line	C	5/15/63	8-23-1
State Line Branch	From North Carolina-Tennessee State Line to Buck Creek	C	5/15/63	8-23-1-1
Bear Branch	From source to North Carolina-Tennessee State Line	C	5/15/63	8-23-1-2

APPENDIX III

DWQ Benthic Macroinvertebrate Sampling Program
in the Watauga River Basin

BENTHIC MACROINVERTEBRATES

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since many taxa in a community have life cycles of six months to one year, the effects of short term pollution (such as a spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures. Criteria have been developed to assign 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 (EPT S). Likewise, ratings can be assigned with a Biotic Index. This index summarizes tolerance data for all taxa in each collection. The two rankings are given equal weight in final site classification. Higher taxa richness values are associated with better water quality. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is poorly assessed by a taxa richness analysis. Different criteria have been developed for different ecoregions (mountains, piedmont and coastal) within North Carolina.

Classification Criteria by Ecoregion*

A. EPT taxa richness values

	10-sample Qualitative Samples			4-sample EPT Samples		
	Mountains	Piedmont	Coastal	Mountains	Piedmont	Coastal
Excellent	>41	>31	>27	>35	>27	>23
Good	32-41	24-31	21-27	28-35	21-27	18-23
Good-Fair	22-31	16-23	14-20	19-27	14-20	12-17
Fair	12-21	8-15	7-13	11-18	7-13	6-11
Poor	0-11	0-7	0-6	0-10	0-6	0-5

B. Biotic Index Values (Range = 0-10)

	Mountains	Piedmont	Coastal A
Excellent	<4.05	<5.19	<5.47
Good	4.06-4.88	5.19-5.78	5.47-6.05
Good-Fair	4.89-5.74	5.79-6.48	6.06-6.72
Fair	5.75-7.00	6.49-7.48	6.73-7.73
Poor	>7.00	>7.48	>7.73

*These criteria apply to flowing water systems only. Biotic index criteria are only used for full-scale (10-sample) qualitative samples.

Table 1 below lists all the benthic macroinvertebrate collections in the Watauga River basin between 1983 and 1994, giving site location, DEM classification schedule Index Number, collection date, taxa richness and biotic index values, and bioclassifications. Final bioclassifications assigned may take into account seasonal correction of both EPT taxa richness and Biotic Index value if the sample is collected outside of summer. Bioclassifications listed in this report may differ from older reports because evaluation criteria have changed since 1983. Originally, Total taxa richness and EPT taxa richness criteria were used, then just EPT taxa richness, and now BI as well as EPT taxa richness criteria are used. Refinements of the criteria continue to occur as more data is gathered.

Since 1983, 48 benthos samples have been taken at 31 sites in the basin. Of these, 22 were given an Excellent bioclassification, 24 were Good, and 2 were Good-Fair. No Fair or Poor sites were found.

Table 1. Benthic Macroinvertebrate Data Collected from 1983 through 1994 in the Watauga River Basin

Site	Old/New DEM #	Index #	Date	S/EPT S	BI/BIEPT	Bioclass
Watauga R, SR 1339, Avery	6/B-1	8-(1)	07/88	-/38	-/1.70	Excellent
			08/85	61/33	3.22/2.02	Excellent
Watauga R, SR 1594, Watauga	7/B-2	8-(1)	03/90	-/40	-/1.89	Good
			07/88	83/44	3.21/2.39	Excellent
			08/85	67/34	3.24/2.52	Excellent
Watauga R, SR 1580, Watauga	8/B-4	8-(1)	08/94	-/38	-/2.86	Excellent
			07/88	-/38	-/3.16	Excellent
			08/85	76/32	4.45/3.15	Good
Watauga R, NC 105 nr Shulls Mill, Watauga	F/B-5	8-(1)	08/94	74/41	3.68/2.99	Excellent
			03/90	99/57	3.18/2.42	Excellent
			08/89	104/46	3.79/2.96	Excellent
			07/88	-/45	-/2.62	Excellent
			08/87	93/45	3.98/2.76	Excellent
			08/85	84/45	4.00/2.71	Excellent
Valley Cr, NC 105, Watauga	59/B-6	8-4	03/90	-/29	-/1.90	Good-Fair
Spice Bottom Cr, SR 1560, Watauga	60/B-7	8-5-1	03/90	-/38	-/2.76	Good
Boone Fk, SR 1561, Watauga	-/B-8	8-7	08/94	58/36	2.37/1.72	Excellent
			11/89	-/42	-/1.59	Excellent
Boone Fk, off SR 1558 (bel lake), Watauga	-/B-9	8-7	08/94	-/31	-/2.38	Good
Boone Fk, SR 1558, Watauga	61/B-10	8-7	03/90	-/45	-/2.27	Excellent
Lance Fk, ab golf course, Watauga	62/B-11	8-8	03/90	-/33	-/1.88	Excellent
Lance Fk, in golf course, Watauga	63/B-12	8-8	03/90	-/27	-/2.39	Good
Laurel Fk, SR 1111, Watauga	64/B-13	8-10	09/94	-/24	-/2.78	Good-Fair
			03/90	-/31	-/2.71	Good
Dutch Cr, off NC 105, Watauga	22/B-14	8-12	07/88	87/38	4.49/3.16	Good
Watauga R, NC 194, Watauga	58/B-15	8-(16)	03/90	93/51	3.80/2.83	Excellent
Watauga R, SR 1121 nr Sugar Grove, Watauga	G/B-16	8-(16)	08/94	87/42	4.10/3.32	Good
			07/90	101/48	4.57/3.48	Excellent
			07/86	101/45	4.84/3.31	Good
			08/85	88/40	4.63/3.38	Good
			08/84	99/41	4.77/3.25	Good
			08/83	94/40	4.92/3.67	Good
Watauga R, SR 1200 nr Peoria, Watauga	24/B-17	8-(16)	08/94	97/46	3.57/2.73	Excellent
			07/88	86/38	4.57/3.00	Good
Cove Cr, SR 1305, Watauga	23/B-18	8-15	07/88	-/33	-/3.12	Good
Cove Cr, NC 321, Watauga	-/B-19	8-15	08/94	-/31	-/3.10	Good
Beaverdam Cr, SR 1201, Watauga	-/B-20	8-19	08/94	-/32	-/2.42	Good
Beech Cr, ab Pond Cr, Watauga	13/B-21	8-20	09/87	53/29	2.55/1.45	Good
Beech Cr, SR 1126 (be Pond Cr), Watauga	13/B-22	8-20	09/87	54/30	2.92/1.70	Good
Beech Cr, NC 321 (ab Poga Cr), Watauga	-/B-23	8-20	08/94	95/46	3.08/2.32	Excellent
Pond Cr, ab WWTP, Watauga	11/B-24	8-20-2	09/87	54/29	2.89/1.51	Excellent
Pond Cr, nr mouth, Watauga	12/B-25	8-20-2	09/87	41/24	2.88/1.85	Good
Buckeye Cr, headwaters, Watauga	10/B-26	8-20-3	04/84	48/26	2.95/1.74	Good
Buckeye Cr, ab Grassy Gap Cr, Watauga	10/B-27	8-20-3	04/84	50/29	2.40/1.79	Good
Buckeye Cr, SR 1312, Watauga	10/B-28	8-20-3	04/84	59/31	2.85/1.72	Good
Elk R, off NC 184 be SR 1337, Avery	-/B-29	8-22-(3)	08/94	77/33	4.60/3.71	Good
Elk R, SR 1326 be Banner Elk, Avery	-/B-30	8-22-(3)	08/94	76/33	3.83/3.02	Good
Elk R, SR 1305 nr Horseshoe Bend, Avery	-/B-31	8-22-(3) 08/94	-/36	-/2.67	Excellent	

APPENDIX IV

NPDES Permit Requirements for Trout Farms

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL MANAGEMENT

GENERAL PERMIT NO. NCG0000

TO DISCHARGE SEAFOOD PACKING AND RINSING, FISH FARMS AND SIMILIAR WASTEWATERS UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provision of North Carolina General Statute 143-215.1, other lawful standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission, and the Federal Water Pollution Control Act, as amended, this permit is hereby issued to all owners or operators, hereafter permittees, which are covered by this permit as evidenced by receipt of a Certificate of Coverage by the Environmental Management Commission to allow the discharge of treated wastewater in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, III and IV hereof.

This permit shall become effective August 1, 1992

This permit shall expire at midnight on July 31, 1997

Date: 7-31-92

A. Preston Howard, Jr., P.E., Acting Director
Division of Environmental Management
By Authority of the Environmental Management Commission

PART I

A. Effluent Limitations and Monitoring Requirements Final

NPDES Permit No. NCG 0000

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge from outfall(s) serial number 001. Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristics	Discharge Limitation		Monitoring Requirements		
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location
Flow			Annually	Estimate	Effluent
Total Suspended Solids	30.0 mg/l	60.0 mg/l	Annually	Grab	Effluent
Settleable Solids	5.0 ml/l	10.0 ml/l	Annually	Grab	Effluent
Dissolved Oxygen	*	*	Annually	Grab	Effluent

* The daily average dissolved oxygen effluent concentration shall not be less than 6.0 mg/l.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units for fresh surface water classifications. The pH shall not be less than 6.8 standard units nor greater than 8.5 standard units for tidal salt water classifications.

There shall be no discharge of fish parts, floating solids, or visible foam except in other than trace amounts.

PART I

SECTION B. SCHEDULE OF COMPLIANCE

1. The permittee shall comply with Final Effluent Limitations specified for discharges in accordance with the following schedule:

   Permittee shall comply with Final Effluent Limitations by the effective date of the permit unless specified below.

2. Permittee shall at all times provide the operation and maintenance necessary to operate the existing facilities at optimum efficiency.

3. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next schedule requirements.

PART II
STANDARD CONDITIONS FOR NPDES PERMITS

SECTION A. DEFINITIONS

1. Permit Issuing Authority

   The Director of the Division of Environmental Management.

2. DEM or Division

   Means the Division of Environmental Management, Department of Environment, Health and Natural Resources.

3. EMC

   Used herein means the North Carolina Environmental Management Commission.

4. Permittee

   Used herein means the entity who obtains coverage under this general permit by subsequent issuance of a "Certificate of Coverage" by the Division of Environmental Management.

5. Act or "the Act"

   The Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 USC 1251, et. seq.

6. Mass/Day Measurements

   a. The "monthly average discharge" is defined as the total mass of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such month. It is therefore, an arithmetic mean found by adding the weights of the pollutant found each day of the month and then dividing this sum by the number of days the tests were reported. The limitation is identified as "Monthly Average" in Part I of the permit.

   b. The "weekly average discharge" is defined as the total mass of all daily discharges sampled and/or measured during the calendar week (Sunday - Saturday) on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such week. It is, therefore, an arithmetic mean found by adding the weights of pollutants found each day of the week and then dividing this sum by the number of days the tests were reported. This limitation is identified as "Weekly Average" in Part I of the permit.

   c. The "maximum daily discharge" is the total mass (weight) of a pollutant discharged during a calendar day. If only one sample is taken during any calendar day the weight of pollutant calculated from it is the "maximum daily discharge." This limitation is identified as "Daily Maximum," in Part I of the permit.

d. The "average annual discharge" is defined as the total mass of all daily discharges sampled and/or measured during the calendar year on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such year. It is, therefore, an arithmetic mean found by adding the weights of pollutants found each day of the year and then dividing this sum by the number of days the tests were reported. This limitation is defined as "Annual Average" in Part I of the permit.

7. Concentration Measurement

a. The "average monthly concentration," other than for fecal coliform bacteria, is the sum of the concentrations of all daily discharges sampled and/or measured during a calendar month on which daily discharges are sampled and measured, divided by the number of daily discharges sampled and/or measured during such month (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all the samples collected during that calendar day. The average monthly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar month. This limitation is identified as "Monthly Average" under "Other Units" in Part I of the permit.

b. The "average weekly concentration," other than for fecal coliform bacteria, is the sum of the concentrations of all daily discharges sampled and/or measured during a calendar week (Sunday/Saturday) on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such week (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all the samples collected during that calendar day. The average weekly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar week. This limitation is identified as "Weekly Average" under "Other Units" in Part I of the permit.

c. The "maximum daily concentration" is the concentration of a pollutant discharge during a calendar day. If only one sample is taken during any calendar day the concentration of pollutant calculated from it is the "Maximum Daily Concentration". It is identified as "Daily Maximum" under "Other Units" in Part I of the permit.

d. The "average annual concentration," other than for fecal coliform bacteria, is the sum of the concentrations of all daily discharges sampled and/or measured during a calendar year on which daily discharges are sampled and measured divided by the number of daily discharges sampled and/or measured during such year (arithmetic mean of the daily concentration values). The daily concentration value is equal to the concentration of a composite sample or in the case of grab samples is the arithmetic mean (weighted by flow value) of all the samples collected during that calendar day . The average yearly count for fecal coliform bacteria is the geometric mean of the counts for samples collected during a calendar year.

e. The "daily average concentration" (for dissolved oxygen) is the minimum allowable amount of dissolved oxygen required to be available in the effluent prior to discharge averaged over a calendar day. If only one dissolved oxygen sample is taken over a calendar day, the sample is considered to be the "daily average concentration" for the discharge. It is identified as "daily average" in the text of Part I.

f. The "quarterly average concentration" is the average of all samples taken over a calendar quarter. It is identified as "Quarterly Average Limitation" in the text of Part I of the permit.

g. A calendar quarter is defined as one of the following distinct periods: January through March, April through June, July through September, and October through December.

8. Other Measurements

a. Flow, (MGD): The flow limit expressed in this permit is the 24 hours average flow, averaged monthly. It is determined as the arithmetic mean of the total daily flows recorded during the calendar month.

b. An "instantaneous flow measurement" is a measure of flow taken at the time of sampling, when both the sample and flow will be representative of the total discharge.

c. A "continuous flow measurement" is a measure of discharge flow from the facility which occurs continually without interruption throughout the operating hours of the facility. Flow shall be monitored continually except for the infrequent times when there may be no flow or for infrequent maintenance activities on the flow device.

9. Types of Samples

a. Composite Sample: A composite sample shall consist of:

(1) a series of grab samples collected at equal time intervals over a 24 hour period of discharge and combined proportional to the rate of flow measured at the time of individual sample collection, or

(2) a series of grab samples of equal volume collected over a 24 hour period with the time intervals between samples determined by a preset number of gallons passing the sampling point. Flow measurement between sample intervals shall be determined by use of a flow recorder and totalizer, and the present gallon interval between sample collection fixed at no greater than 1/24 of the expected total daily flow at the treatment system, or

(3) a single, continuous sample collected over a 24 hour period proportional to the rate of flow.

In accordance with (1) above, the time interval between influent grab samples shall be no greater than once per hour, and the time interval between effluent grab

samples shall be no greater than once per hour except at wastewater treatment systems having a detention time of greater than 24 hours. In such cases, effluent grab samples may be collected at time intervals evenly spaced over the 24 hour period which are equal in number of hours to the detention time of the system in number of days. However, in no case may the time interval between effluent grab samples be greater than six (6) hours nor the number of samples less than four (4) during a 24 hour sampling period.

b. Grab Sample: Grab samples are individual samples collected over a period of time not exceeding 15 minutes; the grab sample can be taken manually.

10. Calculation of Means

a Arithmetic Mean: The arithmetic mean of any set of values is the summation of the individual values divided by the number of individual values.

b. Geometric Mean: The geometric mean of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

c. Weighted by Flow Value: Weighted by flow value means the summation of each concentration times its respective flow divided by the summation of the respective flows.

11. Calendar Day

A calendar day is defined as the period from midnight of one day until midnight of the next day. However, for purposes of this permit, any consecutive 24-hour period that reasonably represents the calendar day may be used for sampling.

11. Hazardous Substance

A hazardous substance means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the Clean Water Act.

13. Toxic Pollutant

A toxic pollutant is any pollutant listed as toxic under Section 307(a)(1) of the Clean Water Act.

SECTION B. GENERAL CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

Part II

a. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the Clean Water Act within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

b. The Clean Water Act provides that any person who violates a permit condition is subject to a civil penalty not to exceed $25,000 per day for each violation. Any person who negligently violates any permit condition is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment for not more than 1 year, or both. Any person who knowingly violates permit conditions is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. Also, any person who violates a permit condition may be assessed an administrative penalty not to exceed $10,000 per violation with the maximum amount not to exceed $125,000. [Ref: Section 309 of the Federal Act 33 U.S.C. 1319 and 40 CFR 122.41 (a)].

c. Under state law, a daily civil penalty of not more than ten thousand dollars ($10,000) per violation may be assessed against any person who violates or fails to act in accordance with the terms, conditions, or requirements of a permit. [Ref: North Carolina General Statutes § 143-215.6 (A)].

2. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II, C.4.) and "Power Failures" (Part II, C.7.), nothing in this permit shall be construed to relieve the permittee from any responsibilities, liabilities, or penalties for noncompliance pursuant to NCGS 143-215.3, 143-215.6 or Section 309 of the Federal Act, 33 USC 1319. Furthermore, the permittee is responsible for consequential damages, such as fish kills, even though the responsibility for effective compliance may be temporarily suspended.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under NCGS 143-215.75 et seq. or Section 311 of the Federal Act, 33 USG 1321. Furthermore, the permittee is responsible for consequential damages, such as fish kills, even though the responsibility for effective compliance may be temporarily suspended.

5. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

Part II

6. Onshore or Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

7. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

8. Duty to Provide Information

The permittee shall furnish to the Permit Issuing Authority, within a reasonable time, any information which the Permit Issuing Authority may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Permit Issuing Authority upon request, copies of records required to be kept by this permit.

9. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

10. Permit Termination

After public notice and opportunity for a hearing, the general permit and Certificates of Coverage issued under this general permit may be terminated for cause.

11. When an Individual Permit may be Required

The Division may require any owner authorized to discharge under this permit to apply for and obtain an individual permit. Cases where an individual permit may be required include, but are not limited to, the following:

(a) The discharger is a significant contributor of pollution.

(b) Conditions at the operating facility change altering the constituents and/or characteristics of the discharge such that the discharge no longer qualifies for a General Permit.

(c) The discharge violates the terms or conditions of this permit.

(d) A change has occurred in the availability of demonstrated technology or practices for the control or abatement of pollutants applicable to the point source.

(e) Effluent limitation guidelines are promulgated for the point sources covered by this permit.

(f) A water quality management plan containing requirements applicable to such point sources is approved after the issuance of this permit.

This permit may be terminated as to an individual owner for any of the reasons set forth above after appropriate notice in accordance with N.C.G.S. 143-215.1.

12. When an Individual Permit may be Requested

Any permittee operating under this permit may request to be excluded from the coverage of this permit by applying for an individual permit. When an individual permit is issued to an owner the applicability of this general permit is automatically terminated on the effective date of the individual permit. When a General Permit is issued which applies to an owner already covered by an individual permit, such permittee may request exclusion from the provisions of the General Permit and subsequent coverage under an individual permit.

13. Signatory Requirements

All applications, reports, or information submitted to the Permit Issuing Authority shall be signed and certified.

a. All permit applications shall be signed as follows:

(1) For a corporation: by a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means: (a) a president, secretary, treasurer or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or (b) the manager of one or more manufacturing production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding 25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.

b. All reports required by the permit and other information requested by the Permit Issuing Authority shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described above;

(2) The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or well field, superintendent, a position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized

representative may thus be either a named individual or any individual occupying a named position.); and

(3) The written authorization is submitted to the Permit Issuing Authority.

c. Certification. Any person signing a document under paragraphs a. or b. of this section shall make the following certification:

"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

14. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

15. Permit Modification, Revocation and Reissuance, or Termination

The issuance of this permit does not prohibit the permit issuing authority from reopening and modifying the permit, revoking and reissuing the permit, or terminating the permit as allowed by the laws, rules, and regulations contained in Title 40, Code of Federal Regulations, Parts 122 and 123; Title 15A of the North Carolina Administrative Code, Subchapter 2H .0100; and North Carolina General Statute 143-215.1 et. al.

SECTION C. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Certified Operator

Pursuant to Chapter 90A-44 of North Carolina General Statutes, the permittee shall employ a certified wastewater treatment plant operator in responsible charge (ORC) of the wastewater treatment facilities. Such operator must hold a certification of the grade equivalent to or greater than the classification assigned to the wastewater treatment facilities. The permittee shall notify the Division's Operator Training and Certification Unit within thirty days of any change in the ORC status.

2. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit.

Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

3. Need to Halt or Reduce not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the condition of this permit.

4. Bypassing of Treatment Facilities

a. Definitions

(1) "Bypass" means the known diversion of waste streams from any portion of a treatment facility including the collection system, which is not a designed or established or operating mode for the facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations.

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Paragraphs c. and d. of this section.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass; including an evaluation of the anticipated quality and affect of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part II, E. 6. of this permit. (24-hour notice).

d. Prohibition of Bypass

(1) Bypass is prohibited and the Permit Issuing Authority may take enforcement action against a permittee for bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes or maintenance during normal

periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The permittee submitted notices as required under Paragraph c. of this section.

(2) The Permit Issuing Authority may approve an anticipated bypass, after considering its adverse affects, if the Permit Issuing Authority determines that it will meet the three conditions listed above in Paragraph d. (1) of this section.

5. Upsets

a. Definition.

"Upset " means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph c. of this condition are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset.

A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset as required in Part II, E. 6. (b) (B) of this permit.

(4) The permittee complied with any remedial measures required under Part II, B. 2. of this permit.

d. Burden of proof.

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

Part II

6. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in accordance with NCGS 143-215.1 and in a manner such as to prevent any pollutant from such materials from entering waters of the State or navigable waters of the United States. The permittee shall comply with all existing federal regulations governing the disposal of sewage sludge. Upon promulgation of 40 CFR Part 503, any permit issued by the Permit Issuing Authority for the disposal of sludge may be reopened and modified, or revoked and reissued, to incorporate applicable requirements at 40 CFR Part 503. The permittee shall comply with applicable 40 CFR Part 503 Standards for the Use and Disposal of Sewage Sludge (when promulgated) within the time provided in the regulation, even if the permit is not modified to incorporate the requirement. The permittee shall notify the Permit Issuing Authority of any significant change in its sludge use or disposal practices.

7. Power Failures

The permittee is responsible for maintaining adequate safeguards as required by DEM Regulation, Title 15A, North Carolina Administrative Code, Subchapter 2H, .0124 Reliability, to prevent the discharge of untreated or inadequately treated wastes during electrical power failures either by means of alternate power sources, standby generators or retention of inadequately treated effluent.

SECTION D. MONITORING AND RECORDS

1. Representative Sampling

Samples collected and measurements taken, as required herein, shall be characteristic of the volume and nature of the permitted discharge. Samples collected at a frequency less than daily shall be taken on a day and time that is characteristic of the discharge over the entire period which the sample represents. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Permit Issuing Authority.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than 10% from the true discharge rates throughout the range of expected discharge volumes. Once-through condenser cooling water flow which is monitored by pump logs, or pump hour meters as specified in Part I of this permit and based on the manufacturer's pump curves shall not be subject to this requirement.

3. Test Procedures

Test procedures for the analysis of pollutants shall conform to the EMC regulations published pursuant to NCGS 143-215.63 et. seq., the Water and Air Quality Reporting Acts, and to regulations published pursuant to Section 304(g), 33 USC 1314, of the Federal Water Pollution Control Act, as Amended, and Regulation 40 CFR 136. To meet the intent of the monitoring required by this permit, all test procedures must produce minimum detection and reporting levels that are below

the permit discharge requirements and all data generated must be reported down to the minimum detection or lower reporting level of the procedure. If no approved methods are determined capable of achieving minimum detection and reporting levels below permit discharge requirements, then the most sensitive (method with the lowest possible detection and reporting level) approved method must be used.

4. Penalties for Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

5. Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

6. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The date, exact place, and time of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

7. Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to;

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

SECTION E. REPORTING REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

2. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR Part 122.29 (b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR Part 122.42 (a) (1).

3. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

4. Transfers

This permit is not transferable to any person except after notice to and approval by the Director. The Director may require modification or revocation and reissuance of the permit and incorporating such other requirements as may be necessary under the Clean Water Act.

5. Twenty-four Hour Reporting

a. The permittee shall report to the central office or the appropriate regional office any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee became aware of the circumstances. A written submission shall also be provided

within 5 days of the time the permittee becomes aware of the circumstances.

The written submission shall contain a description of the noncompliance, and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

b. The following shall be included as information which must be reported within 24 hours under this paragraph.

(A) Any unanticipated bypass which exceeds any effluent limitation in the permit.

(B) Any upset which exceeds any effluent limitation in the permit.

(C) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours.

c. The Director may waive the written report on a case-by-case basis for reports under paragraph b. above of this condition if the oral report has been received within 24 hours.

6. Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

7. Noncompliance Notification

The permittee shall report by telephone to either the central office or the appropriate regional office of the Division as soon as possible, but in no case more than 24 hours or on the next working day following the occurrence or first knowledge of the occurrence of any of the following:

a. Any occurrence at the water pollution control facility which results in the discharge of significant amounts of wastes which are abnormal in quantity or characteristic, such as the dumping of the contents of a sludge digester; the known passage of a slug of hazardous substance through the facility; or any other unusual circumstances.

b. Any process unit failure, due to known or unknown reasons, that render the facility incapable of adequate wastewater treatment such as mechanical or electrical failures of pumps, aerators, compressors, etc.

c. Any failure of a pumping station, sewer line, or treatment facility resulting in a by-pass directly to receiving waters without treatment of all or any portion of the influent to such station or facility.

Persons reporting such occurrences by telephone shall also file a written report in letter form within 5 days following first knowledge of the occurrence.

Part II

8. Availability of Reports

Except for data determined to be confidential under NCGS 143-215.3(a)(2) or Section 308 of the Federal Act, 33 USC 1318, all reports prepared in accordance with the terms shall be made available for public inspection at the offices of the Division of Environmental Management or at the site of the discharge within a reasonable time period, not to exceed five (5) days. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such
report may result in the imposition of criminal penalties as provided for in NCGS 143-215.1(b)(2) or in Section 309 of the Federal Act.

9. Penalties for Falsification of Reports

The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both.

PART III
OTHER REQUIREMENTS

1. Previous Permits

   All previous State water quality permits issued to this facility for this particular discharge, whether for construction or operation or discharge, are hereby revoked by issuance of this permit and subsequent issuance of a Certificate of Coverage. The conditions, requirements, terms, and provisions of this permit authorizing discharge under the National Pollutant Discharge Elimination System govern discharges from this facility.

2. Construction

   No construction of wastewater treatment facilities or additions thereto shall be begun until Final Plans and Specifications have been submitted to the Division of Environmental Management and approval has been granted by the Division. Design and operation of facilities and/or treatment works shall be in accordance with the application and supporting information. If facility deficiencies, design and/or operational, are identified in the future which could affect the facility performance or reliability, it is the responsibility of the permittee to correct such deficiencies.

3. Certified Operator

   Pursuant to Chapter 90A-44 of North Carolina General Statutes, the permittee shall employ a certified wastewater treatment plant operator in responsible charge (ORC) of the wastewater treatment facilities. Such operator must hold a certification of the grade equivalent to or greater than the classification assigned to the wastewater treatment facilities. The permittee shall notify the Division's Operator Training and Certification Unit within five days of any change in the ORC status.

4. Groundwater Monitoring

   The permittee shall, upon written notice from the Director of the Division of Environmental Management, conduct groundwater monitoring as may be required to determine the compliance of this NPDES permitted facility with the current groundwater standards.

5. Limitations Reopener

   This permit shall be modified or alternatively, revoked and reissued, to comply with any applicable effluent guideline or water quality standard issued or approved under Sections 302(b) (2) (c), and (d), 304(b) (2), and 307(a) (2) of the Clean Water Act, if the effluent guideline or water quality standard so issued or approved:

   a. contains different conditions or is otherwise more stringent than any effluent limitation in the permit; except for, if a water quality standard for Dioxin is modified and approved, this permit will be reopened or modified to reflect such changes as provided by 40 CFR 122.62 (c) (3)(i)(B); or

   b. controls any pollutant not limited in the permit.

   The permit as modified or reissued under this paragraph shall also contain any other requirements in the Act then applicable.

PART IV
ANNUAL ADMINISTERING AND COMPLIANCE MONITORING FEE REQUIREMENTS

1. The permittee must pay the annual administering and compliance monitoring fee within 30 (thirty) days after being billed by the Division. Failure to pay the fee in a timely manner in accordance with 15A NCAC 2H .0105(b)(4) may cause this Division to initiate action to revoke the Certificate of Coverage.

APPENDIX V

Lists of Best Management Practices (BMPs) For:

- Agriculture
- Urban Runoff
- Erosion and Sedimentation Control
- Onsite Wastewater Disposal
- Solid Waste Disposal
- Forestry
- Mining
  - Hydrologic Modifications

BMPs FOR AGRICULTURE

Detailed Implementation Plan*
September 1996 (Revised)

Definition of Practices

(1) An agrichemical handling facility means a permanent structure that provides an environmentally safe means of mixing agrichemicals and filling tanks with agrichemicals for the application and storage of agrichemicals to prevent accidental degradation of surface and ground water.

(2) A conservation tillage system means any tillage and planting system in which at least (30) thirty percent of the soil surface is covered by plant residue to reduce soil erosion and improve the quality of surface water.

(3) A critical area planting means an area of highly erodible land which can not be stabilized by ordinary conservation treatment on which permanent perennial vegetative cover is established and protected to reduce soil erosion and sedimentation and to improve the quality of surface water.

(4) A cropland conversion practice means to establish and maintain a conservation cover of grasses, trees, or wildlife plantings on fields previously used for crop production to reduce soil erosion and sedimentation and to improve the quality of surface water.

(5) A diversion means a channel constructed across a slope with a supporting ridge on the lower side to control drainage by diverting excess water from an area to reduce soil erosion and sedimentation and to improve the quality of surface water.

(6) A field border means a strip of perennial vegetation established at the edge of the field that provides a stabilized outlet for row water to reduce erosion, sedimentation and nutrient pollution to improve the quality of surface water.

(7) A filter strip means an area of permanent perennial vegetation for removing sediment, organic matter, and other pollutants from runoff and waste water to reduce erosion, sedimentation and nutrient pollution to improve the quality of surface water.

(8) A grade stabilization structure means a structure (earth embankment, mechanical spillway, detention-type, etc.) used to control the grade and head cutting in natural or artificial channels to reduce erosion and sedimentation and to improve the quality of surface water.

(9) A grassed waterway means a natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff to reduce erosion and sedimentation and to improve the quality of surface water.

(10) A heavy use protection area means an area used frequently and intensively by animals which must be stabilized by surfacing with suitable materials to reduce erosion, sedimentation and nutrient pollution to improve the quality of surface water.

(11) A livestock exclusion system means a system of permanent fencing (board, barbed, high tensile or electric wire) installed to exclude livestock from streams and critical areas not intended for grazing to reduce erosion, sedimentation and to improve the quality of surface water.

(12) A long term no-till practice means planting all crops for five consecutive years in at least 80 percent plant residue from preceding crops to reduce soil erosion and sedimentation and improve the quality of surface water.

(13) A pastureland conversion practice means establishing trees or perennial wildlife plantings on excessively eroding Class VII land being used for pasture that is too steep to mow or maintain with conventional equipment to reduce soil erosion and sedimentation and to improve the quality of surface water.

(14) A nutrient management practice means a definitive plan to manage the amount, form, placement, and timing of applications nutrients to minimize entry of nutrient to surface and groundwater and to improve water quality.

(15) A rock-lined outlet means a waterway having an erosionresistant lining of concrete, stone or other permanent material where an unlined or grassed waterways would be inadequate to provide safe disposal of runoff, reduce erosion and sedimentation and to improve the quality of surface water.

(16) A sediment basin means a basin constructed to trap and store waterborne sediment where physical conditions or land ownership preclude treatment of a sediment source by the installation of other erosion control measures to improve the quality of surface water.

(17) A sod-based rotation practice means an adapted sequence of crops and grasses established and maintained for a definite number of years which is designed to provide adequate organic residue for maintenance or improvement of soil filth to help reduce erosion and improve surface water quality.

(18) A stock trail or walkway means to provide a stable area used frequently and intensively for livestock movement by surfacing with suitable material to reduce erosion sedimentation and nutrient pollution to improve the quality of surface water.

(19) A stream protection system means a planned system for protecting streams and streambanks which eliminates the need for livestock to be in streams by providing an alternative watering source for livestock to reduce erosion and sedimentation and to improve the quality of surface water. System components may include:

(A) A spring development means improving springs and seeps by excavating, cleaning, capping or providing collection and storage facilities.

(B) A trough or tank means devices installed to provide drinking water for livestock at a stabilized location.

(C) A well means constructing a drilled, driven or dug well to supply water from an underground source.

(D) A windmill means erecting or constructing a mill operated by the wind's rotation of large vanes and is used as a source of power for pumping water.

(E) A stream crossing means a trail constructed across a stream to allow livestock to cross without disturbing the bottom or causing erosion on the banks.

(20) A stripcropping practice means to grow crops and sod in a systematic arrangement of alternating strips on the contour to reduce soil erosion and sedimentation and to improve the quality of surface water.

(21) A terrace means an earth embankment, a channel, or a combination ridge and channel constructed across the slope to reduce erosion, reduce sediment content in runoff water, and to improve the quality of surface water.

(22) A waste management system means a planned system in which all necessary components are installed for managing liquid and solid waste to prevent or minimize degradation of soil and water resources. System components may include:

(A) A waste storage pond means an impoundment made by excavation or earthfill for temporary storage of animal waste, waste water and polluted runoff.

(B) A drystack means a fabricated structure for temporary storage of animal waste.

(C) A composter/storage structure means a facility for the biological treatment, stabilization and environmentally safe storage of organic waste material (such as livestock and poultry manure and dead animal carcasses) to produce a material that can be recycled as a soil amendment and fertilizer substitute.

(D) A waste treatment lagoon means an impoundment made by excavation or earthfill for biological treatment and storage of animal waste.

(E) A waste application system means an environmentally safe system (such as solid set, dry hydrant, mobile irrigation equipment, etc.) for the conveyance and distribution of animal wastes from waste treatment and storage structures to agricultural field as part of an irrigation and nutrient management plan.

(F) A constructed wetlands for land application practice means an artificial wetland area into which liquid animal waste from a waste storage pond or lagoon is dispersed over time to lower the nutrient content of the liquid animal waste.

(G) A controlled livestock lounging area means a planned, stabilized and vegetated area in which livestock are kept for a short duration.

(H) A closure of abandoned waste treatment lagoons and waste storage ponds practice means the safe removal of existing waste and waste water and the application of this waste on land in an environmentally safe manner.

(I) A storm water management system means a system of collection and diversion practices (buttering, collection boxes, diversions, etc.) to prevent unpolluted storm water from flowing across concentrated waste area on animal operations.

(23) A water control structure means to provide control of surface and subsurface water through the use of permanent structures which increase infiltration and reduce runoff to improve the quality of surface and ground water.

(24) A waste utilization plan means a plan of using animal waste on land in an environmentally acceptable manner while maintaining or improving soil and plant resources to safeguard water resources.

(25) An insect control practice means an method of pest management used in an integrated pest management program to control target organisms and minimize contamination of soil, water, and

air, and minimize impacts to non-target organisms through cultural, biological and physical practices including safe and prudent use of pesticides.

(26) A riparian buffer means an area adjacent to solid blue line streams as shown on 7.5 minute USGS maps where a permanent, long-lived vegetative cover (sod, shrubs, trees, or a combination of vegetation types) is established to reduce soil erosion, sedimentation, nutrient and pesticide pollution, and to improve the quality of surface water and shallow ground water.

(27) An odor control management system means a practice or combination of practices (planting windbreaks, precharging structures, incorporation of waste into soil, etc.) which manages or controls odors from confined animal operations, waste treatment and storage structures and waste applied to agricultural land.

*To be used in conjunction with the most recent version of the APA Rules for the North Carolina Agriculture Cost Share Program for Nonpoint Source Pollution Control and the NCACSP Manual.

Best Management Practices Eligible for Cost Share Payments

Best Management Practices eligible for cost sharing include the following practices and any approved District BMPs. District BMPs shall be reviewed by the Division for technical merit in achieving the goals of this program. Upon approval by the Division, the District BMPs will be eligible to receive cost share funding.

The minimum life expectancy of the BMPs is listed below. Practices designated by a District shall meet the life expectancy requirement established by the Division for that District BMP. The list of BMPs eligible for cost sharing may be revised by the Commission as deemed appropriate in order to meet program purpose and goals.

Practice	Minimum Life Expectancy (years)
Agrichemical Handling Facility	10
Conservation Tillage System	10
Critical Area Planting	10
Cropland Conversion	10
Diversion	10
Field Border	10
Filter Strip	10
Grade Stabilization Structure	10
Grassed Waterway	10
Heavy Use Area Protection	10
Insect Control	5
Livestock Exclusion	10
Long Term No-Till	5
Mobile Irrigation Equipment	10
Pastureland Conversion	10
Nutrient Reduction Management System	3
Rock-lined Waterway or Outlet	10
Sediment Control Structure	10
Sod-based Rotation	4 or 5
Stock Trail and Walkway	10
Stream Protection System	
Spring Development	10
Trough or Tank	10
Well	10
Windmills	10
Stream Crossing	10
Stripcropping	5
Riparian Buffer	10
Terrace	10

Best Management Practices Eligible for Cost Share Payments (continued)

Waste Management System	
Waste Storage Pond	10
Waste Storage Structure	10
Waste Treatment Lagoon	10
System for Land Application of Animal Waste	10
Wetlands Development for Land Application	10
Controlled Livestock Lounging Area	10
To-Be-Abandoned or Abandoned Confined	
Animal Operation (CAO)	5
Odor Control	1 to 10
Water Control Structure	10

Agricultural Best Management Practices

I. Crop and Pasture Lands

A. BMPs for Sediment Control
- Conservation Tillage System
- Critical Area Planting
- Cropland Conversion
- Diversion
- Field Border
- Filter Strip
- Grade Stabilization Structure
- Grassed Waterway
- Rock-lined Waterways or Outlets
- Sediment Control Structure
- Sod-based Rotation
- Stripcropping
- Terrace
- Water Control Structure
- Pastureland Conversion

B. BMPs for Nutrient Control
- Legumes in Rotation
- Soil Testing
- Liming
- Setting Realistic Crop Yield Goals (determines fertilization rates)
- Fertilizer Waste Application (method, rate, and timing)
- Sediment Control BMPs

C. BMPs for pesticide control
- Alternative Pesticides
- Optimize Pesticide Formulation, Amount, Placement Timing, Frequency
- Crop Rotation
- Resistant Crop Varieties
- Other Cultural or Biological Controls
- Optimize Crop Planting Time
- Plant Pest Quarantines
- Proper Disposal of Obsolete Pesticides and Containers
- Certification of Applicators
- Sediment Control BMP's

II. Animal Production (esp. Confined Animal Operations)
- BMPs for bacteria and nutrient control
- Grade Stabilization Structures
- Heavy Use Area Protection
- Livestock Exclusion
- Spring Development
- Stock Trails and Walkways
- Trough or Tank
- Waste Management System
- Waste Storage Pond
- Waste Storage Structure
- Waste Treatment Lagoon
- Land Application of Waste
- Water Control Structure

BMPs FOR URBAN STORMWATER

Structural Best Management Practices for urban runoff control are typically designed to reduce sediment, its attached pollutants, and nutrients. In addition, other BMPs protect the riparian ecosystem, provide streambank stabilization, provide shade to water bodies and reduce the likelihood of excessive water temperatures. Non-structural BMPs, such as a design manual or a public education program, encourage the comprehensive and effective implementation of structural BMPs. The table below contains a list of both structural and non-structural BMPs. This list is taken from the *Stormwater Management Guidance Manual*, published by DWQ's Water Quality Planning Branch in 1995. The *Manual* provides a detailed discussion of each of the BMPs, including its characteristics, pollutant-specific effectiveness, reliability, feasibility, costs, unknown use factors, design considerations, and references for further information.

STRUCTURAL BMPs
I. Wet Detention Basin
II. Constructed Wetlands
• Wet Retention Basin
• Dry Detention Basin
• Infiltration Basin
• Vegetative Practices
◊ Filter Strips
◊ Grassed Swales with Check Dams
• Sand Filter
• Oil and Grease Separator
• Rollover-Type Curbing
NON-STRUCTURAL BMPs
I. Preventive Measures
II. Pollutant Minimization
• Exposure Reduction (proper scheduling, etc. - see Manual)
• Landscaping and Lawn Maintenance Controls
• Animal Waste Collection
• Curb Elimination
• Parking Lot and Street Cleaning
• Road Salt Application Control
• Catch Basin Cleaning
III. Riparian area protection
IV. Design Manual for Urban BMPs
V. Public Education
VI. Identification and Enforcement of Illegal Discharges
VII. Land-Use Control
• Low-Density Development
• Comprehensive Site Planning
• Buffer Zone
• Sanitary Waste Management
VIII. Conservation Easement

Structural BMPs may affect groundwater quality in certain situations. Devices that recharge groundwater pose the risk of passing soluble pollutants into groundwater systems. It is not currently known whether pollutant concentrations in recharged groundwater areas pose a significant environmental or health risk. USGS is presently studying groundwater quality effects of urban BMPs. In addition, if funds are made available, DWQ may conduct a similar study in North Carolina.

BMPs FOR EROSION AND SEDIMENTATION CONTROL

Best Management Practices suggested pursuant to the NC Sedimentation Pollution Control Act of 1973 are selected on the basis of performance in providing protection from the maximum peak rate of runoff from a 10-year storm. This allows the developer/designer of the control measures, structures, or devices to determine and submit for approval the most economical and effective means of controlling erosion and preventing sedimentation damage. Practices are therefore reviewed for acceptability based upon the characteristics of each individual site and its erosion potential. Ideally, the erosion control plan will employ both practices and construction management techniques which will provide the most effective and reasonable means of controlling erosion while considering the uniqueness of each site. The following table provides a list of practices commonly used in sedimentation and erosion control plans across North Carolina.

Check Dam	Sand Fence (Wind Fence)
Construction Road Stabilization	Sediment Basin
Dust Control	Sediment Fence
Grade Stabilization Structure	Sod Drop Inlet Protection
Grass-lined Channels	Sodding
Grass Channels with Liner	Structural Streambank Stabilization
Land Grading	Subsurface Drain
Level Spreader	Surface Roughening
Mulching	Temporary Block & Gravel Inlet Protection
Outlet Stabilization Structure	Temporary Diversions
Paved Channels	Temporary Excavated Drop Inlet Protection Fabric Drop Inlet Protection
Paved Flume (Chutes)	Temporary Gravel Construction Entrance/Exit
Perimeter Dike	Temporary Sediment Trap
Permanent Diversions	Temporary Seeding
Permanent Seeding	Temporary Slope Drains
Permanent Stream Crossing	Temporary Stream Crossing
Right-Of-Way Diversions	Topsoiling
Riprap	Tree Preservation & Protection
Riprap-lined Channels	Trees, Shrubs, Vines & Ground Covers
Rock Dam	Vegetative Dune Stabilization
	Vegetative Streambank Stabilization

BMPs FOR ON-SITE WASTEWATER DISPOSAL

To protect public health and water quality, best management practices (BMPs) need to be implemented throughout the life cycle of an on-site wastewater disposal system. Life-cycle management problems can be addressed in three phases (Steinbeck, 1984). The first phase includes system siting, design, and installation. The second phase involves the operation of the system and phase three involves maintenance and repair when the system malfunctions or fails. As BMPs are applied in each life-cycle phase, the primary factor the success of the system is the participation of the local influencing health department and the cooperation of the developer, owner, design engineer, system operator, and the state. The table that follows gives a summary of the current life-cycle management practices and penalties utilized in North Carolina to implement the on-site sewage systems program (Steinbeck, 1984).

1. Application -- The developer or property owner meets with the staff of the local health department to review the project proposal and submits an application to the local health department that contains information regarding ownership, plat of property, site plan, type of facility, estimated sewage flow, and proposed method of sewage collection, treatment, and disposal.
2. Site Evaluation -- The local health department, with technical assistance from the state, evaluates the proposed sewage effluent disposal site for several factors, including slope, landscape position, soil morphology, soil drainage, soil depth, and space requirements. Next, the local health department will assign a site suitability classification, establish the design sewage flow, and the design loading rate for the soil disposal system.
3. Design Review --The applicant is required to submit plans and specifications for the sewage collection, treatment, and disposal system prepared by a professional engineer, for complex systems, or for systems exceeding 3,000 gal/day. Reviews are made by both state and local health departments. The designer must also include in the plans and specifications, installation procedures, phasing schedules, operation and maintenance procedures, monitoring requirements, and designate the responsible agents for operation and maintenance.
4. Legal Document Review -- For systems with multiple ownership or off-site disposal, the applicant must prepare and submit to state and local health departments for their legal review documents applicable to the project.
5. Improvement Permit -- Issued only after a successful review of the proposed project, including each of the items discussed above and allows construction to begin for the on-site sewage system. The improvement permit must be issued prior to other construction permits and allows only temporary electrical power to the site. This permit contains the necessary conditions for construction of the projects with the plans, specifications, and legal documentation appended to it.
6. Operation Permit -- Issued to the owner of the on-site sewage system by the local health department when it determines that all the requirements in the rules, plans and specifications are met; all conditions on the improvement permit are met; and the design engineer for the sewage collection, treatment, and disposal system certifies in writing to the local health department that the on-site system has been installed in accordance with the approved plans and specifications. The operation permit is also conditioned to establish performance requirements and may be issued for a specific period of time. It allows the on-site sewage system to be placed into use, prevents permanent electrical service to the project and prevents occupancy of the facilities until issued. The operation permit applies to systems larger than 480 gallons per day. A certificate of completion is required for conventional septic tank systems when the design sewage flow is less than 480 gal/day.

On-Site Wastewater Disposal BMPs (continued)

7. Surveillance -- Once an on-site sewage system is placed into operation the local health department must make routine inspections at least annually for large systems to determine that the system is performing satisfactorily and not creating a public health nuisance or hazard. Additionally, required monitoring reports are routinely submitted to the local health department as required in the permits. The state provides technical assistance to the local health department and the system operator in assuring adequate performance. While annual inspections are required, frequent performance checks must be made by the local health department.
8. Remedies -- When voluntary compliance with the performance requirements for the on-site system is unsuccessful, the General Statutes (1983) provide for the following remedies:
a) Right of Entry -- Allows the state or local health department to enter the premises to determine compliance with the laws and rules and provides for an administrative search and inspection warrant when entry is denied.
b) Injunction -- The state or local health department may institute an action for injunctive relief against the owner to bring the on-site sewage system into compliance.
c) Order of Abatement -- The state or local health department is empowered to issue an order of abatement directing the owner to take any necessary action to bring the system into compliance. However, if the on-site system is determined to be creating an imminent health hazard, the state or local health department may, after previous unsuccessful attempts at correction, take the necessary action to correct the problem and recover any costs for abatement from the owner. This is the least frequently applied remedy.
d) Administrative Penalties -- The state may impose administrative penalties up to $300 per day for violation of the laws, rules, or any permit condition for on-site sewage systems serving multi-family residences with a flow greater than 480 gal/day. A penalty of up to $50 per day can be assessed for malfunctioning systems where the flow is less than or equal to 480 gal/day.
e) Suspension and Revocation of Permits -- The state may suspend or revoke a permit for violations of the laws, rules, or permit conditions upon a finding that a violation has occurred.
f) Misdemeanor -- The owner who violates the sewage laws or rules shall be guilty of a misdemeanor and punishable by a fine or imprisonment as determined by the courts. This is the most frequently used remedy.

BMPs FOR SOLID WASTE MANAGEMENT

Best Management Practices for solid waste management address the water quality impacts of leachate migration and surface erosion. A list of BMPs for controlling solid waste impacts on water quality can be found in the table below.

The BMPs offer significant benefits for groundwater quality. Landfill liners will prohibit or greatly decrease the volume of leachate entering groundwater. In turn, leachate collection systems capture leachate for subsequent treatment rather than groundwater disposal. For even greater protection, groundwater and surface water monitoring should detect failures in the liner or collection system.

Reduce, Recover, and Recycle Solid Waste to Maximum Extent
Incineration with Energy Recovery
North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities, 1987
Liners (Clay or Synthetic) for All New Landfills
Leachate Collection Systems
Erosion Control Plan
Operation and Maintenance Plan
Buffers Between Landfill and Streams, Property Lines and Dwellings
Groundwater Quality Monitoring
Surface Water Quality Monitoring
Public Education
Stormwater Runoff Control
Sedimentation Control

BMPs FOR FORESTRY

A. General BMPs for Forestry Operations in North Carolina

Forest Practices Guidelines Related to Water Quality (15A NCAC 1I.0101-.0209) have been adopted as published in the NCR, Volume 4, Issue 11, pages 601-604, and were effective January 1, 1990. These guidelines are summarized below.

Streamside Management Zone(SMZ)
• Must establish SMZ along natural, intermittent and perennial streams and water bodies. (Not required along man-made ditches and canals, although erosion protection is needed).
• Must have sufficient width and adequate ground cover to confine visible sediment (usually best to protect existing ground cover).
• Place roads, trails and decks outside of SMZ.
• Limited cutting(harvesting) is permitted within the SMZ.
Prohibition of Debris Entering Streams
• Prevent debris(logging slash, soil) of all types that can cause stream flow impediment or water quality degradation from entering intermittent and perennial streams and water bodies.
• Remove debris that accidentally enters streams.
Access Road and Skid Trail Stream Crossing
• Avoid crossing streams where possible.
• Avoid using stream channels as roads or trails.
• Construct crossings to minimize sediment entering streams.
• Protect stream banks and channels from damage.
• Provide water control devices and/or structures and, within 10 working days of initial disturbance provide ground cover sufficient to restrain accelerated erosion and prevent stream sedimentation.
Access Road Entrance
• Prevent soil and debris from being deposited on public highways which may result in stream sedimentation.
Keep Waste from Entering Streams, Water bodies and Groundwater
• Prevent oil, fuels, fertilizer and other chemical waste from entering streams, water bodies and groundwater.
Pesticide Application
• Application must follow labeling and N.C. Pesticides Board rules. Includes insecticides, fungicides, herbicides, and rodenticides.
Fertilizer Application
• Apply in a manner to prevent adverse impacts on water quality.
Stream Temperature
• Retain shade sufficient to prevent temperature fluctuations which result in a violation.
Rehabilitation of Project Site
• Within 30 working days after ceasing operations, provide sedimentation control measures to prevent water quality damage.
• Permanently stabilize SMZ areas and other areas that may directly contribute visible sediment to streams.

B. BMPs for Forestry Operations in Wetlands

The Division of Forest Resources is in the process of developing BMPs for forested wetlands. Economic pressure to expand forestry activities in wetlands continues to increase. This expansion will require a sound strategy to protect these environmentally sensitive areas.

A Forested Wetlands BMP Committee was established in the winter of 1987. Committee members represent federal and state agencies, industry, education, and environmental groups who have a role in the fate of wetlands.

In the absence of state standards, federal BMPs for forested wetlands are implemented. The table below identifies these federally mandated BMPs for Waters of the United States and wetlands adjacent to such Waters (Fed. Register 53(108): 207775, June 6, 1988). The Clean Water Act Section 404 Permit Exemption for forest roads applies only where the following BMP standards are fully met.

• Permanent roads (for forestry), temporary access roads (for forestry), and skid trails (for logging) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with silvicultural and local topographic and climatic conditions;
• All roads shall be located sufficiently far from streams or other water bodies (except for portions of such roads that must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.;
• Road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows;
• Fill shall be properly stabilized and maintained to prevent erosion during and following construction;
• Discharges of dredged or fill material into waters of the U.S. to construct road fills shall be made in a manner that minimizes encroachment of trucks, tractors, bulldozers, and other heavy equipment into waters of the U.S. (including adjacent wetlands that lie outside the lateral boundaries of the fill itself);
• In designing, constructing, an maintaining roads, vegetative disturbance in waters of the U.S. shall be kept to a minimum;
• Design, construction and maintenance of road crossings shall not disrupt the migration or other movement of those aquatic species inhabiting the water body;
• Borrow material shall be taken from upland sources whenever feasible;
• The discharge shall not take, or jeopardize the continued existence of, a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;
• Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist;
• Discharge shall not be located in proximity to a public water supply intake;
• The discharge shall not occur in areas of concentrated shellfish production;
• Discharge shall not occur in a designated National Wild and Scenic River;
• Discharge shall be of suitable material free from toxic pollutants in toxic amounts; and
• All temporary fills shall be removed in their entirety and the area restored to its original elevation.

BMPs FOR MINING OPERATIONS

Significant environmental damage can and often times does occur during land-disturbing activities of mining operations, especially during the initial stages. The potential for such damage can be substantially reduced with the installation of BMPs. Once the mining has terminated, BMPs are used to reclaim or reasonably rehabilitate the site (for mined lands after June 11, 1971). The basic objective of the reclamation is to establish on a continuing basis the vegetative cover, soil stability, and water and safety conditions appropriate to the area. The BMPs are performance-oriented, allowing a mining permit applicant to design and propose the most economical and effective means of a) controlling erosion and preventing off-site sedimentation damage; b) preventing contamination of surface waters and groundwater; and, c) preventing any condition that will have unduly adverse effects on wildlife or freshwater, estuarine, or marine fisheries. BMP selection is site-specific and controlled in part by the pre- and post-mining land use(s). The acceptability of a BMP is therefore based upon the characteristics of the individual site and its potential for off-site damage.

The table which follows provides a list of BMPs used for activities associated with mining activities in North Carolina. This list is essentially the same as that provided for Sedimentation and Erosion Control, due to the similar nature of activities in both programs.

Check Dam	Sediment Basin
Construction Road Stabilization	Sediment Fence
Dust Control	Sod Drop Inlet Protection
Grade Stabilization Structure	Sodding
Grass-lined Channel	Structural Streambank Stabilization
Grass Channels with Liner	Subsurface Drain
Groundwater Monitoring Wells	Surface Roughening
Land Grading	Temporary Block and Gravel Inlet Protection
Level Spreader	Temporary Diversions
Mulching	Temporary Excavated Drop Inlet Protection
Outlet Stabilization Structure	Temporary Fabric Drop Inlet Protection
Paved Flume (Chutes)	Temporary Gravel Construction Entrance/Exit
Perimeter Dike	Temporary Sediment Trap
Permanent Diversions	Temporary Seeding
Permanent Seeding	Temporary Slope Drains
Permanent Stream Crossing	Temporary Stream Crossing
Right-of-Way Diversions	Topsoiling
Riprap	Tree Preservation and Protection
Riprap-lined Channels	Trees, Shrubs, Vines & Ground Covers
Rock Dam	Vegetative Dune Stabilization
Sand Fence (Wind Fence)	Vegetative Streambank Stabilization

BMPs FOR HYDROLOGIC MODIFICATION (related to mining operations)

BMPs for Discharges of Dredged or Fill Material (Adapted from 40 CFR 230 - Guidelines for Specification of Disposal Sites for Dredged or Fill Material)

1. Actions concerning the location of the discharge.
a) Minimize smothering of organisms;
b) Avoid disruption of periodic water inundation patterns;
c) Select a previously used disposal site;
d) Select a disposal site with substrate similar in composition to the material being disposed;
e) Minimize extent of any plume; and
f) Minimize or prevent creation of standing bodies of waters in areas of normally fluctuating water levels.
2. Actions concerning the material to be discharged.
a) Maintain physiochemical conditions and reduce potency and availability of pollutants;
b) Limit solid, liquid and gaseous components;
c) Add treatment substances; and
d) Utilize chemical flocculants in diked disposal areas.
3. Actions controlling the materials after discharge.
a) Reduce potential for erosion, slumping or leaching by
i) using containment levees, sediment basins and cover crops to reduce erosion; and
ii) using lined containment areas to reduce leaching.
b) Cap in-place contaminated material with clean material;
c) Prevent point and nonpoint sources of pollution; and
d) Time the discharge to minimize impact, especially during unusual high water flows, wind, wave and tidal actions.
4. Actions affecting the method of dispersion.
a) Maintain natural substrate contours and elevation;
b) Minimize undesirable obstruction to the water current or circulation pattern;
c) Confine suspended particulate/turbidity to a small area where settling can occur;
d) Mix, dilute and disperse the discharge;
e) Minimize water column turbidity;
f) Maintain light penetration for organisms; and
g) Set limitations on the amount of material to be discharged per unit of time or volume of receiving water.
5. Actions related to technology.
a) Use appropriate equipment and machinery, including protective devices;
b) Employ appropriate operation and maintenance of machinery, including training, staffing and working procedures;
c) Use machinery and techniques designed to reduce damage to wetlands, including devices that scatter rather than mound excavated materials, machines with specially designed wheels or tracks, and the use of mats under heavy machinery to reduce compaction and rutting; and
d) Design access roads and channel spanning structures to accommodate fluctuating water levels and circulation patterns.

BMPs for Hydrologic Modification (continued)

6. Actions affecting plant and animal populations.
a) Avoid changes in water current and circulation patterns;
b) Prevent or avoid creating habitat conducive to the development of undesirable predators or species;
c) Avoid sites having unique habitat or other value, including endangered or threatened species;
d) Institute habitat development and restoration;
e) Avoid spawning or migration seasons and other biologically critical time periods; and
f) Avoid destruction of remnant natural sites within areas already affected by development.
7. Actions affecting human use.
a) Prevent or minimize damage to the aesthetically pleasing features of an aquatic site, including water quality;
b) Avoid disposal sites valuable as natural aquatic areas;
c) Avoid seasons or periods when human recreational activity associated with the aquatic site is most important;
d) Avoid sites which will increase incompatible human activity or require frequent dredge or fill maintenance in remote fish and wildlife areas; and
e) Locate disposal site outside of the vicinity of a public water supply intake.

APPENDIX VI

Existing Point And Nonpoint Source
Water Quality Programs

APPENDIX VI

EXISTING POINT AND NONPOINT SOURCE POLLUTION CONTROL PROGRAMS

NORTH CAROLINA'S POINT SOURCE CONTROL PROGRAMS

Discharge permits are issued under the authority of North Carolina General Statute (NCGS) 143.215.1 and the National Pollutant Discharge Elimination System (NPDES) program. NPDES permits establish effluent limitations on the maximum level of wastes or pollutants, that may be discharged into surface waters. North Carolina has a very comprehensive NPDES program that includes the following major components:

1. NPDES Permit Review and Processing,
2. Wasteload Allocation Modeling,
3. Compliance Monitoring and Enforcement,
4. Aquatic Toxicity Testing,
5. Pretreatment,
6. Operator Certification and Training and
7. Nondischarge and Regional Wastewater Treatment Alternatives.

Below is a brief summary of key components of North Carolina's NPDES program

NPDES Permit Review and Processing

In North Carolina, the issuance of discharge permits is coordinated with the basinwide planning process. Thus, DWQ issues all discharge permits within a given basin at approximately the same time. These permits are valid for five years. New discharge permits issued during an interim period between cycles will have a shorter expiration period in order to coincide with the next basin permitting cycle. Thus, DWQ can more effectively monitor and modify its permitting system consistently across the river basins.

DWQ will not process a permit application until the application is complete. The requirements for discharge permit application and processing are outlined in Administrative Code Section: 15A NCAC 2H .0100 - Wastewater Discharges to Surface Waters. Under this rule, all applications must include a feasibility analysis on alternative disposal options, such as spray irrigation, and justification for the selection of the discharge option.

Applications for new discharges greater than 500,000 gallons per day of wastewater, 10 million gallons per day (MGD) of cooling water, or 1 MGD of any other type of effluent must include an *assessment* report in addition to the normal permit application. The assessment is to provide sufficient information to describe the impact of the proposed action on the waters in the area. DWQ may also require an Environmental Impact Statement or Environmental Assessment, under the NC Environmental Policy Act for certain publicly funded projects.

DWQ staff establish waste limits for permit applications based on a wasteload allocation process (described in the following section). The staff review also includes a site inspection (for existing facilities up for renewal, the inspection may be conducted prior to submittal of a complete application). If DWQ finds the application acceptable, it will issue a public notice (called a Notice of Intent to Issue) in newspapers having wide circulation in the local area. The Notice of Intent includes all of the permit applications for a particular subbasin (or subbasins) that will be issued

within a given month. The public then has a 30-day period to comment on the proposed permit. If the public expresses sufficient interest in one or more of the applications, DWQ may hold a public hearing.

DWQ also sends copies of the Notice of Intent to a number of state and federal agencies for comment. For example, the Division of Environmental Health reviews the applications for their potential impact on surface water sources of drinking water. Once DWQ received and evaluates the comments, the Director of DWQ decides whether to issue or deny the permit. The final permit will include recommended waste limits and other special conditions that may be necessary to ensure protection of water quality standards.

Establishing Discharge Permit Effluent Limitations/Wasteload Allocations

Effluent limitations, also called waste limits, dictate the amounts of wastes (pollutants), that the permittee is allowed to discharge into surface waters under an NPDES permit. Before DWQ issues a discharge permit, it evaluates the projected impact of the discharge on the receiving waters. This determination, called a wasteload allocation (WLA), is usually based on a computer model which considers many factors, including the characteristics of the waste (e.g., flow and type) and the characteristics of the receiving waters (e.g., flow, waste assimilative capacity, channel configuration, rate of reaeration, water quality classification). DWQ determines permit limits using models called water quality-based limits. DWQ also bases some permit limits based on federal effluent guidelines established by the USEPA.

DWQ performs wasteload allocations by using various models, depending on the parameter (type of pollutant) of interest and the characteristics of the receiving waters. Model frameworks (discussed in more detail in Appendix IV) can range from simple mass balance analyses to 3-dimensional dynamic water quality models. Modeling fits into the basin plan by drawing on the current conditions within the basin and evaluating the effects of various management strategies. DWQ uses models for a number of objectives, including determining the fate and transport of pollutants, setting reduction goals for point and nonpoint sources, and to derive effluent limits for NPDES permits. For example, models can be used to predict concentrations of a parameter at a given site, such as instream DO or chlorophyll *a* in a lake.

Models can also be a tool for determining the level of pollutant reductions needed to protect instream standards. In addition, DWQ performs uncertainty analyses of water quality models to expand their predictive capabilities and increase confidence in results. Waste limits may vary from summer to winter for some parameters, such as nutrients and ammonia, with winter limits being somewhat less stringent than summer limits due to higher instream flows during the winter months.

When point sources are responsible for water quality problems, WLAs can yield appropriate permit limits that offer adequate water quality protection. Where a sole discharge is responsible for the water quality impacts, DWQ can perform a simple WLA without considering other discharges. In this case, DWQ will establish limits in accordance with the state's Standard Operating Procedures (SOP) for Wasteload Allocations manual. The SOP manual has been developed to support State and Federal regulations and guidelines and has been approved by the EPA.

A critical factor in determining the wasteload for an individual discharge is whether the receiving waters have a flow during 7Q10 or 30Q2 conditions. DWQ's policy prohibits new or expanded discharges into "no flow" streams that have a 7Q10 and a 30Q2 equal to zero. In addition, DWQ will look for ways to remove existing discharges on such streams unless it is determined that there are no reasonable alternatives. If it is not feasible to remove the discharge, then the facility will be

required to meet limits of 5 mg/l BOD_5 and 2 mg/l NH_3N in summer (and 10 mg/l BOD_5 and 4 mg/l NH_3N in winter).

When numerous discharges affect water quality, the Environmental Management Commission is required to consider the cumulative impacts of all of the permitted discharges to a water body (pursuant to NCGS 143-215.1(b)(2)). Such areas are identified and discussed in Chapter 6. Generally, these are areas where the SOP alone does not provide adequate guidance. Since the SOP addresses mostly single discharge or relatively simple interaction of multiple discharges, WLA procedures outside the realm of the SOP represent the larger, basinwide strategy that DWQ is implementing.

Compliance Monitoring and Enforcement

Most dischargers are required to periodically sample the treated effluent from their discharge pipes. Also, many larger and more complex dischargers are required to sample points in the receiving waters both up and downstream from the discharge point. This process is called self-monitoring and it is typically required five days a week for some parameters (Monday through Friday) for major facilities. The sampling results (contained in a daily monitoring report or DMR) are then submitted each month to DWQ for compliance evaluations.

If a plant does not meet its permitted limits, DWQ may take one or more of the following actions: issue a notice of violation, initiate enforcement action, place the facility on moratorium, and/or enter into a Special Order by Consent (SOC). An SOC is a legal commitment entered into by the state and the discharger that establishes a time schedule for bringing the wastewater treatment plant back into compliance. During this time period, interim waste limits may be assigned to the facility until the improvements can be made. These interim limits may be less stringent than those in the permit although they are still required to protect water quality in the receiving waters.

In addition to the DMR data, illegal or improperly treated discharges may be identified in other ways including through third party reports, routine DWQ site inspections, and water quality monitoring conducted by DWQ staff.

Aquatic Toxicity Testing

There are thousands of chemicals and compounds that can enter wastewater systems and potentially be discharged to surface waters. Treatment plants are unable to monitor each of these chemicals individually due to limited funds and time, and limits in the ability of current analytical techniques to detect some pollutants. Even if the existence and potential effects of every constituent of a wastewater were known, the combined effects of these constituents could not be predicted.

North Carolina uses an integrated approach to aquatic toxicity testing that includes monitoring specific chemicals, assessing resident aquatic populations, and analyzing whole effluent toxicity (WET). Whole effluent toxicity limits predict the impacts of toxicants by measuring those impacts in a laboratory setting. It is from this same foundation of aquatic toxicity laboratory tests that chemical specific limits and criteria are derived for the majority of chemical toxicants.

In February 1987, North Carolina implemented a policy to incorporate WET limits for all major and complex minor permits. As of June 1996, 567 permitted NPDES discharges were required to perform WET monitoring, and over 15,000 individual toxicity analyses had been performed for plants across the state. WET limits were developed to protect aquatic life from the discharge of substances in toxic amounts as prescribed by 15 NCAC 2B. 0208 (i.e. so as not to result in chronic toxicity at permitted discharge flow and 7Q10 receiving flow volumes). Since the

inception of the program, a change in WET limitations has been observed. Previously, DWQ had predicted that approximately 25% of the facilities tested to be acutely toxic instream; however, DWQ has lowered that prediction to ten percent.

Aquatic toxicity testing, like other complex analytical techniques, requires a great deal of quality assurance and control to achieve reliable results. In 1988, North Carolina initiated a program that requires all laboratories performing NPDES analyses in North Carolina to be certified by the state as a biological laboratory. As of June 1996, 22 commercial, municipal, and industrial laboratories had achieved this certification in either aquatic toxicity analyses and/or aquatic population survey. The NC Biological Laboratory Certification Program, much like WET permitting in North Carolina, is looked at as a national leader in its field.

Pretreatment Program

The goal of pretreatment program is to protect municipal treatment plants or publicly-owned treatment works (POTWs) as well as the environment from the discharge of hazardous or toxic wastes into a public sewage system. The pretreatment program regulates non-domestic (e.g., industrial) users of POTWs that discharge toxic wastes under the Domestic Sewage Exclusion of the Resource Conservation and Recovery Act (RCRA). In essence, the program requires that businesses and other entities that use or produce toxic wastes pretreat their wastes prior to discharging their wastewater into the sewage collection system of POTW. State-approved pretreatment programs are typically administered by local governments that operate POTWs.

Local pretreatment program address four areas of concern: (1) interference with POTW operations, (2) pass-through of pollutants to a receiving stream, (3) municipal sludge contamination, and (4) exposure of workers to chemical hazards. Interference refers to any problem with plant operation, including physical obstruction and inhibition of biological activity. DWQ and the local government develop local pretreatment limits by determining the maximum amount of each pollutant the plant can accept at the influent (or headworks) and still protect the receiving water, the POTW itself, and the POTW's sludge disposal options.

Operator Certification and Training Program

Water pollution control systems must be operated by individuals certified by the North Carolina Water Pollution Control System Operators Certification Commission (WPCSOCC). The level of training and certification that the operator must have is based on the type and complexity of the wastewater treatment system. These systems include: wastewater treatment plants, wastewater collection systems and "non-discharge" ground absorption systems, such as alternative on-site disposal technologies and spray irrigation facilities. The Commission currently certifies operators in four grades of wastewater treatment, four grades of collection system operation, subsurface operation, spray irrigation operation, animal waste management and a variety of specialized conditional exams for specific technologies (e.g. oil/water separators).

The Technical Assistance and Certification Group of the North Carolina Division of Water Quality provides staff support for the Commission and assists in organizing training for operators in cooperation with the North Carolina University System, the North Carolina Community College System and through the professional associations for operators and pollution control professionals. Specialty courses and seminars for operators are also offered by the North Carolina combined Section Of The Water Environment Association/American Water Works Association (WEA/AWWA).

Training and certification of operators is essential to the proper operation and maintenance of pollution control systems. Without proper operation and maintenance, even the most effectively designed treatment system will not function efficiently. The goal of the WPCSOCC is to train

competent and conscientious professionals that will provide the best wastewater treatment and thus protect the environment and public health.

Nondischarge and Regional Wastewater Treatment Alternatives

DWQ requires NPDES permit applicants to consider alternatives for disposal of wastewater effluent other than discharge to a stream. For some, there may be no other economically feasible alternatives. However, for others, particularly smaller dischargers, there are a number of potentially cost-effective and environmentally sound alternatives. There are several types of non-discharging wastewater treatment systems including spray irrigation, rapid infiltration, trickling systems and underground injection. Researchers in North Carolina are evaluating artificial wetlands as wastewater treatment systems. Permit requirements for nondischarging systems are listed in Administrative Code Section 15 NCAC 2H .0200 - Waste Not Discharged to Surface Waters.

Another alternative to a surface water discharge is to tie into an existing wastewater treatment system. Where possible, DWQ is encouraging smaller dischargers to connect to large established municipal systems. Regionalization, as this is called, has several advantages. Large municipal facilities, unlike smaller package-type plants, have a larger and better-trained staff, thereby reducing the potential for plant malfunctions. When malfunctions do occur in a large plant, they can be caught and remedied more quickly than in a small plant. Larger facilities provide a higher level of treatment more economically and more consistently than can smaller plants. Larger plants are monitored daily. Additionally, centralizing the discharges reduces the number of streams receiving effluent. As DWQ evaluates future permit expansion requests from regional facilities, it will look favorably upon plants that accept flows from smaller discharges.

Nondischarge permits are required for alternative methods of wastewater treatment. Nondischarge permits are also issued for the land application of residual solids (sludge) from wastewater treatment processes.

NONPOINT SOURCE CONTROL PROGRAMS

Agricultural Nonpoint Source (NPS) Control Programs

Agricultural BMPs have been developed largely to control the five major agriculturally-related causes of pollution: nutrients, sediment, pesticides, oxygen-demanding substances and bacteria. BMPs vary from site to site and are dependent upon a particular pollutant but include practices such as grassed waterways and vegetated buffers, nondischarging animal waste lagoons, integrated crop and pest management and soil testing. BMPs may be administered through one or more of the agricultural programs described below. Common agricultural BMPs are listed in Appendix VI.

- **North Carolina Agriculture Cost Share Program**
  In 1984, the North Carolina General Assembly budgeted approximately $2 million to assist landowners in 16 counties within the "Nutrient Sensitive Water" (NSW) watersheds including the Upper Neuse River (Falls Lake) and the New River in Onslow County to implement BMPs for agricultural and silvicultural activities. These funds were increased in May 1987 to include 17 additional coastal counties by the passage of a General Statute formally creating the *Agriculture Cost Share Program for Nonpoint Source Pollution Control (NCACSP).* In 1989 the NCACSP became a statewide program. The NCACSP will pay a farmer 75 percent of the average cost of implementing approved BMPs and offer technical assistance to the landowners or users which would provide the greatest benefit for water quality protection. The primary purpose of this voluntary program is water quality protection.

The local Soil and Water Conservation District Boards under the administration of the North Carolina Soil and Water Conservation Commission (SWCC) are responsible for identifying treatment areas, allocating resources, signing contractual agreements with landowners, providing technical assistance for the planning and implementation of BMPs and generally encouraging the use of appropriate BMPs to protect water quality. The criteria for allocating funds to the District is "based on the identified level of agricultural related nonpoint source pollution problems and the respective District's BMP installation goals and available technical services as demonstrated in the Districts annual strategy plan" (NC Administrative Code, Title 15, Chapter 6, Section 6E). This local participation is crucial to the success of the program.

The DEHNR-Division of Soil and Water Conservation (DSWC) provides staff, administrative and technical support to the SWCC. The DSWC also coordinates the efforts of various associated Program committees and acts as the clearinghouse for District strategy plans, contracts, etc. A legislated Technical Review Committee meets quarterly "to review the progress of the Program" (G.S. 143-215.74B) and to make technical recommendations to the Commission.

Technical assistance for the implementation of approved BMPs is provided to the Districts through a 50:50 cost share provision for technical positions to be filled at the District level. The USDA-Natural Resources Conservation Service also provides technical assistance.

- **North Carolina Pesticide Law of 1971**

In 1971 the General Assembly created and authorized the North Carolina Pesticide Board to regulate the use, application, sale, disposal and registration of pesticides for the protection of the health, safety, and welfare of the people and for the promotion of a healthy and safe environment. Some of the responsibilities of the Pesticide Board and the North Carolina Department of Agriculture include registering all pesticides prior to distribution and sale in North Carolina, sampling pesticides to insure that all products are up to guaranteed analysis and unadulterated by any other pesticide, sampling pesticides at time of application to insure that the applicator is following label instructions, and certifying the competency of applicators and dealers of restricted use pesticides.

The Pesticide Section of the North Carolina Department of Agriculture conducts mandatory annual inspections of all aircraft used in pesticide application and conducts random inspections of ground application equipment and chemigation systems (application of pesticides through irrigation systems). These inspections are intended to encourage proper calibration and use of equipment in order to avoid excessive application rates and accidental spills from faulty systems. Stop use orders are issued for noncompliance with the regulations.

Inspections are also required for bulk storage tanks prior to filling. All commercial pesticide storage facilities are required to have an approved Pre-fire Plan. In addition, each large commercial storage facility is required to develop and maintain an Emergency Contingency Plan. This plan describes the actions facility personnel shall take to respond to fires, explosions, spills, or any other sudden or gradual release of pesticides or pesticide contaminated materials to air, soil, or surface waters. The Contingency Plan is designed to minimize hazards to human health and the environment.

Penalties are assessed to careless pesticide applicators. Enforcement of the law is based on where the pesticide is deposited rather than just where it is applied. For example, if a pesticide is found in a stream as a result of wind drift, the applicator is subject to legal action. The Raleigh Office staff of the NCDA Pesticide Section is comprised of 20 employees. There are 10 Inspectors who conduct field-level compliance monitoring and investigation services. The annual budget for pesticide control and analytical work is $1.4 million.

- **NCDA Pesticide Disposal Program**

In 1976, the North Carolina Pesticide Board adopted regulations governing the disposal of pesticides. These regulations make it illegal in North Carolina to dispose of hazardous waste (which includes certain pesticides) in sanitary landfills. While households and farms which generate less than 220 pounds of hazardous waste and less than 2 pounds of acutely hazardous waste are exempt from federal disposal requirements, the regulations prohibiting the disposal of these wastes in sanitary landfills still applies to them. The option to use commercial hazardous waste disposal companies is too expensive and most companies will not pickup small quantities. As a result of this dilemma, the NCDA created the Pesticide Disposal Program in 1980 through appropriations from the General Assembly.

The goal of the Program is to provide an available, affordable and environmentally acceptable mechanism in which any homeowner, farmer, or institution can dispose of unwanted or unusable pesticides. It is mandatory, however, that all pesticide products are labeled correctly before NCDA will pick them up. An EPA permitted hazardous waste treatment or disposal facility (TSD) requires proper identification before the products can be disposed.

The Food and Drug Division of the North Carolina Department of Agriculture administers the Pesticide Disposal Program. The same staff used for enforcing the North Carolina Pesticide Law of 1971 are used in the Disposal Program.

- **Animal Waste Management**

Regulations

On December 10, 1992, the Environmental Management Commission adopted a rule modification (15A NCAC 2H .0217) to establish procedures for properly managing and reusing animal wastes from intensive livestock operations. The goal of the rule is for intensive animal operations to operate so that animal waste is not discharged to waters of the state. This means that if criteria are met and no waste is discharged to surface waters, then an individual permit from DWQ is not required. The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve more than or equal to the following animal populations: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds with a liquid waste system. These operations are deemed permitted if a signed registration and an approved waste management plan certification are submitted to DWQ by the appropriate deadlines.

The deadline for submittal of registrations to DWQ for existing facilities was December 31, 1993. Animal waste management plans for existing facilities must be certified by a technical specialist designated by the Soil and Water Conservation Commission and submitted to DWQ by December 31, 1997. The standards and specifications of the USDA Natural Resources Conservation Service are the minimum criteria used for plan approval by the local Soil and Water Conservation Districts.

Operator Training and Certification

The North Carolina General Assembly ratified Senate Bill 974 (NCGS 143-215.74C - E) on July 29, 1995, which requires that the Department of Environment, Health and Natural Resources, in cooperation with the Cooperative Extension Service, develop and administer a training and certification program for operators of swine facilities with more than 250 swine that land apply animal waste. The Department assigned the task of developing and administering this program to the Technical Assistance and Certification Group of the Water Quality Section. The purpose of this program is to reduce nonpoint source pollution associated with the operation of animal waste management systems. Animal waste management systems are defined as a combination of structural and non-structural practices that collect, treat, store, or apply animal waste to the land. All animal operations with 250 or more swine (Sus scrofa)

are required to designate an Operator in Charge who has primary responsibility for the operation of the animal waste management system. There are approximately 4,000 animal operations in the state that are required to designate an Operator in Charge.

A steering committee was established that includes representatives from the animal agriculture industry, environmental groups, North Carolina Department of Agriculture, Natural Resources Conservation Service, Division of Soil and Water Conservation, North Carolina Cooperative Extension Service and the Division of Environmental Management. The primary purpose of this committee was to develop the instructional manual and exam questions for the training and certification program. The manual has been completed and is being used in the training sessions that are primarily being conducted by the Cooperative Extensive Service in each county. Also involved in the training will be personnel from the NC Department of Agriculture, Natural Resources Conservation Service and pork producers. The training sessions for the operators began in April 1996. The examinations will be administered by the Technical Assistance and Certification Group in eighteen locations throughout the state beginning in May, 1996.

Persons who wish to be certified as operators of animal waste management systems must attend a minimum of six hours of training and demonstrate competence in the operation of animal waste management systems by passing an examination. The training and certification requirements must be completed once every five years. Participants in the training program will receive instruction in the following areas: 1) proper operation of animal waste management system components such as lagoons and irrigation systems; 2) waste utilization plans and proper waste, soil and tissue sampling techniques; 3) proper application of waste including calculation of application rates and calibration of equipment; and 4) consequences of improper management and environmental stewardship.

Inspection and Enforcement

Prior to July, 1995, DWQ's limited compliance resources were mostly directed toward getting existing facilities registered, insuring that new and existing facilities had approved waste management plans and responding to citizen complaints.

Following major lagoon dike breaks in late June and July, 1995, DWQ and the Department's natural resources divisions made a major commitment to inspecting all animal operations. As of December 1, 1995, over 4,000 operations were inspected.

These inspections have found a very high percentage of these facilities with problems. DWQ is currently working with these problem facilities to get them into compliance. These efforts include technical assistance, Notices of Violations, notification of loss of deemed permitted status and other appropriate enforcement actions. Approximately 1,800 out of the 3,922 reports entered in the Division's database indicate a compliance problem. As of May 13, 1996, approximately 200 facilities were found to have a discharge during an inspection.

As of May 13, 1996, 40 civil penalty cases were assessed and 8 court injunctions have been filed. Eighty-five facilities have lost their deemed permitted status and are required to obtain a certified waste management plan prior to the December 31, 1997 deadline.

Animal Inspection Database
May 13, 1996

Inspections	Total	Swine	Cattle	Poultry
Reports Entered	3922	3,012	803	107
Inadequate Freeboard	579	449	87	43
Seepage observed from lagoon	118	85	26	7
Erosion observed	426	376	32	18
Inadequate acreage available for spray	112	96	3	13
Cover crop inadequate	225	206	4	15
Man made conveyance of wastes	154	99	52	3
Inadequate Records	1,078	868	162	48
Non-Man made conveyance of wastes	59	43	8	8

This is preliminary information based on only the inspection reports entered as of the date of the report. These numbers are not considered accurate until a quality assurance procedure is in place. These numbers will change daily based on the entry of new reports and quality assurance checks of the information in the data base.

Swine Farm Siting Act
The Swine Farm Siting Act, SB 1080, was adopted on July 11, 1995 to minimize adverse impacts on property adjoining concentrated animal operations. The Act specifies that a swine house or lagoon of a new farm sited on or after October 1, 1995 is required to be at least 1,500 feet from any occupied residence; at least 2,500 feet from any school, hospital, or church; and at least 100 feet from any property boundary. The Act restricts the application of lagoon effluent to land at least 50 feet from a residential property line and from any perennial stream or river, excluding irrigation ditches and canals. If written permission is given by the property owner and recorded with the Register of Deeds, a swine house or lagoon may locate closer to a residence, school, hospital, church, or property boundary.

- **NC Cooperative Extension Service and Agricultural Research Service**
Crop and animal production programs are administered under the research and education activities of the NC Agricultural Research Service (ARS) and the NC Cooperative Extension Service (CES). The research and education efforts are broad and include areas such as variety development, crop fertilizer requirements, soil testing, integrated pest management, animal housing, animal waste management, machinery development and irrigation. Guidelines for most agricultural enterprises have been developed and made available to farmers. A more intensified water quality emphasis is being incorporated in these areas and many other projects undertaken by ARS and CES. The local contact that county CES agents have with farmers and homeowners provides an excellent opportunity for dialogue and education in nonpoint source pollution control. This network of contacts can be used to inform people about BMPs and to provide some structure for a general NPS education program.

The NC Agricultural Research Service and the NC Cooperative Extension Service conduct broad research and education efforts that include areas such as variety development, crop fertilizer requirements, soil testing, integrated pest management, animal housing, animal waste management, machinery development, and irrigation. County Cooperative Extension agents work closely with farmers and homeowners, providing an excellent opportunity for dialogue and education in nonpoint source pollution control. In addition, CES has begun assisting DWQ in holding a series of public workshops in each river basin prior to DWQ's preparation of the draft basin plan.

- **Soil, Plant Tissue, and Animal Waste Testing Program**
These services provide farmers with information necessary to improve crop production efficiency, to manage the soil properly and to protect environmental quality. The Soil, Plant

Tissue and Animal Waste Testing Program is administered by the Agronomic Division of the North Carolina Department of Agriculture. Water and wastewater from lagoons is also tested for irrigation and fertilizer use.

- **Watershed Protection and Flood Prevention Program (PL 83-566)**
  The purpose of the Watershed Protection and Flood Prevention Program is to provide technical and financial assistance in planning, designing, and installing improvement projects for protection and development of small watersheds. The Program is administered by the USDA-Natural Resources Conservation Service in cooperation with the NC Division of Soil and Water Conservation, the State Soil and Water Conservation Commission, the U.S. Forest Service, Soil and Water Conservation Districts, and other project sponsors.

  The emphasis of the Program over the past three decades has been to provide flood control. However, legislation has shifted emphasis of PL-566 land treatment projects so that a project proposal must demonstrate off-site water quality benefits in order to have any chance of funding.

- **Food Security Act of 1985 (FSA) and the Food, Agriculture, Conservation and Trade Act of 1990 (FACTA)**
  There are several provisions authorized by the federal Food Security Act of 1985 (FSA) and re-authorized by the Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) which offer excellent opportunities for the abatement of agricultural nonpoint source pollution. The FSA and FACTA make the goals of the USDA farm and conservation programs more consistent by encouraging the reduction of soil erosion and production of surplus commodities and the retention of wetlands. At the same time, the provisions can serve as tools to remove from production those areas which critically degrade water quality by contributing to sedimentation. Important water quality-related provisions are known as the Conservation Reserve, Conservation Compliance, Sodbuster, Swampbuster, and Conservation Easement, Wetland Reserve, and Water Quality Incentive Program. These provisions are administered by the USDA.

  Conservation Reserve Program
  The Conservation Reserve Program (CRP) is administered by the USDA Agricultural Stabilization and Conservation Service (ASCS) and the USDA Natural Resources Conservation Service (NRCS). Other cooperating agencies include the NC CES, NC Division of Forest Resources and local Soil and Water Conservation Districts. The CRP was established to encourage removing highly erodible land from crop production and to promote planting long-term permanent grasses and tree cover. The ASCS will share up to half of the cost of establishing this protective cover. The intention of the program is to protect the long term ability of the US to produce food and fiber by reducing soil erosion, improving water quality and improving habitat for fish and wildlife. Additional objectives are to curb the production of surplus commodities and to provide farmers with income supports through rental payments over a 10 year contract period for land entered under the CRP.

  Conservation Compliance
  The Conservation Compliance provision of the FSA and FACTA discourages the production of crops on highly erodible cropland where the land is not carefully protected from erosion. Highly erodible land is defined as land where the potential erosion (erodibility index) is equal to eight times or greater than the rate at which the soil can maintain continued productivity. This rate is determined by the Natural Resources Conservation Service.

  A farmer had until January 1, 1990 to develop and begin applying a conservation plan on highly erodible land. Plans were required to be operational by January 1, 1995. If a conservation plan is not developed and implemented, the farmer loses eligibility in price and

income supports, crop insurance, FHA loans, Commodity Credit Corporation storage payments, farm storage facility loans, Conservation Reserve Program annual payments, and other programs under which USDA makes commodity-related payments. In other words, Conservation Compliance is an economic disincentive, quasi-regulatory program.

Sodbuster

The Sodbuster provision of the FSA and FACTA is aimed at discouraging the conversion of highly erodible land for agricultural production. It applies to highly erodible land that was not planted in annually tilled crops during the period 1981-85. As with the other provisions of the FSA, the Natural Resources Conservation Service determines if a field is highly erodible. If a highly erodible field is planted in an agricultural commodity without an approved conservation system, the landowner (or farmer) becomes ineligible for certain USDA program benefits.

Swampbuster

The purpose of Swampbuster is to discourage the conversion of wetlands to cropland use. Wetlands are defined as areas that have a predominance of hydric soils that are inundated or saturated by surface water or groundwater at a frequency or duration sufficient to support a prevalence of hydrophytic (water loving) vegetation. It is the responsibility of the Natural Resources Conservation Service to determine if an area is a wetland. Like the other provisions of the FSA and FACTA, a farmer will lose eligibility for certain USDA program benefits on all the land which is farmed if a wetland area is converted to cropland.

Conservation Easement

The Conservation Easement provision encourages producers whose FHA loans are in or near default to place their wetland, highly erodible land, and fragile land in conservation, recreation, or wildlife uses for periods of at least 50 years. The producer benefits by having the FHA loan partially canceled. The environment benefits by reducing the level of soil disturbing activities and the threat of agricultural pollutants.

Wetland Reserve

FACTA established a voluntary program for farmers to grant the federal government a 30-year or perpetual easement to wetlands. Eligible land includes farmed or converted wetlands which could be restored to their highest wetland function and value. The goal is to enroll one million acres by the end of 1995.

Water Quality Incentive Program

FACTA established this cost sharing program to help farmers control pollution problems associated with agricultural activities. A producer could receive up to $3,500 in cost share assistance to implement approved BMPs. The goal is to enroll 10 million acres by 1995.

Nonpoint Source Programs for Urban and Developed Lands

- **Federal Urban Stormwater Discharge Program / NC NPDES Stormwater Program**

  In 1987, Congress passed the Water Quality Act Amendments to the Clean Water Act requiring the U.S. Environmental Protection Agency (EPA) to develop regulations on permit application requirements for stormwater discharges associated with industrial activities as well as those associated with large and medium municipal separate storm sewer systems (population greater than 100,000). These regulations became effective in December 1990.

  The goal of the stormwater discharge permitting regulations in North Carolina is to prevent stormwater runoff pollution by controlling the source(s) of pollutants. Defining the potential pollutant sources and establishing controls of the sources that will reduce and minimize pollutant availability will result in an improvement to the water quality of the receiving streams, consistent with the overall goal of the water quality program. Authority to administer these

regulations has been delegated to the North Carolina Division of Water Quality (DWQ). The NPDES stormwater regulations require that facilities with stormwater point source discharges associated with industrial activity and municipalities defined as either large or medium municipal separate storm sewer systems be permitted.
The municipal permitting requirements are designed to lead to the formation of site-specific stormwater management programs for a municipal area. Therefore, the permits issued to municipalities for their municipal separate storm sewer systems will be explicitly written for each individual municipality. Municipal permits of this type in North Carolina are currently required for Charlotte, Durham, Greensboro, Raleigh, Winston-Salem and Fayetteville/Cumberland County. The municipalities will develop and implement comprehensive stormwater quality management programs to reduce the discharge of pollutants in stormwater to the maximum extent practicable (MEP). MEP will be defined separately for each municipality required to be permitted. Industrial facilities discharging through a municipal separate storm sewer system are required to submit a permit application to the state and receive their own NPDES stormwater permit.

Industrial activities which require permitting are defined in eleven categories in the federal regulations ranging from sawmills and landfills to phosphate manufacturing plants and hazardous waste treatment, storage or disposal facilities. The regulations cover point source discharges that are related to manufacturing, processing, or material storage areas at an industrial facility. Stormwater discharges associated with industrial activities are required to be covered by permits which contain technology based controls based on Best Available Technology (BAT)/Best Conventional Pollutant Control Technology (BCT) considerations or water quality controls, if necessary. Through monitoring and regulating stormwater discharge quality, the goal of the NPDES stormwater program is to reduce the pollutant load in stormwater runoff.

The permitting requirements described here represent Phase I of the stormwater program. EPA and Congress are currently involved in studies to determine the scope of additional stormwater coverage under Phase II of the stormwater program. Further stormwater NPDES coverage could include additional industrial activities or additional municipal areas. If additional areas of coverage are added under the federal stormwater programs, DWQ will be responsible for the appropriate permitting of these areas within North Carolina.

- **Water Supply Watershed Protection Program**

Approximately 50 percent of North Carolina's population depends on surface water supplies for drinking, commercial, and industrial uses. Water supplies have become more important in recent years because of increased demand for water, concern over potential contamination by toxic substances, and protection of human health. As a result, the General Assembly passed the Water Supply Watershed Protection Act of 1989 (NCGS 143-214.5). This Act requires all local governments that have land-use jurisdiction within surface water supply watersheds, or a portion thereof, to be responsible for implementation and enforcement of nonpoint source management requirements related to urban development, according to minimum standards adopted by the state. NPS control strategies are included in the rules for urban, agricultural, silvicultural, and Department of Transportation activities. The Water Supply Watershed Protection Rules were adopted by the Environmental Management Commission on February 13, 1992 and became effective on August 3, 1992. These rules were recently revised (effective August 1, 1995) to give local governments more flexibility in the implementation of water supply protection programs.

The purpose of the Water Supply Watershed Protection Program is to encourage communities to work with the state to provide enhanced protection for their water supply from nonpoint pollution sources. There are five water supply classes that are defined according to existing land use and the amount and types of permitted wastewater discharges. (See Appendix I for a

summary of the management requirements for the five water supply classifications.) By classifying a watershed as a water supply watershed, local governments with land use jurisdiction within the watershed will take steps to control nonpoint sources of pollution and thereby reduce the potential of pollutants contaminating drinking water supplies. In turn, the state limits the point source discharges that can locate within the watershed which reduces the potential of contamination of the water supply.

This dual approach of state and local government action to preclude potential impacts from stormwater runoff and wastewater discharges is important since only a small fraction of the pollutants that enter water supplies from nonpoint sources have water quality standards. As more is learned about the types and effects of pollutants in our drinking waters, the state will be forced to adopt additional water quality standards. If these additional standards are imposed, one effect may be that water treatment facilities will be required to apply additional technology and possibly more expensive treatment facilities or operation to ensure safe drinking water. It is, therefore, very important for the state and local governments to consider alternative means of preventing nonpoint source pollution from entering drinking water supplies in the first place. The land-use requirements, including density controls, buffers along perennial streams and stormwater control requirements for high density developments are but a few ways to accomplish this.

The Water Supply Protection Program is administered by staff in the Operations Branch of the DWQ. These staff coordinate with the Division of Community Assistance (NCDCA) which helps local governments develop land-use ordinances, the Division of Environmental Health, which certifies that a proposed water supply is suitable for drinking water, and DWQ staff in NCDEHNR regional offices who are responsible for water quality sampling. Statewide, the compliance rate for submittals is 100%.

- **Coastal Stormwater Management**

In November 1986, the EMC adopted rules which required new development in a limited zone (575 feet) around Class SA (shellfish) waters to control stormwater either by limiting density or completely controlling a 4.5 inch, 24-hour storm with the use of a stormwater treatment system. The regulations applied to development activities which required either a CAMA major permit or a Sediment/Erosion Control Plan (generally development disturbing more than one acre). The design storm, low density limits, and aerial coverage were all quite controversial and the adopted rules represented a compromise by all parties. A sunset provision was added to the rules to force the staff and Commission to reconsider the rules after a year. These rules expired December 31, 1987, but new stormwater regulations were adopted having an effective date of January 1, 1988. These regulations are administered by the DWQ. Approximately five man-years are allocated to implementing this program. Planning Branch staff are responsible for providing guidance and interpretation to promote consistent implementation of the rules. DWQ regional staff review and approve plans and enforce the requirements of the regulations.

Perhaps the most important measure accomplished with the regulations has been the applicability of stormwater controls to development activities within the 20 CAMA coastal counties. Certainly the near-water impact of stormwater as addressed in the original rules is important, but the staff believed the cumulative impact of stormwater runoff throughout the coastal zone also needed to be addressed. Therefore, the expanded area of coverage helps provide better protection of both shellfish waters and coastal water quality in general.

Other major items specified in the rules address the sizing of stormwater treatment systems. For developments adjacent to SA waters, infiltration systems must be able to retain 1.5 inches of rainfall, whereas development in other areas must control one inch of rainfall. Wet detention ponds are not allowed for stormwater control near SA waters and must be sized for 85 percent TSS removal in other areas. In addition, porous pavement is considered an innovative

infiltration system (only five are allowed until they are proven to work) as evidence has not been provided regarding its effectiveness in coastal areas. A low density option of the new regulations applies a built-upon limit of 25 percent for SA areas and 30 percent for other coastal areas rather than a limit on effective impervious cover. Development exceeding these levels is required to have a engineered stormwater system as indicated.

In summary, the regulations which have an expanded aerial coverage increases the annual number of projects affected from approximately 50 (original rules) to 500. This increase is coincident with a reduction in design storm that is comparable to requirements in other states. In addition, the low density option, retained from the original regulations, is encouraged as operation and maintenance concerns associated with stormwater controls are not applicable.

- **Coastal Nonpoint Pollution Control Programs**
  As part of the Coastal Zone Act Reauthorization Amendments of 1990, Congress enacted a new section 6217 entitled "Protecting Coastal Waters". This provision requires states with coastal zone management programs (which includes North Carolina) that have received Federal approval under section 306 of the Coastal Zone Management Act (CZMA) to develop and implement Coastal Nonpoint Pollution Control Programs. The coastal nonpoint programs will provide additional control for sources of nonpoint pollution that impair coastal water quality. Sources subject to the 6217 Coastal NPS Program include: agriculture, forestry operations, urban and developing areas, marinas, hydromodification projects, and wetlands and riparian areas.

  Section 6217 requires coastal states to submit their coastal nonpoint control programs to the National Oceanic and Atmospheric Administration (NOAA) and the U.S. EPA for approval by July 1995. The programs are to be implemented by January, 1999. Failure to submit an approvable program by July 1995 will result in a state losing substantial portions of its Federal funding under section 306 of the CZMA and section 319 of the Clean Water Act. The coastal nonpoint program will be developed and administered jointly by the NC Division of Coastal Management and DWQ.

Summary of Changes Since 1989

- The N.C. DWQ has developed programs for the administration of NPDES stormwater permits for industries and municipalities.
- The N.C. DWQ has developed and issued eighteen general permits to cover a variety of facilities that discharge stormwater associated with industrial activity.
- Water Supply Protection Legislation was passed in N.C. which has resulted in the development and implementation of statewide water supply watershed protection requirements. This program is described in detail in the previous section.
- The stormwater management rules governing coastal areas, High Quality Waters and Outstanding Resource Waters have been modified. These rules were finalized and effective on September 1, 1995. These programs are described in more detail in the previous section.
- Educational Efforts: The N.C. DWQ has instituted a number of educational efforts related to stormwater management across the state. These efforts have included:

- Guidance Manuals:
1 *Stormwater Management Guidance Manual*
2 *Stormwater Management In North Carolina: A Guide For Local Officials*
- Fact Sheets on Stormwater Management
1 *Stormwater Problems and Impacts*
2 *Stormwater Control Principles and Practices*
3 *Stormwater Management Roles and Regulations*
4 *Local Stormwater Program Elements and Funding Alternatives*
- Statewide Stormwater Conference - (1994)

- Statewide Workshops on The Water Supply Protection Program (1994 & 95)
- Statewide Workshops on Stormwater Management (1995)

- **ORW and HQW Stream Classifications**
  Outstanding Resource Waters (ORW) and High Quality Waters (HQW) have management strategies that address handling of urban stormwater. Controls for urban stormwater, either through development density limitations or stormwater treatment systems, are required by DWQ. Other NPS management agencies are expected to place priority on protecting these waters as well. For example, the NC Department of Transportation and the NC Division of Land Resources require more stringent sediment control on construction sites in ORW and HQW areas.

- **CAMA Land Use Plans**
  The Coastal Area Management Act (CAMA), passed in 1974, requires the development of land use plans by each of the 20 coastal counties that fall within the coastal area. These plans must be consistent with state guidelines and address a wide range of issues, including resource protection and conservation, hazards mitigation, economic development and public participation. Land use plans must be updated every five years. 1995 revisions to the land use planning guidelines strengthened the connection between land use planning and surface water quality. Future land use plan updates must consider water quality use classifications, watershed planning and problems identified in basinwide plans. There are 91 jurisdictions that have prepared and adopted CAMA land use plans.

  A land use plan is a "blueprint" used by local leaders to help guide the decisions that affect their community. Through land use planning, local jurisdictions can influence how growth will affect surface water quality by adopting policies supported by local ordinances, promoting better sedimentation and erosion control standards, stream buffers and lower levels of impervious surface cover. Although land use plans are required only in the state's coastal area, these land use planning tools for the protection of water quality are available to any jurisdiction which chooses to implement them.

Construction - Sedimentation and Erosion Control Nonpoint Source Program

In 1973, the North Carolina General Assembly enacted the Sedimentation Pollution Control Act (SPCA). The Act authorized the establishment of a sediment control program to prevent accelerated erosion and off-site sedimentation caused by land-disturbing activities other than agriculture, forestry, and mining. The Land Quality Section of the Division of Land Resources is responsible for administration and enforcement of the requirements of the Act under the authority of the NC Sedimentation Control Commission.

The sediment control program requires, prior to construction, the submission and approval of erosion control plans on all projects disturbing one or more acres. On-site inspections are conducted to determine compliance with the plan and to evaluate the effectiveness of the BMPs which are used. The intent is to offer permanent downstream protection for stream banks and channels from damages caused by increased runoff velocities. If voluntary compliance with the approved plan is not achieved and violations occur, the Land Quality Section will pursue enforcement through civil penalties and injunctive relief. House Bill 448, passed in 1991, authorized the issuance of stop-work orders for violations of the SPCA. This additional enforcement mechanism will help improve the overall performance of the program.

Sedimentation control rules are more stringent for areas draining to waters supplementally classified as Trout or High Quality Waters.

Local programs are reviewed annually for compliance with the requirements of the Sedimentation Pollution Control Act. The Land Quality Section also conducts educational programs directed toward state and local government officials in order to strengthen the local programs. Persons engaged in land-disturbing activities and interested citizen groups are included in the educational effort.

The Sedimentation Control Commission has delegated to the Division of Highways of the North Carolina Department of Transportation (DOT) the authority to approve erosion and sedimentation control plans for land-disturbing activity conducted by that agency or by other persons under highway contracts with that agency. The DOT sedimentation control program has been reviewed by the Division of Land Resources under the authority of the Sedimentation Control Commission. DOT uses more stringent sedimentation controls in areas adjacent to High Quality Waters and Outstanding Resource Waters. The NC Department of Environment, Health, and Natural Resources (NCDEHNR) has established a position to evaluate environmental aspects of DOT highway projects and programs. DOT, in cooperation with DWQ, has developed and adopted formal BMPs for protection of surface waters. These BMPs and other efforts are significant improvements in developing a proactive system at DOT toward environmental issues.

On-Site Wastewater Disposal - Sanitary Sewage Systems Nonpoint Source Program

Septic tank soil absorption systems are the most widely used method of on-site domestic wastewater disposal in North Carolina. More than 52 percent of all housing units in the state are served by septic tank systems or other systems besides public or community sewage systems. A conventional septic system consists of a septic tank, a distribution box or equivalent branching lines, and a series of subsurface absorption lines consisting of tile or perforated pipes laid in a bed of gravel. All subsurface sanitary sewage systems are under the jurisdiction of the Commission for Health Services (CHS) of the Department of Environment, Health, and Natural Resources. The CHS establishes the rules for on-site sewage systems which are administered by the Division to Environmental Health. BMPs for onsite sewage systems are listed in Appendix VI.

According to GS 130A-335(e) and (f), the rules of the CHS and the rules of the local board of health shall address at least the following: sewage characteristics; design unit; design capacity; design volume; criteria for the design, installation, operation, maintenance, and performance of sanitary sewage collection, treatment, and disposal systems; soil morphology and drainage; topography and landscape position; depth to seasonally high water table, rock, and water impeding formations; proximity to water supply wells, shellfish waters, estuaries, marshes, wetlands, areas subject to frequent flooding, streams, lakes, swamps, and other bodies of surface or groundwaters; density of sanitary sewage collection, treatment, and disposal systems in a geographical area; requirements for issuance, suspension, and revocation of permits; and other factors which affect the effective operation in performance of sanitary sewage collection treatment and disposal systems.

The rules also must provide construction requirements, standards for operation, and ownership requirements for each classification of sanitary systems of sewage collection, treatment, and disposal in order to prevent, as far as reasonably possible, any contamination of the land, groundwater, and surface waters. There exists a strict permitting procedure which regulates site selection, system design, and installation of on-site sewage systems. Privately owned subsurface sewage discharging systems are governed by NCDEHNR through local county health departments. Authorized local sanitariums serve as agents of NCDEHNR and assist in implementing the state sewage rules. Local boards of health may adopt by reference the state rules and append to those rules more stringent laws and local criteria which they desire. These amendments, however, must be approved by the state. Only nine counties in the state currently

operate under local rules. The 1983 amendments of the state public health laws eliminated the co-mingling of state rules with local rules except by state approval.

The Straight Pipe Elimination Amnesty Program was established in 1996 for the purpose of eliminating domestic sewage or wastewater discharges, from both straight pipes and overland flow of failing septic systems. The program contains three components: identification and elimination of domestic sewage discharges into streams currently or proposed to be used for public water supplies; an amnesty period to end on December 31, 1997 during which time violations of State rules and laws on domestic sewage and wastewater discharges identified as a result of this program will not result in legal consequences; and a public education effort on the program and the amnesty period.

Solid Waste Disposal NPS Programs

- **Federal Program**
  The major federal legislation in the area of solid waste management is the Resource Conservation and Recovery Act (RCRA) administered by the U.S. Environmental Protection Agency (EPA). RCRA deals almost entirely with hazardous waste management but it does require that states meet minimum standards for solid waste facilities. EPA does not have permitting authority over solid waste management facilities.

- **State Program**
  States are accorded a major role in solid waste management by RCRA. North Carolina now operates under revisions by the General Assembly to Chapter 130A of the General Statutes. The Division of Solid Waste Management (DSWM) in the Department of Environment Health and Natural Resources is authorized as the single state agency for the management of solid waste. DSWM is responsible for the development of the state's solid waste management plan, has permitting authority over all solid waste management facility siting and operation, inspects permitted facilities, provides technical assistance, investigates complaints, responds to emergencies, monitors ground water quality at facilities, promotes the state's recycling effort, and closes non-conforming sites.

  The Solid Waste Management Act of 1989 established the policies and goals of the state to recycle at least 25 percent of the total waste stream by January 1, 1993. This Act created a Solid Waste Management Trust Fund to promote waste reduction and fund research and demonstration projects to manage solid waste. In 1991, the Solid Waste Management Act of 1989 was amended to broaden the goal to reduce the solid waste stream by 40 percent through source reduction, reuse, recycling, and composting by June 30, 2001.

  The state adopted solid waste management rules, effective February 1, 1991, requiring liner, leachate collection, and final cover systems at all new landfills, lateral expansions of existing landfills, and at all active landfills by January 1, 1998. Septage rules and regulations also have been adopted and are administered through a permit program.

- **Local Program**
  Solid waste collection and disposal has long been a municipal function. The operation of solid waste collection and disposal facilities is among the enterprises which municipalities are expressly authorized by statute to operate (G.S. 160A-311 through 160A-321). Municipalities are also authorized to regulate the disposal of solid waste within their corporate limits. Such regulations may specify the location and type of receptacles to be used for collection (G.S. 160A-192).

  Outside municipal limits, counties are authorized to operate solid waste collection and disposal facilities either as a function of county government or through establishment of a special service

district (G.S. 153A-292 and 301). Since 1970, county governments have increasingly accepted responsibility for solid waste disposal activities and most disposal facilities in the state are now operated by counties or with county financial assistance.

Forestry NPS Programs

- **Forest Practice Guidelines Related to Water Quality**
  In 1989 the Sedimentation Pollution Control Act (SPCA) was amended to limit the forestry exemption to those operations that adhere to forest practice guidelines. The forestry amendment to the SPCA required the Division of Forest Resources to develop performance standards known as the Forest Practices Guidelines Related to Water Quality.

  Guidelines consist of nine performance standards for activities such as maintaining streamside management zones and applying fertilizer and pesticide applications. These Guidelines are used to determine if a forestry operation will fall under the jurisdiction of the Division of Land Resources which enforces the SPCA. The Guidelines were developed in October 1989 and were put into effect on January 1, 1990. A Memorandum of Agreement was also signed between the Division of Forest Resources and the Division of Land Resources to coordinate their respective activities in the sedimentation control program. DLR has also signed an MOA with DWQ.

  Site-disturbing forestry activities are being inspected by local DFR personnel as part of a training, mitigation, and monitoring program. Site inspections are conducted when a problem or potential problem is suspected to exist. Sites not brought into compliance within a reasonable time schedule are referred by DFR to DLR or DWQ for appropriate enforcement action. Commonly used forestry BMPs are listed in Appendix VI.

- **National Forest Management Act (NFMA)**
  The National Forest Management Act was passed in 1976 and applies to all lands owned or administered by the National Forest System. The Act stipulates that land management plans be prepared which consider economic and environmental aspects of forest resources. The Act further states that timber will be harvested from National Forest lands only where soil, slope, or other watershed conditions will not be irreversibly damaged; and where protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of watercourses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat.

- **Forest Stewardship Program**
  The Division of Forest Resources initiated the Forest Stewardship Program in 1991 along with the cooperation and support of several other natural resource and conservation agencies. This program encourages landowners with ten or more acres of forestland to become involved and committed to the wise development, protection and use of all natural forest resources they own or control.

Mining NPS Program

In 1971 the North Carolina General Assembly passed the Mining Act to ensure that the usefulness, productivity, and scenic values of all land and waters involved in mining will receive the greatest practical degree of protection and restoration. The Mining Commission is the rule-making body for the Act and has designated authority to administer and enforce the rules and regulations of the Act to the Mining Program within the Land Quality Section of the NCDEHNR Division of Land Resources.

The Mining program has four major areas of responsibility. First, the Program requires submission and approval of a mining permit application prior to initiating land disturbing activity if the mining operation is one (1) or more acres in surface area. The mining permit application must have a reclamation plan for these operations. Second, the Program conducts on-site inspections to determine compliance with the approved application and whether or not the plan is effective in protecting land and water quality. Third, the program pursues enforcement action through civil penalties, injunctive relief, and/or bond forfeiture to gain compliance when voluntary compliance is not achieved. Finally, the Mining Program conducts educational efforts for mine operators.

Wetlands Regulatory NPS Programs

There are numerous reasons for preserving wetlands, but of special interest within the context of basinwide planning is their role in protecting water quality. Because of their intrinsic characteristics and location within the landscape, wetlands function to protect water quality in a number of ways. These functions include the retention and removal of pollutants, stabilization of shorelines, and storage of flood waters.

Numerous authors have studied the effectiveness of riparian wetland forests for nutrient retention and transformation (Jones et al. 1976; Yates and Sheridan 1983; Brinson et al. 1984; Lowrance et al. 1984; Peterjohn and Correll 1984; Jacobs and Gilliam 1985; Budd et al. 1987; and Groffman et al. 1991). The location of riparian wetlands allows them the opportunity to receive nutrients from the surrounding landscape as well as through overbank flooding. In addition to the storage of nutrients in wetland vegetation, the microbial and chemical processes within wetland soils may function to completely remove nutrients from the system.

Headwater riparian wetlands are extremely important and effective in terms of sediment and associated nutrient and toxicant retention and transformation. Since small streams comprise most of the total stream length within a watershed (Leopold 1974), these areas intercept the greatest proportion of eroded sediments and associated substances from uplands before these pollutant reach waters downstream. Novitzki (1978) found that approximately 80% of the sediments entering a stream were retained in headwater wetlands.

Wetlands adjacent to streams, rivers and lakes stabilize shorelines and help protect these bodies of water from erosive forces. This function is particularly important in urbanized watersheds where the prevalence of impervious surfaces contributes to greater peak storm flows. Wetland vegetation serves to dissipate erosive forces and anchors the shoreline in place preventing sediments and associated pollutants from entering waterways. Wetlands by their very nature of being "wet" are also vital for water storage. Those wetlands adjacent to surface waters, that have the opportunity to receive flood waters and surface runoff, are most important to water storage. Wetlands located in headwaters generally minimize peak flood waters in tributaries and main channels. Lakes and wetlands with restricted outlets hold back flood waters and attenuate flood peaks (Carter et al. 1978).

Several important state and federal wetland protection programs are described below. In addition to the following wetlands programs, provisions of the 1985 and 1990 Farm Bills, discussed in Section 5.3.1, should also help reduce wetlands impacts. Agriculture conversions should be reduced by the "swampbuster" provision of the 1985 Farm Bill, which encourages farmers not to convert wetlands for agriculture to prevent the loss of their USDA subsidies, loans, and price supports. Silviculture is exempted from the swampbuster provision and therefore, conversion of wetlands for intensive or managed forestry is not affected by this provision. A Wetland Reserve Program was established by the 1990 Farm Bill with the goal of allowing one million acres of prior-converted wetlands to revert back to wetlands by 1995.

- **Section 10 of the Rivers and Harbors Act of 1899**
  This act, administered by the US Army Corps of Engineers, provides the basis for regulating dredge and fill activities in navigable waters of the United States. Originally, this Act was administered to protect navigation and the navigation capacity of the nation's waters. In 1968, due to growing environmental concerns, the review of permit applications was changed to include factors other than navigation including fish and wildlife conservation, pollution, aesthetics, ecology, and general public interest. Activities which may be covered under the Act include dredging and filling, piers, dams, dikes, marinas, bulkheads, bank stabilization and others.

- **Section 404 of the Clean Water Act**
  The U.S. Army Corps of Engineers administers a national regulatory program under Section 404 of the Clean Water Act aimed at controlling the discharge of dredged or fill material into waters of the United States. Section 404 applies to the discharge of dredged or fill materials into waters of the United States including dredging. Waters of the United States refers to navigable waters, their tributaries, and adjacent wetlands. Activities covered under Section 404 include dams, dikes, marinas, bulkheads, utility and power transmission lines and bank stabilization. Although the 404 program does not fully protect wetlands, it is nonetheless the only existing federal tool for regulating wetland development statewide. State legislation has not been adopted to protect inland freshwater wetlands in North Carolina, as has been done for coastal wetlands, but the EMC in March of 1996 adopted rules which will formalize the wetlands protection measures associated with the 401 Water Quality Certification review process.

- **Section 401 Water Quality Certification (from CWA)**
  The Division of Water Quality is responsible for the issuance of 401 Water Quality Certifications. Section 401 of the federal Clean Water Act provides that no federal agency can issue any license or permit to conduct any activity that may result in a discharge to navigable waters unless the state in which the discharge may occur certifies that the discharge will not result in a violation of any state water quality or related standards. Thus, a 401 certification is required for, among other things, a discharge into surface waters or wetlands for projects that require a section 404 permit. A federal permit cannot be issued if a 401 certification is denied. Any conditions added to the 401 certification become conditions of the 404 permit. The 401 certification process is coordinated with the 404 and CAMA processes in the 20 counties of CAMA jurisdiction.

- **North Carolina Dredge and Fill Act (1969)**
  This act requires permits for "excavation or filling begun in any estuarine waters, tidelands, marshlands, or state-owned lake". This law is currently administered with North Carolina's Coastal Area Management Act (CAMA) (1974).

- **Wetlands Restoration Program/Funds**
  The Wetlands Restoration Program was established in 1996 as a nonregulatory program "...for the acquisition, maintenance, restoration, enhancement, and creation of wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, wildlife habitat, and recreational opportunities". The purposes of the program include: the restoration of wetlands function and values; to provide a consistent and simplified approach to mitigation requirements associated with permits or Corps of Engineers authorizations; to streamline the permitting process; to increase the ecological effectiveness of mitigation efforts; to achieve a net increase in wetlands acres, functions and values for each major river basin; to promote a comprehensive approach to environmental protection.

  Through the Wetlands Restoration Program, basinwide plans for wetlands and riparian area restoration will be developed. The goals of the plans are to protect and enhance "...water

quality, flood prevention, fisheries, wildlife habitat, and recreational opportunities..." These plans will be developed for each of the seventeen major river basins in the state beginning in July 1997. Compensatory mitigation (a required condition of section 404 permits issued by the U.S. Corps of Engineers) options will be addressed within the plans.

A Wetlands Restoration Fund has been established under the program. The Fund is a trust fund designed as a repository for monetary contributions and dedication of interest to real property under the compensatory mitigation options. These funds will primarily be used to restore, enhance, preserve or create wetlands and riparian areas in accordance with the basinwide plan.

Hydrologic Modification

Hydrologic modification is defined as channelization, dredging, dam construction, flow regulation and modification, bridge construction, removal of riparian vegetation, streambank modification/destabilization, and dam collapse. By its very nature hydrologic modification is closely tied to wetland issues. It is not surprising then that the U.S. Army Corps of Engineers (Corps) is the agency most involved in issuing permits for land-disturbing activities in wetlands. These permits are issued through Section 404 and the Rivers and Harbors Act discussed above.

In addition to wetland issues, dam construction and the lack of low flow releases into streams can severely impact downstream aquatic resources. Dam construction, repair, modification, and removal are regulated by the NC Division of Land Resources under the Dam Safety Law of 1967. A dam safety permit is required for any dam which is 15 feet or greater in height (from top of dam to lowest point on downstream toe) and the impoundment capacity is 10-acre-feet or greater at the top of the dam. Low-flow release requirements to maintain adequate instream flows are established in permits where appropriate. Instream flows are recommended by the NC Division of Water Resources.

There are several other programs which can affect hydrologic modification. The Forest Practice Guidelines Related to Water Quality requires streamside management zones to be maintained during logging operations. The Water Supply Watershed Protection Program also has requirements to maintain buffers for certain activities. The Conservation Reserve Program encourages the establishment of vegetative filter strips (66-99 feet wide) for farming operations. A significant number of local governments have established greenway programs within urban settings in order to maintain and protect riparian areas.

Water Supply Legislation in North Carolina

- **Water Supply Planning Law**
  The Water Supply Planning law (G.S. 143-355 (l) and (m)) was adopted in 1989 and amended in 1993. It requires all local governments that supply or plan to supply water to prepare a local water supply plan. In their plans, local governments are to include present and projected population, industrial development and water use within the service area, present and future water supplies, an estimate of technical assistance needs and other information that may be required by the Department. All local plans are to be approved and submitted to DWR by January 1, 1995. Information in those local plans is to be included in a State Water Supply Plan. The State Plan will also investigate the extent to which the various local plans are compatible.

- **Registration of Water Withdrawals and Transfers Law**
  The Registration of Water Withdrawals and Transfers law (G.S. 143-215.22H) requires any person who withdraws or transfers 1 MGD or more of surface water or groundwater to register the average daily and maximum daily withdrawal or transfer with the Environmental

Management Commission (EMC). The law also provides that if a local government has an approved local water supply plan on file with DWR, it does not have to register that withdrawal, thereby reducing duplication of effort by local governments that otherwise would be subject to both laws. In addition, the law includes a 5-year renewal requirement, which will ensure that the data is regularly updated.

- **Regulation of Surface Water Transfers Act**
  In 1993, the legislature adopted the Regulation of Surface Water Transfers Act (G.S. 143-215.22I et seq.). This law was designed to regulate large surface water transfers by requiring a certificate from the EMC and by repealing several other laws that had previously affected interbasin transfers. The law applies to anyone initiating a transfer of 2 MGD from one river basin to another and to anyone increasing an existing transfer by 25 percent or more if the total transfer is 2 MGD or more. Applicants for certificates must petition the EMC and include a description of the transfer facilities, the proposed water uses, water conservation measures to assure efficient use and any other information desired by the EMC. A certificate will be granted for the transfer if the Commission concludes that the overall benefits of the transfer outweigh its detriments. The Commission may grant the petition in whole or in part, or deny it, and it may require mitigation measures to minimize detrimental effects. The law also provides for a $10,000 civil penalty for violating various statutes.

- **Capacity Use Act**
  DWR administers the Capacity Use Act (G.S. 143-215.11 et seq.), which allows the EMC to establish a Capacity Use Area where it finds that the use of ground water, surface water or both requires coordination and limited regulation. If after an investigation and public hearings a Capacity Use Area is designated, the EMC may adopt regulations within the area, including issuance of permits for water users. In the near future, DWR plans to review the rules for implementation of the Capacity Use statute and develop a model of the aquifer system, in coordination with the Groundwater Section of DWQ, for Capacity Use Area 1, which was created to regulate surface water and ground water withdrawals in an area surrounding Texasgulf, Inc. in Aurora, N.C. A new ground water flow model will be used to simulate Capacity Use Area 1 as a basis for permitting withdrawals.

- **Dam Safety law**
  The Dam Safety law (G.S. 143-215.24) was amended in 1993, and rules are being developed for implementation of these amendments. Among the changes, the amendment defines "minimum stream flow" as a quantity and quality sufficient in the judgment of the Department of Environment, Health and Natural Resources (DEHNR) to meet and maintain stream classifications and water quality standards established by DEHNR and to maintain aquatic habitat in the affected stream length.

  The Dam Safety Law applies to dams that are 15 feet or more high or with impoundment capacity of 10 acre feet or more. The law requires that the EMC adopt rules specifying minimum stream flow in the length of the stream affected by a dam and sets specific parameters for minimum stream flow for dams operated by small power producers that divert water from 4,000 feet or less of a natural stream bed and return the water to the same stream.

<u>Section 319 Nonpoint Source Management and Other Programs</u>

- **Section 319**
  Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies in the state that deal with NPS problems submit proposals to DWQ each year for use of these funds in various projects. Projects that have been funded in the past include BMP demonstrations, watershed water quality improvement projects, data management, educational activities, modeling, stream restoration efforts, riparian buffer

establishment, and others. North Carolina DWQ established a Workgroup process in 1995 for prioritizing and selecting projects from the pool of cost-share proposals for inclusion in its annual application to EPA. DWQ staff first reviews proposals for minimum 319 eligibility criteria such as:

- support state Program milestones;
- address targeted, high priority watersheds;
- provide sufficient cost-share match (40% of project costs);
- propose adequate time periods;
- identify measurable outputs;
- use compatible GIS products with those of the state; and
- make commitment for educational activities and a final report.

Workgroup members separately review and rank each proposal which meets the minimum 319 eligibility criteria. The Workgroup consists of representatives from the state and federal agencies that deal with NPS issues, including agricultural, silvicultural, on-site wastewater, mining, solid waste and resource protection. In their review, members consider such factors as: technical soundness; likelihood of achieving water quality results; degree of balance lent to the state Program in terms of project type; and competence/reliability of contracting agency. They then convene to discuss individual projects' merits, to pool all rankings and to arrive at final rankings for the projects. All proposals that rank above the funding target are included in the annual grant application to EPA, with DWQ reserving the right to make final changes to the list. Actual funding depends on approval from EPA and yearly Congressional appropriations.

- **Use Restoration Waters**

The North Carolina Division of Water Quality is currently developing the Use Restoration Waters (URW) program to restore surface waters to their designated uses. If adopted, this program will allow the state to work with local governments, businesses, and residents to develop management strategies appropriate for the area. In order to be effective, the URW program will include a mix of mandatory and voluntary programs. The voluntary and mandatory programs will be coordinated on a site-specific basis by DWQ and a group of stakeholders who have an interest in the impaired water body and associated watershed. In addition, the URW program will attempt to develop cooperative relationships among these agencies so that overlapping efforts can be consolidated and targeted to restore designated water body uses.

The URW Program will apply to polluted surface waters where the following conditions apply:

- Biological, physical and/or chemical data indicate the specific sources of pollution.
- A use attainment study indicates that the sources of pollution are not transitory.
- It is possible to control the sources of pollution by implementing appropriate management strategies under the existing authority of the North Carolina Environmental Management Commission (EMC), other state commissions, and local agencies or voluntary actions implemented by citizens and other groups.

Based on current water quality data, there are approximately 4,300 miles of freshwater streams (or about 1.4 percent of total miles) and about 40,000 saltwater acres (or about 2 percent of total saltwater acres) that would be potential candidates for URW consideration.

The restoration strategies developed under the URW Program will be site-specific to the watershed of the nonsupporting or impaired water body. DWQ and the stakeholders will coordinate each URW strategy with other agencies' programs to create a holistic approach to address the array of pollution problems in the watershed.

- **The Nonpoint Source (NPS) Team Process**

Successfully managing NPS pollution requires not only a knowledge of science and technology, but also an understanding of the local resources and economy. Although there are some general management guidelines, there is no single technique for controlling NPS pollution. The most efficient and effective NPS solutions will be site-specific. Formulating NPS solutions often requires cooperation between different interested parties. Each group that contributes to the NPS problem must be part of the solution.

DWQ will coordinate the Watauga NPS Team to include a wide variety of stakeholders interested in the basin. This team will take the lead in identifying NPS problems and implementing solutions. The NPS Team process is discussed below and in Chapter 7.

1. Coordinate the NPS Team.
DWQ's goal in forming the Watauga NPS Team is to choose predominantly locally-based members that represent the federal, local, and state agencies, local governments, industries, and citizens' groups that have interests and responsibilities pertaining to NPS pollution. DWQ will consult local groups to determine which interests should be represented on the team.

Once the NPS Team is formed, DWQ and the team will work as partners to identify, prioritize, and address the NPS problems in the basin. DWQ will offer information from the state's water quality monitoring program and its staffs' knowledge of technical and financial resources. The NPS Team will describe current NPS initiatives, identify priority NPS-impaired waterbodies, and analyze NPS issues and needs. One of the most important missions of the DWQ-NPS Team partnership is to foster coordination and cooperation between the basin's diverse interest groups and agencies. The eventual goal of the NPS Team is to create and implement Action Plans that will address priority *NPS-impaired waterbodies* and *NPS issues* as part of the basinwide planning process. The implementation schedule will be determined as the plans are developed.

2. Take inventory of the initiatives and programs in place to address NPS pollution.
Each member of the NPS Team will describe the existing initiatives and programs of the agency or group he/she represents. A list of these initiatives is included in the basinwide plan to show readers some of the potential resources for addressing their NPS problems (see Chapter 5). This effort will provide an opportunity for mutual education, understanding and coordination with other stakeholders. An important responsibility of the NPS Teams will be to assess whether existing initiatives and programs in the basin are successfully improving water quality.

3. Choosing the priority NPS-impaired waterbodies and NPS issues.
Since the NPS Team will not be able to address all of the *NPS-impaired waterbodies* and *NPS issues* in the basin, it will have to follow a system for prioritization. The NPS Team will use the following process to target NPS-impaired waterbodies and select NPS issues.

Selecting the Priority NPS-impaired Waterbodies

Within the guidelines described below, the NPS Team will select at least one NPS-impaired waterbody for which an Action Plan will be developed. More than one waterbody may be selected if time and resources allow. The goal of the Action Plan will be to restore the designated use of the selected waterbody using a comprehensive, site-specific, and coordinated approach. The Actions Plans will be a prime candidate for funding under the federal Section 319(h) program.

The NPS Team will use both primary and secondary criteria to select the *priority NPS-impaired waterbodies*. The primary criteria are (in order of importance):

- Highly-valued resource waters, such as High Quality Waters and Water Supplies I-IV, that have a demonstrated pollution problem.
- Monitored waters that have an overall use support rating of non-supporting.
- Monitored waters that have a use support rating of partially supporting but have a high predicted loading for one or more pollutants.
- Highly valued resource waters, such as High Quality Waters and Water Supplies I-IV, that are in need of protection.
- Monitored waters that have an overall use support rating of partially supporting.

DWQ will provide a list of waterbodies that meet the primary criteria to the NPS Team.

The secondary criteria for selecting the priority *NPS-impaired waterbodies* are:

- Waters that pose a potential threat to human health,
- Waters that are important for ecological reasons not reflected in their classification and use support ratings (such as endangered species, unique habitats, or significant biological resources),
- Waters that are highly eroded or have other evidence of serious erosion problems that are not reflected in the use support ratings,
- Waters that have experienced a recent, rapid decline in water quality, and
- Waters that have identifiable pollution sources and a high likelihood of successful restoration.

An NPS-impaired waterbody that meets the primary criteria as well as one or more of the secondary criteria listed above is a good candidate for prioritization by the NPS Team. However, the NPS Team may select a priority NPS-impaired waterbody that does not meet the primary criteria but meets *several* of the secondary criteria. This allows the team to select waters that DWQ did not monitor or waters for which the use support rating failed to describe the extent of the NPS problem.

Selecting the Priority NPS Issues

In order to address problems in the remaining NPS-impaired or threatened waterbodies (ones not prioritized for specific Action Plans), the follwing criteria will be used to target NPS issues throughout the basin:

- Issues that apply throughout a significant portion of the basin or address one or more impaired waters that were not selected as a *priority NPS-impaired waterbody,*
- Issues that have a clearly defined "problem" and "solution," and
- Issues that are within the team's ability to address through educational efforts, improved coordination between stakeholders, focused new initiatives, or involvement of additional stakeholders.

4. Determine what is needed to address the priority NPS-impaired waterbody and the NPS issues the team selects.

The NPS Team will decide which actions are likely to restore the priority NPS-impaired waterbodies and address the NPS issues. Some of the possible needs include:

- Public education. When water quality problems result from citizens' lack of knowledge about how their local actions affect water quality or from land use decisions, public education is a key component of the solution.

- Implementation of best management practices (BMPs). BMPs are structural or nonstructural management practices used to reduce nonpoint source inputs to receiving waterbodies in order to achieve water quality protection goals. Often higher levels of pollutant removal can be achieved by using a combination of different BMPs.
  * Structural BMPs generally work by capturing, retaining, and treating runoff before it leaves an area. Some examples of structural BMPs include constructed wetlands and wet detention ponds in urban settings and controlled drainage on agricultural lands. Structural BMPs require regular maintenance.
  * There are a variety of nonstructural BMPs. One nonstructural BMP is source reduction, which reduces the amount of pollutants that are introduced into the environment. Some types of source reduction are nutrient management plans for crop production and hazardous waste collection sites in urban areas. Another nonstructural BMP is maintaining natural drainageways to allow the vegetation and soil to cleanse runoff before it enters a waterbody.
- Ecosystem restoration and management. If a stream's ecosystem is badly damaged, removing pollutants alone will not always restore the water's uses. In cases like these, it will be necessary to restore the ecosystem through measures such as riparian revegetation and streambank stabilization.
- Local water quality planning. Development sites can be planned in order to reduce their risk of harming water quality. Some planning techniques include steering development towards less environmentally sensitive areas, using natural drainage systems rather than curb and gutter, and planning for development densities that allow for open space, greenways, and wildlife corridors.

5. **Develop comprehensive Action Plans consisting of management strategies to address the priority NPS-impaired waterbody and the NPS issues.**

The NPS Team members will work together to develop "Action Plans." These Action Plans will consist of a list of Action Items that form a coordinated, comprehensive effort to address each priority NPS-impaired waterbody and NPS issue. Each Action Item will include lead contacts, goals, and a schedule for completion and may utilize one or more of the following vehicles for implementation:

- Efforts by NPS Team members: The NPS Team members can make commitments to target their agency's/group's existing resources to address the priority NPS-impaired waterbody or NPS issues. Team members can also agree to share their expertise on a volunteer basis.
- Section 319: Clean Water Act Section 319(h) grant monies are made available to the states on an annual basis by EPA. Agencies in the state that deal with NPS problems submit proposals to DWQ each year for use of these funds in various projects. Projects that have been funded in the past include BMP demonstrations, watershed water quality improvement projects, data management, educational activities, modeling, stream restoration efforts, riparian buffer establishment, and others. Refer to Section 5.7 for a complete program description.
- Agriculture Cost Share Program: Provides a number of cost-share practices designed to solve soil, water, and related environmental problems in agricultural areas including forested buffer strips.
- Wetlands Restoration Program. A bill recently ratified by the NC General Assembly establishes a statewide Wetland Restoration Program that will provide a leadership role in targeting and consolidating all wetland and riparian area restoration initiatives in NC.
- Proposed Use Restoration Waters (URW) Program. DWQ is currently developing the URW program to restore surface waterbodies to their designated uses. If adopted, this program would allow the state to work with local governments, businesses, and residents to develop

focused management strategies appropriate for the area. Those affected by the URW program will be requested to meet well-defined milestones and goals for water quality improvement. If these milestones are not met on a voluntary basis within an established schedule, mandatory controls may be considered by the Environmental Management Commission.

- Federal Initiatives: There are a number of federal programs and resources that may be available to address the Priority NPS-impaired waterbody and NPS issues. These include US Fish and Wildlife Service funds, the USDA-NRCS Wetland Reserve Program, and the Environmental Quality Initiative Program (EQIP) provisions of the Farm Bill.
- Other Programs: There are numerous other programs sponsored by private and state agencies that could be initiated to address the NPS Team's priority waterbodies and issues. Some of these programs include corporate funding for educational programs, the Small Watershed Program, and US Fish and Wildlife Grants. A complete list of funding sources for NPS pollution is listed in Appendix VIII.

6. Implement Action Plans.

Implementation is the most important part of the state's NPS program since it is the only way to restore the priority NPS-impaired waterbody and address NPS issues. Most, if not all, members of the NPS Team will be involved with the implementation of one or more of the Action Items. During the implementation phase, the NPS Team will continue to meet on a regular basis. The purpose of these meetings will be for the team to update each other on their progress toward completing the Action Items and provide a forum for continuing the coordination between team members. When some of the team members experience setbacks in implementing an Action Item, the rest of the team can advise and/or provide additional help so that the item can be completed successfully.

7. Monitor to evaluate the effectiveness of management strategies.

The NPS Team will identify where additional water quality monitoring sites may be needed to document the effectiveness of its Action Plans. DWQ and the NPS Team will cooperate to assure that pre- and post-monitoring is in place before a new program, initiative or BMP is implemented. In order to supplement DWQ's monitoring programs, the team may seek the involvement of citizens' groups. Any agencies that receive 319 grants will be required to conduct pre- and post-evaluations as a part of their project.

8. Consider additional management strategies if the voluntary approaches do not result in an improvement in water quality.

If the NPS Team's management strategies do not show progress in improving water quality according to the designated schedule, DWQ and the team will work together to identify the reason for the lack of progress. Some of the potential courses of action are:

- Reevaluate the source of impairment.
- Increase and/or redirect voluntary measures.
- Consider additional measures.

APPENDIX VII

Potential Sources of Funding for Projects
to Address Point Sources

Appendix VII
Potential Sources of Funding for Projects to Address Point Sources

Funding Program	Application	Contact
U.S. Rural Utilities Service: Water and Wastewater Loan and Grant Program	For rural areas and towns up to 10,000 in population who wish to construct, enlarge, extend, or otherwise improve water or waste disposal facilities providing essential service primarily to rural residents and businesses. Applicants must provide evidence that they cannot finance desired facilities at reasonable rates and terms.	Jeff Duval Jefferson, NC (910) 246-2885
Rural Business and Cooperative Service: Rural Business Enterprise Grants	For rural areas and towns up to 50,000 in population to facilitate and support the development of small and emerging private business enterprises. This includes the construction and development of water and sewer facilities. Grants must either create or save jobs.	One of the RECD Rural Development Managers listed under "Rural Utilities Service" serving the area where the project is located.
Appalachian Regional Commission: Supplements to Other Federal Grants in Aid	For public bodies and nonprofit groups located in wester North Carolina to assist in the improvement of water and sewer facilities which will facilitate the creation or retention of industrial and commercial jobs.	Sara Stuckey NC Department of Administration 116 West Jones Street Raleigh, NC 27603-8003 (919) 733-7232
U.S. Economic Development Administration: Public Works and Development Facilities Grant Program	For any public or nonprofit agency to assist communities with funding public works and development facilities that contribute to the creation or retention of primarily private sector jobs and alleviation of unemployment and underemployment.	Dale L. Jones Economic Development Representative P.O. Box 2522 Raleigh, NC 27601 (919) 856-4570
NC Division of Water Quality: Construction Grants and Loans Program	Provides grants and loans to local government agencies for the construction, upgrade, and expansion of wastewater collection and treatment systems.	Bobby Blowe Construction Grants/Loans Section Division of Water Quality P.O. Box 29579 Raleigh, NC 27626-0579 (919) 733-6900
NC Division of Community Assistance: Small Cities Community Development Block Grant	For municipalities and counties (except for 22 entitlement cities and Wake and Cumberland Counties, which receive money directly from U.S. Dept. of Housing and Urban Development) to develop viable communities by providing decent suitable living environments and to expand economic opportunities mainly for persons of low to moderate income. Funds may be used for public water/wastewater activities.	Liz Wolfe or Phyllis Denmark Division of Community Assistance P.O. Box 12600 Raleigh, NC 27605-2600 (919) 733-2850

Appendix VII
Potential Sources of Funding for Projects to Address Point Sources, continued

Funding Program	Application	Contact
NC Commerce Finance Center: Industrial Development Fund	For counties and their local units of government (with the same exceptions as above) which access the fund on behalf of new or existing manufacturing firms to provide a financing incentive for jobs creation in the state's most economically distressed counties. Funds may be used for a wide variety of repair, renovation, and modification type projects including sewer infrastructure.	Charles Johnson Industrial Finance Specialist 301 N. Wilmington St. P.O. Box 29571 Raleigh, NC 27626-0571 (919) 715-6558
Rural Economic Development Center, Inc.: Supplemental and Capacity Grants Program	*Supplemental Grants* - Provide funds to match federal and other grants that support necessary economic development projects in economically distressed areas. *Capacity Grants* - Enable local governments to acquire short-term capacity for the planning and writing of federal grants that address immediate economic needs.	Johnnie Southerland Senior Associate Wastewater Grants Rural Economic Development Ctr. 1200 St. Mary's Street Raleigh, NC 27605 (919) 715-2725

APPENDIX VIII

Potential Sources Of Funding For Projects
To Address Nonpoint Sources

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
NC Agriculture Cost Share Program for NPS Pollution Control (NCACSP)	**Agriculture:** Provides up to 75% cost-share, as well as technical assistance, for practices that protect water quality in agricultural areas.	Donna Moffit NC Division of Soil and Water Conservation (919) 715-6107
Environmental Quality Incentives Program (EQIP)	**Agriculture:** Establishes conservation priority areas -- agricultural lands with significant water, soil, and related natural resource problems. Provides 5 to 10 year contracts to pay up to 75% of the cost of conservation practices such as manure management systems, IPM, and erosion control. USDA also provides technical assistance.	Tim Jones USDA, Farm Service Agency 4407 Bland Road Suite 175 Raleigh, NC 27609 (919) 790-2867
Conservation Reserve Program (CRP)	**Agriculture:** Payments to farmers who voluntarily take highly erodible land out of production for at least ten years. Annual rental payments along with 50% cost-share for establishment of permanent cover (grass, trees).	Tim Jones USDA, Farm Service Agency 4407 Bland Road Suite 175 Raleigh, NC 27609 (919) 790-2867
Emergency Conservation Program	**Agriculture:** Provides technical assistance and direct cost-share payments for agricultural producers who, without federal assistance, cannot rehabilitate their private farm land after a natural disaster. Payments are limited to 64% of the first $62,400, 40% of the second $62,400, and 20% of the cost above $125,000.	Tim Jones USDA - Farm Service Agency 4407 Bland Road Suite 175 Raleigh, NC 27609 (919) 790-2867
Farm Debt Cancellation-Conservation Easement Program	**Agriculture:** Farm Service Agency credit borrowers who have loans secured by real estate and have qualifying land may be given debt cancellation on outstanding loan balances in exchange for conservation easements. The cancellation may not exceed 33% of the principal for current borrowers, or the fair market value of the easement for delinquent borrowers.	Mickey Cochran USDA, Farm Service Agency 4407 Bland Road Suite 175 Raleigh, NC 27609 (919) 790-3057

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
Interest Assistance Program	**Agriculture:** Provides guaranteed loans to, among other things, enhance and protect land and water resources -- including pollution abatement and control. Eligible recipients include farm owners/operators who are unable to obtain financing at reasonable rates or rates that allow them to maintain a positive cash flow.	Mickey Cochran USDA, Farm Service Agency 4407 Bland Road Suite 175 Raleigh, NC 27609 (919) 790-3057
Wetland Reserve Program (WRP)	**Agriculture:** Allows farmers to sell permanent wetland easements to USDA. Also cost-share to restore altered wetlands to natural condition. Eligible land includes prior converted cropland, farmed wetlands, riparian areas along streams or water courses that link protected wetlands.	USDA - Natural Resources Conservation Service Contact your local conservationist.
Small Watershed Program, PL-566	**Agriculture:** Technical and financial assistance for projects protecting and developing small watersheds. Historic emphasis on flood control, program now requires off-site water quality benefits.	Carroll Pierce NC Division of Soil and Water Conservation (919) 715-6110
GTE Foundation	**Education:** Supports projects improving math and science for underrepresented groups.	GTE Foundation GTE Corporate Communications One Stamford Forum Stamford, CT 06904 (203) 965-3620
Toyota TAPESTRY Grants	**Education:** Supports innovative science education by teachers in environmental education and physical science.	Eric Crossley National Science Teachers Assoc. Toyota Tapestry 1840 Wilson Blvd. Arlington, VA 22201-3000 (703) 312-9258
Toshiba America Foundation	**Education:** Supports secondary school science and math education.	John Sumansky Toshiba America Foundation 1251 Avenue of the Americas Suite 4100 New York, NY 10020 (212) 596-0600
Digital Equipment Corporation	**Education:** Supports science and math education through school-based and community-linked organizations.	Programs Manager Corporate Contributions Programs Digital Equipment Corp. 110 Powder Mill Rd. MSO 1/L14 Maynard, MA 01754-1418 (508) 493-6550

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
National Environmental Education and Training Foundation (NEETF)	**Education:** Provides funds for environmental education projects that foster informed decision-making, target adults and adolescents in informal educational settings, and address environmental issues affecting health. Require at least a 50% cash match provided by a non-federal source other than the award recipient.	NEETF 915 Fifteenth St. NW Suite 200 Washington, D.C. 20005 (202) 628-8200
National Research Initiative Competitive Grants Program	**Research:** Supports research on key problems of national and regional importance in biological, environmental, physical, and social science relevant to agriculture, food, and the environment, including assessment and protection of water resources. Scientists at public and private agencies and universities are eligible.	USDA - CSREES National Research Initiative Competitive Grants Program Room 323, Aerospace Center AG Box 2241 Washington, DC 20250-22441 (202) 401-5022 (Request for proposals published annually in the *Federal Register*.)
Environmental Contaminants - Identification and Assessment	**Research:** Provides short and medium duration studies/investigations of contaminant exposure and effect to individuals and organizations with a need for such information. Applicants must provide matching funds or in-kind services.	Tom Ausperger US Fish and Wildlife Service P.O. Box 33726 Raleigh, NC 27636-3627 (919) 856-4520
Environmental Contaminants - Prevention	**Research:** Provides technical and engineering support to prevent contaminant problems. No direct financial assistance is provided.	Tom Ausperger US Fish and Wildlife Service P.O. Box 33726 Raleigh, NC 27636-3627 (919) 856-4520
Environmental Geochemistry and Biogeochemistry Research Program	**Research:** Supports interdisciplinary research on how chemical and biological processes in nature alter water quality. A minimum 1% cost-share is required. Eligible recipients are scientists, engineers, and educators at universities and other not-for-profit institutions.	National Science Foundation Division of Earth Sciences Director, Environmental Chemistry and Geochemistry Program 4201 Wilson Blvd. Arlington, VA 22230 (703) 306-1554
Hydrologic Science Research Program	**Research:** Supports research in hydrologic science on the quality of waters in streams and aquifers. A minimum 1% cost-share is required. Eligible recipients are scientists, engineers, and educators at universities and other not-for-profit institutions.	National Science Foundation Division of Earth Sciences Director, Hydrologic Sciences Program 4201 Wilson Blvd. Arlington, VA 22230 (703) 306-1549

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
Water and Watersheds Research Program	**Research:** A joint NSF/EPA special awards program to support interdiciplinary teams joining the physical, biological, and socioeconomic sciences and engineering in research on water quality issues. A minimum 1% cost-share is required. Eligible recipients are scientists, engineers, and educators at universities and other not-for-profit institutions.	National Science Foundation Directorate for Biological Sciences Executive Officer 4201 Wilson Blvd. Arlington, VA 22230 (703) 306-1400
Flood Plain Management Services	**Water Quality Planning:** Provides invormation and data on floods and actions to reduce flood damage to local governments.	U.S. Army Corps of Engineers, Planning Division Directorate of Civil Works, Chief Flood Plain Management Services 20 Massachusetts Ave., NW Washington, D.C. 20314-1000 (202) 761-0169
Resource Conservation and Development Program	**Water Quality Planning:** Provides funds and technical assistance to local governments and nonprofits to plan, develop, and implement programs for resource conservation and community sustainability.	Stan Steury RC&D Executive Director Blue Ridge RC&D Council, Inc. P.O. Box 2 Boone, NC 28607 (704) 265-4005
River Basin Surveys and Investigations	**Water Quality Planning:** Provides planning assistance to local agencies to develop coordinated water and relanted land resource programs, with priority given to solving upstream flooding of rural communityies, improving water quality from agricultural nonpoint sources, abd wetland preservation, etc.	USDA, Natural Resources Conservation Service Director, Watersheds and Wetlands Division P.O. Box 2890 Washington, D.C. 20013 (202) 720-3534
Soil and Water Conservation Program	**Water Quality Planning:** Provides technical assistance to local governments for resource planning and management to improve water quality and reduce pollution.	USDA, Natural Resources Conservation Service Contact your local conservationist
Watershed Protection and Flood Preventions (Small Watershed Program)	**Water Quality Planning:** Provides monitoring, loans, cost-share, and technical assitance for the installation of land treatment measures. Provides up to 100% of the cost of structural flood prevention measures. Eligible agencies include local government, nonprofits, and SWCDs.	USDA, Natural Resources Conservation Service Contact your local conservationist.

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
Rivers, Trails, and Conservation Assistance Program	**Water Quality Planning:** Provides technical assistance for assessing resources, identifying land protection strategies, and developing organizations to address environmental concerns.	Mary Rountree Great Smokey Mountains Nat. Park 107 Park Headquarters Gatlinburg, TN 37738-4102 (423) 436-1246
Section 205(j) Water Quality Planning Grants	**Water Quality Planning:** Provides funds for planning activities such as developing plans for meeting and maintaining local water quality standards, implementing such plans, and determining the nature, extent, and causes of water quality problems.	Alan Clark Division of Water Quality Planning Branch P.O. 29535 Raleigh, NC 27607 (919) 733-5083 ext. 570
NC Division of Water Resources Stream Repair Funding	**Stream Restoration:** Provides cost-share funds and technical assistance in stream restoration projects to local governments.	Jeff Bruton Division of Water Resources P.O. Box 27687 Raleigh, NC 27611-7687 (919) 733-4064
Forestry Stewardship Incentive Program	**Forestry:** Up to 75% cost-share (max $10,000/person-yr) to enhance management of nonindustrial private forest lands to increase timber supply and improve fish and wildlife habitat and recreation.	Larry Such NC Division of Forest Resources P.O. Box 29581 Raleigh, NC 27626 (919) 733-2162 ext. 241
Forestry Incentives Program	**Forestry:** Up to 65% funding for tree planting and stand improvement to increase supplies from nonindustrial private forest lands.	Larry Such NC Division of Forest Resources P.O. Box 29581 Raleigh, NC 27626 (919) 733-2162 ext. 241
Rural Abandoned Mine Program	**Reclamation:** Direct payments of up to 100% in cost-share funds for conservation practices determined to be needed for reclamation, conservation, and development of up to 320 acres per owner of rural abandoned coal mine land or lands and waters affected by coal mining.	USDA, Natural Resources Conservation Service Contact your local conservationist.
Environmental Contaminants -- Natural Resource Damage Assessment	**Reclamation:** Provides funding for the assessment of damage to water quality and Trust resources from oil spills and/or other hazardous substance releases for individuals or organizations interested in the restoration of fish and wildlife, including aquatic habitat and water quality.	Tom Ausperger US Fish and Wildlife Service P.O. Box 33726 Raleigh, NC 27636-3627 (919) 856-4520

Appendix VIII
Potential Sources of Funding for Projects to Address Nonpoint Sources

Funding Program	Application	Contact
NC Conservation Tax Credit Program	**Land Conservation:** Allows credit against individual and corporate income taxes when real property is donated for conservation purposes. Interests in property that promote fish, wildlife, etc. conservation purposes may be donated to a qualified recipient for a substantial tax credit (currently 25% of the value of the gift up to $25,000).	Bill Flournoy NC DEHNR (919) 715-4191

APPENDIX IX

Section 303(d) of the Clean Water Act

APPENDIX IX

Section 303(d) of the Clean Water Act and the Waters of the Watauga River Basin

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 achieve the standards or uses. Waterbodies which are listed must be prioritized, and a management strategy or total maximum daily load (TMDL) must subsequently be developed for all listed waters.

303(d) List Development

The 305(b) report was used as a basis for developing the 303(d) list. Section 305(b) of the CWA requires states to report biennially to the U.S. Environmental Protection Agency (EPA) on the quality of waters in their state. In general, the report describes the quality of the state's surface waters, groundwaters, and wetlands, and existing programs to protect water quality. Information on use support, likely causes (e.g., sediment, nutrients, etc.) and sources (point sources, agriculture, etc.) of impairment are also presented in the report.

Many types of information were used to make use support assessments and to determine causes and sources of use support impairment. Chemical, physical, and biological data were the primary sources of information used to make use support assessments. North Carolina has an extensive ambient and biological monitoring network throughout the state. Benthic macroinvertebrate data which indicate taxa richness of pollution intolerant groups are an important data source. North Carolina also collects fish tissue and fish community structure data and phytoplankton bloom data that are used in the assessments. In addition, fish consumption advisories, information from other agencies, workshops, and reports, predictive modeling results, toxicity data, and self monitoring data is considered when making final use support determinations. In the Watauga River Basin, the Tennessee Valley Authority (TVA) has collected data. Their data collection and analysis methods differ from DWQ's, and therefore their data were not used to determine final use support. However, their data are summarized in Section 4.2.4. DWQ will use their data to help determine future sampling sites. For example, if TVA data show impairment, DWQ will try to monitor that waterbody to see if our data also indicate impairment. DWQ will also work with TVA to choose reference sites that both agencies believe have high quality. These sites will then be sampled to determine if similar results are obtained from each agency. Overlap sampling may also occur at other sites throughout the basin.

The list also includes probable problem parameters. Where the list has no problem parameter listed, the use support rating was based on biological data, and available chemical data showed no impairment. It should be noted that where a problem parameter has been identified, the water quality standard for that parameter was exceeded. This parameter is a potential cause of the impairment, but there may be other unidentified causes contributing to the impairment as well.

Only those waterbodies whose use support rating were not supporting (NS) or partially supporting (PS) in the 305(b) report were considered as candidates for the 303(d) list. Of those waterbodies that showed impairment (PS or NS rating) only those waterbodies that had a use support rating based on monitoring data collected in the last five years were included on the 303(d) list. Since many changes can occur within a watershed in a five year period, conclusive information about a waterbody's use support cannot be made with older data. However, North Carolina will be collecting information on as many of these evaluated waterbodies as staffing and time permit for subsequent updates of the basin plan and 303(d) list. As more conclusive information on streams

rated using older data or best professional judgment is obtained, evaluated waterbodies will be added to the list if the data indicate impairment.

The only change made to the Watauga River Basin 303(d) list from the previous list is that Laurel Fork was removed. This stream was included on older lists based on information obtained at a workshop in 1988. Biological data collected in 1990 resulted in a rating of Good (fully supporting), and biological data collected in 1994 resulted in a Good-fair rating (supporting but threatened). This updated information was used to determine that Laurel Fork's uses are currently being met.

This listing process resulted in no waterbodies on the Watauga River Basin 303(d) list.