NORTH CAROLINA

STATE WATER SUPPLY PLAN

January 2001

STATE OF NORTH CAROLINA
Michael F. Easley, Governor

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
William G. Ross Jr., Secretary

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This document is available on the Division of Water Resources' web site at: *www.ncwater.org*.

PREFACE

This State Water Supply Plan is the first document of its kind in North Carolina. North Carolina has been working toward development of a State Water Supply Plan for 10 years now, since the passage of legislation in 1989 mandating the state and local water supply planning process.

The State Water Supply Plan is a compilation of over 500 Local Water Supply Plans developed by local government water systems to assess their water supply needs over the next 20 years. This version of the State Water Supply Plan, dated January 2001, is based on the most recent Local Water Supply Plans, most of which were developed during 1998 and 1999. The Division of Water Resources carefully reviewed these plans and worked with local governments to assure that they were as complete and accurate as possible. In addition, the state plan incorporates the 1999 water withdrawal registration data that other water users submitted during 2000. The State Water Supply Plan will be updated at five year intervals, with each update reflecting the most recent Local Water Supply Plans and water withdrawal registration data.

The State Water Supply Plan describes the major water supply issues facing state and local governments now and over the next 5-10 year period, such as how to address the serious decline in ground water levels in portions of our central coastal plain. This document presents relevant information for local communities and their consultants to use when planning for their future water supply needs, such as water conservation, additional water supply alternatives, and the various state regulations and programs affecting water supply planning.

A draft State Water Supply Plan was released in January 2000, based on 1992 Local Water Supply Plan data. In addition to incorporating more recent data, this final version also reflects public and agency comments received during 14 public meetings that were held across the state during June and July 2000 and other written comments received throughout the year.

The State Water Supply Plan is available online at the division's website at *www.ncwater.org*. For additional information or to provide comments, contact the Water Supply Planning Section in the North Carolina Division of Water Resources at 1611 Mail Service Center, Raleigh, NC 27699-1611 or call (919) 733-4064. Comments and inquiries can also be sent by email to DWR at *swsp@news.ncwater.org*.

EXECUTIVE SUMMARY

North Carolina is fortunate in having a generous natural supply of water. However, North Carolina is beginning to experience some problems in areas where somewhat limited natural availability of water is coupled with high demand or competition among water users. Some of these emerging pressure points are the Central Coastal Plain, where the Cretaceous aquifers have a relatively slow recharge rate; the headwater areas of our Piedmont river basins, where streamflows are greatly reduced during dry weather; and some areas near the coast and on the Outer Banks, where the natural availability of fresh water is limited. In cases such as these, residents, community leaders, and the economic development community need to recognize that water demands have to be managed and matched to available supplies to prevent water from becoming the limiting factor on economic growth.

Providing for North Carolina's future water supply needs will require a determined effort by local governments, water users, and state government working together to orchestrate the right combination of monitoring, planning, and regulation.

As our water supplies experience heavier demands, it becomes increasingly important to monitor the availability of our ground and surface water supplies. We also need good data on all types of water use. Taken together, the data on water availability and water use give us a foundation for planning for our future water needs.

Planning is necessary to work out the specific solutions to our future water supply needs. The North Carolina General Assembly has provided a good basis for water supply planning by requiring all local government water systems to prepare Local Water Supply Plans that assess their water supply needs and available supplies over at least a 20-year planning period. These local water supply plans, which are updated every 5 years, are the building blocks for the State Water Supply Plan. As each local government defines its future needs and preferences for additional supplies, regional planning may be necessary to coordinate cost-effective and reliable water supply solutions.

In some cases, regulation is needed to avoid depletion of our water supplies or to create a fair allocation of water among competing needs. The most important regulatory tool is the Water Use Act of 1967, which allows the Environmental Management Commission to declare a Capacity Use Area and regulate water withdrawals in areas where water resources are being depleted or damaging conflicts among water users are occurring. State statutes also regulate the transfer of surface water from one river basin to another to assure that resources in both basins are adequately protected.

Recommendations

' In areas of the Coastal Plain, overpumping of ground water is resulting in serious water level declines and encroachment of salt water into fresh water portions of the Black Creek and Upper Cape Fear aquifers. It is essential that water withdrawals be reduced in those areas to protect the aquifers and ensure that they remain a long-term, regional water supply. To address this issue, the Environmental

Management Commission has enacted a Central Coastal Plain Capacity Use Area for a 15-county area in eastern North Carolina. The rule, scheduled to become effective in August 2002, will require water use permits for ground water withdrawals above 100,000 gallons per day, along with phased-in pumping reductions in specific problem areas. Parallel to this regulatory response, water systems in the Central Coastal Plain need to begin planning for new sustainable water supplies and expanding their water conservation efforts to assure that water is available to support the region's economy.

' Water systems whose average daily water demands already exceed 80 percent of their available water supply should be actively managing their water demand and pursuing additional water supplies. These systems are at greater risk of experiencing water shortages during periods of peak water use and especially during drought. The Division of Water Resources can assist these systems with their water conservation and water supply development efforts to help assure that adequate water supplies are maintained.

' All water systems should develop a Water Shortage Response Plan. While drought is a common cause of water shortages, other events, such as mechanical failures, pipe breaks, or contamination of water sources, can also result in water shortages. Planning ahead for such occurrences minimizes the time needed to respond to emergencies and provides a strategy for communities to follow.

' Water is a regional resource, and some local governments will need to seek regional solutions to water supply issues. Regional water supply planning and management is critical to successful long-term protection of the quality and quantity of water available to citizens and businesses in North Carolina. The increasing costs and requirements for planning and permitting new facilities, treating water, and developing additional water sources will make it less practical for many communities to act independently to meet future water supply needs.

' A number of state programs and regulations affect water supply planning efforts by local governments, presenting challenges to and perhaps even discouraging innovative water supply solutions, such as aggressive water reuse, aquifer storage and recovery, or regional water supply projects involving multiple river basins. The General Assembly, state agencies, local governments, and consultants should work together to ensure that a regulatory framework exists that allows innovative water supply projects such as these to be reasonably developed without compromising health and environmental standards.

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SECTION 1. INTRODUCTION

As North Carolina's population and economy continue to grow, so does our need for good quality, reliable water supplies. Will we have enough water for our future needs if our desired growth continues? The future of our economy depends on the answer to this question.

North Carolina is fortunate in having a generous natural supply of water. We receive an average of 48 inches of rain per year in North Carolina, much more than many other states. Our geologic history has given us a pattern of river valleys that provide surface water to most of our major population centers and also productive regional aquifers in the coastal plain.

Even so, North Carolina is beginning to see some water supply shortages and competition among water users in areas where the natural availability of surface or ground water is somewhat limited. The headwaters of our Piedmont river basins, where stream flows are greatly reduced during dry weather; the Cretaceous aquifers of the Coastal Plain, which have a relatively slow recharge rate; and areas along the coast and on the Outer Banks, where the natural availability of fresh water is limited, are all currently experiencing critical water supply problems. As North Carolina continues to grow, we will encounter water supply problems more frequently.

Having an adequate water supply is usually thought of as being able to meet "offstream" water uses, such as municipal, industrial, and agricultural uses. However, we also need to maintain a healthy flow of water in our rivers and streams for the "instream" uses, such as protecting aquatic habitat, maintaining water quality, and providing recreation. Meeting future water supply needs, including instream flow needs, will require a determined effort by local governments, water users, and state government working in partnership. This effort will consist of three major elements–monitoring, planning and regulation.

As our water supplies experience heavier demands, it will be increasingly important to closely monitor the availability of our water supplies. Our primary monitoring tools are a statewide network of stream gages to measure surface water flow and a network of ground water observation wells to monitor ground water levels. These monitoring networks tell us the amount of water available in surface and ground water sources and the rate at which these sources are increasing or decreasing. We also need good data on all types of water use. Having a good data record for a long period of time is essential to understanding the full range of natural variability in streamflows and ground water levels and the long-term effects of increasing water withdrawals on our water resources. Taken together, the data on water availability and water use give us a good foundation for planning for our future water needs.

Planning is necessary to work out specific solutions to our future water supply needs. The North Carolina General Assembly has provided a good basis for water supply planning by requiring all local governments that provide water service to prepare local water supply plans. These plans, which cover a 20-year period and are updated every five years, assess the availability of water supply, the projected future needs for water, and the sources that will be used to meet any deficit that is

identified over the planning period. These local water supply plans have become an essential resource for local and regional water supply planning and are the building blocks for this State Water Supply Plan. As each local government defines its future needs and its alternative sources of supply, regional planning is necessary to fit the pieces together into a cost-effective and reliable water supply solution.

In some cases, regulation is needed to avoid depletion of our water supplies or to create a fair allocation of water among competing needs. The General Assembly has provided three primary laws for this purpose. The Dam Safety Act establishes requirements for minimum streamflows below dams and provides a way of assuring adequate instream flows as our water withdrawals increase. The Regulation of Surface Water Transfers Act creates a permitting system for large transfers of water from one river basin to another, assuring the protection of the economic and environmental welfare of each of the 38 defined basins. The third and most important of these statutes is the Water Use Act of 1967, which allows the Environmental Management Commission to declare a Capacity Use Area in parts of the state where the rate of water use is threatening to deplete resources or cause damaging conflicts among water users. Within these Capacity Use Areas, water use above 100,000 gallons per day is regulated by permit.

The best solution to our water supply problems will be found by having the right orchestration of monitoring, planning, and regulation.

SECTION 2. WATER SUPPLY PLANNING IN NORTH CAROLINA

Section 2.1 Background

Historically, the State of North Carolina has supported water supply planning through data collection and studies, as well as through legislation to resolve issues that were beyond the capabilities of local governments, especially to protect the public health. For instance, at the end of the 1800s, concern over protecting waters used as public supplies lead to the passage of several state laws that prohibited disposal of animal carcasses and untreated sewage in streams used as public water supplies. The state supported extensive surveys of our rivers and streams during the early decades of the 20th century to determine water availability and identify sites for hydroelectric power facilities. Some of these reservoirs developed for hydropower generation also provide water to surrounding communities, especially in the Catawba and Yadkin basins.

The state has also supported the development of regional water supply projects. Passage by Congress of the 1936 Omnibus Flood Control Act allowed development of multi-purpose reservoir projects that could be adapted to provide storage for public water supply if non-federal entities assumed responsibility for the associated costs. Two prominent examples of this arrangement in North Carolina are Falls Lake in the Neuse basin, with costs assumed by the City of Raleigh, and B. Everett Jordan Lake in the Cape Fear basin, where the State of North Carolina assumed the costs associated with developing regional water supply storage.

After World War II, protecting public water supplies by protecting water quality increased in priority as some communities began to have trouble securing adequate supplies of drinking water due to pollution concerns. In the early 1950s the State Stream Sanitation Committee surveyed the major river basins and classified streams according to their "best use." Water quality standards were established for each classification and pollution abatement plans were developed for basins across the state. A prolonged drought from 1953-1955 raised the level of concern over water quantity issues and lead to the formation of the State Board of Water Commissioners in 1955 to study state water policy. By 1960, in an effort to coordinate water resource activities, various water-related agencies were merged under the umbrella of the Department of Water Resources. Water resource planning, which had been an adjunct to other agency responsibilities, got a boost with the passage of the federal Water Resources Planning Act in 1965. This act provided grant money to encourage states to plan for activities affecting water and related land resources.

During the 1970s, with federal support, North Carolina conducted another inventory of water resources to facilitate wise planning and use of water and related land resources. The resulting North Carolina Water Resources Framework Study was intended to bring water resource development, including water supplies, into a common framework that would guide state actions to meet the needs over the remainder of the century. The document outlined resource development options for eleven major river basins and was envisioned as the initial phase in the development of a detailed North

Carolina Water Plan. The study provided valuable information for communities and regional development efforts but a comprehensive state water plan was not developed.

State authority over water use increased when the North Carolina General Assembly passed the Water Use Act of 1967. The act was passed in response to concerns over potential ground water problems in the vicinity of a proposed phosphate mine in Beaufort County. There was concern that heavy pumping of ground water, necessary to conduct the mining operation, would reduce the water levels in neighboring wells. Under this act, if the Environmental Management Commission (EMC) finds that the use of water resources in an area requires coordination and regulation to protect the interests and rights of residents and property owners or to protect the water resources, the EMC can declare the area a Capacity Use Area (CUA). In a CUA water withdrawals above 100,000 gallons per day require a permit from the EMC and limitations on the quantity and timing of water withdrawals can be imposed. As of December 2000, there is one designated Capacity Use Area, which surrounds the phosphate mine that prompted the legislation. However, in December 2000, the EMC approved a set of rules to declare a 15-county area in the Central Coastal Plain a Capacity Use Area due to over-pumping of ground water. The rules must be approved by the Rules Review Commission and are subject to review and revision by the General Assembly through the 2002 legislative session. The rules could become effective August 1, 2002.

Section 2.2 State and Local Water Supply Planning

The need to look at how communities meet their water supply needs resurfaced in the mid-1980s due to a multi-year drought. In 1989, the General Assembly passed House Bill 157 to provide for the development of a State Water Supply Plan "in order to assure the availability of adequate supplies of good quality water to protect the public health and to support desirable economic growth." The bill added sections (l) and (m) to General Statute 143-355. The Division of Water Resources (DWR) in the Department of Environment and Natural Resources is responsible for implementation of these provisions of the statute.

Section (l) requires units of local government that provide or plan to provide public water service to develop a Local Water Supply Plan (LWSP). The bill stipulated that the local plans shall include: present and projected population, present and projected water use in the service area, present and future water supplies, an estimate of technical assistance needed at the local level to address projected water needs, and other related information. Local plans are adopted by the governing boards of the units of local government after they are submitted to DWR for review. They must be revised at least every five years to reflect changes in relevant data, unless a more frequent revision is requested by DWR. Section (m) requires development of a State Water Supply Plan based on the information included in the LWSPs and other appropriate information sources.

The North Carolina General Assembly has created a "bottom up" approach to water supply planning, starting with local government water supply plans. North Carolina allowed a period of time

for local governments to become familiar with water supply planning, starting with a voluntary approach with state technical assistance before establishing mandatory deadlines for preparing local water supply plans.

Water supply planning has been generally well accepted by local governments. In addition, the Local Water Supply Plans have become an essential data source for local and regional water supply planning in North Carolina. The water supply policies established by the General Assembly have been well suited to the diversity of water supply arrangements in North Carolina and to the lead role of local governments in developing and managing water systems. In the future the state will likely have an active role in water supply planning as regional solutions are developed to address the growing regional demands for water across the state.

2.2.1 1989 Water System Surveys

DWR began implementing the provisions of House Bill 157 shortly after passage on July 11, 1989. A Water Supply System Report questionnaire was developed for an initial survey of water systems and to identify technical assistance needs and availability of data at the local level. These questionnaires were mailed in October 1990 to over 640 public water systems serving at least 500 persons to collect water use and system information for calendar year 1989. By August 1992, 550 questionnaires had been returned to DWR. Review of these questionnaires and discussions with local officials indicated that over 90% of local governments did not have readily available water use and water need information for preparing Local Water Supply Plans. A quarter of respondents requested assistance with developing a local plan.

During this period local governments faced considerable work to implement provisions of the Water Supply Watershed Protection Act that was also passed in 1989. This act required many local governments to amend or establish zoning ordinances to protect water supply sources and, unlike House Bill 157, included severe consequences for non-compliance. By necessity, communities had to give priority to compliance with the Water Supply Watershed Protection Act.

2.2.2 1992 Local Water Supply Plans

Based on the responses to the initial surveys and discussions with local officials, the questionnaire used in 1989 was revised and a handbook entitled "Guidelines for Minimum Requirements of a Local Water Supply Plan" was developed to assist local governments with collecting data and preparing their local plans. DWR conducted a pilot study of the Local Water Supply Plan development process with water systems in Moore County throughout 1992. During the pilot study the guidelines and instructions were further revised, the process used to review plans was developed, and additional technical material was added regarding safe yield determinations for water sources.

After the pilot study, the guidelines, instructions, and questionnaire were reviewed by numerous organizations having an interest in the implementation of House Bill 157, including the North Carolina Rural Water Association, the North Carolina Association of County Commissioners, the North Carolina

League of Municipalities, the North Carolina Water Resources Research Institute, several regional Councils of Government, and several municipalities. Reviews and comments were also provided by the Division of Environmental Health and the Division of Water Quality. Changes were made in the written documents in response to comments and a series of workshops were planned to explain the process and to provide direct assistance to water systems. Water use and system information for calendar year 1992 was used as the basis for the first round of local plans.

In early 1993, presentations explaining the local water supply planning requirements and procedures were made to more than thirteen organizations across the state. The needed forms, guidelines, and instructions were mailed out over a six-month period beginning in March 1993 to distribute the workload associated with assisting local governments with plan preparation and internal plan review. During the first round of local water supply plans, it was expected that about 525 local government water systems would prepare plans.

The 1993 General Assembly provided an additional appropriation to support the water supply planning legislation enacted in 1989. That appropriation allowed DWR to strengthen its ability to assist local governments, to review local water supply plans, and to create a state water use database.

As of September 1996, DWR had received draft LWSPs from 500 water systems for review. These plans were reviewed for internal consistency, and DWR provided assistance to ensure plans met the minimum requirements of the law. Over 80 percent of plans required at least two drafts before they were determined to be ready to adopt by local authorities as their Local Water Supply Plan. Almost 40 percent of plans submitted required three drafts and 12 percent needed four drafts before meeting minimum requirements. By September 1, 1996 there were 416 LWSPs on file with DWR that met the minimum requirements of the law and had been adopted by the local governing board as required by the law.

2.2.3 1997 Local Water Supply Plan Updates

The law requires that Local Water Supply Plans be revised to reflect changes in relevant data and projections at least once every five years. Therefore, the second round of local plans needed to be prepared using 1997 water supply and demand information. Based on experiences with the 1992 plans, the questionnaires and instructions were revised during 1997 in preparation for the local plan updates. Water systems were notified in early 1997 of the pending update and were provided a checklist of data to collect to simplify the process. During 1998, after mailing copies of the revised information packet to systems across the state, six workshops were conducted to explain the process and provide direct assistance to system representatives.

There were 412 systems that had submitted a draft of their 1997 LWSP by the January 1, 1999 deadline. As of December 2000, only 16 of the 553 water systems expected to submit plans had not submitted a draft 1997 LWSP. Of the LWSPs received, 209 of the plans are either complete or are ready to be adopted by the local governing board. DWR will be working diligently with the remaining local governments to get their updated plans completed by mid-2001.

SECTION 3. PHYSICAL AND SOCIAL ENVIRONMENT

North Carolina's physical environment–its terrain, soils, and geology–have determined the nature of its river basins and aquifers and thereby the availability of water supplies. The availability of water for public water supply, industry, power generation, and navigation has been an important factor influencing the location and amount of growth in North Carolina.

In turn, North Carolina's economic and population growth has led to the construction of reservoirs and to increased use of surface and ground water, which has changed the "natural" availability of water.

The amount of water available for public water supply in North Carolina will continue to be influenced by the interplay between the natural availability of water in each part of the state and the impacts of our increasing use of our water resources.

3.1 Geography and Climate

Despite the rapid growth occurring in the state, most of North Carolina's 52,669 square miles remain undeveloped. Forestland accounts for about half (51 percent) of the total area. An additional 24 percent of the state is cropland or pastureland, and about 8 percent is covered by water. Developed land, at 10.5 percent, accounts for most of the remaining area, along with federal lands not in National Forests at 3.6 percent and other minor land uses at 3 percent. The proportion of developed land has been growing while the proportions of cropland and forestland have been declining. From 1982 to1999, developed land area increased from 7.7 percent to 10.5 percent of total area, while forestland and cropland areas each decreased by more than 2 percent in total area.

Located between 34 and 37 degrees north of the equator, North Carolina generally has a humid subtropical climate characterized by short mild winters and humid summers. The predominance of warm season precipitation and annual average precipitation of 48 inches means there is usually an adequate amount of rainfall to support agriculture, supply water to our towns and cities, and maintain healthy streamflows.

Stretching over 500 miles inland from the Outer Banks, North Carolina's elevation begins at sea level in the east and rises to over 6,500 feet in the western mountains. The state can be divided into three distinct physiographic regions–Coastal Plain, Piedmont, and Mountains. These regions are shown in Figure 3-1.

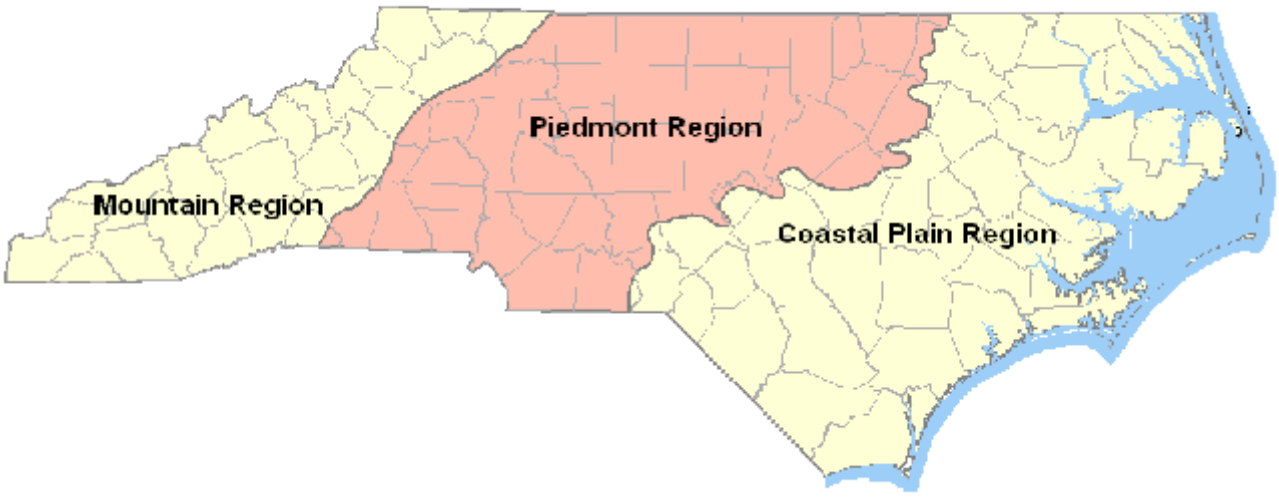


Figure 3-1. General Physiographic Regions of North Carolina

3.1.1 Coastal Plain

The Coastal Plain covers about 23,000 square miles of land along the Atlantic Coast characterized by flat terrain, swamplands, estuaries, and sandy beaches. Elevations in this region range from sea level along the coast to near 300 feet along its western boundary with the Piedmont. Vast areas of the Coastal Plain lie only a few feet above sea level. The Coastal Plain is composed of layers of sediments that have accumulated over millions of years from the weathering of the lands to the west. These layers of sediments form a series of productive aquifers that store vast quantities of water.

Annual precipitation ranges from 40-50 inches in the western Coastal Plain to 50-60 inches along the coast. The Coastal Plain is the main agricultural region of the state, with over 3.1 million acres of harvested cropland producing food and fiber crops for market. However, in recent years field crops have been surpassed by livestock operations as the major source of agricultural income.

The attractiveness of the North Carolina coast has lead to rapid population growth in many coastal communities. This pattern is expected to continue as the popularity of the North Carolina coast continues to grow. While many rivers flow through the Coastal Plain, the flat terrain offers few natural locations to develop reservoirs to hold water. Use of coastal rivers for water supply is also limited by the movement of salt water upriver during dry periods. Most residents of the region depend on ground water from the underlying regional aquifer systems that have historically provided readily-accessible water.

3.1.2 Piedmont

The gently rolling terrain of the Piedmont covers about17,500 square miles, or a little over a third of the state. Elevation in the Piedmont generally rises from about 300 feet above sea level near the fall line, where it meets the Coastal Plain, to around 1500 feet where it merges with the mountains. Precipitation averages from 40 to 50 inches per year over most of the region. The rolling hills in the Piedmont provided locations to economically develop dams and harness the power of the rivers flowing through the region. There are many privately controlled reservoirs built for hydropower generation as well as community water supply reservoirs on the rivers of the region.

The Piedmont is the manufacturing region of the state. This region is also the most populous region in the state with about 56 percent of its population classified as urban. Much of the state's population growth is taking place in the Piedmont Urban Crescent, along the Interstate 40 and Interstate 85 corridors stretching from east of Raleigh westward to Charlotte. Dynamic growth in the state's largest metropolitan areas of Charlotte, the Piedmont Triad, and the Research Triangle is driving suburban sprawl that is shrinking the amount of rural land that has historically separated the state's urban centers.

3.1.3 Mountains

The Mountain region covers about 9000 square miles. The Eastern Continental Divide runs through this region along the ridges of the Blue Ridge Mountains. This series of ridge lines forms the divide between the Atlantic and Mississippi drainages. Waterways on the western slope drain to the Tennessee and Ohio River basins and eventually flow into the Gulf of Mexico. Many rivers in the Tennessee River drainage are regulated by the Tennessee Valley Authority dams for flood control, hydroelectric power, and navigation purposes. Runoff from the eastern side of the divide flows to the Atlantic Ocean by way of rivers flowing through Georgia, South Carolina, and North Carolina.

The mountains create a barrier to moist air moving easterly from the Gulf of Mexico. As moist air masses rise over the mountains, much of the moisture falls on the western slopes, reducing the amount of moisture available to fall on the eastern slopes. The extremes of annual precipitation in the state can be found in this region. The area around Macon County, west of the divide, receives the highest annual average precipitation of over 90 inches, while the Asheville area, lying in the rain shadow, has the lowest annual average of about 38 inches.

The steep hillsides of the Appalachian Mountains and shallow soils that dominate this region are heavily forested, with much of the land contained in the Pisgah and Nantahala National Forests. The valley bottoms and the areas of gently sloping terrain support agricultural operations and are the locations of most of the developed lands in the region. Forest products, including Christmas tree production, are major components of the regional economy. This region is the least populated in the state and continues to maintain a rural population distribution. However, some of the counties in this

region are experiencing increasing growth rates as the region has become more accessible because of highway improvements. In addition, the Mountains have become a popular retirement and second home location.

3.2 Economy and Growth

North Carolina is in a period of economic growth and transition, accompanied by rapid population growth. The state also continues to make major investments in industrial recruitment, its university and technical college systems, and infrastructure such as roads, water, and sewer to support this growth. During the last thirty years, North Carolina has changed from a predominantly agriculturally-oriented economy to a more manufacturing-intensive state. The mix of manufacturing sectors continues to change as well. The historically dominant sectors of textiles, tobacco, and furniture are being challenged by expansions in the transportation, health, and electronics sectors. The non-manufacturing sectors of the economy, especially services, are also expected to continue expanding. Since water use varies among sectors of the economy, the economic transition taking place will change how and where water is used.

Growth in urban areas of North Carolina during the 1980s pushed the state from its historical status as a rural state to one that is now predominantly urban and suburban. According to the Office of State Planning, the population of North Carolina has increased over 40 percent since 1970. The Office of State Planning estimated the July 1997 population at 7.55 million, a 13.8 percent increase over the 1990 census figures, making North Carolina the eleventh most populous state. By April 2000, the population had grown to 8.05 million, 21.4% more than 1990. The appeal of North Carolina as a relocation destination has been enhanced in recent years by low unemployment and high rankings in national surveys of desirable places to live and work. The state's population is projected to grow to 9.6 million by 2020.

Like water resources, population is not evenly distributed across the state. Growth in metropolitan areas and along the coast has outpaced growth in rural areas. A distinctive feature of this pattern is the expanding band of suburban and urban areas that stretches across the Piedmont from east of Raleigh westward through the Triad and southerly to Charlotte. Growth in many of the coastal counties is increasing at dramatic rates as well. From 1990 to 1999, population in Brunswick, Pender, Currituck, Dare, and New Hanover Counties all grew by over 23 percent. This is comparable to growth in some of the Piedmont's metropolitan counties. For instance, over the same period, Wake, Hoke, Johnston, and Union Counties grew by over 36 percent; Harnett, Franklin, Cabarrus, Iredell, and Mecklenburg Counties grew by over 24 percent; and, Moore, Yadkin, Chatham, Orange, Randolph, Davie, Granville and Lee Counties all grew by over 17 percent. Not all counties experienced such dramatic growth. Eight counties had growth rates less than 3 percent, and eight

counties–Bertie, Edgecombe, Northampton, Halifax, Hertford, Jones, Onslow, and Washington decreased in population.

Higher than average population growth is also occurring in the Mountain counties of Macon, Clay, Henderson, and Polk, along the border with Georgia and South Carolina. As with the coast, much of this growth seems to be the result of increased access, tourism, and increasing popularity of the area as a place to retire.

From a water supply perspective, this shift in development patterns means that demand for water is becoming more concentrated and increasing around these rapidly growing metropolitan areas. Water resources in the vicinity of these regional growth centers are being called on to provide more and more water to support our growing economy. The ability of water purveyors to meet demand depends on both the regional availability of water and the ability to finance additional water supplies and construction of water and wastewater facilities. Growing demand for water in areas where regional supplies are limited may increase the need to move water between river basins, increasing the reliance on interbasin transfers to meet water demands. Currently at least 110 water systems rely on transferring water between basins.

Figure 3-2 shows how overall water use has increased and varied by water use type over the last three decades in North Carolina.

3.3 Water Use Patterns

Each community's overall water use pattern varies depending on its particular mix of water customer types–residential, commercial, industrial, and institutional. Variations in water use can occur for each type of use, but residential demands typically cause the most variation throughout the year.

Residential water demands are a combination of indoor and outdoor water uses. Outdoor water uses tend to be seasonal, with use increasing during the summer months and peaking sharply during dry periods. The amount of water used for outdoor purposes varies with the lifestyle choices and the affluence of residential water users. If the financial means allow, residential water users may use large amounts of water for landscape irrigation and swimming pools. The seasonal nature of these outdoor uses raises demand for water in the hot summer months when available supplies are most subject to limitations. Coastal communities are also subject to major increases in demand during the summer months which bring an influx of seasonal residents.

Our personal lifestyle choices and preferred community development styles can have significant effects on community water demand. From a water supply planning perspective, this means that the useful life of water supply and treatment facility investments will be influenced by the type of development patterns that are encouraged by local land use plans, or are allowed because there is no local development plan.

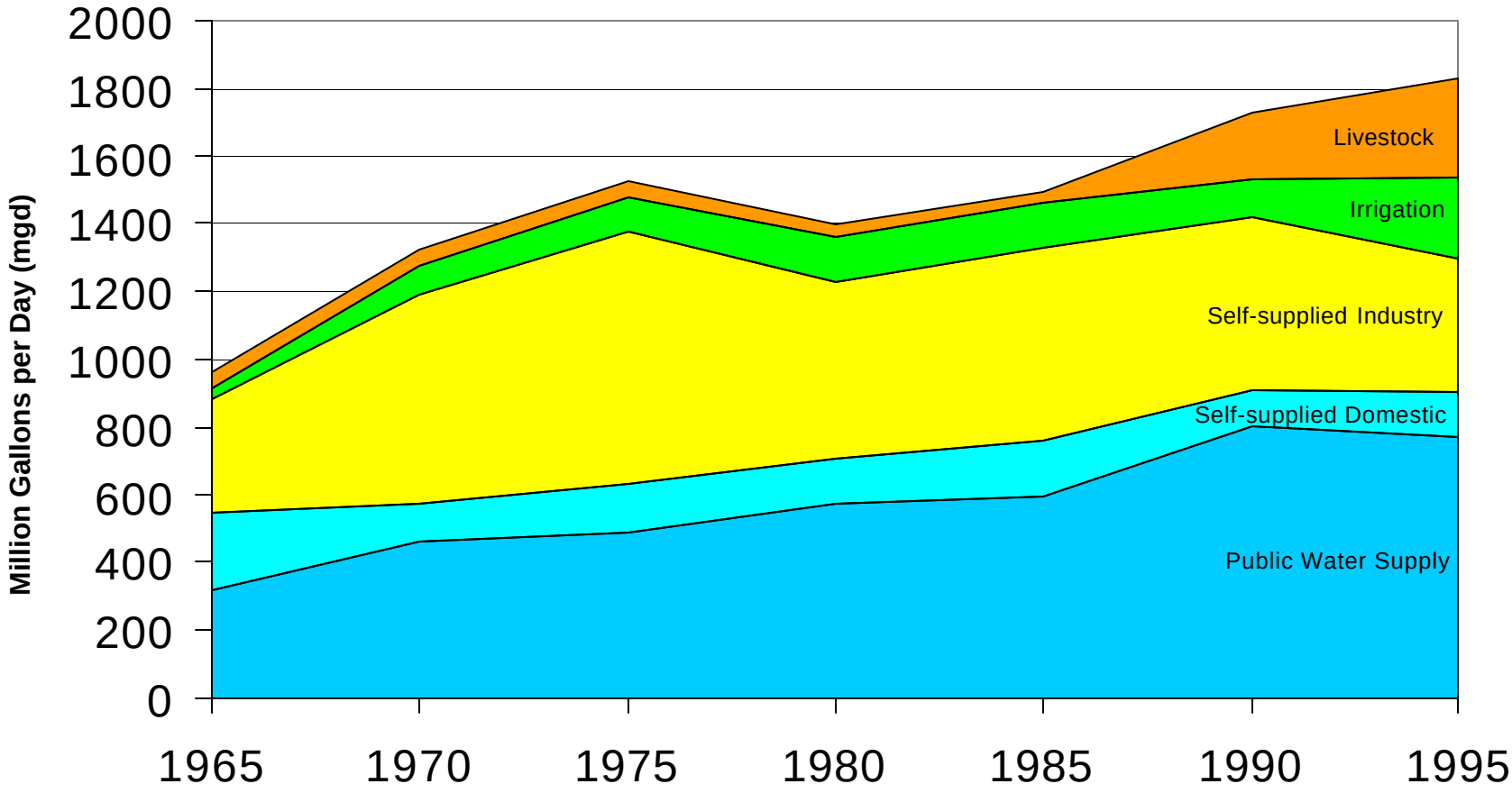


Figure 3-2. Water Use in North Carolina 1965 - 1995
(data from USGS estimates of water use in North Carolina)

SECTION 4. CURRENT WATER SUPPLY ISSUES

Almost all of the counties and river basins in the state have some water supply issues that are at least of local significance. However, numerous water supply issues currently have more regional or even statewide significance. These issues are touched on in various other sections of this report and in the basin summaries, however, they are presented here in greater detail.

4.1 Ground Water Issues in Eastern North Carolina

Ground water is an extremely important water supply source in North Carolina. Half of the state's population relies on ground water for water supply. For most public water systems in the coastal plain, ground water is the primary water source.

Ground water is the water that fills the pores and cracks in the soil and rocks below ground level. In the Piedmont and Mountain regions of the state, wells typically tap into water in the cracks in rock formations. In the coastal plain, wells typically tap into water contained within numerous layers of water-bearing sediments (or aquifers) that yield water of varying quantity and quality, depending on the depth and location of the well. Many of these coastal plain aquifers are capable of yielding large volumes of high-quality water. The amount of ground water available depends on the amount of natural recharge that occurs from rainfall slowly seeping into the aquifers.

4.1.1 Capacity Use Area #1

The Water Use Act of 1967 allows the Environmental Management Commission to designate an area as a Capacity Use Area (CUA) if it finds that the long-term sustainability of the water resource is threatened or that water use in an area requires coordination to protect the public interest. Within a designated CUA, all persons withdrawing more than 100,000 gallons of water per day must first obtain a permit from the Division of Water Resources (DWR).

Capacity Use Area # 1 (CUA #1) was formed in 1976 in response to pumping of the Castle Hayne aquifer associated with a phosphate mining operation in Beaufort County. Pumping of tens of millions of gallons of ground water per day to dewater the mine near the town of Aurora affected water levels in wells tens of miles away. CUA#1 includes all or parts of eight eastern North Carolina counties surrounding the mine, as shown in Figure 4-1.

Water use throughout much of CUA#1 currently appears to be at sustainable levels. Even though water use by many existing and new permittees has increased, the high recharge to the Castle Hayne aquifer, coupled with decreased pumping at the phosphate mine, have lessened the impacts of increased water use. However, DWR has recognized some areas of concern with respect to salt water intrusion and is currently working with the affected parties to mitigate the problem.

DWR is currently working to improve the management of the water resources within CUA#1. DWR has established a field office in New Bern to monitor and maintain wells in

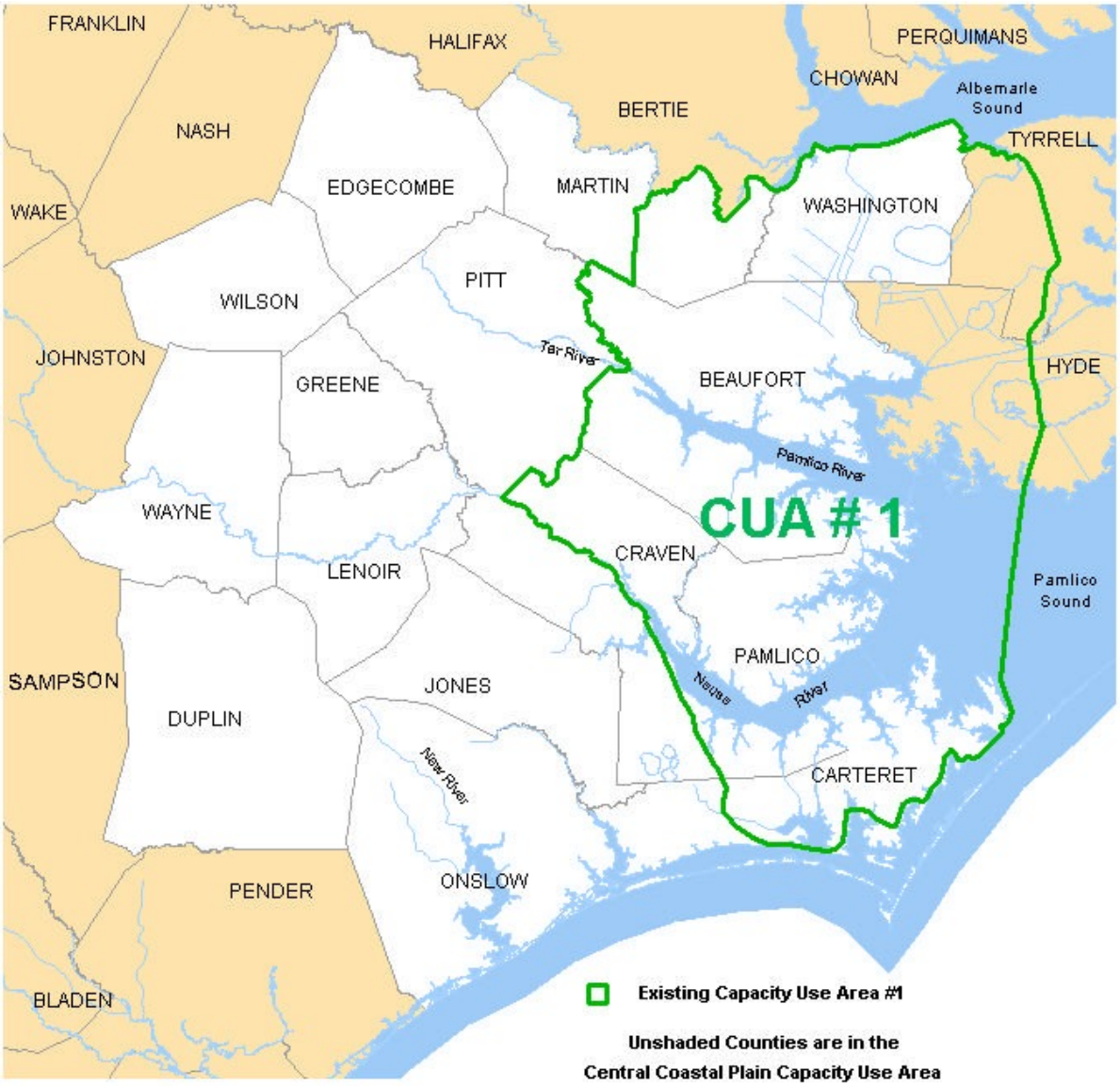


Figure 4-1. Vicinity Map of Capacity Use Area #1

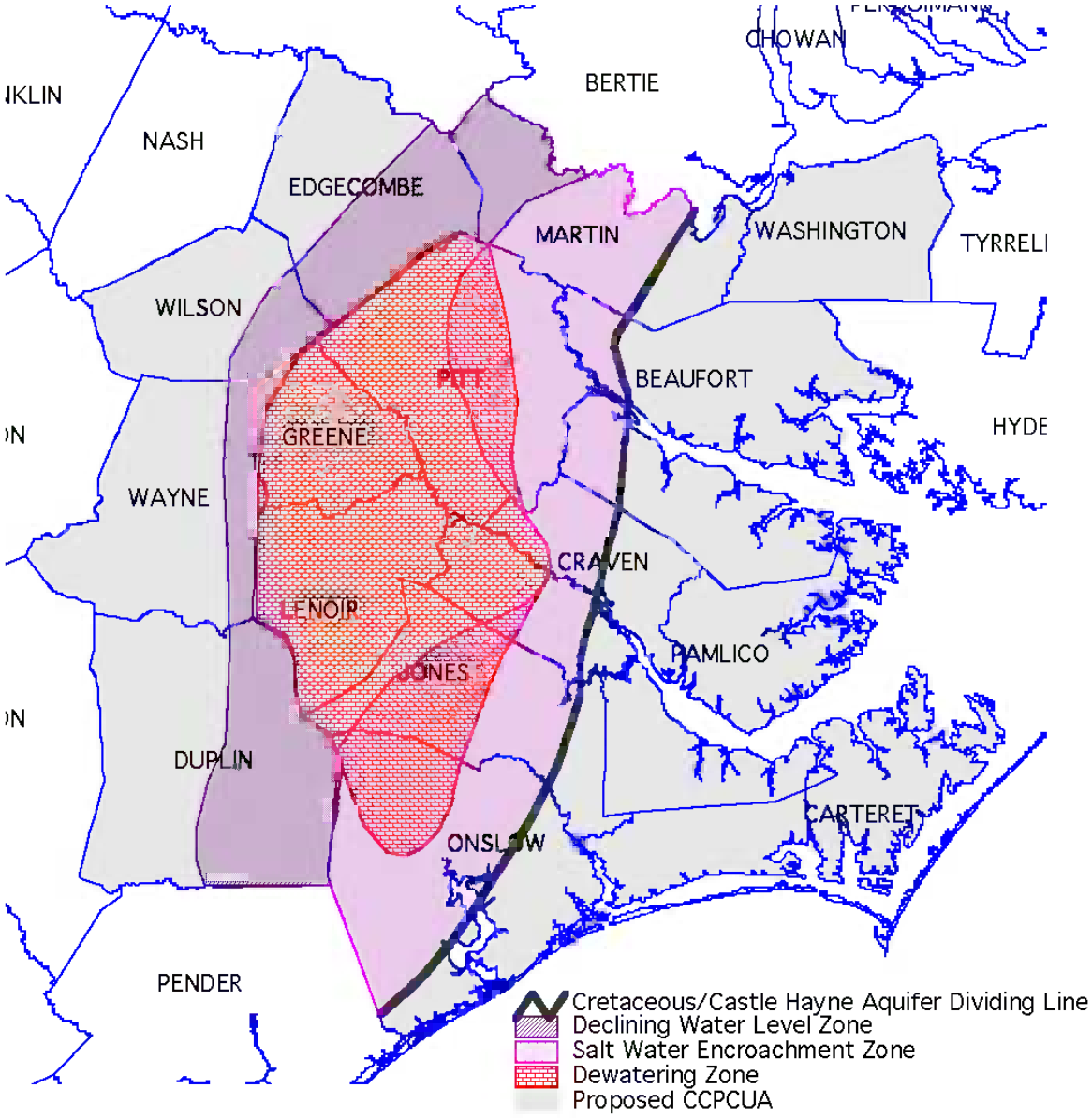


Figure 4-2. Cretaceous Aquifer Zones for Central Coastal Plain Capacity Use Area

the monitoring well network. Well data is being digitized and stored in a water use database that will allow for easier interpretation and greater public access to this data. In addition, DWR is developing a hydrogeologic framework model of the Castle Hayne aquifer to allow assessment of the cumulative impacts of multiple water withdrawals within CUA#1.

4.1.2 Central Coastal Plain Ground Water Issues

Ground water levels in the confined aquifers of the Central Coastal Plain have been declining for decades as ground water withdrawals have increased. Up to a certain point, water level declines are a normal and acceptable part of ground water use. However, if water levels continue to decline without stabilizing, it is an indication that ground water is being withdrawn faster than it can be recharged, which can lead to reduced water yield and damage to the aquifers. The Division of Water Resources has been tracking coastal plain ground water levels for a number of years. In early 1998, new monitoring data indicated that the declines had increased somewhat faster than predicted, and that in some areas water levels are falling below the top of the aquifer. This dewatering of the aquifer may result in serious impairment to the aquifer and ground water quality.

Water levels in the Black Creek and Upper Cape Fear aquifers have been declining since the late 1960s. Information from the 1920s indicated that water flowed freely from some wells at the time they were constructed. In some areas, water levels are now more than 200 feet below the land surface. This continued decline indicates that current withdrawals of water from these aquifers exceed the available supply that can be used on a sustainable basis.

DWR held a workshop with ground water users from the Central Coastal Plain in Greenville in March 1998 to review the monitoring data and discuss what responses should be made to assure a sustainable water supply for the coastal plain. Based on the available data and on this discussion with water users, DWR has developed a three-point program to assure good ground water management in the coastal plain:

Monitoring: The ground water level monitoring well network is currently being expanded and rehabilitated as needed to provide accurate data on the amount and rate of ground water level declines. This information is needed to guide management efforts to minimize damage to the aquifers and to track progress in reversing water level declines through improved management. Information on water usage in the region must be monitored so the relationship between pumping and water level changes can be understood and used by all water users to make management decisions.

Planning: The solution to the water supply problems in the Central Coastal Plain will involve careful management of ground water to make the best use of the sustainable yield while, at the same time, developing additional water sources to meet needs beyond those which can be met from the Black Creek and Upper Cape Fear aquifers. Communities have a number of options for using existing water sources more efficiently or developing additional water supply sources, including water

conservation, water reuse, switching to aquifers which are less stressed, developing new surface water sources, aquifer storage and recovery, and others.

Since 1998, local governments in North Carolina have been updating their Local Water Supply Plans (LWSPs) for a twenty-year period into the future. DWR held a special water supply plan workshop for Central Coastal Plain communities in Kinston in May 1998 to emphasize the need for planning for supplemental sources to ground water. During the LWSP review process, DWR has been working with systems to help them develop sustainable water supply plans that reflect the current conditions of regional water resources. In February 2000, DWR held a well-attended water conservation workshop in Kinston for Central Coastal Plain communities and other large water users.

Regulation: The Water Use Act of 1967 allows for regulation of water withdrawals by permit in areas where water use is exceeding the capacity of local water resources. In December 2000, the EMC establish a Central Coastal Plain Capacity Use Area to coordinate the usage of water in the most critical areas. Regulation under the Water Use Act alone cannot solve the water supply problem in the Central Coastal Plain, but is needed to protect the resource and to assure fairness among water users. Resolving water supply issues in the region will require the effective coordination of monitoring and water supply planning and development along with reasonable regulations.

The major ground water impacts are being observed in two principal aquifers, the Black Creek and Upper Cape Fear, which have been a desirable source of high-quality, low-cost drinking water throughout the coastal plain. The most threatened portions of these aquifers lie beneath the following fifteen North Carolina counties: Beaufort, Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt, Washington, Wayne and Wilson.

DWR proposed Central Coastal Plain Capacity Use Area (CCPCUA) rules to the Environmental Management Commission (EMC) in early 1999 for the 15 counties listed above. Draft rules went to public hearing on July 14, 1999. Based on comments received during the hearing and the public comment period, a collaborative stakeholder process was undertaken during February, March, and April 2000 to address specific concerns about the proposed rules. A revised set of CCPCUA rules were developed and taken before the EMC in May 2000. Following a second set of public hearings on August 8, 2000, the EMC approved the final rules on December 14, 2000. The CCPCUA rules must be approved by the Rules Review Commission during 2001 and are subject to review and revision by the General Assembly through the 2002 session. The CCPCUA rule could then become effective August 1, 2002.

In general, the CCPCUA rules will require anyone withdrawing more than 100,000 gallons of ground water per day to first obtain a water use permit from DWR. Withdrawal rates that will cause or continue to cause adverse impacts on the resource, such as dewatering of aquifers, encroachment of salt water, and land subsidence or sinkhole development will not be permitted. In addition, users

of ground water from zones of the Cretaceous (Black Creek and Upper Cape Fear) aquifers that are being most affected by overpumping will be required to reduce water use from these aquifers over a 16-year period. These zones, the Declining Water Level Zone, the Saltwater Encroachment Zone, and the Dewatering Zone, are shown in Figure 4-2.

The Saltwater Encroachment and Dewatering Zones are the areas of most concern. Reductions in pumping from these two aquifers of up to 75 percent over a 16-year period may be required to reduce water use from these sources to sustainable levels. Twenty-five (25) percent reductions in pumping from these sources would occur at the end of six years and also at the end of 11 years and 16 years if further reductions are needed. In the Declining Water Level Zone, reductions in pumping of up to 30 percent over a 16-year period may be required, with 10 percent reductions occuring in each of the three time intervals noted above.

Development of supplemental water sources to meet growing water demands will be critical to offset the reductions in water use from these aquifers. Equally important will be water conservation to make the most efficient use of the available water supplies.

Several significant water supply projects are already underway or under development in the Central Coastal Plain that will help to meet long-term water demands. Water systems in Lenoir County are planning an intake on the Neuse River. Greenville is planning an aquifer storage and recovery project, whereby unused, treated drinking water from the Tar River will be injected and stored under ground during low demand periods for later withdrawal and use during summer months. A private company is also pursuing development of a regional pipeline that would make available ground water from the PCS Phosphate mining operations that would otherwise be discharged into the Pamlico River. In addition, Onslow County has begun to use ground water from the Castle Hayne aquifer to reduce their reliance on the Black Creek aquifer.

To further assist water systems with water supply planning efforts, a steering committee has been convened by the NC Rural Economic Development Center to assist local governments with water supply alternatives development, water conservation, cost assessments, public education, and other aspects of this water supply problem.

4.1.3 Other Ground Water Issues

Several other areas of eastern North Carolina have ground water concerns. Some of these are newly emerging concerns and some are issues that have been ongoing. A brief discussion of these problems is given below. More detailed information can be obtained from the Ground Water Branch of the Division of Water Resources.

Southern Coastal Plain: Lumber River Council of Governments (LRCOG) has expressed concern about falling ground water levels in the Black Creek and Upper Cape Fear aquifers in Robeson, Bladen, and Columbus Counties. The Division of Water Resources will team up with LRCOG and the U.S. Geological Survey (USGS) in 2001 to determine the hydrogeologic

framework and an appropriate management plan for the region. USGS is currently collecting ground water levels for the LRCOG.

Saltwater Intrusion: Several coastal areas, particularly in New Hanover, Brunswick, and Onslow Counties, are experiencing saltwater intrusion in water supply aquifers. Daily pumping that exceeds the freshwater recharge rate allows saltwater to migrate into the freshwater zone. As overpumping continues, saltwater moves further inland and water from wells become saltier over time and may become unusable or require advanced treatment such as reverse osmosis. To raise public awareness of this problem, the Division of Water Resources is working with local water systems to help them understand their susceptibility to saltwater intrusion and also communicate that information to private well users. In addition, the division has begun improving the monitoring well network to improve prediction of future problem areas.

North Albemarle: The North Albemarle region is the six-county area north of the Albemarle Sound and east of the Chowan River. DWR has completed a water resources availability survey of this region. Survey objectives included quantifying existing water resources, estimating future water needs, and identifying future water supply sources. This region must deal with the problems of saline water threatening surface and ground water supplies and low yielding wells. To support that effort, the Division monitored water levels and drilled new wells to fill in gaps in our understanding of the subsurface geology. Data on the subsurface structure have been collected using Time Domain Electromagnetic Survey methods. A better understanding of how ground water flows through the system of aquifers will improve the estimates of the amount of ground water supply available for use. A report entitled "Hydrogeologic Framework and Ground Water Resources of the North Albemarle Region, North Carolina" (Sep 98) is available. The division will continue working with public water systems in this region to plan for future water supplies.

Currituck Outer Banks: Currituck County Commissioners, county officials, and citizens of the Currituck Outer Banks requested that the DWR look into their water supply situation in late 1987. The division did an extensive investigation and published the Currituck County Outer Banks Water Supply Study in 1991, analyzing the ground water resources of the island. Alternatives were suggested to augment water supply and allow planned development. Currituck County officials are using this document as a basis for water supply planning and have formed a task force to develop a strategy for providing adequate future water supplies. The division will continue providing technical and planning assistance as regional plans develop.

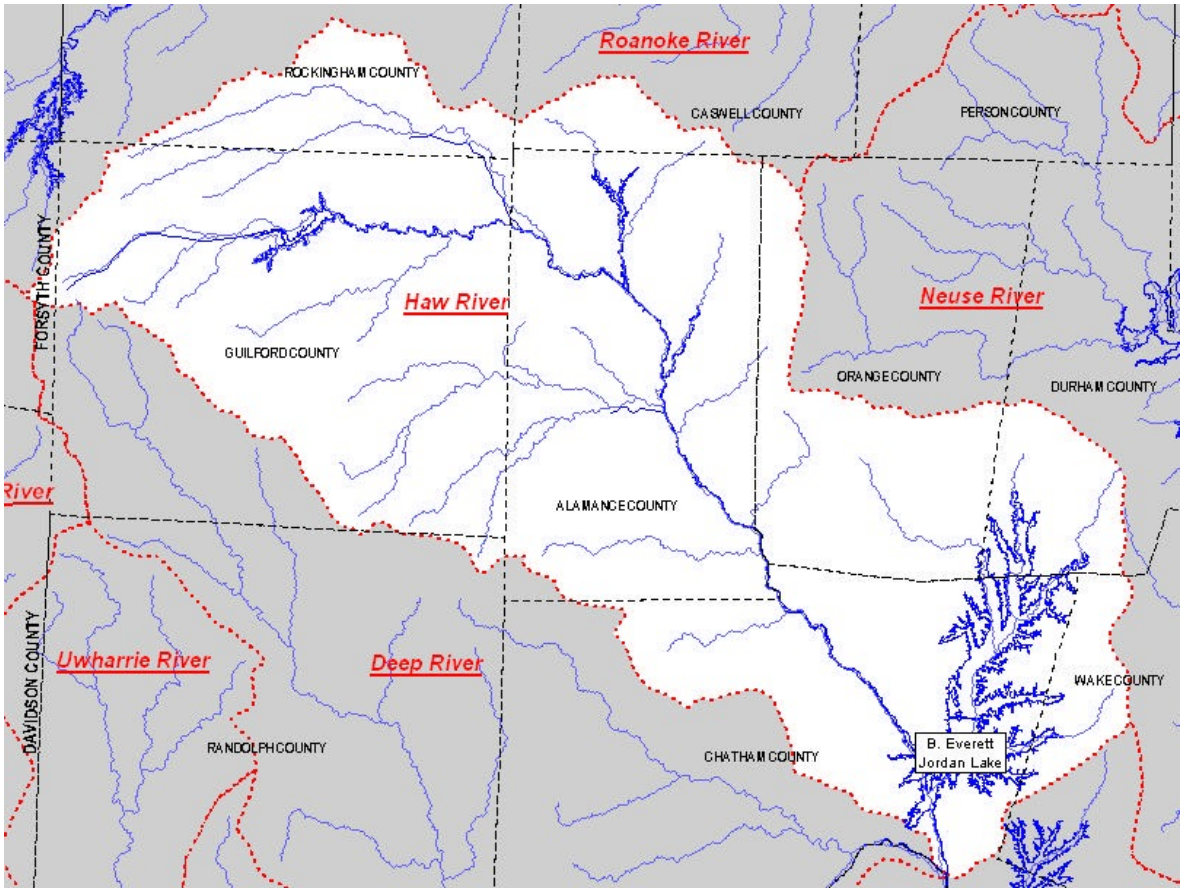


Figure 4-3. Haw River Basin Showing Jordan Lake

4.2 Allocation of Water Supply Storage in B. Everett Jordan Lake

Occupying 22 square miles, B. Everett Jordan Lake is a prominent geographic feature in the Research Triangle region and an important water source for the growing population of central North Carolina. Jordan Lake is a multi-purpose reservoir authorized by Congress for flood control, water supply, downstream flow augmentation, recreation, and fish and wildlife management.

Swimming, fishing, boating, and other water-based activities have become very popular with over 1.2 million persons visiting the Jordan Lake State Recreation Area in 1997 alone. Jordan Lake is already used by the Chatham County and Cary/Apex water systems as a source of drinking water, and many other communities in the region have expressed interested in the lake as a future water supply.

4.2.1 Description of Jordan Lake

Jordan Lake is located on the Haw River just downstream of the confluence of the Haw and New Hope Rivers. The watershed of the lake covers most of the Haw River basin, about 1690 square miles north and northwest from the dam as shown in Figure 4-3. At the normal lake level of 216 feet above sea level, approximately 140,400 acre-feet of water is available for water supply and water quality releases. About a third of this storage (45,800 acre-feet or about 15 billion gallons) is designated for water supply, providing an estimated safe yield of 100 million gallons per day (MGD).

The remaining two-thirds (94,600 acre-feet) is used for significant downstream flow augmentation during naturally occurring low flow periods. This water quality storage is used by the Corps of Engineers to maintain a minimum flow target of about 600 cubic feet per second (cfs), or about 388 MGD, at the stream gage at Lillington. Prior to Jordan Lake's operation, the 7-day, 10-year low-flow (a statistical low flow commonly used for setting wastewater discharge limits) at Lillington was just under 80 cfs and the minimum recorded streamflow was only 11 cfs.

The water quality storage and water supply storage are managed as if they were separate reservoirs. For bookkeeping purposes releases for flow augmentation are deducted from the water quality storage and water supply withdrawals are deducted from the water supply storage, meaning that water quality storage and water supply storage can be depleted at different rates. This was the case during the 1998-99 drought when the water supply storage remained nearly full (because less than 20 percent of the water supply storage is currently being used), while only about 25 percent of the water quality storage remained at one point.

4.2.2 Status of Jordan Lake Allocations

The State of North Carolina controls the water supply storage in Jordan Lake and, under G.S. 143-354(a)(11), can assign this storage to any local government having a need for water supply. Any system receiving an allocation must enter into a contract with the State of North Carolina to repay the costs associated with its storage allocation amount. Administrative Rule T15A: 02G .0500 describes

the specific procedures to be used by the Environmental Management Commission (EMC) in allocating the Jordan Lake water supply storage.

The two main criteria for evaluating Jordan Lake water supply allocations requests are (1) documented future water needs and (2) the availability of alternative water supplies. The EMC must reserve half of the lake's water supply storage for allocations within the lake's watershed, however, the EMC may review and revise this limit based on experience managing the lake. If any of the allocation requests involve an interbasin transfer, the EMC must also coordinate their review with the interbasin transfer certification.

Allocations are defined as a percent of the water supply pool. However, with an estimated yield of 100 MGD, a 1.0 percent allocation is approximately equal to 1.0 MGD. For convenience in this report allocations will be expressed in MGD, but it is important to remember that allocations are for a percentage of the water supply storage and not a rate of withdrawal.

In the initial round of allocations in 1988, the EMC allocated 42 MGD of the water supply storage; however, some original allocation holders later released their allocations, resulting in a net allocation of 33 MGD for the initial round. In May 1996, the Towns of Apex and Cary requested an increase in their initial water supply storage allocation. A second round of allocations was then opened to any local government interested in new or additional allocations.

Second-round allocation requests from local governments totaled 130.5 MGD, even though only 67 MGD was available to be allocated. After review of the applications received, the Division of Water Resources (DWR) recommended to the EMC that only 11.0 MGD of the requested 130.5 MGD be allocated. Refer to Table 4-1 for a summary of existing allocation amounts, requested allocation amounts, and recommended allocations.

Table 4-1. Jordan Lake Water Supply Allocation Status

Allocation Holder or Applicant	Existing Allocations in 1996	1997 Requested Allocations (MGD)		1997 State Recommendation (MGD)	
		System Request	Total[1]	Allocation	Total[1]
Chatham County	6.0	7.0	13.0	None	6.0
City of Durham		25.0	25.0	None	0
Fayetteville		20.0	20.0	None	0
Greensboro		25.0	25.0	None	0
Holly Springs		4.5	4.5	2.0	2.0[4]
Apex & Cary	16.0	29.0	45.0	5.0	21.0[2]
Morrisville		4.5	4.5	2.5	2.5[2]
Wake County/RTP[3]		3.5	3.5	1.5	1.5[2]
Harnett County		12.0	12.0	None	0
OWASA	10.0	No application this round			10.0
Orange County	1.0	No application this round			1.0
Totals	33.0	130.5	163.5	11.0	44.0

1-This column shows the total allocations if all the current requests or recommendations were approved
2-Allocation is contingent on obtaining interbasin transfer certification. The recommendations provided are for informational purposes only at this time.
3-Research Triangle Park
4-Approved by EMC

DWR used conservative allocation criteria that allocated water based on 20-year needs, instead of the allowable 30 years. Because the region of the state interested in water supply from Jordan Lake is growing so rapidly, accurately projecting longer term demands seemed somewhat unrealistic. Using the 20-year projections left more water supply storage available to accommodate future demand as development patterns solidified.

The EMC accepted DWR's allocation recommendations at its December 11, 1997 meeting. However, a final decision could only be made on Holly Spring's 2.0 MGD allocation, since all of the other recommended allocations (Apex and Cary, Morrisville, and Wake County/RTP) involved interbasin transfer issues. The EMC will make a final decision on both the allocation request and interbasin transfer petition after the interbasin transfer review process is completed. Following a public hearing sometime in March 2001, the EMC can make its final decision on these remaining round-two allocations.

Concurrent with the conclusion of the round-two allocations, the EMC decided in July 2000 to begin a third round of Jordan Lake water supply storage allocations, following an additional request by the City of Durham for an allocation. DWR then conducted a series of stakeholder meeting in August and September 2000 to develop application and evaluation criteria for round three allocation requests.

As part of this third round of allocations, DWR will be developing a long-range Water Supply Plan for the Cape Fear River Basin. This plan will complement the hydrologic model of the Cape Fear River basin recently developed to evaluate interbasin transfer impacts. Together, these tools will help to guide allocation decision-making and future water resources management in the Cape Fear basin.

4.3 FERC Relicensing Issues

Many of our Mountain and Piedmont waterways have been impounded for hydroelectric power generation. The Federal Energy Regulatory Commission (FERC) is responsible for licensing hydroelectric generating facilities on navigable waterways that are not operated by a Federal agency. The licenses for all the major hydroelectric facilities in the state will expire between 2001 and 2008.

Numerous communities, especially in the Catawba and Yadkin Basins, depend on hydropower reservoirs for their water supply or have their water supply intakes on rivers that are influenced by hydropower operations. With all the major hydropower operations due for relicensing in the near future and the increased emphasis on balancing the benefits of these projects, communities that depend on rivers affected by these projects have the opportunity to have concerns about water availability addressed in the relicensing process.

Table 4-2 lists the major hydroelectric projects in North Carolina that are licensed by the Federal Energy Regulatory Commission and the date that the current license expires.

Table 4-2. Major FERC Hydroelectric Projects to be Relicensed

Project Name	Licensee	Expiration Date
Gaston / Roanoke Rapids	Virginia Power	1/31/2001
Queens Creek	Nantahala Power and Light, a division of Duke Energy Corp.	9/30/2001
Tapoco (Santeetlah, Cheoah, Calderwood)	Alcoa Power Generating, Inc., Tapoco Division.	2/28/2005
Bryson, Dillsboro, & Franklin	Nantahala Power and Light, a division of Duke Energy Corp.	7/31/2005
Mission	Nantahala Power and Light, a division of Duke Energy Corp.	8/01/2005
East Fork (Tanasee, Wolf Creek, Bear Creek, Cedar Cliff)	Nantahala Power and Light, a division of Duke Energy Corp.	1/31/2006
West Fork (Thorpe, Little Glenville)	Nantahala Power and Light, a division of Duke Energy Corp.	1/31/2006
Nantahala (Nantahala, Whiteoak, Dicks Creek)	Nantahala Power and Light, a division of Duke Energy Corp.	2/28/2006
Yadkin (High Rock, Tuckertown, Badin, Falls)	Alcoa Power Generating, Inc., Yadkin Division	4/30/2008
Yadkin - Pee Dee (Tillery, Blewett Falls)	Carolina Power & Light Co.	4/30/2008
Catawba - Wateree (James, Rhodhiss, Hickory, Lookout Shoals, Norman, Mountain Island, Wylie)	Duke Power	8/31/2008
The relicensing process begins at least 5 years before the expiration of the current license.		

Since issuance of the original licenses, the regulatory framework affecting these facilities has changed, requiring extensive environmental review and stakeholder participation during relicensing. Licence holders must notify FERC five years prior to the expiration of their license if they intend to apply for a new license. After this notification, the licensee, resource management agencies, and interested parties work together to identify concerns that need to be addressed in the application for a new license. Two years before expiration of the existing license, the applicant submits a draft application for a new license to FERC. The application is open to any interested party for review. The applicant is responsible for providing project information to resource agencies and the public and for conducting any engineering or environmental studies needed to address effects of the project. Applicants are also expected to review recreational needs in the area of the project.

FERC then conducts an independent analysis of the proposed project, which includes preparation of an environmental analysis document. FERC must ensure a proper balance of developmental and non-developmental interests in its licensing decisions and determine if the proposed project is consistent with any federal or state comprehensive plans for the affected waterways. FERC then attempts to resolve any disputed conditions with the resource agencies prior to preparation of a final environmental analysis document and the licensing terms and conditions.

Relicensing also requires the applicant to obtain water quality certification under Section 401 of the Clean Water Act, which is administered by the Division of Water Quality. Conditions can be attached to the 401 certification to maintain water quality standards and maintain uses of the water according to the waterway's water quality classification, such as water supply, aquatic habitat, and recreation.

4.4 Drought Monitoring and Response

Drought is a normal, recurring weather phenomenon that can have a profound impact on our state's water supplies. However, the extent to which an individual water system will be affected by drought depends on numerous factors, such as: (1) the severity, duration, and timing of the drought; (2) how early a community responds with its water shortage response measures, and (3) how closely a community's water demands are approaching its total available supply.

4.4.1 1998-2000 Drought

As year 2000 ends, the western half of North Carolina is still dealing with a drought that has been plaguing parts of the state since 1998. Rainfall deficits began back in May 1998 and gradually began to build during the summer as normal weather patterns were disrupted by La Nina, the cold water event in the Pacific Ocean. By late summer of 1998, the Mountains and western Piedmont portions of the state were beginning to feel the effects of the drought as lake levels and streamflows began to decline.

DWR held a Drought Preparedness Workshop in Asheville in September 1998 to increase awareness of potential water supply problems and provide water systems with strategies for dealing with the drought. By late fall, several systems in the Mountains and western Piedmont were dealing with water shortages and had instituted mandatory water restrictions, particularly Greensboro and Asheville, who were experiencing record low reservoir levels. Greensboro's and Asheville's aggressive water conservation efforts were commendable and helped ease the impacts on those systems. Figure 4-4 shows the systems that instituted water use restrictions during 1998.

Rainfall in January 1999 temporarily eased drought problems for most areas. Greensboro's reservoirs recovered during January, however, Asheville's reservoirs did not recover until mid-1999. Below normal rainfall resumed in February and continued through the summer of 1999 for most of the state. Below normal rainfall and record high temperatures during the summer stressed many water systems to their limits, resulting in over 40 water systems calling for water use restrictions during 1999, also shown in Figure 4-4.

In September 1999, hurricanes Floyd and Dennis eliminated drought conditions in eastern and central North Carolina, but drought conditions west of the Piedmont persisted for the remainder of 1999 and continued into 2000, preventing the normal winter replenishment of streams, reservoirs, and ground water levels. By the end of August 2000, numerous systems in the western Piedmont were beginning to experience water supply problems as streamflows and lake levels continued to decline,

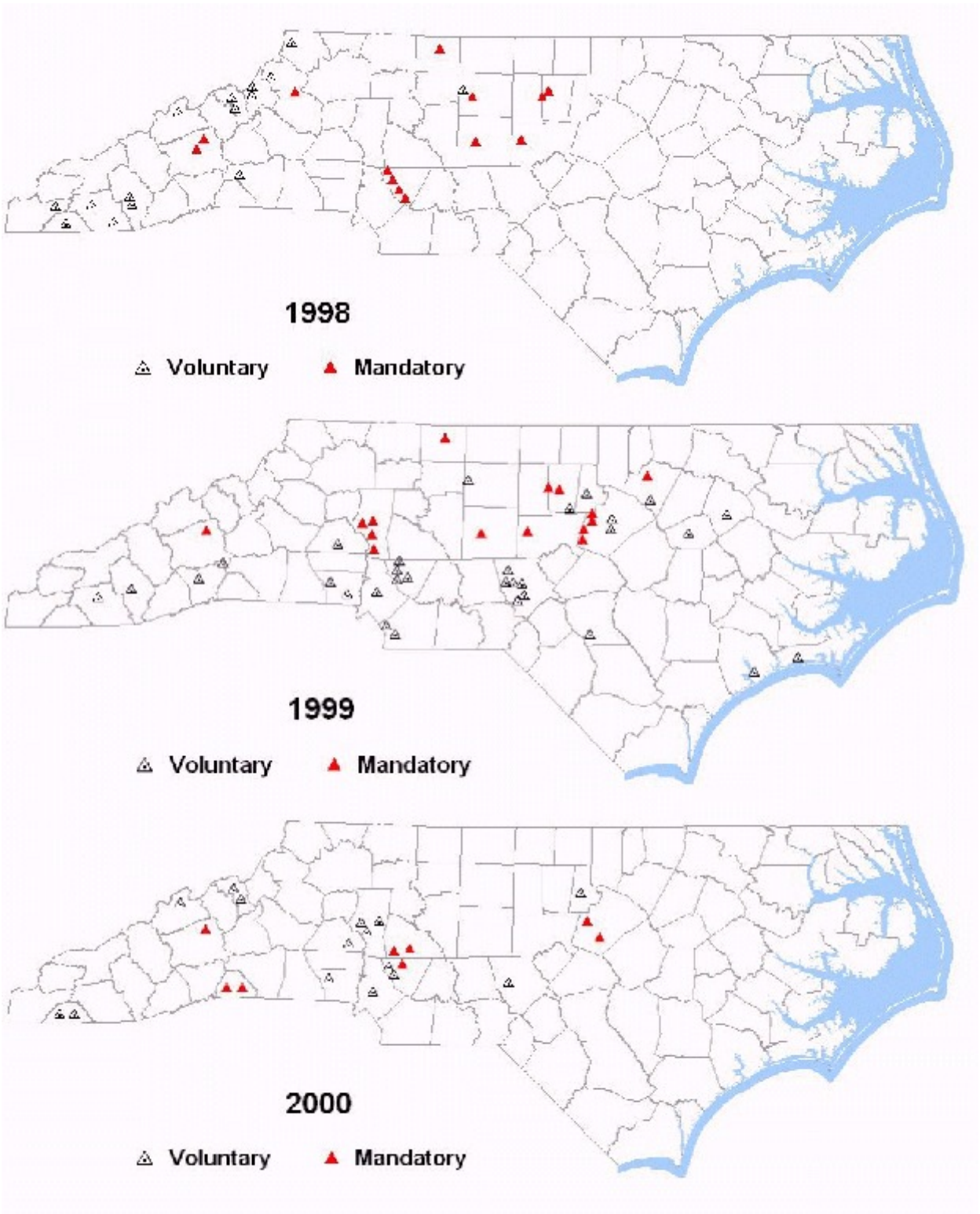


Figure 4-4. Water System Conservation during 1998-2000 Drought

prompting water conservation for some systems (also shown in Figure 4-4). However, conditions improved markedly during September due to extended periods of wetter, cooler weather. This wet period was then followed by over a month of extremely dry weather, with much of the state receiving no measurable rainfall for the entire month of October, again causing serious water supply concerns for numerous water sytems. Since October 2000, conditions have slightly improved for most systems, however, as of December 2000 several systems remain under voluntary or mandatory water use restrictions. More normal rainfall is expected for early 2001, which should further ease drought conditions and begin to allow water supplies to recover.

Both Asheville and Greensboro will be better able to cope with drought in the future because of additional water supplies. Asheville's Mills River intake and water plant came on-line in November 1999, providing Asheville with at least 5 MGD of additional supply. Greensboro has completed a connection with Reidsville that could supply an additional 8 MGD. In addition, the Piedmont Triad Water Authority, of which Greensboro is a member, is nearing final approval and construction of Randleman Lake, a major regional water supply.

4.4.2 Local Drought Response

Because water supply systems in North Carolina are so numerous and diverse, the best place to address water shortages and drought response is at the local level. To provide guidance to local systems, the Division of Water Resources has developed a "Water Shortage Response Handbook" for public water supply systems in North Carolina. The handbook emphasizes the need for local officials and the local community to develop a program to deal with a drought or other water shortage. Most importantly, the handbook describes how a community can implement a multi-level drought response program. Having a water shortage response plan, including a drought ordinance, allows a community to respond to water shortages early and hopefully avoid the need for extreme measures later on.

4.4.3 State Drought Response

A State Drought Response Plan has been adopted by North Carolina agencies to provide a systematic means of assessing and responding to the impact of drought on water supply and agriculture. The assessment system calls for representatives from state and federal agencies to form task forces that use a broad range of data sources to evaluate and assess water availability and drought impacts and distribute the information to water system managers. The response system deals with unmet water supply needs across the state. When necessary, recommendations are made to seek legislative or federal assistance.

The Drought Monitoring Council (DMC) is a working group of various federal and state agencies with expertise in the areas of water resources, climatology, agriculture, public health, and emergency management. The DMC, chaired by the Water Supply Planning Section, Division of Water Resources, oversees North Carolina's response to water shortage situations. The DMC routinely monitors climatological and other drought related information, including precipitation, streamflows, ground water levels, soil moisture, reservoir levels, water supply and demand, and other drought data.

During an extended drought, the DMC keeps the State Emergency Response Team apprised of any unmet water needs, identifies and recommends ways to meet those needs, ensures inter-agency coordination, identifies potential drought mitigation measures, and determines when to deactivate as problems subside.

4.5 Growth in Headwaters

Much of North Carolina's growth is occurring along the Piedmont Urban Crescent, the Interstate 40 and Interstate 85 corridors stretching from Raleigh to Charlotte. Part of this crescent is also located in the headwaters of the Cape Fear and Neuse River basins, particularly Guilford, Alamance, Orange, and Durham Counties.

Headwaters are the upper reaches of a river basin comprised of smaller streams that later merge downstream to form the main rivers in a basin, such as the Cape Fear or Neuse River. These smaller streams may offer plenty of water under normal rainfall conditions, but their yields can be quite low during dry periods.

As communities in these headwater areas continue to grow, developing additional water sources that supply sufficient amounts of water, are economically feasible, and have acceptable environmental impacts will be challenging. Two new reservoir projects–one currently under constructions and one in the final approval stage–will be crucial for the long-term water supply needs for this area.

Hillsborough's new reservoir, completed in November 2000, will provide much needed future water supply for that community. Additional withdrawals from the Eno River are not allowed under the voluntary capacity use agreement that restricts Hillsborough's current withdrawals from the river.

The Piedmont Triad Regional Water Authority's Randleman Reservoir project is still awaiting final approval from the U.S. Army Corps of Engineers. This 48 million gallon per day regional water supply project on the Deep River will provide water for the long-term needs of Greensboro, High Point, Jamestown, Archdale, Randleman, and Randolph County. The Piedmont Triad Regional Water Authority has been pursuing this project since 1986. The Final Environmental Impact Statement (EIS) for the Randleman Reservoir was released on December 11, 2000. Following a 30-day public comment period, a Record of Decision will be prepared, concluding the EIS process. A final decision on the Federal 404 Permit for the project could be rendered by the Corps of Engineers as early as February 2001.

Another area of concern along the Urban Crescent has been the Cabarrus County portion of the Rocky River Basin. Several water systems in the area, including Kannapolis and Concord, have been especially impacted by the drought. Reservoirs in this area have been unable to refill for the past three years due to limited rainfall and low streamflows.

Besides the Piedmont Urban Crescent, headwater situations in some mountain river basins are also presenting challenges to local water systems. For example, Blowing Rock (which straddles the headwaters of three different river basins) is pursuing additional water sources to supplement its limited existing surface water supplies.

Efficient use of both the existing and new water supplies will be critical to communities in these headwaters. Water reuse should be part of the overall water management strategy for communities where irrigation and industrial use comprises a significant portion of their water use. Regional cooperation will also be important for successful water supply management in areas where some systems may have surplus water supply. An example of this cooperation is the recent agreement between Greensboro and Reidsville, whereby Greensboro will purchase surplus water from Reidsville.

Based on experience, developing additional water supplies in these high-growth headwater areas will be a challenging and lengthy process, so communities need to plan accordingly.

4.6 Eno River Voluntary Capacity Use Area

The Eno River originates in northern Orange County at the confluence of the East and West Forks. From its headwaters, the river flows in a southerly direction through Hillsborough, and then east into Durham County. Approximately eight miles northeast of the City of Durham, the Eno River and the Flat River combine to form the Neuse River. Major tributaries include the East and West Forks, Seven Mile Creek, McGowan Creek, and the Little River.

Three water supply reservoirs–Lake Orange (Orange County), Corporation Lake (Orange-Alamance Water System), and Lake Ben Johnson (Hillsborough)–have been constructed on the East Fork and the Eno River. Historically, the Eno River has been a water supply for various water systems, including Hillsborough, Durham, Orange-Alamance Water System, and the Orange Water and Sewer Authority. Currently, only Hillsborough, Orange-Alamance Water System, and Piedmont Minerals withdraw water from the Eno River.

4.6.1 History of Problem

Increasing development and use of the river led to a situation of no flow below Lake Ben Johnson during dry periods. During the 1980's, there were periods lasting several weeks when the Eno River was completely dewatered, bringing complaints from riverside property owners, patrons of the Eno State Park, and environmental groups.

Concerned with the worsening situation, Orange County Commissioners asked the state to consider a Capacity Use Area designation under the Water Use Act of 1967. In response to the request, the Division of Water Resources conducted a capacity use investigation.

In its Eno River Capacity Use Investigation published in1987, the division recommended designating the Eno River watershed above the confluence with the Little River as a Capacity Use Area. In an effort to avoid regulation, the three main water users, Hillsborough, Orange-Alamance Water System, and Piedmont Minerals, Inc., agreed to a voluntary Capacity Use Agreement to be monitored by the Division of Water Resources. This agreement sets tiered withdrawal limits based on storage remaining in Lake Orange for each participant whenever the average daily flow drops below 10 cubic feet per second (cfs) for seven consecutive days.

4.6.2 Status of Agreement

While the voluntary capacity use agreement has functioned well and flows in the Eno River have greatly improved, additional water supplies in the basin are needed for future growth. In order to meet demands during low flow periods, both Hillsborough and Orange-Alamance Water System have needed to purchase water from sources outside of the Eno River basin.

Hillsborough's new water supply reservoir on the West Fork of the Eno is a significant water supply development that will improve the water supply situation for the area. This reservoir, which was completed and began filling in November 2000, will increase Hillsborough's available water supply by 1.8 million gallons per day (MGD) initially and by 3.0 MGD when Phase II of the project is completed around 2005. In addition, the reservoir will improve flow conditions in the river system by increasing minimum instream flow targets by at least 1.0 cfs downstream at the Eno River gage in Hillsborough. Hillsborough is also planning to expand its existing Eno River intake to provide the capacity necessary to withdraw the additional yield provided by the new West Fork reservoir.

Orange-Alamance needs to secure additional water supplies to meet existing and future demands, particularly during low-flow periods. In 1995, Orange-Alamance added a 0.2-MGD well to serve as a supplemental supply during low flow periods. During the summer of 1999, an extended low flow period coupled with the temporary loss of an interconnection with the Graham-Mebane Water System prompted Orange-Alamance to install a second well in late 2000, which will provide an additional 0.115 MGD of supply. Despite these increases in Orange-Alamance's water supply, additional water supplies are still needed.

SECTION 5. MEETING FUTURE WATER SUPPLY NEEDS

Part of the strategy for meeting future water supply needs will obviously include the planning and development of additional water supplies. Some additional reservoirs will likely be built in North Carolina, although the era of major dam construction is passed. In some cases, reallocating storage in existing reservoirs to water supply purposes may achieve additional water supply. Pilot studies are underway in eastern North Carolina to determine if potable water can be stored underground for later use when needed. In coastal areas of the state, reverse osmosis is a proven method for desalinating brackish ground water to produce potable water. In many cases, regionalization of water supply systems could provide a solution by linking systems with inadequate supplies to regional sources that can meet regional needs.

In addition to increasing the supply of water, an equally important part of the strategy for meeting future water supply needs will be more efficient use of water supplies. Water conservation needs to evolve from being thought of as a response to occasional emergencies to being a tool for practical, everyday water management. Both residential and industrial users of water have many opportunities for water conservation. It is increasingly important to take advantage of these efficiencies. North Carolina also has great opportunities to reuse highly treated wastewater, particularly for irrigation and industrial purposes, thereby reducing demand for new water supplies.

5.1 Developing Additional Water Supplies

Developing a new water supply source can be a costly and lengthy process. Alternatives to a new source should first be considered. Enhancing an existing supply delays the need to develop a new water source, and may even make a new source unnecessary.

5.1.1 Enhancing Existing Supplies

Enhancement of existing sources begins with an evaluation of a system's facilities. A water system should examine existing water supply sources and operations to decide if they can produce additional drinking water before adding a new source. Three areas in particular may be examined:

(1) The available water supply from existing sources should be reevaluated. The source may be able to safely supply more water than is currently assumed.
(2) For run-of-river systems (those withdrawing directly from a river or stream), increasing water withdrawals may be possible if instream flow needs and water quality downstream will not be significantly affected. Repositioning the intake may also make more streamflow accessible during low flows. For systems with insufficient streamflows during dry periods, adding an off-stream storage reservoir should be considered. Off-stream reservoirs, generally much smaller than on-stream reservoirs, store water during wetter periods to augment water supply

in drier periods when withdrawals may be limited.

(3) For systems with water supply reservoirs, raising the dam spillway or adding flashboards can increase useable storage for water supply. It may also be possible to relocate or configure the reservoir intake to make more water available without adversely affecting water quality.

Another important way to enhance an existing water supply is to protect the quality of the source. Since treating water of poorer quality is more costly and less efficient, maintaining a high level of raw water quality is vital.

5.1.2 Developing New Sources

If enhancement or expansion of existing supplies does not provide sufficient opportunities for increasing water supply, developing a new water source may be necessary. Any proposed surface water supply source must be sufficient to meet projected water supply needs and instream flow requirements, even during periods of drought. Also, raw water quality must be acceptable for producing drinking water. Most high quality, readily available water sources are already being used, so new sources may be more expensive to get and treat and may involve lengthy approvals.

Options for new sources include purchasing water from a nearby system, developing a new surface or ground water supply, or an appropriate combination of these water supply options.

Purchasing Water: A purchase arrangement often requires the least time to develop, and is often an attractive option for smaller systems, especially those near systems with surplus capacity. A purchase arrangement can sometimes provide an interim solution while another source is being pursued. Even after the other source is complete, the interconnection can increase the reliability of both systems. It is extremely important for both systems involved in a water purchase to have a contract that specifies the maximum purchase amount, how long the agreement will remain in place, the price structure, and any other details of concern.

On-Stream Reservoir: Developing an on-stream reservoir is typically the most lengthy water supply option. It may also be the most reliable and is often the only feasible long-term option for large systems. The safe yield available from a reservoir should be based on a specific risk of water shortage. For smaller water systems serving less than 50,000 people, a 20-year safe yield is recommended, meaning that the supply is expected to be inadequate in one year out of 20 on the average. For larger systems serving 50,000 or more people, a 50-year safe yield is recommended, meaning that the supply is expected to be inadequate in only one year out of 50 on the average. Most reservoirs will also require a minimum release from the dam that will affect the reservoir's safe yield.

Run-of-river intakes: Run-of-river systems simply withdraw water from a stream or river as it

flows past an intake point. Run-of-river withdrawals may be limited during low flow periods to ensure that instream flow needs are met downstream of the intake. An off-stream storage reservoir may be needed to supplement run-of-river withdrawals during low-flow periods.

Ground water supplies: The quantity and quality of ground water varies across the state. However, for areas with adequate ground water supplies, installing water supply wells can be an economical water supply option. The 12-hour supply available from a well, as determined from a 24-hour pump test, should be used for determining if a ground water supply is adequate. In areas with water quality problems, treatment may be necessary. Desalination of brackish ground water by reverse osmosis is becoming a primary method of producing potable water in Dare, Currituck, and Hyde Counties–systems in these counties have the capacity to desalt nearly 11 million gallons of ground water daily.

Aquifer storage and recovery (ASR) is the injection and storage of potable water in the ground for later retrieval. ASR may have potential for application in some areas of the coastal plain. In fact, the City of Greenville is proceeding with pilot testing of an ASR project. The city would treat surface water from the Tar River to drinking water standards and then inject it into the ground, and later during periods of high demand, would pump this water back out of the ground and distribute it with minimal treatment.

5.2 Water Conservation

Water conservation is increasingly becoming a necessary part of overall water management for water systems across the state. Water conservation can help a water system extend the use of its available water supplies, reduce the impacts caused by drought, delay expansion of treatment facilities, and reduce operating costs.

Some advances in water conservation have resulted from federal water use standards for plumbing fixtures, such as toilets, faucets, and showerheads manufactured in the United States after January 1, 1994. As communities grow, new housing will require less water to meet indoor demand, compared with what would have been necessary with the continued use of less efficient fixtures. Retrofitting older housing with newer, more efficient fixtures will further reduce overall per capita water demand.

However, most other advances in water conservation will depend on local efforts. An effective, comprehensive water conservation plan should include the following programs: (1) water shortage response, (2) water loss reduction, (3) water use efficiency, and (4) public education and outreach.

5.2.1 Water Shortage Response

A water shortage response program prepares a system to respond to drought or other water shortages, and should ideally be put into place well before a shortage develops. Because water systems in North Carolina are so numerous and diverse, the best place to address water shortages is at the local level. A water shortage response program can enable a community to respond to water shortages early and avoid the need for more extreme measures later.

The most important element of a water shortage response plan is enactment of an ordinance that provides for the declaration of a water shortage and specifies the voluntary and mandatory measures to reduce water demand. Classifying different water uses as essential or non-essential is important when deciding which water uses should be restricted or banned first. A successful water conservation ordinance should also have specific triggers (such as lake level, streamflow, etc.) to gage the severity of the shortage and determine when each level of response should begin.

5.2.2 Water Loss Reduction and Leak Detection

Water loss reduction and leak detection is a process that identifies and decreases the amount of water losses and reduces wasteful potable water use. A water loss reduction program of water audits and leak detection are essential to effective water conservation efforts. Water loss reduction programs help systems use water more efficiently, make more water available for customers, recover more of their operational costs through more accurate billing, and reduce operational costs.

A water audit provides an accounting of all types of water use–both metered and un-metered. Unaccounted-for water can include water leaks from pipes, fire hydrant use, faulty meters, un-metered connections, water main breaks, and street cleaning, and can result in serious financial problems for water supply systems. Water systems measure unaccounted-for water as a percentage of all the finished water produced and purchased. According to the American Water Works Association, unaccounted-for water between 10-15 percent or less of the average daily use is generally acceptable. If the water audit suggests unaccounted-for water is more than 15 percent of the average daily water use, they should inspect the system for leaks.

Most people do not regard a small leak, such as one gallon per minute, as a significant water loss, but a one gallon per minute leak amounts to a loss of over a half million gallons per year. Considerable amounts of water (and revenue) can be lost in a year from one small leak.

The Division of Water Resources provides leak detection assistance and loans of equipment. On-site training and videos on how to find underground leaks are also available upon request.

5.2.3 Water Use Efficiency

Water conservation includes not only those measures needed to respond to a water shortage emergency–it also includes the day-to-day measures that have a positive effect on the normal daily demands placed on water systems. This includes developing demand management strategies that help systems meet normal daily water demands more efficiently and make the best use of available potable water supplies. Specific measures include:

Rate Structures: Water systems should establish water rate structures that encourage water conservation and discourage wasteful water use. One-charge (blanket) rates and declining rates do nothing to encourage water conservation and should not be used. On the other hand, flat rates and, especially, increasing rate structures discourage unnecessary water use. Increasing rate structures typically allow for average water usage at a reasonable rate, however, above a certain amount of normal household water usage, rates are substantially higher per unit of water used. Therefore, customers that use large amounts of potable water for lawn irrigation would pay considerably more each month than someone who does not. Historically, just the opposite has been the case, water rates per unit of water decreased as more was used.

Low-flow Fixtures: Water systems should promote and/or provide low-flow plumbing devices and fixtures. Retrofitting existing plumbing fixtures can significantly reduce per capita indoor household water use. Replacing older shower heads with low-flow models, installing faucet aerators in older kitchens and baths, and installing early-close flappers in older toilet tanks can reduce household water use by an estimated 10-15 percent. These retrofit kits are quite inexpensive and can pay for themselves with water savings in a matter of months.

Outdoor Water Use: Water systems serving areas where residential irrigation is common should target excessive outdoor water use for reduction. Promoting proper lawn watering practices and encouraging drought tolerant landscaping can significantly reduce outdoor water usage. Most people overwater their lawns. Less frequent watering can help establish better root systems, making lawns and shrubs more drought tolerant.

Non-Residential Water Use: For many public water supply systems, industrial and other non-residential water uses represent a major component of water demand. Improving the water use efficiency of these non-residential customers can have a significant impact on overall demand. The North Carolina Division of Pollution Prevention and Environmental Assistance offers assistance to businesses, industries, and municipalities in North Carolina. Their program emphasizes source reduction, reuse, and recycling as ways to reduce both water use and wastewater generation. Assistance is available by contacting the Division of Pollution Prevention and Environmental Assistance at 1-800-763-0136 or (919) 715-6500.

5.2.4 Public Education and Outreach

A comprehensive program informing all water users of the many opportunities and benefits of conserving water will increase the effectiveness of a system's other water conservation efforts. In-school programs, water treatment plant tours, and water bill inserts are all part of this effort.

The Division of Water Resources offers water conservation information and technical assistance to public water systems. For further information on water conservation, contact the Division of Water

Resources at (919) 733-4064. Water conservation information is also available on the Division of Water Resources' web page at *www.ncwater.org*.

5.3 Water Reuse

Water reuse, or water reclamation, is the use of highly treated wastewater to satisfy non-potable demands for water. All water systems have a certain percentage of uses that do not require water treated to drinking water standards. Substitution of reclaimed, non-potable water for uses that do not require potable water (e.g., some industrial uses and irrigation) could reduce demand on current potable water supplies and postpone the need for additional water supplies and treatment capacity.

Current regulations allow many uses of reclaimed water, such as irrigation, cooling water, process water, fire fighting, street and vehicle washing, and dust control (North Carolina Administrative Code 15A 2H .0219). However, reclaimed water cannot be used for potable water supply, irrigation of direct food chain crops, or filling pools or tubs.

For some systems, installing a reclaimed water distribution system may be more cost-effective than increasing raw water supplies and expanding treatment facilities. Installing dual (potable and non-potable) water distribution systems for new development is more economical than retrofitting existing development, and should be considered in areas where reclaimed water access is feasible. However, retrofitting of existing development can still be a viable option. For example, the Town of Cary is currently retrofitting a reclaimed water distribution system to make reclaimed water available to both residential and nonresidential customers.

In addition to Cary's reuse project, numerous other major water reuse projects are underway or planned by water systems across the state, including Raleigh, Charlotte-Mecklenburg, Wilson, and Johnston County.

Systems interested in obtaining additional information about water reuse requirements should contact the North Carolina Division of Water Quality at (919) 733-5083.

5.4 Regional Water Supply Systems

Cooperation and coordination between water systems is becoming an increasingly important water supply planning strategy. Water systems can be linked by interconnections to take advantage of regional water supply opportunities. Regional water supplies, many of which already exist, are those supplies that serve a significant portion of a county or counties or a number of municipalities on a regular basis. More than 60 water supplies across the state can be considered regional water supplies.

In some cases, water systems with inadequate water supplies may link with systems that have surplus water supply. In other cases, water systems needing future water supplies may team together to develop a long-term regional water supply that would otherwise be too expensive or perhaps have political or institutional difficulties.

SECTION 6. REGULATIONS AFFECTING WATER SUPPLY PLANNING

Numerous regulations and governmental programs exist that need to be considered when planning for water supply needs. A general discussion of these requirements and programs follows. For more specific information, please contact the designated lead agency.

6.1 Water Use Act of 1967

North Carolina has generally had sufficient water resources to meet its water supply needs. Consequently, there are no statewide water use permitting requirements. However, the Water Use Act of 1967 does allow the Environmental Management Commission to designate an area as a Capacity Use Area (CUA) if the sustainability of water resources in an area becomes threatened or if competition among water users requires coordination to protect the public interest.

Within a CUA, all persons withdrawing more than 100,000 gallons of water per day must first obtain a permit from the Division of Water Resources (DWR). CUA water use permits specify a maximum daily water withdrawal to protect the water source and other water users from negative impacts that might otherwise occur.

Presently, there is one capacity use area. Capacity Use Area #1 encompasses all or parts of Beaufort, Carteret, Craven, Hyde, Martin, Pamlico, Tyrrell, and Washington Counties. It was declared a capacity use area in 1976 due to concern over the potential impact of a large phosphate mining operation on water resources in the region.

Contact the Division of Water Resources at (919) 733-4064 for additional information about the Water Use Act and capacity use area issues.

6.2 Local and State Water Supply Planning

Local governments that provide or plan to provide public water service are required to prepare a local water supply plan (LWSP), in accordance with NCGS 143-355(l), and submit it to the Division of Water Resources (DWR). DWR also encourages private water systems serving 1000 customers or more to prepare a local water supply plan.

The LWSP is basically an assessment of a system's water supply needs for a 20 to 25-year period and that system's ability to meet those needs. For systems with average daily demands that exceed 80 percent of their available supply during the planning period, a specific plan is required for meeting those needs. After DWR determines that the plan meets the requirements of the law, the plan must be adopted by the local governing board for the system. The LWSP must be updated at least every five years.

The first round of LWSPs were based on 1992 water supply and demand information and included projections through 2020. Over 500 local government water systems prepared 1992

LWSPs, along with numerous private water systems that voluntarily completed LWSPs. During 1998 and 1999, nearly all of these systems updated their LWSP using 1997 data.

The LWSPs are the building blocks for the State Water Supply Plan (SWSP), also required under NCGS 143-355. Prepared by DWR, and also to be updated every five years, the SWSP is a compilation of the local plan data, along with a detailed discussion of current and upcoming water supply issues that state and local governments will be dealing with over the next five to ten years.

6.3 Interbasin Transfer of Surface Water

North Carolina's water resources have the potential to meet all of the state's agricultural, industrial, and public water supply needs. However, water is not distributed evenly across the state. To meet demands, it is sometimes necessary to transfer water from one area to another, which may involve transferring water between river basins. In other cases, as water systems grow, their service areas may extend into an adjoining river basin, or linking of systems to form regional water supply systems may involve multiple river basins. Sometimes, wastewater is discharged to a stream in a river basin different than the raw water source. In all of these situations, water is being transferred from one river basin to another in some degree.

When water is transferred out of a river basin, flows downstream of the withdrawal are reduced, which can raise a number of economic and ecological concerns. Likewise, increased water availability and wastewater discharges in the receiving basin can also raise a number of concerns. Issues include potential impacts on water supply availability, wastewater assimilation, water quality, fish and wildlife habitat, hydropower, navigation, recreation, and flooding.

6.3.1 Regulation of Surface Water Transfers

The Regulation of Surface Water Transfers Act (NCGS 143-215.22I) was enacted in 1993 to regulate large surface water transfers between river basins by requiring a certificate from the Environmental Management Commission (EMC). Transfers between any of the 38 defined river basins shown in Figure 6-1 may be subject to the provisions of the statute, depending on the transfer amount.

A transfer certificate is required for a new transfer of two million gallons per day (MGD) or more and for an increase in an existing transfer by 25 percent or more, if the total transfer including the increase is two MGD or more. But, if a transfer facility existed or was under construction on July 1, 1993, a certificate is not required up to the full capacity of that facility to transfer water, regardless of the transfer amount.

Responsibility for obtaining a transfer certificate lies with the owner of the pipe where it crosses the basin boundary. However, another party involved in the transfer can assume that responsibility, if approved by the Division of Water Resources.

The amount of a transfer is determined as the amount of water moved from the source basin to the receiving basin, less the amount of that water returned to the source basin. Therefore, any water

consumption or loss that occurs in the receiving basin would be considered a transfer, even if the remaining wastewater is discharged back to the source basin. If that out-of-basin consumption or loss is 2 MGD or greater, then certification would be required.

Petitions for certification must provide a description of the transfer facilities, the proposed water uses, water conservation measures that will be used to assure efficient use, and any other information necessary for the EMC to fully evaluate the request. The statute requires extensive public notice and a public hearing. Among the items that the EMC must consider in determining whether a certificate may be issued for a transfer are:

- The necessity, reasonableness, and beneficial effects of the transfer;
- Any detrimental effects on both the source river basin and receiving river basin;
- Reasonable alternatives to the proposed transfer, including their probable costs and environmental impacts;
- Projected municipal water needs in the source basin;
- The cumulative effect on the source basin of any water transfer or consumptive water use currently authorized under this law or projected in any local water supply plan.

A certificate will be granted for a transfer if the applicant establishes and the EMC concludes by a preponderance of the evidence that (i) the benefits of the proposed transfer outweigh the detriments of the transfer, and, (ii) the detriments have been or will be mitigated to a reasonable degree. The EMC may grant the petition in whole or in part, or deny it, and may require mitigation measures to minimize detrimental effects.

Transfers requiring certification are also subject to the State Environmental Policy Act (SEPA). Preparation of an environmental document will be necessary (either an Environmental Assessment or an Environmental Impact Statement, depending on the issues involved in the transfer). As a result, the certification process can be expected to take 2 to 3 years to complete. The amount of time necessary will also depend on the level of public interest and the controversial nature of the proposed transfer.

Table 6-1 lists the estimated average daily transfer amounts (in million gallons per day) that occurred across the state in 1997. Many of these transfers were quite small and, unless they exceeded 100,000 gallons per day, were not quantified. Larger transfer amounts were estimated using average water use, sales, and discharge data from the 1997 Local Water Supply Plans. Certification is only required for those transfers that exceed the 2.0 MGD threshold or the grandfathered transfer amount, whichever is greater. However, the table does demonstrate how common interbasin transfers are across the state. Contact the Division of Water Resources at (919) 733-4064 for additional information about interbasin transfer and certification requirements.

6.3.2 Interbasin Transfer Certifications

The Towns of Cary and Apex are currently approved for a 16 million gallon per day transfer from the Haw River basin to the Neuse River basin. This transfer was approved under General

Statutes 153A-285 and 162A-7, which were replaced with NCGS 143-215.22I described above. In addition, the Piedmont Triad Regional Water Authority already has approval to transfer up to 30.5 million gallons per day from the Deep River basin to the Haw and Yadkin River basins, in conjunction with its planned Randleman Reservoir project.

The Division of Water Resources is currently reviewing two requests for interbasin transfer certifications. Cary, Apex, Morrisville, and Wake County (serving Research Triangle Park) have requested an increase in their transfer amount totaling about 27 million gallons per day, associated with their requests for water supply storage allocations from Jordan Lake. An Environmental Impact Statement to support this request has been completed. The Environmental Management Commission approved a request to proceed to public hearing at its December 14, 2000 meeting. This hearing, which will be held in March 2001, will pertain to both the Jordan Lake allocation request and the associated interbasin transfers.

Charlotte Mecklenburg Utilities (CMU) has applied for a certificate to increase its transfer of water from the Catawba River basin to the Rocky River basin related to expansion of its Mallard Creed Water Reclamation Facility. CMU is currently preparing the SEPA environmental document required for the interbasin transfer petition.

6.4 Registration of Water Withdrawals and Transfers

In 1991, the General Assembly required that any person who withdraws or transfers one million gallons per day or more of surface water must register those withdrawals with the Division of Water Resources (NCGS 143-215.22H). That initial round of registrations was based on surface water withdrawals in 1991 and included local government water systems that later prepared a LWSP. The law was changed in 1993 to require registration of ground water withdrawals also and to exempt local government water systems with local water supply plans from the registration requirement. A second round of registrations was then held that included both surface and ground water withdrawals for 1993. In 1998, the registration threshold for all water uses except agriculture was lowered from one million gallons per day (MGD) to 100,000 gallons per day. The withdrawal registration threshold for agricultural water uses is still 1.0 MGD. Registrations for 1999 water withdrawals were due March 1, 2000. Water users must update their water withdrawal registrations every five years.

Registering water withdrawals provides water use information needed for water supply planning and management throughout the state. By registering water use every five years, water users will establish a record of the amount of water they have been using.

6.5 Instream Flow Assessment

Adequate flow needs to be maintained in streams to protect aquatic habitat, allow recreational use, and maintain water quality. Downstream users also be depend on adequate flow reaching their intakes. Evaluating and maintaining instream flows is therefore very important.

In North Carolina, policies have been adopted that are intended to ensure adequate instream flows below reservoirs and river intakes. The Division of Water Resources, in conjunction with other state and federal resource agencies, determines instream flow requirements. The Division of Land Resources specifies the minimum release requirements for reservoirs in their dam safety permits.

Generally, instream flow requirements are not considered unless withdrawals exceed 20 percent of that location's 7Q10 flow (the lowest consecutive seven-day average flow expected to occur once in ten years). If withdrawals do exceed 20 percent of the 7Q10 flow, instream flow needs will be assessed based on the habitat rating of the affected reach, with higher habitat ratings typically resulting in higher instream flow requirements. The Division of Water Quality may further limit withdrawals based on water quality considerations (such as wastewater assimilation).

Minimum release requirements may have a significant impact on planning for public water supply systems, especially systems that do not currently have minimum release requirements. Any expansion of an existing reservoir or intake will subject that project to evaluation of instream flow requirements. When a new minimum release is applied to an existing reservoir, the minimum release can be up to ten percent of the reservoir's safe yield if habitat conditions warrant. For run-of-river intake expansions, the existing withdrawal capacity is normally "grandfathered," so a system can continue to rely on at least that grandfathered amount. However, when amounts in excess of this grandfathered capacity are withdrawn, a downstream flow target will need to be met, possibly restricting withdrawals. Detailed rules by which minimum releases and maximum withdrawals are set can be found in Title 15A 2K.0501-.0504 of the North Carolina Administrative Code.

Many smaller systems are beginning to outgrow their small water supplies. These systems may face difficulties in finding additional water supply because of financial constraints or because they are not located near a larger source or another system from which they could purchase water. From an instream flow standpoint, this can lead to some difficult situations where a local system would like to increase its demands on perhaps an already overtaxed surface water source.

Table 6-2 lists the instream flow studies that the Division of Water Resources has conducted, along with the water system and water body involved.

6.6 Water Supply Watershed Protection

A water supply watershed is all of the land area that drains to a public water supply. There are over two hundred water supply watersheds in North Carolina. Land use activities on the watershed affect the quality and quantity of available water.

In 1989, the North Carolina General Assembly passed the Water Supply Watershed Protection Act (NCGS 143-214.5 and 143-214.6) to establish minimum statewide water supply protection measures. Watershed classifications are based on the presence of wastewater discharges and the level of development in the watershed at the time of classification. There are five classifications, ranging from WS-I, for an essentially undeveloped watershed in public ownership, to WS-V, which is the least restrictive water supply watershed classification.

Local governments with land use jurisdiction in water supply watersheds are required to develop ordinances to protect water quality in the streams and water bodies receiving runoff from the protected areas. Restrictions vary depending on classification, but could require limits on development density, storm water management, and vegetated buffers along waterways. Limitations are most strict on WS-I watersheds. Because of the diversity of communities in the state, watershed management programs are administered locally, but management plans have to be approved by the Environmental Management Commission.

If a new surface water source is planned along a stream segment that is not already part of a water supply watershed, a reclassification must be conducted before that new water supply can be used. The reclassification process can be expected to take about two years to complete. For further information contact the Division of Water Quality at (919) 733-5083.

6.7 Basinwide Water Quality Planning

In 1991, the Division of Water Quality (DWQ) instituted a basinwide approach to water quality management. The program is a watershed-based management approach intended to improve the efficiency, effectiveness, consistency, and equitability of the state's surface water quality program. This approach features development of basinwide water quality management plans for the state's major river basins, basinwide permitting of wastewater discharges, and integration of existing point and non-point source programs within each basin.

DWQ has prepared basinwide water quality management plans for each of the major river basins in the state. The plans communicate the state's rationale, approaches, and long-term water quality management strategies for each basin. The process of evaluating conditions in a basin and developing a management plan is a multi-year endeavor. DWQ will evaluate and update each basin plan every five years.

DWQ collects information from other agencies having resource management or data collection responsibilities within the basin, including water withdrawal and interbasin transfer data from the Division of Water Resources. Conditions in the basin are evaluated and implementation, monitoring, and enforcement plans are developed. After review by the Environmental Management Commission (EMC), DWQ releases a draft Basinwide Water Quality Plan for public comment. After revisions are made and the final plan is adopted by the EMC, water quality protection efforts throughout the basin are guided by the plan.

Water quality protection programs can have a major impact on community water supply planning. Maintaining the quality of raw water supplies is very important for ensuring consistently high quality drinking water. In addition, concerns about water quality downstream of existing or planned water withdrawals can limit the amount of water a community can withdraw from a surface water source. Water quality concerns can also limit the quantity of wastewater a community will be permitted to discharge, limiting system expansion.

As the population of North Carolina continues to grow, demands placed on our water resources also grow, resulting in conflicts between water uses. We expect our rivers and streams to

provide us with a variety of services, such as drinking water, irrigation, livestock watering, commercial fisheries, industrial supply, recreation, habitat maintenance, navigation, and waste assimilation. In order to manage our water resources to meet this wide range of demands, evaluation of the cumulative effects of water use on water quality is critical. The basinwide water quality planning process is a vital tool to promote responsible stewardship of our water resources while also trying to accommodate our state's growth. For more information on the Basinwide Water Quality Plan, visit the NC Division of Water Quality's web site at http://h2o.enr.state.nc.us/basinwide/index.htm or call (919) 733-5083.

6.8 Approval of Water System Expansions

The Public Water Supply Section (PWSS) of the Division of Environmental Health (DEH) ensures the safety and reliability of public water systems. Plans for expansions of existing water systems, or for new systems, must be submitted to PWSS for approval. Construction or modification of a system can not legally begin until approval is received. PWSS approval focuses on assuring that drinking water delivered to customers meets health standards and the requirements of the Safe Drinking Water Act.

PWSS can also limit the number of service connections to a public water system based on the quality and quantity of water the system is capable of delivering. Several DEH rules that govern public water systems have specific references to local water supply plans. Of particular significance is the section that relates to new connections (T15A: 18C .0409). Units of local government which are operating under a LWSP in accordance with NCGS 143-355(l) shall not be limited in the number of service connections. This is because the local water supply plans consider future water needs and the water system's ability to meet those increased water supply needs. However, a public water system that does not have a LWSP must limit the number of connections based on criteria set out in DEH rules. The rules, in effect, encourage the preparation of LWSPs.

Under rules developed in 1999 to satisfy requirements included in the 1996 amendments to the Safe Drinking Water Act, water systems planning to modify or expand must now also document their technical, managerial, and financial "capacity" to operate. A Water System Management Plan must be prepared and submitted to PWSS in addition to the engineering plans that are submitted for approval. Units of local government that are required to develop a LWSP must submit copies of their adopted LWSP to PWSS along with the Engineer's Report and the Water System Management Plan.

The PWSS also oversees the Wellhead Protection and Source Water Assessment Programs. These programs are intended to assure that the quality of a system's raw water source is protected.

For more information on these programs, please contact the Public Water Supply Section at (919) 733-2321.

6.9 Coastal Area Management Act

The Coastal Area Management Act (CAMA) of 1974 (NCGS 113A-100) was enacted to ensure the wise growth and protection of North Carolina coastal areas. The act establishes a cooperative program of coastal area management between state and local governments. It details policies and guidelines for the protection of natural resources, economic development, recreation, and tourism in coastal areas.

Land use planning lies at the center of local government's involvement in coastal area management. It gives local leaders the opportunity and responsibility to establish and enforce policies to guide the development of their communities. Under CAMA, each of the 20 coastal counties must prepare a land use plan and update that plan every five years. Municipalities in the coastal area can either be covered by a county plan or develop their own plan. The Division of Coastal Management (DCM) provides financial and technical assistance to local governments for land use plan preparation.

Land use planning under CAMA affects many water supply systems in the coastal counties. The Division of Water Resources is working with DCM to coordinate land use and local water supply planning. According to CAMA's land use planning guidelines, all adopted local water supply plans that fall within the planning jurisdiction must be included as an appendix to the land use plan. Water supply issues in the land use plan may be referred to this appendix. By including local water supply plans in the land use planning process, coastal communities will be able to ensure that future water supply needs have been addressed.

6.10 State Environmental Policy Act

In 1971, the General Assembly passed the North Carolina Environmental Policy Act (SEPA) to "declare a State policy which will encourage wise, productive, and beneficial use of the natural resources of the State without damage to the environment". It requires state agencies to review and report on the potential environmental effects and consequences of activities that involve an action by a state agency, an expenditure of public funds, or private use of public lands, and have a potential environmental effect. Actions by a state agency include such things as land and money appropriations, awarding grants, issuing permits, or granting licenses.

The rules implementing the law establish threshold criteria that, when exceeded, require the preparation of an environmental assessment (EA) of the potential impacts of a proposed project. An EA provides the agency with a decision-making tool to evaluate whether a proposed project has potential environmental impacts. After reviewing an EA, if the agency determines that potential impacts are significant then an environmental impact statement (EIS) will be required. If impacts are not expected to be significant the agency will issue a Finding of No Significant Impact (FONSI), a declaration that an EIS need not be prepared.

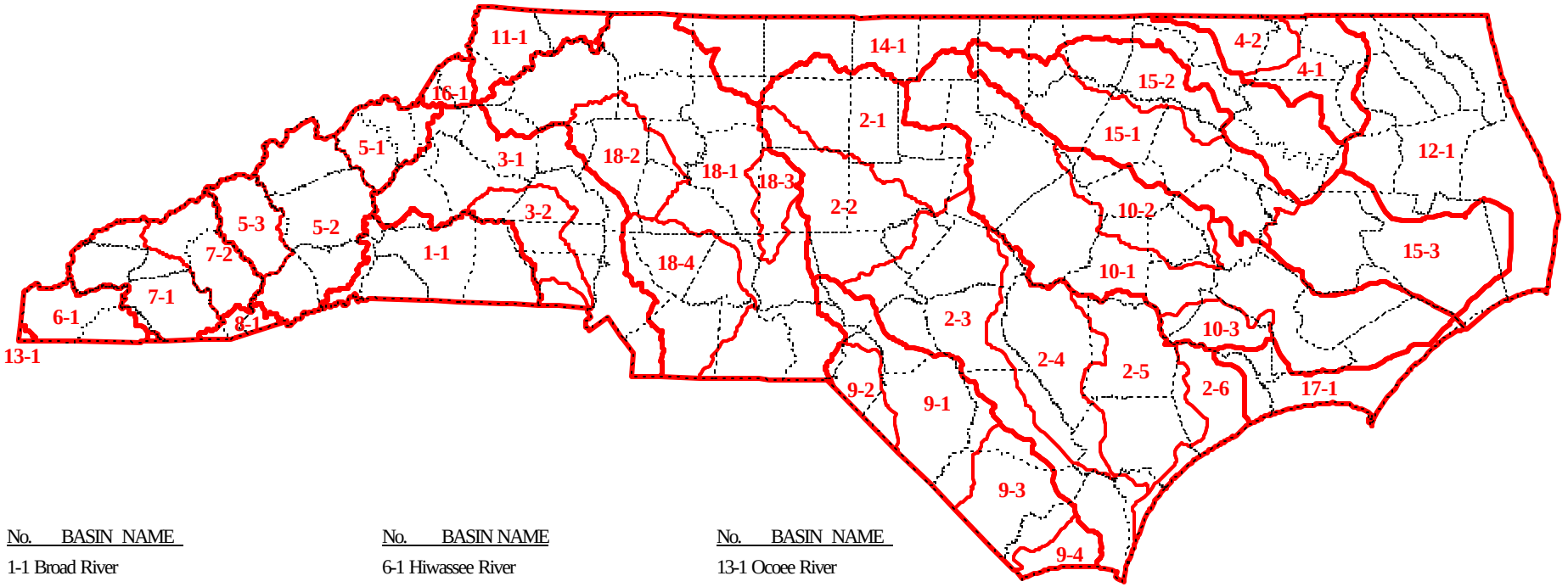
Non-major activities for which an EA is usually not required are listed in the NC Administrative Code at 15A NCAC 1C .0100 et seq. If a proposed project exceeds the criteria defined as "non-

major", it is considered a major activity and an EA must be prepared. The criteria for non-major activities associated with water system projects are:

(1) improvements to a water treatment plant involving an increase in capacity of less than 1 MGD or improvements that result in a combined design withdrawal capacity less than one-fifth of the 7-day, 10-year low flow of the contributing stream;
(2) ground water withdrawals of less than 1 MGD where such withdrawals are not expected to cause a significant alteration in established land use patterns, or degradation of ground water or surface water quality;
(3) construction of a dam less than 25 feet in height and having storage capacity less than 50 acre-feet.

The rules have provisions for the Secretary of the Department of Environment and Natural Resources (DENR) to require environmental documentation even for non-major activities if there is the potential for significant adverse environmental or public health impacts.

The environmental review process under SEPA provides a mechanism to evaluate potential impacts on water resources of proposed projects before they are constructed. Through this process the detrimental impacts on resources can be mitigated and minimized. This process can be time consuming and has to be factored into decision-making for and scheduling of water supply projects. The DENR Customer Service Center (1-877-623-6748) can provide assistance with SEPA criteria and referrals to other sources of help.



No. BASIN NAME

1-1 Broad River

2 Cape Fear
- 2-1 Haw River
- 2-2 Deep River
- 2-3 Cape Fear River
- 2-4 South River
- 2-5 Northeast Cape Fear River
- 2-6 New River

3 Catawba
- 3-1 Catawba River
- 3-2 South Fork Catawba River

4 Chowan
- 4-1 Chowan River
- 4-2 Meherrin River

5 French Broad
- 5-1 Nolichucky River
- 5-2 French Broad River
- 5-3 Pigeon River

No. BASIN NAME

6-1 Hiwassee River

7 Little Tennessee
- 7-1 Little Tennessee River
- 7-2 Tuckasegee River

8-1 Savannah River

9 Lumber
- 9-1 Lumber River
- 9-2 Big Shoe Heel Creek
- 9-3 Waccamaw River
- 9-4 Shallotte River

10 Neuse
- 10-1 Neuse River
- 10-2 Contentnea Creek
- 10-3 Trent River

11-1 New River

12-1 Albemarle Sound

No. BASIN NAME

13-1 Ocoee River

14-1 Roanoke River

15 Tar - Pamlico
- 15-1 Tar River
- 15-2 Fishing Creek
- 15-3 Pamlico River & Sound

16-1 Watauga River

17-1 White Oak River

18 Yadkin
- 18-1 Yadkin River
- 18-2 South Yadkin River
- 18-3 Uwharrie River
- 18-4 Rocky River

Legend

- Major River Basin Boundary
- Sub-Basin Boundary
- County Boundary

Figure 6-1. Basins in North Carolina as Defined by General Statute 143-215.22.G

Table 6-1. Estimated Interbasin Transfers in 1997

Source Sub-Basin	Supplier	Receiving Sub-Basin	Receiver (if different from Supplier)	Average Transfer (in MGD)
Broad River	Kings Mountain	Catawba River		0.288
	Kings Mountain	S Fork Catawba River	Gastonia WWTP	1.186
Haw River	Cary	Neuse River		8.200
	Cary	Neuse River	Apex	1.200
	Cary	Cape Fear River	Apex	0.300
	Cary	Neuse River	Holly Springs	<0.1
	Cary	Neuse River	Morrisville	<0.1
	Greensboro	Deep River		0.600
	Greensboro	Deep River	Jamestown	<0.1
	Reidsville	Roanoke River		<0.1
Deep River	High Point	Yadkin River		4.400
Cape Fear River	Brunswick Co	Shallotte River	Carolina Blythe	0.083
	Brunswick Co	Shallotte River	Holden Beach	0.353
	Brunswick Co	Shallotte River	Long Beach	0.360
	Brunswick Co	Shallotte River	Ocean Isle Beach	0.386
	Brunswick Co	Shallotte River	Shallotte	0.205
	Brunswick Co	Shallotte River	Sunset Beach	0.501
	Carthage	Deep River		0.200
	Carthage	Lumber River	Moore Co WWTP	0.111
	Dunn	South River		<0.1
	Dunn	Neuse River	Benson	1.200
	Dunn	South River	Falcon	<0.1
	Harnett Co	South River	Angier	0.200
	Harnett Co	South River	Coats	<0.1
	Harnett Co	Neuse River	Fuquay-Varina	0.140
	Sanford	Deep River		1.600
	Sanford	Deep River	Chatham Co E	<0.1
	Vass	Lumber River	Moore Co WWTP	0.094
	Wilmington	NE Cape Fear River		4.600
	Wilmington	New River (Cape Fear)		<0.1
Catawba River	Belmont	S Fork Catawba River		unknown
	Belmont	S Fork Catawba River	Cramerton	<0.1
	Burlington Industries	Rocky River	Mooresville WWTP	0.384
	Charlotte-Mecklenburg	Rocky River		9.000
	Charlotte-Mecklenburg	Rocky River	Union Co	<0.1
	Gastonia	S Fork Catawba River		6.724
	Gastonia	S Fork Catawba River	Cramerton	0.329
	Gastonia	S Fork Catawba River	Dallas	<0.1
	Gastonia	S Fork Catawba River	Lowell	0.454
	Gastonia	S Fork Catawba River	McAdenville	0.425
	Gastonia	S Fork Catawba River	Ranlo	0.329
	Hickory	S Fork Catawba River		5.100
	Hickory	S Fork Catawba River	Brookford	<0.1
	Hickory	S Fork Catawba River	Conover	<0.1
	Hickory	S Fork Catawba River	Icard	<0.1

Table 6-1. Estimated Interbasin Transfers in 1997 (continued)

Source Sub-Basin	Supplier	Receiving Sub-Basin	Receiver (if different from Supplier)	Average Transfer (in MGD)
Catawba River	Hickory	S Fork Catawba River	Long View	<0.1
	Lenoir	Yadkin River	Caldwell Co N	<0.1
	Lenoir	Yadkin River	Caldwell Co SE	<0.1
	Lincoln Co	S Fork Catawba River		unknown
	Lincoln Co	S Fork Catawba River	Lincolnton	0.110
	Long View	S Fork Catawba River		1.310
	Long View	S Fork Catawba River	Burke Co	<0.1
	Mooresville	Rocky River		unknown
	Mooresville	South Yadkin River		unknown
	Morganton	S Fork Catawba River		<0.1
	Morganton	S Fork Catawba River	Burke Co	<0.1
	Mount Holly	S Fork Catawba River	Stanley	<0.1
	Union Co	Rocky River		3.600
	Union Co	Rocky River	Monroe	2.000
	Valdese	S Fork Catawba River	Burke Co	<0.1
	Valdese	S Fork Catawba River	Icard	<0.1
S Fork Catawba River	Bessemer City	Catawba River		0.366
	Cherryville	Broad River		unknown
	Lincolnton	Catawba River		<0.1
	Newton	Catawba River		<0.1
	Newton	Catawba River	Catawba	<0.1
	Stanley	Catawba River		<0.1
French Broad River	Hendersonville	Broad River		<0.1
	Hendersonville	Broad River	Saluda	0.151
Pigeon River	Canton	French Broad River		<0.1
Little Tennessee River	Highlands	Savannah River		0.110
Lumber River	Southern Pines	Cape Fear River		unknown
	Southern Pines	Cape Fear River	Moore Co (Pinehurst)	unknown
Neuse River	Durham	Haw River		18.000
	Goldsboro	Contentnea Creek	Wayne WD	<0.1
	Goldsboro	NE Cape Fear River	Wayne WD	<0.1
	Hillsborough	Haw River	Orange-Alamance WS	<0.1
	Orange-Alamance WS	Haw River		0.500
	Raleigh	Contentnea Creek	Zebulon	<0.1
	Zebulon	Contentnea Creek		0.680
New River	Blowing Rock	Catawba River		0.137
	Blowing Rock	Yadkin River		<0.1
	Boone	Watauga River		<0.1
Roanoke River	Kerr Lake RWS	Tar River	Henderson	<0.1
	Kerr Lake RWS	Tar River	Oxford	1.330
	Kerr Lake RWS	Fishing Creek	Warren Co	0.644
	Roanoke Rapids SD	Meherrin River	Halifax Co	<0.1
	Roanoke Rapids SD	Meherrin River	Northampton-Gaston	<0.1
	Roxboro	Neuse River		<0.1
Tar River	Franklin Co	Neuse River	Youngsville	<0.1

Table 6-1. Estimated Interbasin Transfers in 1997 (continued)

Source Sub-Basin	Supplier	Receiving Sub-Basin	Receiver (if different from Supplier)	Average Transfer (in MGD)
Yadkin River	Albemarle	Rocky River		5.822
	Albemarle	Rocky River	Pfeiffer-North Stanly WA	0.153
	Albemarle	Rocky River	Stanly Co	0.775
	Anson Co	Rocky River		0.650
	Anson Co	Rocky River	Ansonville	<0.1
	Anson Co	Rocky River	Marshville	0.249
	Anson Co	Rocky River	Peachland	<0.1
	Anson Co	Rocky River	Polkton	<0.1
	Anson Co	Rocky River	Union Co	0.788
	Davidson Water	Uwharrie River		1.120
	Davidson Water	Deep River		0.420
	Davidson Water	Deep River	Archdale	0.176
	Davidson Water	Deep River	High Point	<0.1
	Denton	Uwharrie River	Handy SD	<0.1
	Hamlet	Big Shoe Heel Creek	Richmond Co	<0.1
	King	Roanoke River		<0.1
	Landis	Rocky River		<0.1
	Montgomery Co	Deep/Lumber/Uwharrie River		unknown
	Montgomery Co	Deep River	Biscoe	<0.1
	Montgomery Co	Deep River	Candor	<0.1
	Montgomery Co	Lumber River	Candor	<0.1
	Montgomery Co	Deep River	Star	<0.1
	North Wilkesboro	Cape Fear River	Broadway	0.062
	Norwood	Rocky River		0.355
	Norwood	Rocky River	Stanly Co	<0.1
	Richmond Co	Big Shoe Heel Creek		<0.1
	Richmond Co	Lumber River		<0.1
	Salisbury	South Yadkin River		0.290
	Salisbury	South Yadkin River	Rowan Co	0.119
	Thomasville	Uwharrie River		<0.1
	Winston-Salem	Roanoke River		0.386
	Winston-Salem	Haw River		<0.1
	Winston-Salem	Deep River		<0.1
South Yadkin River	Alexander Co WC	Catawba River		unknown
	Alexander Co WC	Catawba River	Taylorsville	0.400
	Alexander Co WC	Catawba River	West Iredell WC	<0.1
	Davie Co	Yadkin River		<0.1
	Kannapolis	Rocky River		4.492
	Mocksville	Yadkin River		0.563
	Statesville	Catawba River	Troutman	<0.1
	Statesville	Catawba River	West Iredell WC	unknown
Uwharrie River	Asheboro	Deep River		4.630
	Asheboro	Yadkin River		<0.1
	Asheboro	Deep River	Randleman	<0.1
	Asheboro	Deep River	Seagrove/Ulah WD	<0.1
Rocky River	Monroe	Catawba River		<0.1

Table 6-2. Instream Flow Studies Conducted

RIVER BASIN	WATER SYSTEM	WATER BODY
Broad	Shelby	First Broad River
	Cleveland County Sanitary District	First Broad River
	Rutherford County	Roberson Creek
	Forest City	Second Broad
Cape Fear	Siler City	Rocky River Reservoir
	Piedmont Triad Water Authority	Randleman Reservoir
	Graham-Mebane	Back Creek
	Fayetteville	Little Cross Creek
	Carthage	Nicks Creek
Catawba	Cherryville	Indian Creek
	Lincolnton	South Fork Catawba
	Morganton	Catawba
French Broad	Hendersonville	Mills River North Fork Mills Bradley Creek
	Weaverville	Ivy Creek
	Woodfin	Reems Creek
	Maggie Valley Sanitary District	Campbell Creek Johnathon Creek
Neuse	Falls Lake	Neuse River
	Hillsborough	Eno River West Fork
	Wilson	Contentnea Creek Buckhorn reservoir
Tar-Pamlico	FWASA/Louisburg	Tar River
	Rocky Mount	Tar River
Watauga	Beech Mountain	Buckeye Creek
Yadkin-Pee Dee	Winston-Salem	Yadkin River
	Concord	Coddle Creek Reservoir
	Yadkinville	South Deep Creek
	Yadkin County	South Deep Creek
	Mount Airy	Stewarts Creek Lovills Creek Pauls Creek
	Pilot Mountain	Tom's Creek
Little Tennessee	Cherokee Indian Reservation	Oconaluftee River
Lumber	Southern Pines	Drowning Creek

SECTION 7. DATA SOURCES

7.1 Local Water Supply Plans

This version of the State Water Supply Plan (SWSP) is based on information submitted mostly by local government water systems in their 1997 Local Water Supply Plan updates. Units of local government that supply or plan to supply drinking water to the public are required to prepare a LWSP. Numerous private water systems also prepared LWSPs and the data from these plans are included in the SWSP as well. The LWSPs are currently available on-line at the Division of Water Resources web site at *www.ncwater.org*. This information was reviewed for consistency and reasonableness by staff engineers, but the LWSP information was not verified by site visits. The LWSP information includes:

- population served and water use projections (1997, 2000, 2010, 2020);
- breakdown of water use by type (residential, nonresidential, sales, unaccounted-for water);
- average daily water use by month;
- surface water source data (name and location of water source, average daily withdrawal, safe yield, on-stream storage);
- ground water source data (well, casing, and screen depths, location, average daily withdrawals, 12-hour supply);
- interconnections with other systems (supplier and receiver names, average daily purchase or sale, contract amount);
- future source data (source name, type of source, location, proposed average daily withdrawal, proposed operational date);
- wastewater discharge information (discharge amounts, capacity, and location);
- water conservation program information;
- technical assistance needs.

Since much of the relevant data for a water system has a geographic component, systems were asked to provide the locations of key system features on maps supplied by the division. The information on the system maps was digitized into a Geographic Information System (GIS) to merge the individual system data into a consolidated geographic database and mapping program. Having the information in a GIS simplifies the regional analyses presented in the SWSP and facilitates planning by providing a visual representation of water system features in relation to neighboring systems.

The GIS system contains the 1997 locations of existing facilities and the planned locations of anticipated future facilities. The features mapped from the 1997 LWSPs include wells, surface

water intakes, wastewater discharges, water and wastewater connections with other systems, and service area boundaries.

7.2 Water Withdrawal Registrations

The LWSP information is supplemented by data submitted by persons registering their 1999 water withdrawals under General Statute 143-215.22H. Anyone using 100,000 gallons per day or more in 1999 for all water uses except agriculture were required to register those withdrawals by March 1, 2000. For agricultural water users, anyone using 1.0 million gallons per day or more in 1999 was required to register. The information submitted for water withdrawals are stored in electronic databases and will be available online in early 2001. The registration data have been reviewed for completeness and reasonableness, but have not been field verified.

SECTION 8. STATEWIDE WATER USE

Developing a picture of overall water use across the state requires pulling together information from different sources collected at different times for different purposes. For water use other than water supplied by local government water systems, the Division of Water Resources relies heavily on the U.S. Geological Survey's *Estimated Water Use, by County, in North Carolina, 1995* (Walters, 1997).

8.1 Total Water Use in North Carolina

The most recent estimate of total water use in North Carolina was compiled by the U.S. Geological Survey (USGS) in the mid-1990s. They estimated that total water use in North Carolina was 9,286 million gallons per day, 80 percent of which was used in thermoelectric power generation. There was 8751 MGD of surface water and 535 MGD of ground water withdrawn for all uses. Public water systems withdrew 633 MGD of surface water and 136 MGD of ground water. Table 8-1 shows a breakdown of water use and consumption by type of supplier and type of use. Mining water use in Table 8-1 represents water used to process the extracted materials and does not reflect water withdrawn to keep the operation dry enough to work.

Table 8-1. Statewide Water Use and Consumption in 1995 by Type of Use
(all figures in Million Gallons per Day, MGD)

Type of Use	Self-supplied Surface Water	Self-supplied Ground Water	Public Water Supply (PWS)	Total Use	Returned Flow	Consumptive Use
Domestic	0	172	332	504	341	163
Commercial	0.3	7.3	138	146	138	7
Industrial	308	61	193	562	450	112
Mining	4.3	11.7	-	16	6.7	9.3
Irrigation	181	57	-	238	0	238
Livestock	207	90	-	297	171	125
Thermoelectric	7,417	0.1	0.4	7417	7,343	74
PWS Losses	-	-	105	105	-	-
Total	8118	399	769	9286	8,451	730

Source: Figure 2, Estimated Water Use, by County, in North Carolina, 1995. USGS Open File-Report 97-599.

Thermoelectric use dominates water uses in the state. While using water to cool electric generating facilities can have an impact on water temperature and sometimes on water quality, almost all of the water withdrawn is returned within a short distance and is available for other uses downstream. Therefore, with the focus of this report being water supply planning, unless specifically

noted, the discussions, tables, and analysis throughout this report do not include thermoelectric generation uses.

In the mid-1990s domestic (or residential) water use averaged about 504 MGD of drinking water to meet the demands of about 7.2 million persons or about 70 gallons per day (gpd) per person. If this rate stays the same, in 2020, when the population is estimated to reach about 9.6 million persons, we will be using about 672 MGD of drinking water to meet our domestic water needs. USGS estimates that about two-thirds of the state's population is served by public water supply systems, with the other third getting their water from individual household wells. Of the two-thirds that are publicly-supplied, systems submitting local water supply plans (LWSPs) serve over 95 percent of those residents. The remaining publicly served population are served by privately-owned public water systems that are not required to prepare LWSPs.

Public water systems supplied an estimated 769 MGD for all of its system needs. About 43 percent of public water system use was for domestic (residential) purposes, with an equal amount being used for commercial and industrial uses combined. Public water system losses (leaks and unaccounted-for water uses) comprised the remaining 14 percent.

Excluding thermoelectric uses, we withdrew 1868 MGD of ground and surface water in 1995. Based on a population of about 7.2 million persons in 1995, we withdrew about 259 gpd of water for each person in the state to support the North Carolina economy. Of this 259 gallons per day, an estimated 154 gallons were discharged back to surface water. If this rate of use stays the same, in 2020 we will be withdrawing 2486 MGD of water to support these activities.

8.2 Water Use by Local Water Supply Plan Systems

As mentioned above, local water supply plan (LWSP) systems supply the vast majority of all the water supplied by public water systems across the state. Table 8-2 provides a summary of water use by LWSP water systems in 1997.

Table 8-2. Reported Water Use by LWSP Systems in 1997
(million gallons per day)

Residential	357
Non-residential	357
Backwash	28
Unaccounted-for	125
Total	867

Many water systems purchase water from another system. In 1997, LWSP systems sold an average of 89 million gallons of water per day to other water systems. However, to avoid double-counting, water sales are not included in the water use figures in this section.

Water systems reported water use of about 688 million gallons per day in their 1992 LWSPs. This represents a 26 percent increase in water use by LWSP systems from 1992 to 1997. For this same period, the population served by LWSP systems increased by 20 percent. L W S P systems projected their water supply needs through the year 2020. LWSP systems project that water demands for their systems will reach 1415 million gallons per day by 2020, a 63 percent increase above 1997 levels. Service population and demand projections through 2020 are shown in Table 8-3 below.

Table 8-3. Projected Water Supply Needs for LWSP Systems

Year	Population Served	Demand (million gallons per day)
1997	5,029,056	867
2000	5,602,217	987
2010	6,814,855	1193
2020	8,001,907	1415

The water sources available for use vary across the state. Almost all LWSP systems in the Coastal Plain depend on ground water pumped from an extensive system of aquifers. In the Piedmont and Mountain areas, many systems rely on reservoirs or direct withdrawals from streams for their water supply, with numerous systems also relying on ground water where feasible. Many systems simply purchase water from a neighboring water system to meet their water supply needs. Figure 8-1 shows the water supply source types for LWSP systems in 1997.

The Division of Water Resources (DWR) encourages water systems to maintain demand-to-supply ratios such that average daily demands do not exceed 80 percent of their available water supply. Generally, water systems with demand-to-supply ratios greater than 0.8 are at greater risk of water supply shortages during periods of peak use and especially during drought. For water systems with high seasonal demands, DWR recommends that demand-to-supply ratios be based on these higher seasonal demands. LWSP projections indicate that 111 systems had demands exceeding 80 percent of their available water supply in 1997, and that 141 systems will exceed this threshold in 2010. These systems are shown in Figure 8-2. These systems were required to include a specific plan in their 1997 LWSP for meeting their future water supply needs.

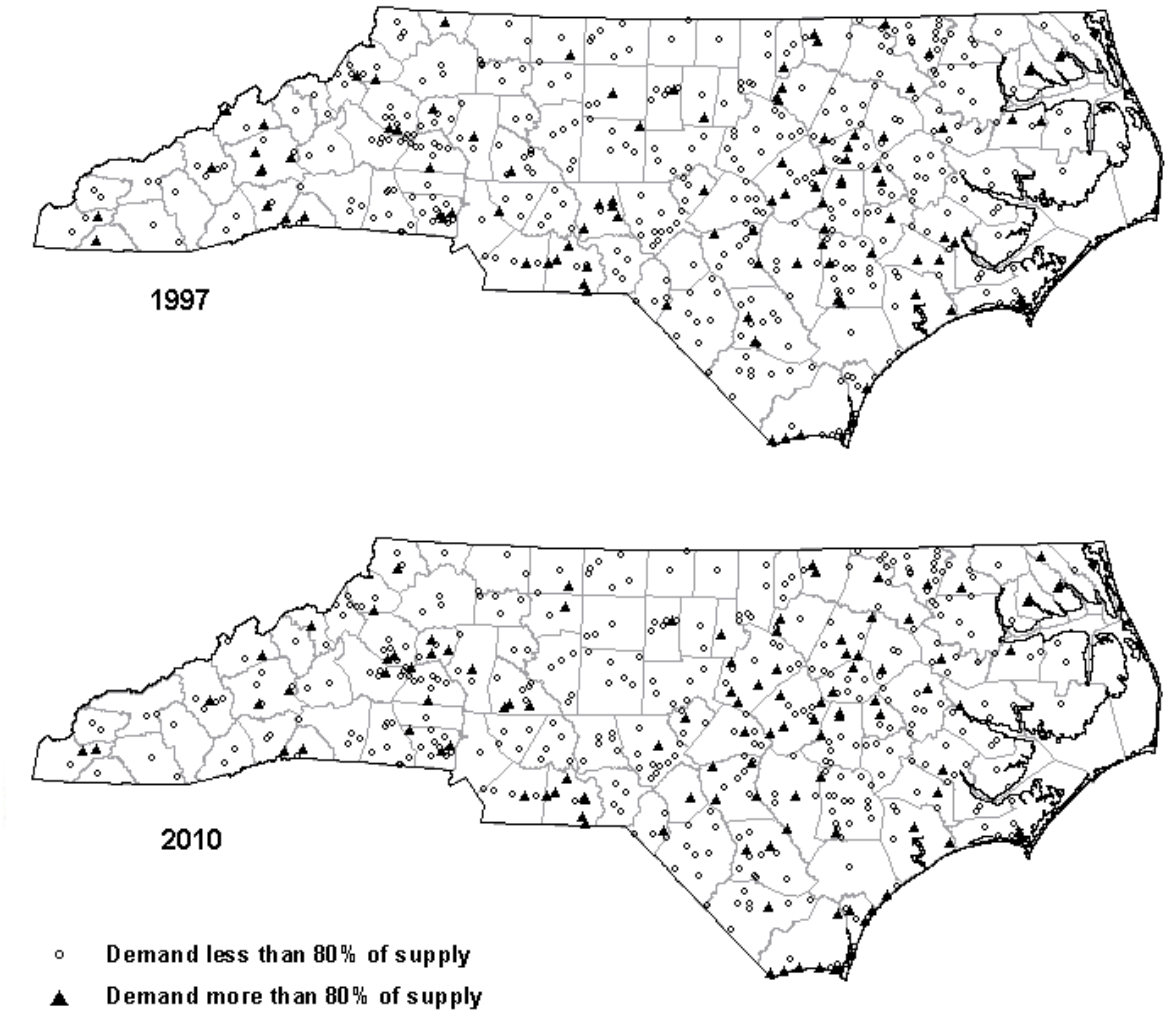


Figure 8-2: Comparison of Supply and Demand for Community Water Supply Systems

8.3 Registered Water Withdrawals

The Local Water Supply Plans provide very good information on local government water systems, plus some private water systems that also submit LWSPs. However, there are many other water users, including most private water systems and self-supplied industry and agriculture, that together use large amounts of water. Having specific information, such as withdrawal amounts and locations, for these other users is also very important.

Information from these other users comes from the state's water withdrawal registration program. This program requires anyone withdrawing 1.0 million gallons per day or more for agricultural uses or 100,000 gallons per day for all other uses to register those withdrawals with the Division of Water Resources every five years. Withdrawals during calendar year 1999 were due by March 1, 2000. An additional source of registration data comes from water users in Capacity Use Area #1 in eastern North Carolina, whose monthly water use report satisfies their registration requirement.

Water withdrawal registration data is summarized in Table 8-4 for the various type of water uses across the state. Water use for power generation greatly exceeds water use for other uses, as discussed in Section 8.1. Registered water use for power generation is reported in Table 8-4, but is not included in the following discussion and analysis.

Agricultural water users registered 236 million gallons of daily water use. Irrigation of crops during the growing season accounted for 75 percent (160 MGD) of registered agricultural use, with surface water being used for 90 percent of this irrigation use. Since irrigation is so weather dependent, the amount of water used can vary drastically from year to year. Nearly all of the remaining water use was for aquaculture operations (fish farms) mainly in the mountains and coastal plain. No livestock operations registered any water use. Additional work needs to be done to determine if the 1.0 million gallon per day threshold is too high to trigger the registration requirement for most livestock operations.

Non-agricultural water users registered 900 million gallons of daily water use. Industrial surface water use accounted for 80 percent (726 MGD) of the non-agricultural uses. Mining operations registered 107 million gallons of withdrawals, which includes pumping to de-water or de-pressure a site as well as surface water withdrawals for process water and dust control. Private water systems registered over 31 MGD of public water supply withdrawals, which is in addition to water withdrawn by Local Water Supply Plan systems. Golf courses registered 11 million gallons of water use for irrigation, 10 MGD of which came from surface water. Other non-agricultural uses included snowmaking at several ski resorts, pipeline pressure testing, recovery wells, and maintaining waterfowl impoundments.

Water withdrawal registration data will be available on the Division of Water Resources web site in early 2001.

Table 8-4. Registered Water Withdrawals in 1999
(million gallons per day)

Type of Use	Surface Water	Ground Water	Total Use
Agricultural			
Irrigation	160	19	179
Livestock	0	0	0
Aquaculture	34	19	53
Other [1]	4	0	4
SUBTOTAL	198	38	236
Non-Agricultural (excluding Power Generation)			
Public Water Supply [2]	7	24	31
Industrial	726	18	744
Mining	72	35	107
Golf Course	10	1	11
Other [3]	6	1	7
SUBTOTAL	821	79	900
TOTAL (excluding Power Generation)	**1,019**	**117**	**1,136**
Power Generation			
Hydroelectric Power	16,362	0	16,362
Thermal Electric Power	8,747	0	8,747
Subtotal	25,109	0	25,109
TOTAL (including Power Generation)	**26,128**	**117**	**26,245**

Notes: [1] surface drainage
[2] excludes water use by local water supply plan systems
[3] includes snowmaking, pipeline testing, recovery wells, and waterfowl impoundments

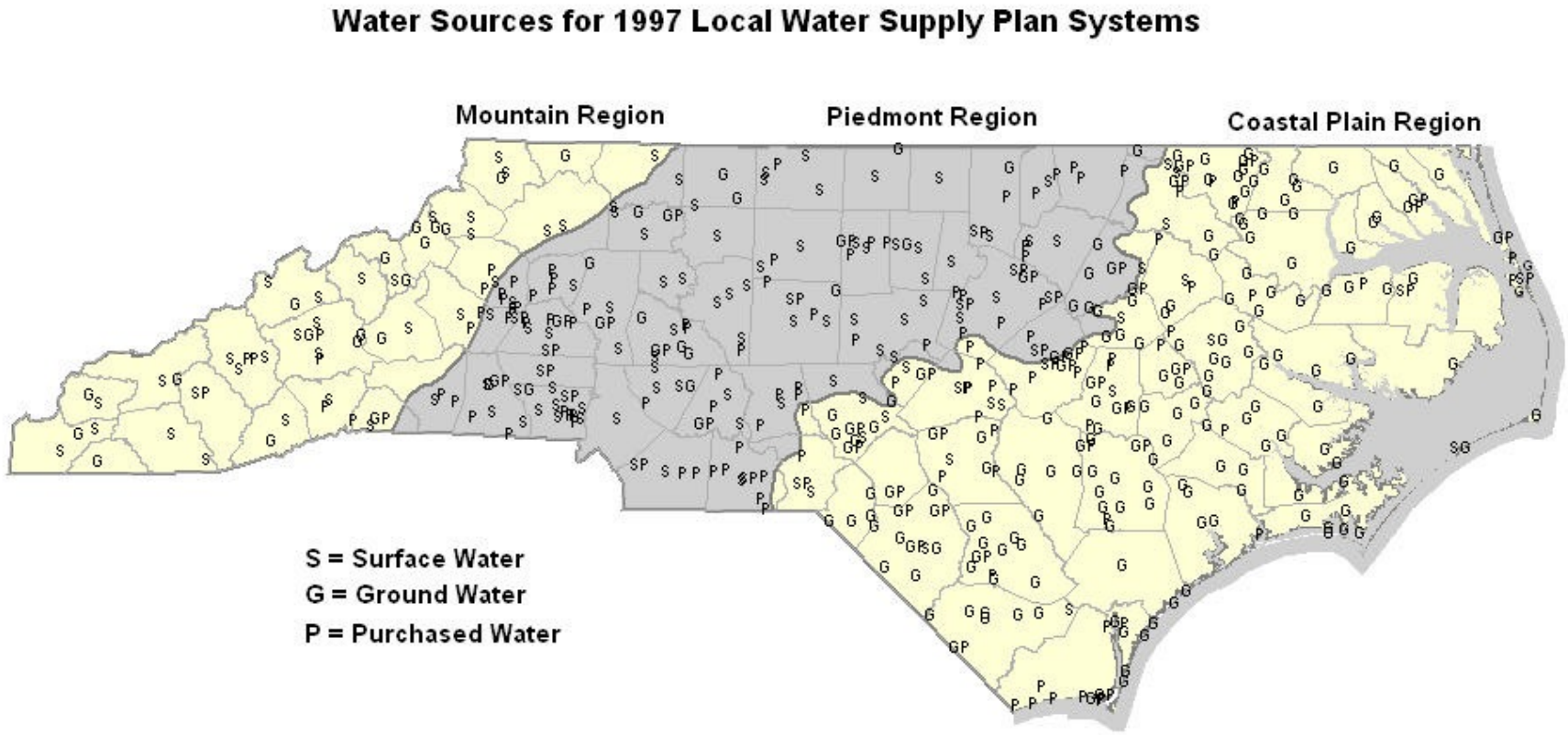


Figure 8-1. Water Source Types for 1997 Local Water Supply Plan Systems

SECTION 9. TECHNICAL ASSISTANCE NEEDS

The legislation mandating Local Water Supply Plans required the Division of Water Resources to estimate the technical assistance required at the local level to address projected water needs. To gather this information, the Local Water Supply Plan includes numerous questions about technical assistance. This information is summarized in Table 9-1 below.

Table 9-1. Technical Assistance Needs Reported in 1997 LWSPs
(out of 535 reporting LWSP systems)

Is technical assistance needed:	Systems Responding "YES"
to develop a local water supply plan?	92
with a leak detection program?	152
with a demand management or water conservation program?	125
with a water shortage response plan?	119
to identify alternative or future water supply sources?	117
with a capacity development plan?	106
with a wellhead or source water protection plan?	110
with water system compliance or operational problems?	63
with Consumer Confidence Reports?	135

DWR has used this information to target its technical assistance efforts, ranging from direct assistance to water systems to preparation of written materials on a variety of topics, such as water shortage response.

Many systems indicated a need for financial assistance. These needs have been partially addressed by the passage of the Clean Water and Natural Gas Critical Needs Bond Act of 1998 by the North Carolina General Assembly and by the provisions for a State Revolving Fund included in the 1996 Amendments to the Safe Drinking Water Act at the federal level.

SECTION 10. RIVER BASIN SUMMARIES

River basins provide a practical framework for compiling water supply information, especially for surface water supplies. North Carolina General Statute 143-215.22G defines 38 river basins for the state, grouped into 18 major basins. These particular basin delineations were defined for the purposes of implementing two important water management programs — the registration of water withdrawals and transfers and the regulation of surface waters transfers. Figure 10-1 shows the boundaries for these 38 river basins.

The river basin summaries in this section present an overview of water use and water availability for Local Water Supply Plan systems in each of the major river basins. A map showing the LWSP systems in the basin and a table of LWSP data for each system is included with each basin summary. No summary is provided for the Ocoee (13-1) or Savannah (8-1) basins, since no LWSP systems are in these basins

Appendix A is a River Basin Index that provides a convenient reference to locate the appropriate river basin summary for each water system.

10.1 Basin Description

Each basin summary provides a brief geographic description of the river basin, including major tributaries, impoundments, and other features of the basin. A location map is also provided for reference.

10.2 Water Use

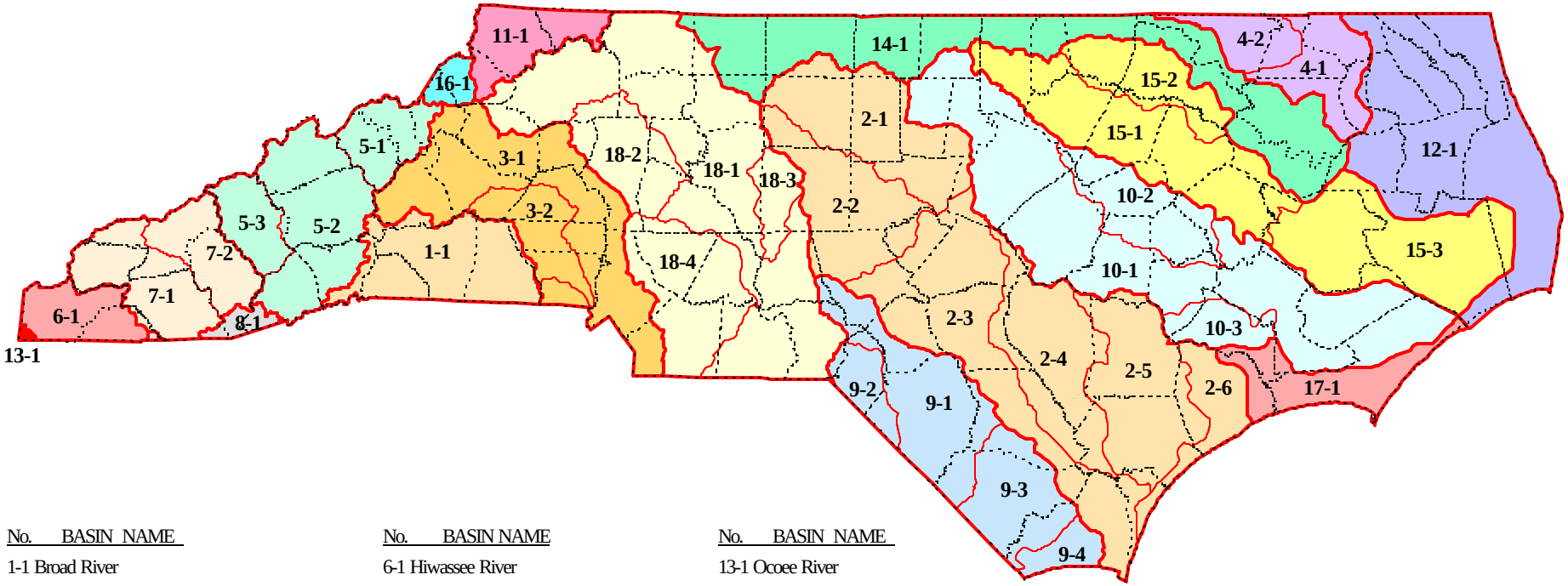
Specific factors affecting water used in each basin is discussed, along with water use information from a variety of sources. All types of water use in each basin are summarized, with detailed water use information from Local Water Supply Plans.

10.2.1 Factors Affecting Water Demand

This section of the basin summaries highlights the specific factors that are affecting water demand in the basin. Population growth, seasonal fluctuations, economy, and other relevant factors are included.

10.2.2 Total Water Use in Basin

Information in this section of the basin summary comes from estimates of statewide water use provided in the U.S. Geological Survey's *Estimated Water Use, by County, in North Carolina, 1995* (Walters, 1997). The total water use amounts presented include residential, commercial, industrial, mining, irrigation, livestock, and public water system losses. Not included are water use for thermoelectric power generation and mine dewatering. USGS estimates for public water system comes primarily from data contained in the 1992 LWSPs.



No. BASIN NAME

1-1 Broad River

2 Cape Fear
- 2-1 Haw River
- 2-2 Deep River
- 2-3 Cape Fear River
- 2-4 South River
- 2-5 Northeast Cape Fear River
- 2-6 New River

3 Catawba
- 3-1 Catawba River
- 3-2 South Fork Catawba River

4 Chowan
- 4-1 Chowan River
- 4-2 Meherrin River

5 French Broad
- 5-1 Nolichucky River
- 5-2 French Broad River
- 5-3 Pigeon River

No. BASIN NAME

6-1 Hiwassee River

7 Little Tennessee
- 7-1 Little Tennessee River
- 7-2 Tuckasegee River

8-1 Savannah River

9 Lumber
- 9-1 Lumber River
- 9-2 Big Shoe Heel Creek
- 9-3 Waccamaw River
- 9-4 Shallotte River

10 Neuse
- 10-1 Neuse River
- 10-2 Contentnea Creek
- 10-3 Trent River

11-1 New River

12-1 Albemarle Sound

No. BASIN NAME

13-1 Ocoee River

14-1 Roanoke River

15 Tar - Pamlico
- 15-1 Tar River
- 15-2 Fishing Creek
- 15-3 Pamlico River & Sound

16-1 Watauga River

17-1 White Oak River

18 Yadkin
- 18-1 Yadkin River
- 18-2 South Yadkin River
- 18-3 Uwharrie River
- 18-4 Rocky River

Legend

- Major River Basin Boundary
- Sub-Basin Boundary
- County Boundary

Figure 10-1. River Basins in NC as Defined by General Statute 143-215.22.G

10.2.3 Local Water Supply Plans

Those LWSP systems that use water from the basin are included in the basin summary, even if their service area happens to be located in another basin. A table showing the estimated LWSP service population using water from the basin is included, along with the amount of water used from the basin by type of use. Percentages of residential, non-residential, and unaccounted-for water use is reported. Specific LWSP data for each system is presented in tables at the end of each basin summary.

The Division of Water Resources recommends that water systems maintain demand-to-supply ratios such that average daily demand does not exceed 80 percent of available supply. Systems with demands in excess of this amount may be susceptible to shortages during drought or peak demand periods and should have a specific plan for addressing this problem, including a water conservation program to manage demands and plans for obtaining additional water supply.

The basin summary includes the number of LWSP systems with demand-to-supply ratios that DWR calculated to be greater than 80 percent. Calculated demand-to-supply ratios for each LWSP system are shown in the tables included with each basin summary. Demand-to-supply ratios of 100 percent for purchase-water systems indicate that no purchase contract amount was provided. Adequate future water may be available from the supplier for many of these systems, however, DWR could not assume this when no contract existed. During the LWSP process, the importance of having a water supply contract is stressed. It is important for purchasers to know the amount of water supply that they can reliably depend on from their supplier, and it is equally important for sellers to recognize their contractual obligations to other systems.

10.2.4 Self-supplied Use

Many water users have their own self-supplied water sources. Domestic self-supply comes from individual household wells. Self-supplied water for non-residential uses is taken from both ground and surface water sources. The estimates of self-supplied water use presented for each basin are from data compiled by USGS for the report *Estimated Water Use, by County, in North Carolina, 1995* (Walters, 1997).

10.2.5 Registered Water Withdrawals

Registered water withdrawals during 1999 are summarized in each basin summary, including the number of withdrawals and the combined withdrawal amounts for both agricultural and non-agricultural uses. Anyone withdrawing 1.0 million gallons or more per day for agricultural uses or 100,000 gallons or more per day for all other uses are required to register those withdrawals with the Division of Water Resources.

10.3 Water Availability

Available water supply reported by water systems in their 1997 LWSPs is discussed in this section. Surface and ground water availability are discussed separately. For surface water supplies, reported safe yield estimates are summed for the basin. These safe yield estimates reflect the amount of raw water available from these sources, however, the amount of potable (drinking) water available at any point in time will be limited by the water treatment capacity of the LWSP systems. In addition, surplus available supply in the basin is not necessarily available to those particular individual water systems needing additional supply, because of planned future use by other systems, proximity to the supply, and many other factors.

For ground water systems, the available supply reported in their LWSP is their 12-hour supply, which is the total amount of water that can be pumped from wells in a 12-hour period as specified in the Rules Governing Public Water Systems (NCAC 15A:18C .0100 to .2100). These reported 12-hour supplies for each ground water system are summed for the basin.

Any significant issues affecting water availability in the basin are also discussed, such as the proposed central coastal plain capacity use area.

10.4 Interbasin Transfers of Surface Water

The estimated amount of interbasin transfers into and out of each river basin are summarized based on 1997 LWSP data. This information is presented to indicate the extent to which communities in these basins currently depend on interbasin transfers of surface water to meet their water demands. Minor transfers less than 100,000 gallons per day were typically not quantified in the LWSPs. As a result, these minor transfers are counted in the number of transfers, but their transfer amount is not part of the transfer total amounts in and out of the basin. Only transfers of 2 MGD or more, or transfers that have exceeded their grandfathered transfer amount, are subject to the interbasin transfer certification requirements. More details on these requirements and a listing of interbasin transfers occurring in 1997 can be found in Section 6, Regulations Affecting Water Supply Planning.

10.5 Summary of Water Supply Information from 1997 LWSPs

The last section of each basin summary captures some of the key water supply information from the 1997 LWSPs for water systems using water from each basin. For convenience and ease of comparison, much of this information is compiled in Table 10-1. Each basin summary discussion is followed by a map showing the service areas of the LWSP systems in that particular basin.

The map is followed by a table that shows the population, water use, and water availability for each of the LWSP systems included in the summary discussion for that basin. The columns entitled "Demand as % of Supply" show the Demand/Supply ratios for each system as a percentage of available supply, based on demand and supply data provided in the 1997 LWSPs. Available supply

was calculated by adding the available supplies from 12-hour well yield, surface water safe yield, and total purchase contracts and then subtracting total sales contracts. Systems that have 100% demand-to-supply ratios for 1997 are those that provided no contract amount for water purchases. For those systems, the amount of water purchased in 1997 was used as the amount available for purchase. Therefore, the system appeared to use all of its available supply in that year. Some systems have negative percentages listed in the table; these systems had sales contracts that exceeded their available water supply for regular use. DWR is working closely with these systems to resolve contract discrepancies.

Appendix B contains supplemental water supply planning information for each water system submitting a 1997 LWSP, listed by county. The first column after the system name indicates the status of each system's 1997 LWSP. The code used indicates whether the 1997 LWSP is complete, ready to adopt, draft, or if no plan was submitted by the system. A "Y" in the second or third columns indicates that average daily demand is greater than 80 percent of available supply in 1997 or 2010, respectively, for that system. A "Y" in the fourth column indicates the system answered yes to the question: "Are peak day demands expected to exceed the water treatment plant capacity by 2010?" The next two columns indicate whether or not a system has an active leak detection program or an ordinance in place to deal with water shortages during a drought.The right-most column on the page indicates whether or not the system currently relies on interbasin transfers for all or part of their water supply, including systems that purchase transfer water from another system.

Local Water Supply Plan information for each system can also be found on the DWR web site at: http://www.ncwater.org.

Table 10-1. Summary of 1997 Local Water Supply Plan Information by River Basin

					Available Supply (MGD)		# of systems with Demand > 80% of Supply			Projected Growth from 1992 to 2020			
Major River Basin	# of systems using water from basin	1997 population served using water from basin	1997 water use from basin (MGD)	1997 Per Capita Use based on total system use (gallons/person/day)	Ground water	Surface Water	1997	2010	# with peak demand > treatment capacity by 2010	Population	Demand	Supply needed by 2010 to keep demand less than 80% of supply (MGD)	# of systems planning additional supplies
Broad	15	100,887	24.8	246	0.6	88	1	1	4	40%	63%	0.03	3
Cape Fear	125	1,367,084	217.8	159	63.6	418	21	35	19	65%	73%	37.56	32
Catawba	47	937,391	175.9	188	1.0	386	7	15	10	63%	58%	7.82	10
Chowan	21	41,851	5.3	126	13.6	0	2	3	1	16%	21%	0.22	4
French Broad	23	223,402	41.0	184	1.7	75	9	8	1	53%	40%	1.53	10
Hiwassee	4	9,070	1.8	200	0.3	13.8	2	2	0	37%	40%	0.29	2
Little Tennessee	7	18,397	3.6	194	0.3	22.2	0	0	2	95%	114%	0	3
Lumber	37	169,685	32.5	192	40.4	20	4	5	5	50%	68%	2.07	9
Neuse	68	896,823	130.6	146	47.2	185	22	16	12	70%	70%	6.19	26
New	6	19,135	2.9	153	0.7	17.4	2	2	3	30%	76%	0.78	1
Albemarle	20	86,063	18.4	214	22.1	0.3	9	11	9	49%	59%	6.64	9
Roanoke	36	123,889	29.0	234	7.2	113	5	4	2	38%	55%	0.41	9
Tar- Pamlico	43	205,776	39.2	191	11.5	72	8	15	7	76%	55%	2.45	18
Watauga	5	3,784	0.7	184	0.7	1	1	0	0	63%	87%	0	2
White Oak	8	22,538	3.3	148	8.8	0	1	1	0	38%	66%	0.01	4
Yadkin	68	803,281	148.0	184	2.4	744	17	23	11	43%	49%	2.83	18