Executive Summary

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

The first basinwide plan for the Cape Fear River basin was completed in 1995 and the second in 2000. The format of this third plan was revised in response to comments received during the first and second planning cycles. A greater emphasis is placed on watershed level information in order to facilitate protection and restoration efforts.

DWQ considered comments from five public workshops held in the basin in spring 2004 and subsequent discussions with local resource agency staff and citizens during draft plan development. This input will help guide continuing water quality management activities in the basin over the next five years.

The goals of basinwide planning are to:

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

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Better evaluate cumulative effects of pollution.
- Improve public awareness and involvement.

Noteable Themes in the Cape Fear River Basinwide Water Quality Plan

- New impairments on the mainstems of the Cape Fear River (Chapter 7 and 15) and Deep River (Chapter 10)
- Development of TMDLs to address fecal coliform bacteria and turbidity (Chapter 35)
- Jordan Reservoir impairment, TMDL and proposed management strategies (Chapter 36)
- Development of lower Cape Fear River TMDL (Chapter 37)
- Population growth and land cover changes (Chapter 26)
- Stormwater runoff control programs (Chapter 31)

Basin Overview

The Cape Fear River basin drains the middle portion of North Carolina and includes portions of 26 counties and 115 municipalities (Figure 1). It is also one of four river basins completely within North Carolina (Figure 2). DWQ subdivides all river basins into subbasins. The Cape Fear River basin contains 24 subbasins (Figure 1). Maps of each subbasin are included in each subbasin chapter. The basin is composed of five major drainages: Haw River, Deep River, Northeast Cape Fear River, Black River and the Cape Fear River.

Population Growth and Land Cover Changes

Chapter 26 provides an overview of population growth in the Cape Fear River basin and associated land cover changes. The overall population (2000) of the basin based on the percent of the counties that are partially or entirely in the basin is 1,834,545, with approximately 197 persons/square mile. Refer to Appendices I and III for more information on population and land cover changes.

Cape Fear River Basin Statistics

Total Area: 9,149 sq. miles
Freshwater Stream Miles: 6,386 mi
Freshwater Lakes Acres: 31,135 ac
Estuarine Acres: 31,753 ac
Coastline Miles: 61 mi
No. of Counties: 26
No. of Municipalities: 115
No. of Subbasins: 24
Population (1990): 1,465,451
Population (2000): 1,834,545*
Pop. Density (2000): 197 persons/sq. mi.*

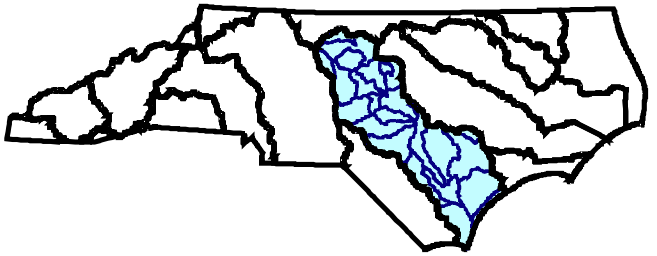
* Estimated based on % of county land area that is partially or entirely within the basin.

The most populated areas are located in and around the Triad, Triangle, Fayetteville and Wilmington. Counties in the upper basin and along the coast are experiencing high population growth that will add increased drinking water demands and wastewater discharges. There will also be a loss of natural areas and an increase in impervious surfaces associated with construction of new homes and businesses. At the current growth rate as much as one million acres of land will be in development by 2020. Many of the water quality problems summarized below are associated with urban and urbanizing areas. Most of the impaired streams in the basin are in heavily urbanized areas. Chapter 31 reviews the various stormwater programs in place to help prevent degradation to streams as urban areas increase in the Cape Fear River basin.

Water Quality Standards and Classifications

Chapter 25 discusses water quality classifications and standards, including maps showing water supply watersheds (WS), Outstanding Resource Waters (ORW), High Quality Waters (HQW) and shellfish harvesting waters (SA). Definitions of each classification and summaries of the miles and acres of the different classifications are provided. The classifications and standards are the basis for use support assessment.

Figure 1 General Map of the Cape Fear River Basin



ROCKINGHAM
CASWELL
Reidsville
03-06-01
03-06-02
FORSYTH
GUILFORD
Greensboro
Burlington
ORANGE
DURHAM
ALAMANCE
03-06-03
High Point
03-06-08
Durham
03-06-06
Archdale
Liberty
Chapel Hill
WAKE
03-06-04
03-06-05
Cary
Asheboro
Siler City
CHATHAM
RANDOLPH
03-06-09
03-06-12
Holly Springs
Goldston
03-06-07
Seagrove
03-06-11
JOHNSTON
Sanford
Angier
03-06-10
LEE
Lillington
MOORE
03-06-13
CAPE FEAR
WAYNE
Star
Carthage
HARNETT
Dunn
MONTGOMERY
Candor
03-06-14
LENOIR
Newton Grove
Spring Lake
Pinehurst
Calypso
03-06-21
03-06-15
CUMBERLAND
03-06-18
SAMPSON
JONES
Fayetteville
Clinton
DUPLIN
Hope Mills
Beulaville
HOKE
03-06-19
03-06-22
03-06-16
Rose Hill
ONSLOW
Tar Heel
Harrells
FEAR
ROBESON
BLADEN
Watha
Elizabethtown
03-06-23
03-06-20
Saint Helena
PENDER
Surf City
NEW HANOVER
03-06-24
COLUMBUS
Northwest
Wilmington
03-06-17
BRUNSWICK
CAPE FEAR RIVER
Boiling Spring Lakes

Legend

- Subbasin Boundary
- County Boundary
- Hydrgraphy
- Municipality

20 0 20 40 Miles

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

Use Support Summary

Appendix X provides DWQ methods for using current data and information to determine if a waterbody is supporting classified uses. Table 1 presents a summary of Impaired waters (in all categories) in the Cape Fear River basin that were monitored by DWQ within the five-year assessment period. Current status and recommendations for restoration of water quality for each Impaired water are discussed in each subbasin chapter (Chapters 1-24). Maps showing current use support ratings for waters in the Cape Fear River basin are presented in each subbasin chapter as well.

Table 1 Summary of Impaired Waters in the Cape Fear River Basin

Use Support Category	Units	Stream Length or Waterbody Area	Percent of All Waters for Each Category
Aquatic Life	Freshwater acres (impoundments)	10,833.9	35.2
Aquatic Life	Freshwater miles (streams)	425.4	6.9
Aquatic Life	Estuarine acres	6,527.4	20.6
Recreation	Freshwater miles	39.2	0.6
Recreation	Estuarine acres	96.6	0.3
Recreation	Coastline miles (Atlantic Ocean)	4.7	7.7
Shellfish Harvesting	Estuarine acres	6,500.7	41.4

Water Quality Stressors Identified in the Cape Fear River Basin

Within this plan, attempts were made to identify stressors for Impaired waters as well as for waters with noteable impacts. Stressors identified during this assessment are discussed below and in more detail in Chapter 27. Certain stressors are associated with specific use support categories. For example, in the recreation category, violations of the fecal coliform bacteria standard are the reason for impairment; therefore, fecal coliform bacteria is the stressor for Impaired waters in this category. In the shellfish harvesting category, a growing area classification that is not approved by Division of Environmental Health Shellfish Sanitation Section results in impairment. The growing area classification is based on fecal coliform bacteria monitoring by DEH; therefore, fecal coliform bacteria is the stressor for Impaired waters in this category as well. In the aquatic life category, Impaired waters result from violations of one or more numerical water quality standards or because a biological community sample (fish or benthic-bottom dwelling aquatic animals) did not meet use support criteria. Stressors to aquatic life can be numerical water quality standards that are violated, or a host of aquatic habitat quality indicators such as excessive sediment or lack of organic habitat. The following discussion summarizes stressors identified during this assessment period and possible sources of the stressors.

DWQ identifies the source of a stressor as specifically as possible depending on the amount of information available in a watershed. Most often the source is based on the predominant land use in a watershed. Stressor sources identified in the Cape Fear River basin during this

assessment period include urban or impervious surface areas, construction sites, road building, land clearing, agriculture and forestry. Because land disturbance is one of the main stressor sources there has been increased funding to the Division of Land Resources to help address these sources. Point source discharges are also water quality stressor sources.

Habitat Degradation

In the Cape Fear River basin, over 140 stream miles are Impaired where at least one form of habitat degradation is the stressor. Quantifying the amount of habitat degradation is very difficult in most cases. The most common stressors associated with physical habitat degradation are sediment, lack of organic material and stream channelization.

Sediment fills in pools and embeds or covers riffle habitat areas. Sediment may come from disturbed land in the watershed via runoff through storm sewers, ditches and roads or may be from stream banks that are eroded during high flow events. In many disturbed and developed watersheds, increased surface runoff becomes more common as impervious surfaces prevent infiltration of rain into the ground. In addition to the loss of instream habitat as noted above, sediment also can alter fish feeding and damage gills. During high flow events, suspended sediment can scour habitats as well as fish and insects.

Organic materials (wood and leaf) in streams are important as habitat and as a food source. A lack of organic habitat can reduce the diversity of benthic and fish species. A lack of organic habitat may also result from reduced riparian area quality associated with unstable stream banks and a lack of stream shading. Organic material in streams can form temporary dams that slow waters during high flows, reducing stream bank erosion and providing increased habitat.

Channelized streams are characterized by having little habitat diversity. Straightened stream channels allow for increased velocity of water during rain events and prevents the formation of pools and riffles seen in naturally sinuous streams. Streams can become channelized due to watershed development, where streams are moved and straightened to allow for roads and structures to be built. This type of channelization is most common in highly urbanized areas where the streams are usually a stormwater conveyance. Streams are also channelized by ditching to drain land for forestry, agriculture and development. These streams are often maintained as ditches and are not allowed to recover to a more natural state. Channelization can also occur by the force of large amounts of water running off the land. These high flows overrun natural bends and the sediment from eroded stream banks is deposited in the stream, resulting in low diversity aquatic habitats. These streams are most closely associated with urbanized and urbanizing areas.

To assess instream habitat degradation requires extensive technical and monetary resources. Although DWQ and other agencies are starting to address this issue, local efforts are needed to prevent further instream habitat degradation and to restore streams that have been impacted by activities that caused habitat degradation. As discharges become less of a source of water quality impairment, nonpoint sources that pollute water and cause habitat degradation need to be addressed to further improve water quality in North Carolina's streams and rivers.

DWQ recommends the use of careful planning to maintain riparian buffers and the use of good land use management practices during all land disturbing activities to prevent habitat degradation. In addition, watersheds that are being developed need to maintain management

practices for long periods to prevent excessive runoff that is the ultimate source of the habitat degradation noted above.

Arsenic
In the Cape Fear River basin during this assessment period, 7 miles of the Deep River are Not Rated due to arsenic standards violations (Chapter 8).

Chlorophyll a
In the Cape Fear River basin during this assessment period, there were over 10,000 freshwater acres and over 10 stream miles Impaired because of chlorophyll *a* standards violations. There were also over 2,160 freshwater acres and over 50 stream miles where chlorophyll *a* levels were elevated enough to be of concern. These violations were detected behind dams on the Deep River (Chapter 10) and Cape Fear River (Chapter 15), as well as in three reservoirs (Chapter 2 and 5) including Jordan Reservoir (Chapter 5 and 36).

Low Dissolved Oxygen
In the Cape Fear River basin during this assessment period, there were over 6,527 estuarine acres and over 40 stream miles Impaired because of dissolved oxygen (DO) standards violations. This includes a large portion of the Cape Fear Estuary (Chapter 17 and 37) and small streams draining mostly urban areas in the upper subbasins. There were also over 400 stream miles where dissolved oxygen levels were low enough to be of concern, although many of these streams are in swampy areas where low DO levels are likely a natural condition.

pH
In the Cape Fear River basin during this assessment period, there were over 6,360 estuarine acres, 1,392 freshwater acres, and over 97 stream miles Impaired because of pH standards violations (Chapters 5, 13, 14 and 15). The low pH was associated with the Cape Fear estuary and Sandhills streams. The elevated pH was associated with the 1,392-acre Haw River Arm of Jordan Reservoir (Chapter 5). There were also over 4,131 freshwater acres and 108 stream miles where pH levels were low enough to be of concern, although many of these streams are in swampy areas where low pH levels are likely a natural condition.

Turbidity
In the Cape Fear River basin during this assessment period, there were over 57 stream miles Impaired because of turbidity standards violations. The turbidity violations were mostly associated with areas downstream of urban and urbanizing areas in the upper subbasins (Chapter 2 and 9). There were also over 200 stream miles where turbidity levels were high enough to be of concern.

Fecal Coliform Bacteria and Enterroccus
During this assessment period, there were 41 stream miles where the fecal coliform bacteria standard was violated and these waters are Impaired for recreation. Most of these violations were associated with urban and urbanizing areas in the upper subbasins. There were also 97 estuarine acres (Chapter 17) and 5 miles of Atlantic coastline (Chapter 24) Impaired for recreation because of permanent postings of swimming advisories by the DEH Recreational Water Quality Monitoring Program. This program uses *enterroccus* as an indicator of potential pathogen contamination. A total of 19,339 acres, 1,120 stream miles and 49 coastline miles were monitored for recreation.

Fecal coliform bacteria are also the stressor for Impaired shellfish harvesting in Class SA waters. In the Cape Fear River basin, there are 2,654 acres of prohibited waters, 94 acres of conditionally approved-closed waters, and 3,822 acres of conditionally approved-open waters. All of these waters (6,571 acres or 41 percent) are Impaired for shellfish harvesting. The Impaired waters are associated with local coastal draining watersheds and not from basinwide sources (Chapter 17 and 24).

Mercury in Fish Tissue

DWQ has sampled fish tissue from 13 locations in the Cape Fear River basin. There are 1,392 freshwater acres and 281freshwater miles Impaired on a monitored basis in the Cape Fear River basin. Because of statewide fish consumption advice for several species of fish, all waters in the basin are Impaired on an evaluated basis in the fish consumption category. The source of mercury is most likely airborne and will have to be addressed on a regional and global scale.

Agriculture and Water Quality

Chapter 28 provides information related to the impacts of agriculture on water quality. Cultivated cropland was 16 percent (947,100 acres) of the land use in the Cape Fear River basin in 1997. While still a large portion of the basin land use, this is 20 percent (1,177,000 acres) less cultivated cropland than reported in 1982 (USDA-NRCS, 2001). In the Cape Fear River basin, there are nearly 265 Impaired stream miles that may be impacted by agricultural activities. Impacts to water quality from agricultural sources may decrease over the next basin cycle due to substantial increases in urban/built-up areas throughout the river basin.

DWQ will identify streams where agricultural activities may be impacting water quality and aquatic habitat. This information will be related to local Division of Soil and Water Conservation and Natural Resources Conservation Service staff to investigate impacts in these watersheds and to reduce these impacts. The DSWC Ag Cost Share Program has spent nearly $5 million on various management practices in the Cape Fear River basin. DWQ recommends that funding and technical support for agricultural BMPs be continued and increased. Refer to Appendix VIII for agricultural nonpoint source agency contact information.

Forestry and Water Quality

Chapter 29 provides information related to the impacts of forestry on water quality. Forestland was 60 (3,531,100 acres) percent of the land use in the Cape Fear River basin in 1997. While still the largest portion of the basin land use, this is six percent less forestland than reported in 1982 (USDA-NRCS, 2001). In the Cape Fear River basin, there are no stream miles Impaired by forest harvesting activities. Most land clearing activities around urban areas are for development and usually not associated with forest harvesting.

DWQ will identify streams where forest harvesting may be impacting water quality and aquatic habitat. This information will be related to Division of Forest Resources staff to investigate the impacts in these watersheds and to recommend BMPs to reduce impacts. DWQ recommends that funding and technical support for forestry BMPs be continued and increased. Refer to Appendix VIII for forestry nonpoint source agency contact information.

Wastewater Treatment and Disposal

Currently, there are 244 permitted wastewater discharges in the Cape Fear River basin with a permitted flow of approximately 425 MGD. Chapter 30 provides summary information (by type and subbasin) about the discharges. This chapter also provides guidance for permitting in various watersheds that may be water quality limited and also contains general information related to wastewater treatment disposal associated with registered animal operations. Maps of permitted facilities are provided in each subbasin chapter. For a complete listing of permitted facilities in the basin, refer to Appendix VI. The majority of NPDES permitted wastewater discharges into the waters of the Cape Fear River basin are from major municipal wastewater treatment plants. Nonmunicipal discharges also contribute substantial wastewater into the Cape Fear River basin.

There were 52 significant NPDES permit violations in the last two years of the assessment period. There are 156 Impaired stream miles where point sources may have negatively impacted the water quality. Facilities, large or small, where recent data show problems with a discharge are discussed in each subbasin chapter. DWQ will determine if the violations are ongoing and address them using the NPDES permitting process. Many other waters are adversely impacted by the cumulative effects of discharges and nonpoint source runoff.

Stormwater Programs

As described above, there have been large increases in population in the Cape Fear River basin. Water quality impacts associated with increased population are numerous. Streams with the worst water quality in the basin are closely associated with existing urban areas. In the Cape Fear River basin, there are over 300 miles of Impaired streams that drain urban or urbanizing watersheds. Chapter 31 describes the various stormwater programs and rules designed to prevent further impacts associated with population growth and development, as well as recommendations for local governments to further address impacts associated with the increased growth.

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

Water Resources, Minimum Streamflows and Interbasin Transfers

Chapter 32 contains an overview of minimum streamflow requirements for many hydroelectric and water supply dams in the Cape Fear River basin. There is also a table that associates the federal and state watersheds by hydrologic units. There is extensive discussion of interbasin transfers and summary of transfers, and discussion of drought conditions during the assessment period for this plan.

Significant Ecological Resources and Endangered Species

The Cape Fear River basin is high in natural diversity with rare mussels and fish in the basin that are found nowhere else. There are four rare mollusks, eight rare insects, two rare crustaceans, and 19 rare fish in the basin. The Natural Heritage Program identifies sites (terrestrial or aquatic) that have particular biodiversity significance. A site's significance may be due to the presence of rare species, rare or high quality natural communities, or other important ecological features. Over 450 individual natural areas have been identified in the Cape Fear River basin. Several of these areas are discussed in Chapter 33. A table of rare animals associated with aquatic habitats in the Cape Fear River basin is also provided.

Water Quality Initiatives

As the Basinwide Planning Program completes its third cycle of plan development, there are many efforts being undertaken at the local level to improve water quality. Information about local efforts particular to a watershed or subbasin is included in Chapters 1-24. DWQ encourages local agencies and organizations to learn about and become active in their watersheds. An important benefit of local initiatives is that people make decisions that affect change in their own communities. There are a variety of state agency limitations that local initiatives can overcome, including: state government budgets, staff resources, lack of regulations for nonpoint sources, the state rule-making process, and many others.

Local organizations and agencies are able to combine professional expertise in a watershed. This allows groups to holistically understand the challenges and opportunities of different water quality efforts. Involving a wide array of people in water quality projects also brings together a range of knowledge and interests, and encourages others to become involved and invested in these projects. By working in coordination across jurisdictions and agency lines, more funding opportunities are available, and it is easier to generate necessary matching or leveraging funds. This will potentially allow local entities to do more work and be involved in more activities because their funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of these local efforts are key to water quality improvements. There are good examples of local agencies and groups using these cooperative strategies throughout the state. Chapter 34 highlights local organizations and agencies in order to share their efforts towards water quality improvement. Specific projects are described in the subbasin chapters (Chapters 1 – 24).

Chapter 34 also summarizes monies spent by federal and state programs to help implement water quality improvement projects. Just over $2 million was granted by the Clean Water Act Section 319 program for 12 projects in the basin and over $54 million was made available through the Clean Water Management Trust Fund. This chapter also contains information about the Ecosystem Enhancement Program.

Total Maximum Daily Loads (TMDLs)

A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody

can be used for the purposes the state had designated. The calculation must also account for seasonal variation and critical conditions in water quality.

For each waterbody limited segment Impaired by a pollutant and identified in the 303(d) list, a TMDL must be developed. A TMDL includes a water quality assessment that provides the scientific foundation for an implementation plan. Seven TMDLs are completed and approved by EPA (Chapter 35); five are for fecal coliform bacteria, one for chlorophyll *a* and one for turbidity. There are seven TMDLs in progress including one for Jordan Reservoir (Chapter 36) and the Cape Fear River Estuary (Chapter 37).

Jordan Reservoir and Haw River Watershed NSW Strategy
Chapter 36 describes the Jordan Reservior stakeholder process, the Clean Water Responsibility Act and the modeling performed to support the nutrient management strategy. Most of the reservoir is Impaired because of chlorophyll *a* violations associated with excess nutrient loading to the reservoir. The nutrient TMDL recommends reductions from both point and nonpoint sources. Chapter 36 provides the framework for making these reductions through a rule-making process.

Cape Fear River Estuary TMDL
The Cape Fear river Estuary from Bryants Creek to Snows Cut is Impaired for aquatic life because of dissolved oxygen standard violations. This portion of the estuary has been considered Impaired since the *1996 Cape Fear River Basinwide Water Quality Plan* and was included on the 1998 303(d) list of Impaired waters. Data used in the water quality assessment of the estuary were collected by DWQ and the Lower Cape Fear River Program. Chapter 37 discusses the water quality assessment in detail.

Sources of the low dissolved oxygen levels include the many discharges of oxygen-consuming waste into this segment of the estuary and to tributary streams. There is also a considerable volume of naturally occurring blackwater that may contribute natural sources of oxygen-consuming materials. This portion of the estuary is influenced by tides and high flows from the entire basin, and therefore goes through many extreme changes in water column chemistry over the course of a year.

The Cape Fear River Estuary continues to violate the dissolved oxygen water quality standard as of this assessment cycle. Therefore, a TMDL is required for the estuary. The DWQ obtained an EPA grant of $253,000 in order to mount an extensive field monitoring project. This field monitoring includes the installation of continuous monitoring devices by the US Geological Survey, sediment oxygen demand measurements, dye studies, and intensive chemical monitoring. A major portion of the monitoring was completed in 2004; however, hurricanes prevented the completion of the study. The study is scheduled to be completed in 2005.

Monitored Impaired Waters in Cape Fear River Basin

Subbasin	Stream Name	AU Number	Length/Area
03-06-01	HAW RIVER	16-(1)d1	1.3 FW Miles
03-06-01	Little Troublesome Creek	16-7b	5.1 FW Miles
03-06-01	Troublesome Creek	16-6-(3)	1.8 FW Miles
03-06-02	Brush Creek	16-11-4-(1)a3	1.6 FW Miles
03-06-02	HAW RIVER	16-(1)d3	2.1 FW Miles
03-06-02	Horsepen Creek	16-11-5-(0.5)b	3.2 FW Miles
03-06-02	Horsepen Creek	16-11-5-(2)	1.8 FW Miles
03-06-02	North Buffalo Creek	16-11-14-1b	8.1 FW Miles
03-06-02	North Buffalo Creek	16-11-14-1a1	7.5 FW Miles
03-06-02	North Buffalo Creek	16-11-14-1a2	1.6 FW Miles
03-06-02	Reedy Creek	16-11-(1)b	4.2 FW Miles
03-06-02	Reedy Fork (Hardys Mill Pond)	16-11-(9)a2	2.2 FW Miles
03-06-02	Reedy Fork (Hardys Mill Pond)	16-11-(9)b	8.6 FW Miles
03-06-02	Ryan Creek	16-11-14-2-3	4.2 FW Miles
03-06-02	South Buffalo Creek	16-11-14-2c	4.8 FW Miles
03-06-02	South Buffalo Creek	16-11-14-2b	4.7 FW Miles
03-06-02	South Buffalo Creek	16-11-14-2a	15.4 FW Miles
03-06-02	Town Branch	16-17	4.2 FW Miles
03-06-02	Unnamed Tributary at Guilford College	16-11-5-1-(2)	1.3 FW Miles
03-06-02	Varnals Creek	16-21a	4.6 FW Miles
03-06-03	Big Alamance Creek (Alamance Cr)(Lk Macintoch)	16-19-(4.5)a	5.6 FW Miles
03-06-03	Little Alamance Creek (Gant Lake, Mays Lake)(Alamance County	16-19-11	12.6 FW Miles
03-06-04	Collins Creek	16-30-(1.5)	3.7 FW Miles
03-06-04	Dry Creek	16-34-(0.7)	10.1 FW Miles
03-06-04	HAW RIVER	16-(37.3)	53.2 FW Acres
03-06-04	Haw River (B. Everett Jordan Lake below normal pool elevatio	16-(37.5)	1,392.3 FW Acres
03-06-04	Robeson Creek	16-38-(3)c	2.4 FW Miles
03-06-05	New Hope Creek	16-41-1-(11.5)c	4.0 FW Miles
03-06-05	New Hope Creek	16-41-1-(11.5)b	3.5 FW Miles
03-06-05	New Hope Creek (including New Hope Creek Arm of New Hope River Arm of B. Everett Jordan Lake)	16-41-1-(14)	1,415.7 FW Acres
03-06-05	New Hope River Arm of B. Everett Jordan Lake (below normal pool elevation)	16-41-(3.5)a	5,673.3 FW Acres
03-06-05	New Hope River Arm of B. Everett Jordan Lake (below normal pool elevation)	16-41-(0.5)	1,199.8 FW Acres
03-06-05	Northeast Creek	16-41-1-17-(0.7	3.3 FW Miles
03-06-05	Northeast Creek	16-41-1-17-(0.7	3.3 FW Miles
03-06-05	Northeast Creek	16-41-1-17-(0.7	3.2 FW Miles
03-06-05	Third Fork Creek	16-41-1-12-(2)	3.9 FW Miles
03-06-06	Bolin Creek (Hogan Lake)	16-41-1-15-1-(0	3.1 FW Miles
03-06-06	Morgan Creek	16-41-2-(5.5)b	4.1 FW Miles
03-06-06	Morgan Creek (including the Morgan Creek Arm of New Hope River Arm of B. Everett Jordan Lake)	16-41-2-(9.5)	836.2 FW Acres
03-06-07	CAPE FEAR RIVER	18-(1)	3.2 FW Miles

Subbasin	Stream Name	AU Number	Length/Area
03-06-07	CAPE FEAR RIVER	18-(4.5)a	0.5 FW Miles
03-06-07	East Buies Creek	18-18-1-(2)	6.2 FW Miles
03-06-07	Kenneth Creek	18-16-1-(2)	3.9 FW Miles
03-06-07	Lick Creek	18-4-(2)	10.3 FW Miles
03-06-07	Neills Creek (Neals Creek)	18-16-(0.7)c1	6.7 FW Miles
03-06-07	Neills Creek (Neals Creek)	18-16-(0.7)a	2.0 FW Miles
03-06-07	Neills Creek (Neals Creek)	18-16-(0.3)	2.6 FW Miles
03-06-07	Neills Creek (Neals Creek)	18-16-(0.7)b	1.3 FW Miles
03-06-08	DEEP RIVER(including High Point Lake at normal pool elevation)	17-(1)	263.3 FW Acres
03-06-08	East Fork Deep River	17-2-(0.7)	0.8 FW Miles
03-06-08	East Fork Deep River	17-2-(0.3)b	4.8 FW Miles
03-06-08	Hickory Creek	17-8.5-(1)a	3.0 FW Miles
03-06-08	Jenny Branch	17-8-2	3.2 FW Miles
03-06-08	Long Branch	17-2-1-(2)	0.5 FW Miles
03-06-08	Long Branch	17-2-1-(1)	3.5 FW Miles
03-06-08	Muddy Creek	17-9-(1)	6.9 FW Miles
03-06-08	Reddicks Creek	17-8-(0.5)a	5.1 FW Miles
03-06-08	Richland Creek	17-7-(0.5)	6.4 FW Miles
03-06-08	Richland Creek	17-7-(4)	1.7 FW Miles
03-06-08	West Fork Deep River(Oak Hollow Reservoir)	17-3-(0.7)a	0.5 FW Miles
03-06-09	DEEP RIVER	17-(10.5)e1	6.7 FW Miles
03-06-09	Haskett Creek	17-12a	6.3 FW Miles
03-06-09	Haskett Creek	17-12b	1.3 FW Miles
03-06-09	Penwood Branch	17-12-1	6.1 FW Miles
03-06-10	Cotton Creek	17-26-5-3c	3.7 FW Miles
03-06-10	Cotton Creek	17-26-5-3b	2.5 FW Miles
03-06-10	Cotton Creek	17-26-5-3a	0.3 FW Miles
03-06-10	DEEP RIVER	17-(32.5)a	4.0 FW Miles
03-06-10	DEEP RIVER	17-(10.5)e2	2.8 FW Miles
03-06-10	Indian Creek	17-35	7.4 FW Miles
03-06-11	Big Buffalo Creek	17-40	8.0 FW Miles
03-06-11	DEEP RIVER	17-(43.5)	6.0 FW Miles
03-06-12	Loves Creek	17-43-10b	2.5 FW Miles
03-06-12	Loves Creek	17-43-10c	0.4 FW Miles
03-06-12	Tick Creek	17-43-13a	8.2 FW Miles
03-06-14	Little River (Lower Little River)	18-23-(10.7)	12.6 FW Miles
03-06-14	Little River (Lower Little River)	18-23-(24)	25.6 FW Miles
03-06-15	CAPE FEAR RIVER	18-(26)c	4.0 FW Miles
03-06-15	Little Cross Creek (Bonnie Doone Lake, Kornbow Lake, Mintz p	18-27-4-(1)e	1.1 FW Miles
03-06-15	Little Cross Creek (Glenville Lake)	18-27-4-(2)	2.1 FW Miles
03-06-15	Rockfish Creek	18-31-(23)	18.8 FW Miles
03-06-15	Rockfish Creek	18-31-(12)	3.8 FW Miles
03-06-15	Rockfish Creek	18-31-(15)	5.9 FW Miles

Subbasin	Stream Name	AU Number	Length/Area
03-06-15	Rockfish Creek [(Upchurches Pond, Old Brower Mill Pond (Number Two Lake)]	18-31-(18)	25.0 FW Miles
03-06-16	Browns Creek (Cross Pond)	18-45	10.5 FW Miles
03-06-16	CAPE FEAR RIVER	18-(26)d	21.3 FW Miles
03-06-17	Atlantic Ocean	99-(3)b	4.7 Coast Miles
03-06-17	Bald Head Creek	18-88-8-4	79.9 S acres
03-06-17	Beaverdam Creek	18-88-9-1-(1.5)	11.3 S acres
03-06-17	Brunswick River	18-77	743.7 S acres
03-06-17	CAPE FEAR RIVER	18-(87.5)a	769.2 S acres
03-06-17	CAPE FEAR RIVER	18-(63)a	3.8 FW Miles
03-06-17	CAPE FEAR RIVER	18-(87.5)d	17.7 S acres
03-06-17	CAPE FEAR RIVER	18-(71)a	5,616.7 S acres
03-06-17	CAPE FEAR RIVER	18-(87.5)c	322.6 S acres
03-06-17	Coward Creek	18-88-9-2-5-1	5.9 S acres
03-06-17	Denis Creek	18-88-9-2-3	34.2 S acres
03-06-17	Dutchman Creek	18-88-9-3-(2.5)	75.8 S acres
03-06-17	Dutchman Creek Outlet Channel	18-88-9-3-3	78.3 S acres
03-06-17	Dutchman Creek Shellfish Area	18-88-9-3-(4)	37.9 S acres
03-06-17	Elizabeth River	18-88-9-2-(1)	83.5 S acres
03-06-17	Elizabeth River Shellfishing Area	18-88-9-2-(2)	205.6 S acres
03-06-17	Fishing Creek	18-88-8-4-1	7.9 S acres
03-06-17	Intracoastal Waterway	18-88-9b	96.6 S acres
03-06-17	Intracoastal Waterway	18-88-9a	222.6 S acres
03-06-17	Molasses Creek	18-88-9-2-5	1.0 S acres
03-06-17	Piney point Creek	18-88-9-2-4	11.5 S acres
03-06-17	Town Creek (Rattlesnake Branch)	18-81	32.1 FW Miles
03-06-18	South River	18-68-12-(8.5)	45.4 FW Miles
03-06-19	Black River	18-68a	31.9 FW Miles
03-06-19	Great Coharie Creek (Blackmans Pond)	18-68-1	42.6 FW Miles
03-06-20	Black River	18-68b	40.5 FW Miles
03-06-20	Moores Creek	18-68-18b	9.9 FW Miles
03-06-22	Goshen Swamp	18-74-19a	16.6 FW Miles
03-06-22	Muddy Creek	18-74-25	14.0 FW Miles
03-06-22	Northeast Cape Fear River	18-74-(25.5)	19.5 FW Miles
03-06-23	Burnt Mill Creek	18-74-63-2	4.6 FW Miles
03-06-23	Long Creek	18-74-55a	7.7 FW Miles
03-06-23	Long Creek	18-74-55b	21.5 FW Miles
03-06-23	Northeast Cape Fear River	18-74-(47.5)	15.6 FW Miles
03-06-23	Smith Creek	18-74-63	11.1 FW Miles
03-06-24	Banks Channel	18-87-10-1b	4.2 S acres
03-06-24	Banks Channel	18-87-24-3	111.1 S acres
03-06-24	Batts Mill Creek (Barlow Creek)	18-87-6	40.8 S acres
03-06-24	Beckys Creek (Bishops Creek)	18-87-8b	66.4 S acres
03-06-24	Beckys Creek (Bishops Creek)	18-87-8a	42.5 S acres
03-06-24	County Line Branch	18-87-6-1	1.0 S acres

Subbasin	Stream Name	AU Number	Length/Area
03-06-24	Cypress Branch	18-87-6-2	1.0 S acres
03-06-24	Everett Bay	18-87-2	240.6 S acres
03-06-24	Everett Creek	18-87-29	0.7 S acres
03-06-24	Futch Creek	18-87-19b	14.3 S acres
03-06-24	Futch Creek	18-87-19a	13.7 S acres
03-06-24	Hewletts Creek	18-87-26b	19.9 S acres
03-06-24	Hewletts Creek	18-87-26a	78.3 S acres
03-06-24	Howe Creek	18-87-23	28.6 S acres
03-06-24	Intracaostal Waterway	18-87-(5.5)	159.6 S acres
03-06-24	Intracoastal Waterway	18-87-(11.5)	112.9 S acres
03-06-24	Intracoastal Waterway	18-87-(23.5)c	70.4 S acres
03-06-24	Intracoastal Waterway	18-87-(23.5)b	63.1 S acres
03-06-24	Intracoastal Waterway	18-87	76.2 S acres
03-06-24	Masonboro Sound ORW Area	18-87-25.7d	64.3 S acres
03-06-24	Masonboro Sound ORW Area	18-87-25.7c	215.9 S acres
03-06-24	Masonboro Sound ORW Area	18-87-25.7b	99.5 S acres
03-06-24	Mill Creek (Betts Creek)	18-87-14	18.2 S acres
03-06-24	Mullett Run	18-87-9-1	7.5 S acres
03-06-24	Nixons Creek	18-87-11	5.8 S acres
03-06-24	Old Mill Creek	18-87-7	0.1 S acres
03-06-24	Old Topsail Creek	18-87-12a	16.5 S acres
03-06-24	Old Topsail Creek	18-87-12b	12.4 S acres
03-06-24	Pages Creek	18-87-22a	48.4 S acres
03-06-24	Pages Creek	18-87-22b	28.5 S acres
03-06-24	Stump Sound	18-87-3	87.3 S acres
03-06-24	Stump Sound ORW Area	18-87-0.5	939.9 S acres
03-06-24	Topsail Sound	18-87-10d	12.7 S acres
03-06-24	Topsail Sound	18-87-10b	56.2 S acres
03-06-24	Topsail Sound	18-87-10c	1,144.5 S acres
03-06-24	Topsail Sound and Middle Sound ORW Area	18-87-11.7c	272.5 S acres
03-06-24	Topsail Sound and Middle Sound ORW Area	18-87-11.7d	2.7 S acres
03-06-24	Topsail Sound and Middle Sound ORW Area	18-87-11.7e	2.7 S acres
03-06-24	Topsail Sound and Middle Sound ORW Area	18-87-11.7f	6.8 S acres
03-06-24	Topsail Sound and Middle Sound ORW Area	18-87-11.7b	2.1 S acres
03-06-24	Turkey Creek	18-87-1a	79.5 S acres
03-06-24	Turkey Creek	18-87-1b	59.6 S acres
03-06-24	Virginia Creek	18-87-9b	73.6 S acres
03-06-24	Virginia Creek	18-87-9a	23.5 S acres
03-06-24	Whiskey Creek (Purviance Creek)	18-87-28	13.0 S acres