CAPE FEAR RIVER BASINWIDE WATER QUALITY MANAGEMENT PLAN

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This document was approved and endorsed by the North Carolina Environmental Management Commission on October 12, 1995 to be used as a guide by the NC Division of Water Quality in carrying out its water quality program responsibilities in the Cape Fear River Basin. It will be updated in 2000.

FORWARD

Clean water is critical to the health, economic well-being and quality of life of those living or working in the Cape Fear River basin. Most water users throughout the basin, including industry, agriculture and the basin's nearly 1.5 million residents, rely on surface water for basic needs such as water supply and/or disposal of treated wastewater. In addition, many businesses and residents of the Cape Fear basin rely directly or indirectly on the basin's lakes and 6300 miles of rivers and streams to meet their recreational needs and provide a source of living. To these groups and the public they serve, it is important that the basin's waters support viable fisheries, that the waters be relatively safe (low risk of contracting water-borne disease) and that they be aesthetically desirable (free of objectionable colors, odors and smells). Yet maintaining clean water becomes increasingly difficult and more expensive as the population grows, as land develops and as competition for its resources heighten.

The protection and restoration of surface waters in the Cape Fear Basin represents a tremendous challenge. Rising in the north central piedmont region of the state, near Greensboro and High Point, the Cape Fear is the largest river basin in North Carolina and one of just four basins located entirely within the state. It covers an area of over 9,000 square miles, and encompasses roughly 25% of the state's population including 114 municipalities and all or portions of 27 counties. The basin also includes one of the most concentrated turkey and hog producing regions in the country. On its way to the ocean, the Cape Fear flows through a series of three locks and dams and past such cities as Lillington, Fayetteville, Elizabethtown and Wilmington.

While 72% of the freshwater streams in the basin are considered to be supporting their designated uses, almost half of these streams are considered threatened; and over 1,100 miles, or approximately 18%, are considered impaired. Sedimentation is the most widespread cause of stream impairment in the basin, but other types of pollution which pose significant threats to water quality include oxygen-demanding wastes, nutrients and toxic substances. Urban stormwater, construction, agriculture and wastewater treatment plant discharges are the major pollution sources in the basin.

In the basin's estuarine waters, 27% percent of the waters are rated as use-impaired with low dissolved oxygen and closed shellfish waters (from fecal coliform bacteria contamination) being the primary causes. Statistics for the state's coastal waters have shown a slow but steady increase in shellfish water closures since the early 1980s which appears to be related to increased urbanization and stormwater runoff. Local government involvement will be needed if this trend is to be curtailed.

In addition, public water supply plans submitted to the state by local governments in the basin estimate that water usage by the year 2020 will double from 1992 levels. Water supply planning for the basin will be a critical need in the years ahead. This will need to be accompanied by both a greater emphasis to be placed on water conservation and reuse, and on expanded and improved waste treatment capacity.

Preserving and enhancing the quality of water in the basin is beyond the capabilities of any one agency or group. State and federal government regulatory programs will play an important part, but much of the responsibility will be at the local level. Those who live, work and recreate in the basin have the most at stake.

This document provides a summary of the causes and sources of water pollution in the basin, the status of the basin's water quality, a summary of water quality rules and statutes that apply to water quality protection in the basin, and recommended measures to protect and enhance the quality of the surface waters in the Cape Fear River basin to protect the uses outlined above. The Cape Fear River Basinwide Water Quality Management Plan will be used as a guide by the NC Division of Water Quality in carrying out its water quality program responsibilities in the basin. Beyond that, it is hoped that the plan will provide a framework for cooperative efforts between the various stakeholders in the basin toward a common goal of protecting the basin's water resources while accommodating reasonable economic growth.

EXECUTIVE SUMMARY

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

Basinwide management is a watershed-based water quality management initiative being implemented by the North Carolina Division of Water Quality (DWQ). The *Cape Fear River Basinwide Water Quality Management Plan* (Cape Fear Plan) is the seventh in a series of basinwide water quality management plans that will be prepared by DWQ for all seventeen of the state's major river basins by the year 1998. The plan will be used as a guide by DWQ in carrying out its water quality program duties and responsibilities in the Cape Fear River Basin.

A basinwide management plan report is prepared for each basin in order to communicate to policy makers, the regulated community and the general public the state's rationale, approaches and long-term water quality management strategies for each basin. The draft plans are circulated for public review and comment and are presented at public meetings in each basin. The plan for a given basin is completed and approved prior to the scheduled date for basinwide permit renewals in that basin. The plans are then to be evaluated, based on follow-up water quality monitoring, and updated at five year intervals.

The Cape Fear Plan was approved by the North Carolina Environmental Management Commission in October of 1995 and will be updated in the year 2000. Basinwide NPDES permitting was scheduled to commence in January 1996.

BASINWIDE GOALS

The primary goals of DWQ's basinwide program are to 1) identify and restore full use to impaired waters, 2) identify and protect highly valued resource waters, and 3) manage problem pollutants throughout the basin to protect water quality standards while accommodating reasonable economic growth. In addition, DWQ is applying this approach to each of the major river basins in the state as a means of better identifying water quality problems; developing appropriate management strategies; maintaining and protecting water quality and aquatic habitat; assuring equitable distribution of waste assimilative capacity for dischargers; and improving public awareness and involvement in management of the state's surface waters.

PUBLIC WORKSHOPS

Two public workshops were held in October 1994 in Elizabethtown and Pittsboro to familiarize stakeholders in the basin with DWQ's basinwide approach and to solicit their comments for the basin plan. The workshops, which had a combined total of 191 participants, were co-sponsored by the North Carolina Cooperative Extension Service (CES), DWQ and the North Carolina League of Municipalities. A summary of the workshop is provided in Appendix IV of the plan. Priority issues and recommended actions identified by two or more discussion groups included:

- Increase support for monitoring and enforcement
- Increase public education and involvement of local stakeholders
- Increase incentives and enforcement for nonpoint sources, including agriculture and forestry
- Promote regional land use and wastewater planning
- Consider economic implications of environmental protection
- improve monitoring data for a sound basis for regulations
- Identify and target critical areas of water quality concerns
- Coordinate local and state government programs to maximize effectiveness

- Address urban stormwater runoff through education and enforcement
- Evaluate nutrient trading for cost-effective pollutant reductions
- Consider impacts on wildlife habitat

CAPE FEAR BASIN OVERVIEW

The Cape Fear Basin is the largest river basin in the state covering 9,149 square miles. It is one of just four river basins in North Carolina located entirely within the state's boundaries and flows from the north central piedmont region near Greensboro to the Atlantic Ocean.

The Cape Fear River is formed at the confluence of the Haw and Deep Rivers on the border of Chatham and Lee Counties just below the Jordan Reservoir dam. From there the river flows across the coastal plain past Fayetteville and Wilmington, is fed by the Black and Northeast Cape Fear River watersheds (two major blackwater systems) and finally enters the Atlantic Ocean at Cape Fear.

There are 27 counties and 114 municipalities located in whole or in part in the basin. Based on 1990 census data, the population of the basin is just under 1.5 million people. The most densely populated areas are in and near the Triad area (Greensboro-High Point), the Durham-Chapel Hill area, and in and around Fayetteville. The overall population density is 160 persons per square mile versus a statewide average of 125 persons per square mile. The percent population growth over the past ten years (1980 - 1990) was 11.5 % versus a statewide average of 12.7%

Over half of the land in the river basin is forested. Statistics provided by the US Department of Agriculture, Natural Resources Conservation Service indicate that during the last decade there has been an increase in the amount of developed land and a decrease in the amount of cropland. Major industries in the basin include chemical manufacturing, textiles, silviculture and agriculture (hogs, poultry, soybeans and tobacco). North Carolina is the number one turkey- and number two hog-producing state in the country. The lower Cape Fear basin encompasses the most concentrated animal producing areas in the state in Sampson and Duplin counties.

The basin includes three coastal Outstanding Resource Waters (ORW) (Stump Sound, Middle and Topsail Sounds and Masonboro Sound) and one inland ORW (a portion of the Black River basin).

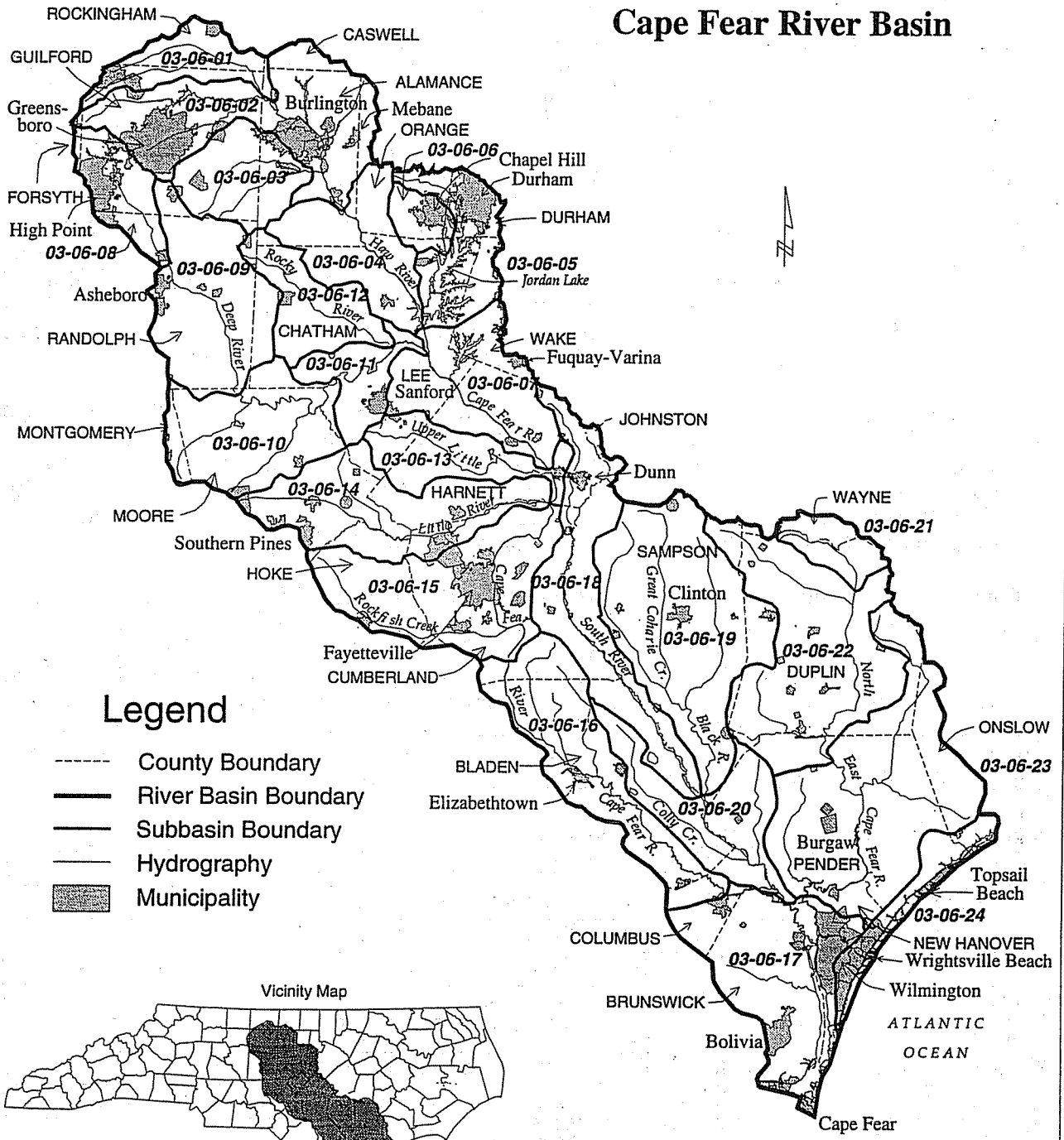
In the Cape Fear River Basin, there are 641 permitted NPDES dischargers, 336 of which are general permits or stormwater discharge permits. Of the total 641 dischargers, 54 are major facilities, 228 are domestic, 58 are municipalities and 212 are industries. The total permitted flow for all facilities is 397 million gallons per day (MGD).

Based on evaluation of water supply plans submitted to the North Carolina Division of Water Resources from 51 local governments in the basin, it is estimated that water usage in the year 2020 will be twice the reported usage by the governments in 1992. Review of interbasin transfer information for the basin indicates that there is a net increase of 13 million gallons per day coming into the Cape Fear basin from adjoining basins. This amount is expected to be reduced as Cary and Apex increase their withdrawals from Jordan Reservoir and discharge their wastewater into the Neuse River basin.

ASSESSMENT OF WATER QUALITY IN THE CAPE FEAR RIVER BASIN

An assessment of water quality data collected by DWQ and others reveals that the Cape Fear River Basin has generally good water quality. Below is a summary of some key monitoring data that reflect water quality in the basin. A more detailed presentation of this information can be found in Chapter 4.

General Map of the Cape Fear River Basin



Legend

- County Boundary
- River Basin Boundary
- Subbasin Boundary
- Hydrography
- Municipality

Vicinity Map

Cape Fear River Basin

1:1,600,000

0 20 40 60 miles

DEHNR

Produced by: State Center for Health and Environmental Statistics
August, 1994

Summary of Biological Indicators

Benthic Macroinvertebrates - These are primarily bottom-dwelling aquatic insect larvae of species such as stoneflies, mayflies and caddisflies. Measurements of the number, types and diversity of these organisms at strategic sampling sites is an important means of assessing water quality.
In the Cape Fear River Basin, A total of 517 benthic macroinvertebrate samples have been collected from 295 monitoring locations from 1983 through 1993. The majority of these samples exhibited either Good/Fair (24%) or Fair (27%) bioclassifications, while only 8% of these samples noted Excellent bioclassifications. Bioclassifications were not given for 46 benthic macroinvertebrate samples collected from swamp-stream or euryhaline ecosystems within the Cape Fear River basin (this number also includes 4 very small streams). This is because bioclassification criteria have not been established for swamp-stream and euryhaline (brackish) ecosystems.

Ninety-four of the total monitoring locations have had data collected on two or more occasions, allowing for long-term data comparisons. Of these 94 monitoring locations, 58 (62%) had no long-term changes in bioclassification, 26 (28%) showed some improvement, and 10 (10%) noted a decline in bioclassification. Many of the improvements noted in bioclassifications were from monitoring sites in the Deep River watershed although this watershed continues to experience water quality problems associated with nutrients, toxicity and low dissolved oxygen.

Fish Community Evaluations - Fish community evaluations were performed at 47 sites in the Cape Fear River Basin. These individual site assessments should not be interpreted as representative samplings of either the entire basin or an entire subbasin. Constraints in both sampling methodology and resources prevent the monitoring of a sufficient number of fish community locations to clearly evaluate the ecological health of the entire basin. Therefore evaluations of the fish community structure analysis should be limited to a site specific interpretation.

Of the forty-seven sites sampled, twelve were rated as Poor or Poor-Fair, 17 rated as Fair or Fair-Good, and 18 rated as Good or Good-Excellent. Grays Branch, Stinking Quarter Creek, Bear Creek, and Grove Creek each received ratings in the Good-Excellent category. Those sites which were rated as Poor or Poor-Fair and reasons for these ratings are presented in the table, below. Some of the sites which were rated Poor or Poor-Fair have already had remedial action taken or planned. The Cherokee Brick Quarry which drains into a tributary of Gulf Creek is currently applying for a stormwater permit, BMPs are being initiated in the Herring Marsh drainage, and the Burgaw WWTP has been upgraded since our sampling date in 1985.

Cape Fear Basin Fish Community Structure Sites which rated Poor or Poor-Fair

SITE	SUBBASIN	REASONS FOR RATINGS
Troublesome Cr at SR-1001	03-06-01	nutrient enrichment
South Buffalo Cr at SR-2821	03-06-02	below WWTP and urban runoff
North Buffalo Cr at SR-2770	03-06-02	below two WWTP's, urban runoff, and poor habitat
Third Cr at NC-751	03-06-05	urban runoff and low flows
Northeast Cr at SR-1100	03-06-05	below WWTP and urban runoff
Kenneth Branch at SR-1441	03-06-07	nutrient enrichment and sedimentation
Gulf Cr trib at SR-1924	03-06-07	sedimentation, nutrient enrichment and low flow
Gulf Cr off SR-1916	03-06-07	sedimentation
Little Coharie Cr at SR-1214	03-06-19	unclear
Herring Marsh at SR-1306	03-06-22	unclear
Burgaw Cr at US-117	03-06-23	below WWTP and sedimentation
Burgaw Cr at SR-1216	03-06-23	below WWTP and sedimentation

Fish Tissue Analyses - Analysis of fish tissues for organic chemicals and metals can serve as an important indicator of contamination of sediments and surface water. Fish tissue analysis results are also used as indicators for human health concerns, fish and wildlife health concerns, and the presence and concentrations of various chemicals in the ecosystem.

In the Cape Fear Basin, 618 fish tissue samples from 51 locations have been analyzed from 1980 through 1994. EPA screening criteria for organic chemicals and metals (mercury) were equaled or exceeded in 52 samples at 16 sites. The FDA limit of 1.0 ppm for mercury was exceeded in ten samples at seven sites. Organic chemicals found in the tissues included: Dieldrin, DDT, Chlordane, Heptachlor epoxide, Heptachlor, Endrin, PCB and Lindane. None of these organic substances was found to exceed applicable FDA limits.

Use-Support Ratings

Another important method for assessing surface water quality is to determine whether the quality is sufficient to support the uses for which the waterbody has been classified by the state. The word *uses* refers to activities such as swimming, fishing and water supply. DWQ has collected extensive chemical and biological water quality monitoring data throughout the basin, some of which is summarized above. All data for a particular stream segment have been assessed to determine the overall *use support* rating; that is, whether the waters are *fully supporting*, *partially supporting* or *not supporting* their uses. A fourth rating, support-*threatened,* applies where all uses are currently being supported but that water quality conditions are marginal. Streams referred to as *impaired* are those rated as either partially supporting or not supporting their uses. Use support ratings in the Cape Fear River basin, described more fully in Chapter 4, are summarized below for freshwater streams and lakes.

Freshwater Streams and Rivers - Of the 6204 miles of freshwater streams and rivers in the Cape Fear basin, use support ratings were determined for 90% or 5601 miles. Of this total, 72% were rated as supporting their uses, 18% were considered impaired and 10% were not evaluated. Of those waters rated as Supporting their uses, approximately half (or 34% of all streams) were considered threatened.

SUPPORTING 72%
- Fully supporting (38%)
- Support-threatened (34%)

IMPAIRED 18%
- Partially supporting (15%)
- Not supporting (3%)

NOT EVALUATED: 10%

Sediment was the most widespread cause of f*reshwater* stream use-support impairment throughout the basin, followed by turbidity, pH, metals, fecal coliform bacteria and ammonia. Information on sources of impairment for stream miles rated partially or not supporting indicated that 870 stream miles were thought to be impaired by nonpoint sources, and 181 stream miles were thought to be impaired by point sources. Agriculture was thought to be the most widespread nonpoint source, followed by urban runoff and construction. It should be noted that most of the use support information is based on older monitored data or best professional judgement of nonpoint source workshop participants in the 1980s. As this information is updated, it is expected that the numbers of stream miles thought to be impaired as a result of agricultural-related sedimentation will change. NRCS data have shown reductions in cropland sediment runoff from 1982 to 1992 (results of federal Farm Bill programs?) which may not be accurately reflected in the use support data.

Oxygen-demanding wastes from point source discharges and nutrients from both point and nonpoint sources are also very important causes of pollution that need to be addressed in

freshwater streams in the Cape Fear Basin. These appear to be the causes for many freshwater streams being support-threatened, and control of these substances is needed to prevent degradation of water quality below standards that could result in impairment of water uses.

Lakes

Thirty-four of the thirty-six lakes assessed in the basin were rated as fully supporting their designated uses. Sixteen of those lakes are listed as threatened which identifies some cause for concern if precautions are not taken. In virtually of these cases, the cause for concern is tied to elevated levels of nutrients. One lake, Greenfield Lake, is designated as not supporting its uses as indicated in the table below. This lake has had ongoing problems with nuisance filamentous algal blooms, fish kills and aquatic macrophytes. To improve the lake's condition, dredging, application of herbicides, and lowering of the lake's water level have been performed. Known contributions of nutrients to the lake include stormwater runoff from the residential watershed.

Threatened and Not Supporting Lakes in the Cape Fear River Basin

LAKE	STATUS	CAUSES
Pittsboro Lake	Support-threatened	Algal blooms, Aquatic weeds, Elevated D.O.
Jordan Reservoir	Support-threatened	Elevated nutrients (TP 0.07MG/L, TN 0.58MG/L)
Upper Moccasin Lake	Support-threatened	Elevated nutrients (TP 0.12 MG/L, TN 0.92 MG/L)
Sandy Creek Res.	Support-threatened	Elevated nutrients (TP 0.07 MG/L, TN 0.77 MG/L)
Carthage City Lake	Support-threatened	Aquatic Weeds
Rocky River Res.	Support-threatened	Elevated nutrients (TP 0.095 MG/L, TN 1.01 MG/L)
Bonnie Doone Lake	Support-threatened	Elevated nutrients (TP 0.12 MG/L, TN 1.07 MG/L)
Mintz Pond	Support-threatened	Elevated nutrients (TP 0.08 MG/L, TN 0.58 MG/L)
Glenville Lake	Support-threatened	Elevated nutrients (TP 0.07 MG/L, TN 0.67 MG/L)
Greenfield Lake	Not Supporting	Algal blooms, Fish kills, Aquatic Weeds
University Lake	Support-threatened	Elevated nutrients (TP 0.065 MG/L, TN 0.66 MG/L)
Lower Moccasin Lake	Support-threatened	Elevated nutrients (TP 0.06 MG/L, TN 0.61 MG/L)
Lake Burlington	Support-threatened	Elevated nutrients (TP 0.065 MG/L, TN 0.56 MG/L)
Kornbow Lake	Support-threatened	Elevated nutrients (TP 0.05 MG/L, TN 0.78 MG/L)
Oak Hollow Lake	Support-threatened	Algal blooms
Harris Lake	Support-threatened	Elevated nutrients (TN 0.61 MG/L)
Burlington Lake	Support-threatened	Elevated nutrients (TN 1.51 MG/L)
Bay Tree Lake	Partially Supporting	Mercury fish consumption advisory

One lake was rated as partially supporting its uses because of fish consumption advisory due to elevated mercury levels found in tissues of fish caught in that lake.

Estuarine Waters

Use support determinations were made for all of the 39,200 acres of estuarine waters in the Cape Fear Basin. Approximately 73 percent of these waters were rated as fully supporting and the remaining 27 percent were rated partially supporting.

Low dissolved oxygen was the most widespread probable cause of impairment in waters downstream of Lock and Dam #1 causing an estimated 5,010 acres to be rated as partially supporting. Point source discharges are considered to be a significant contributor to this problem.

An additional 4,900 acres of shellfish (SA) waters were closed to harvesting due to elevated levels of fecal coliform bacteria. It is noted that the total acreage of estuarine waters in the basin closed to shellfish harvesting by the NC Division of Environmental Health (DEH) Shellfish Sanitation Branch is 18,732 acres. However, only approximately 4,900 acres of these waters have been classified by DWQ for shellfish harvesting, thus only this 4,900 acres are rated as impaired. Another 18,500 acres of estuarine waters are open to shellfish harvesting, based on DEH surveys, although they may be temporarily closed from several days to several weeks after heavy rains or high river flows. Waters are reopened when DEH surveys show fecal coliforms concentrations returning to safe levels.

Nonpoint source pollution is estimated to be the primary pollution source in 77% of the impaired waters (primarily those waters impaired based on shellfish water closures), with the remaining 23% impaired due to point sources (those waters impaired by low dissolved oxygen).

MAJOR WATER QUALITY ISSUES AND RECOMMENDATIONS

Several water quality issues emerge as being of particular importance in light of factors such as the degree of water quality degradation, the value of the resources being impacted, the number of users potentially affected, and the threat to water quality degradation posed by certain pollutants. Those issues considered most significant on a basinwide scale are presented below along with recommended corrective or research actions. These include: A. Oxygen-consuming wastes, B. Nutrients, C. Toxic Substances, D. Erosion and Sedimentation E. Urban Stormwater, F. Color, G. Fecal Coliform Bacteria, and H. Protection of High Resource Value Waters through reclassifications.

A. MANAGEMENT OF OXYGEN-CONSUMING WASTES FROM DISCHARGE FACILITIES

The Division of Water Quality has the responsibility of ensuring that the waste limits in NPDES discharge permits are established to protect dissolved oxygen (DO) standards in receiving waters. The standard for all waters in the Cape Fear River basin, except for waters supplementally classified as swamp waters, is 5.0 mg/l (daily average with instantaneous measurements not to fall below 4.0 mg/l). Swamp waters, which are prevalent in the lower portion of the basin, may have naturally lower levels of dissolved oxygen, and the acceptable dissolved oxygen level can vary from stream to stream. For example, the natural dissolved oxygen concentration in the Black River would be expected to vary considerably from that portion of the mainstem of the lower Cape Fear River below Lock and Dam 1 that is classified as swamp waters because they are two very different river systems.

In the past, DO limits for all dischargers in the basin have been established on a case-by-case basis, but follow-up studies that have examined the cumulative effects of multiple discharges on receiving streams have found that the past approach may result in the overallocation of waste assimilative capacity of receiving waters. Under the basinwide approach, efforts are being made, as resources allow, to establish strategies called total maximum daily loads (TMDLs) which would apply to multiple discharges on streams or watershed areas within a river basin. TMDLs include recommended permit limits designed to protect water quality standards and provide additional capacity for future expansions of new facilities. TMDLs for BOD have been established for streams in the Cape Fear Basin including:

- Buffalo Creek watershed
- Deep River watershed
- Upper Haw River

- Jordan Reservoir watershed
- Kenneth Creek
- Cape Fear River Mainstem from Buckhorn Dam to the mouth

The strategies for each of these waterbodies are presented in section 6.3 of Chapter 6. TMDLs are based on observed water quality data and predictive computer modeling that take into account water quality data, stream flow and physical conditions, waste loading and waste assimilative capacity. Calibrated QUAL2E models were developed for Buffalo Creek and the Cape Fear River during this basin planning process. Calibrated models have been developed in the past for the Rocky River and several tributaries of Jordan Lake.

The most significant dissolved oxygen issues in the basin are summarized below. These strategies are given emphasis based on severity of water quality problems, completion of intensive studies by DWQ, and importance to basinwide water quality.

Buffalo Creek Watershed

North and South Buffalo Creeks, from their headwaters to their confluence at Buffalo Creek/Reedy Fork, are low flow streams dominated by the two City of Greensboro WWTPs and Cone Mills' discharges. Both streams also receive urban and agricultural runoff. These creeks as well as Buffalo Creek and Reedy Fork are on the state's impaired waters list. DWQ and facility self-monitoring data show severely low dissolved oxygen concentrations (less than 2 mg/l) in North and South Buffalo Creek below the WWTPs during summer conditions.

In light of the extremely limited assimilative capacity for oxygen-consuming wastes in Buffalo Creek and its tributaries, no new wastewater outfalls should be constructed within the modeled area. The existing municipal facilities should serve as regional treatment facilities to handle future wastewater needs. Any proposed expansion of the existing regional facilities will be thoroughly evaluated to ensure no additional degradation will occur, and if technically feasible, ensure improvements to water quality. All remaining permitted facilities should conduct an engineering alternatives and economic analysis including the feasibility of connecting to municipal sewer service. If there are no feasible alternatives, limits of BOD_5=5 mg/l, NH_3-N=2 mg/l, and DO=6 mg/l will be recommended and a schedule for implementation developed. Future wastewater expansions may require environmental assessments.

Before approving new and expanding discharges to tributaries outside the modeled area, an empirical (desktop) model should be run to ensure that wastewater is fully assimilated prior to confluence with the mainstem area.

Deep River

The Deep River is one of two headwater tributaries of the Cape Fear River. In the upper reaches the Deep River is shallow and rocky as it flows through the rolling hills of the Piedmont, while the lower, easternmost reaches are flatter, with greater depths and slower velocities. Seventeen dams create impoundments which slow flow and trap pollutants. Dissolved oxygen standard violations have been observed at a number of ambient sites, with most violations occurring downstream of Carbonton Dam in the lower reaches of the Deep River.

Due to the predominance of wastewater in this system during low flow conditions it is recommended that all new and expanding major facilities in the Deep River basin between

High Point Reservoir and Carbonton dam be issued advanced tertiary limits (BOD_5 = 5 mg/l and NH_3-N = 2 mg/l). For new and expanding discharges between High Point Lake and Carbonton dam with flows less than 1 million gallons per day (MGD), regionalization of wastewater treatment is encouraged. If discharge to a regional WWTP is not feasible, new and expanding discharges should prepare an alternatives analysis to evaluate all practicable alternatives to surface water discharge. Where discharge is the most feasible option, permit limits no less stringent than BOD_5 = 15 mg/l and NH_3-N = 4 mg/l are recommended. Additionally, because low dissolved oxygen levels in the Deep River are strongly linked to algae growth, nutrient limits are recommended in this section of the basin.

In the section of the Deep River from Carbonton dam to the Haw River, the assimilative capacity is nearly exhausted and new discharges should not be permitted. Expansion requests by Sanford WWTP due to further regionalization will be thoroughly evaluated to insure no additional water quality degradation will result.

Cape Fear River

The Cape Fear River mainstem is a complex system which can be broken into three distinct segments:

1) Confluence of the Haw and Deep Rivers to Lock & Dam 3,
2) Lock & Dam 3 to Lock & Dam 1 and
3) Lock & Dam 1 to the ocean.

From the Deep River to Erwin, there is significant slope to the river and the dissolved oxygen standard for freshwater is met. Below Erwin, the river becomes flat and there is limited reaeration. In addition, the river receives significant point and nonpoint source pollution loadings resulting in cumulative impacts to the river. Ambient monitoring data collected by DWQ indicate lower dissolved oxygen levels at the stations between Erwin and Lock & Dam 3 than above Erwin. The series of locks and dams slows the river down and creates lake-like conditions under prolonged low flow events. Though the monthly ambient data indicate no dissolved oxygen violations, special studies and facility self-monitoring data indicate that there are pronounced dissolved oxygen sags behind each dam with dissolved oxygen violations occurring under summer conditions. Below Lock & Dam 1, dissolved oxygen levels are influenced by additional point source loads, swamp water from the Black River and tidal influences. Minimum dissolved oxygen levels drop below 5 mg/l downstream of Lock & Dam 1 to as low as 2.6 mg/l near Wilmington.

Field-calibrated predictive models have been developed for much of the Cape Fear River from Buckhorn Dam to Wilmington to examine the impacts of wastewater discharges on dissolved oxygen in the river during low-flow summer conditions. Modeling results indicate that the daily average dissolved oxygen standard of 5 mg/l is not protected under current permitted loading. Instream data support the modeling conclusion that the assimilative capacity of the river for oxygen-consuming wastes is very limited. In order to protect the dissolved oxygen standard in the mainstem of the river, it is recommended that alternatives to discharging to the river be considered for new expanding discharges. Where such alternatives are not feasible, the following recommendations would recommended for new and expanding NPDES discharge permits.

Type	New	Expanding
Domestics < 1 MGD	BOD5=12 & NH3-N =2	BOD5=12 & NH3-N =2
Domestics > 1 MGD	BOD5=5 & NH3-N =2	BOD5=5 & NH3-N =2
Industrial	BOD5=5 & NH3-N =2	Best Available Technology or BOD5=5 & NH3-N =2

Technology-based limits for expanding industrial dischargers will be determined on a case-by-case basis by DWQ, following a review of information submitted by the permittee. The strategies for each of these waterbodies are presented in section 6.3 of Chapter 6. These strategies are based on observed water quality data and predictive computer modeling that take into account water quality data, stream flow and physical conditions, waste loading and waste assimilative capacity. Calibrated QUAL2E models were developed for Buffalo Creek and the Cape Fear River during this basin planning process. Calibrated models have been developed in the past for the Rocky River and several tributaries of Jordan Reservoir.

Other streams in the basin for which recommended NPDES management strategies are recommended include: Little Troublesome Creek, Reedy Fork, Moadams Creek, Back Creek, Haw Creek, Alamance Creek, Robeson Creek, New Hope Creek, Northeast Creek, Kenneth Creek, Utley Creek, Richland Creek, Hasketts Creek, Cotton Creek, Loves Creek, Lower Little River, Northeast Cape Fear River, South River, Black River, Barlow Branch, Panther Branch, Burgaw Creek, and Osgood Canal.

B. NUTRIENTS

Control of two major plant nutrients, phosphorus and nitrogen, is necessary to limit the excessive growth of algae and other aquatic plants in lakes and some slow-moving streams in the Cape Fear River basin. Sources of nutrients include animal operations, cropland, urban stormwater and wastewater treatment plants. Strategies for limiting nutrients have been recommended by DWQ for the Jordan Reservoir watershed and the Deep River watershed (Section 6.4 of Chapter 6). In addition, development and implementation of nutrient management strategies for protection of lakes throughout the basin should be given consideration by local stakeholders. Of the 36 lakes assessed in this document, 16 were considered threatened and one not supporting based nutrient-related problems.

Jordan Reservoir NSW Strategy All surface waters in the watershed of Jordan Reservoir, including the Haw River watershed, have been classified as nutrient sensitive waters (NSW). In addition to the NSW classification, more stringent limits on total phosphorus (TP), as well as possible establishment of limits on total nitrogen (TN), have been necessary in localized areas including a number of tributaries to Jordan Reservoir. Control strategies for nutrients (TP and TN) have been developed for tributaries including Morgan Creek, New Hope Creek and Northeast Creek. A study plan for re-evaluation of the NSW strategy is currently under development to determine the sources and relative contributions of point and nonpoint source nutrient loading to Jordan Reservoir.

Deep River Nutrients The Deep River has severe nutrient problems, and the Deep River and many of its tributaries have been listed as impaired waters. Three factors: impoundments which affect stream velocity, point source nutrient loading, and nonpoint source loadings, play a significant role in the control of eutrophication and DO standards violations in the Deep River. A three-tiered management strategy which includes maintenance of stream velocity and control of point and nonpoint sources of nutrients is

recommended for reduction of eutrophication in the Deep River. This includes recommended nutrient limits of 0.5 mg/l of phosphorus and 6.0 mg/l of nitrogen for the High Point Eastside Wastewater Treatment Plant.

C. TOXIC SUBSTANCES

Point source discharges will be allocated chemical specific toxics limits and monitoring requirements based on a mass balance technique discussed in the Instream Assessment Unit's Standard Operating Procedures manual and in Appendix III of this report. Any available data are used at permit renewal to determine which toxic parameters need to be limited in the NPDES permit. Whole effluent toxicity limits are also assigned to all major discharges and any discharger of complex wastewater. Strategies have been recommended to address point source-related toxicity problems on the following streams. Pollution prevention efforts may be particularly applicable to addressing toxicity problems, especially at industrial facilities. Keeping toxic substances out of the waste stream in the first place is can be a very cost-effective approach to solving the problem.

The following is a list of streams which have not been meeting instream water quality standards or action levels and where specific strategies have been recommended.

Subbasin 01:	Little Troublesome Creek
Subbasin 02:	North Buffalo Cr
	South Buffalo Cr
	Haw River near Burlington
	Richland Creek/Deep River
Subbasin 17	Cape Fear River estuary
Subbasin 21	Northeast Cape Fear River tributaries:
	- Barlow Branch
	- Panther Branch

Nonpoint source strategies to be implemented through the municipal and industrial NPDES stormwater program should also be helpful in reducing toxic substance loading to surface waters. Industries are being required to control runoff from their sites and to cover stockpiles of toxic materials that could pose a threat to water quality. Greensboro, Fayetteville, and Cumberland County will also be implementing stormwater programs that will include identifying and removing illicit discharges to storm drain systems.

D. SEDIMENTATION

Sedimentation is the most widespread cause of water quality use support impairment in the Cape Fear River Basin as it is throughout most of the state. Data, based mostly on best professional judgment of field personnel from several agencies that was presented at nonpoint source workshops held in the mid to late 1980s revealed that 613 miles of streams in the Cape Fear River Basin were thought to be impaired by sediment. It should be noted, however, that data compiled by the USDA Natural Resources Conservation Service have indicated an overall reduction in soil loss per acre from agricultural cropland across the state between 1982 and 1992. Tons of soil lost per crop acre has dropped from 1.4 tons per acre to 1.1 tons per acre.

The major sources of sediment in the Cape Fear Basin include construction, urban development, agriculture, forestry and mining. There are 19 programs administered by various local, state and federal agencies which have been developed to control sediment from these activities (Table 6.13 of Chapter 6). Improvements in several of these programs since 1989 are presented in Chapter 5. Eleven of the 24 subbasins in the basin had 20 or more miles of streams thought to be impaired by sediment based on the earlier

information. Each of these subbasins and their respective miles of sediment-impaired streams is listed below by major watershed areas.

Haw River Watershed: subbasins 01 (26 miles), 02 (31 miles), 03 (23 miles) and 05 (38 miles)
Deep River Watershed: Subbasin 11 (58 miles)
Upper Cape Fear River Watershed: subbasins 07 (44 miles) and 15 (50 miles)
Lower Cape Fear River and Coastal Waters: subbasins 16 (54 miles) and 17 (52 miles)
Black River Watershed: subbasin 18 (31 miles) and 19 (27 miles)
Northeast Cape Fear: subbasin 22 (68 miles) and 23 (35 miles)

DWQ is using the basinwide approach to draw attention to this issue to work more closely with the responsible agencies to find ways of continuing to improve erosion and sediment control.

Recommendations for Improving Erosion and Sediment Control

- Continue to promote effective implementation and maintenance of erosion and sediment control measures by contractors, developers, farmers and other land owners. Education and stewardship are keys. Even the best-designed plans will not work if those responsible for maintaining silt fences, ground cover, settling ponds, grassed waterways, etc. are not carrying out those responsibilities either due to lack of understanding or lack of respect for the
- Evaluate effectiveness of enforcement of existing sediment control programs.
- Encourage more widespread adoption of erosion and sediment control programs by local governments, especially in rapidly developing areas. Coastal counties can include recommendations to address erosion and sedimentation in development of land use plans under the Coastal Zone Management Act. Other city and county governments that have not adopted programs can be still become involved through local education efforts, maintaining publicly-owned lands, and coordinating with other agencies such as local soil and water conservation districts and NC Division of Land Resources to identify and correct problems.
- Promote public education at the state and local level on the impacts of sedimentation and the need for improved sediment control. The cumulative effects of a number of small projects can significantly degrade water quality and habitat downstream.
- Evaluate existing sedimentation and erosion control rules and statutes for possible strengthening at the state and local level. Examples include limiting the area of disturbed land on a given site and reducing the time period for reestablishing vegetation on denuded areas.
- Evaluate opportunities to enhance interagency efforts to enforce sediment control measures.
- Maintaining vegetated stream buffers along fields and in urban areas is an excellent means of controlling sedimentation and other nonpoint source pollution.

E. COLOR

The discharge of color is to be regulated such that only those amounts as will not render the waters injurious to public health, secondary recreation, or to aquatic life and the wildlife or adversely affect the palatability of fish, aesthetic quality or impair the waters for any designated uses. Though no waters in the Cape Fear Basin have been listed as impaired due to color, there are a number of streams in the Cape Fear Basin where color is a concern and where discharges have been identified for participation in future color monitoring pending the outcome of a pilot study in the Catawba River Basin.

Subbasin 01: Little Troublesome Creek
Subbasin 02: North Buffalo Creek
Haw River
Subbasin 08: Richland Creek and Cotton Creek
Subbasin 15: Little Rockfish Creek
Subbasin 22: NE Cape Fear River

F. RUNOFF FROM URBAN STORMWATER AND DEVELOPMENT

Water quality impairment from urbanization is a major concern in the Cape Fear River Basin. Virtually every urban stream sampled by DWQ biologists is found to be impaired, and as land is developed, more streams are impaired. The impacts result from a combination of sedimentation from construction, increased streamflow from more impervious surface areas, and decreased quality of runoff water that contains lawn care products, automobile-related pollutants, fecal coliform bacteria from animals and more.

There are 200 miles of streams in the Cape Fear River Basin that are thought to be impaired by urban stormwater and, based on past experience, the number of miles could have been longer had more streams been sampled. Several streams identified as being at least partially impaired from urban runoff based on DWQ's most recent biological monitoring are listed below.

Subbasin 01: Little Troublesome Creek (Reidsville)
Subbasin 02: South Buffalo Creek, Horsepen Creek, UT Horsepen Creek, Mile Run Creek (Greensboro)
Subbasin 05: Northeast Creek, Burdens Cr (Durham)
Subbasin 06: Morgan Creek, Bolin Creek, Little Creek, Meeting of Waters Creek (Chapel Hill)
Subbasin 08: UT East Fork Deep River, E Fk Deep River, Richland Creek (High Point)
Hasketts Creek (Asheboro)
Subbasin 11: Big Buffalo Creek, Little Buffalo Creek (Sanford)
Subbasin 15: Cross Creek (Fayetteville)
Subbasin 17: Greenfield Lake (Wilmington)

DWQ administers several programs aimed at minimizing water quality impacts from urban stormwater runoff. These include 1) NPDES stormwater permit requirements for municipalities greater than 100,000 in population 2) NPDES stormwater permit requirements for certain industrial activities and 3) programs for the control of development activities near High Quality Waters (HQW), Outstanding Resource Waters (ORW) and designated Water Supply (WS) watersheds.

In the Cape Fear River basin, three municipalities are required to develop urban stormwater programs under the NPDES stormwater requirements because their population exceeds 100,000. These include Greensboro, Durham and Fayetteville/Cumberland County. These programs would cover much of the watershed areas of those seven streams listed above in subbasins 02, 05 and 15. Also, at least two other local governments in the basin have undertaken voluntary stormwater programs including High Point and Chapel Hill.

For other local governments that are not required to develop stormwater programs but where urban stormwater impacts have been identified and/or where urban water quality is of concern to local citizens, there are several basic steps, listed below, that could be undertaken at relatively low cost to help control urban stormwater pollution.

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

DWQ's urban stormwater staff have recently completed a series of stormwater workshops across the state for the benefit of local governments and others on addressing urban stormwater pollution. DWQ can provide additional information to interested local governments or can provide references of other local governments in the state that are undertaking programs on their own. Section 5.3.2 in Chapter 5 lists important accomplishments in the urban stormwater program since 1989.

G. FECAL COLIFORM BACTERIA

Fecal coliforms are bacteria typically associated with the intestinal tract of warm-blooded animals and are widely used as an indicator of the potential presence of disease-causing bacteria and viruses. They enter surface waters from a number of sources including failing onsite wastewater systems, broken sewer lines, improperly treated discharges of domestic wastewater, pump station overflows, and runoff carrying livestock and wildlife wastes.

Based on evaluation of fecal coliform data from 69 ambient water quality monitoring sites throughout the basin (monitoring stations sampled by DWQ once a month), 10 sites were found to have bacteria counts where the geometric mean of all samples (minimum of 10 samples) over the last five years exceeded the state standard of 200/100 ml. These sites include:

Subbasin 01:	Little Troublesome Creek at SR 2600 near Reidsville (Rockingham County)
Subbasin 02:	Reedy Fork at Ossipee (Alamance County)
"	Haw River at Haw River (Alamance County)
"	Town Branch at SR 2109 near Graham (Alamance County)
"	North Buffalo Creek near Greensboro (Guilford County)
Subbasin 05:	New Hope Creek near Blands (Durham County)
"	Northeast Creek near Nelson (Durham County)
Subbasin 08:	East Fork Deep River at SR 1541 near High Point (Guilford County)
"	Muddy Creek at SR 1936 near New Market (Randolph County)
Subbasin 09:	Deep River at SR 2128 at Worthville (Randolph County)

In coastal waters, the NC Division of Environmental Health's Shellfish Sanitation Branch has recommended closure of 18,700 acres of open water for shellfish harvesting due to

elevated levels of bacteria. The fecal coliform bacteria standard for shellfish waters is 14/100 ml while the standard for swimming is 200/100 ml. Approximately 4,900 acres of the closed waters have been classified for shellfish water harvesting (SA) by the Division of Water Quality. Nonpoint sources are reported to be the pollution source for 78% of the impaired estuarine waters with point sources accounting for the remaining 22%. Probable sources of the fecal coliform contamination include urban runoff, failing septic tanks, agriculture, marinas and improperly operating wastewater treatment plants.

Several general recommendations for addressing fecal coliform contamination in both fresh and estuarine waters include:

- Proper maintenance of onsite waste disposal systems (such as septic tanks).
- Maintenance and repair of sanitary sewer lines by WWTP authorities.
- Elimination of direct unpermitted discharges of domestic sewage wastes (also known as "straight pipes") from homes and businesses to streams or stormwater systems.
- Proper management of livestock to keep wastes from reaching surface waters.
- Encouragement of local health departments to routinely monitor waters known to be used for body contact recreation (e.g., swimming and tubing). DWQ has classified 272 miles of streams for primary water contact.

DWQ has targeted several fecal-coliform impaired coastal water bodies in the Cape Fear Basin in which localized watershed-based planning will be needed to begin to effectively address the problems.

- Bradley Creek
- Howe Creek
- Pages Creek
- Futch Creek
- Virginia Creek
- Mill Creek.

It is DWQ's intent, in updating this plan over the next five years, to work cooperatively with the NC Division of Environmental Health, the NC Division of Coastal Management, local governments having jurisdiction over the watersheds of these creeks, UNC-W and other members of the basin nonpoint source pollution team to examine the causes and sources of impairment in these waters, to examine the feasibility of restoration (reopening them) and, where feasible, to recommend actions that would lead to reopening.

One possible avenue for accomplishing these efforts would through reclassifying these waters as URW. DWQ is working on development of a new supplemental water classification called use restoration waters (URW). URW would be assigned to the watersheds of waters that are not supporting their uses such as those listed above. If adopted, reclassification of waters to URW would follow the same formal procedures as for other surface water reclassifications. The reclassification would include preparation of a watershed plan that would stipulate specific BMPs that would need to be implemented to restore uses to the impaired waters.

A second aid in studying and restoring these waters could be federal nonpoint source funding under Section 319 of the Clean Water Act. Because these streams have been assigned a high priority rating for Section 319 funding by DWQ in Table 6.2 of Chapter 6, 319 nonpoint source grant proposals by local governments, university researchers and others would receive a high priority for funding.

A third means of restoring or protecting these waters is recommendation that the local governments having jurisdiction over the watersheds of these waters, and that are required to prepare local land use plans under requirements of the Coastal Area Management Act, consider including provisions that minimize further impacts to these and other shellfish waters along the coast from stormwater runoff from new development.

One local effort for reopening closed shellfish waters, that is already underway, is the Futch Creek Demonstration Project. This project entails dredging two channels through the shoals at the mouth of the creek in order to increase tidal flushing, increase salinity and hopefully decrease fecal coliform counts. The project is being funded through the NC Agricultural Cost Share Program and the Northeast New Hanover Conservancy. Other sponsors include Pender Watch and Conservancy and New Hanover County. Water quality effects of the project are being monitored by UNC-W scientists.

H. RECLASSIFICATION OF HIGH RESOURCE VALUE WATERS

Waters considered to be biologically sensitive or of high resource value may be afforded protection through reclassification to HQW (high quality waters), ORW (outstanding resource waters) or WS (water supply), or they may be protected through more stringent NPDES permit conditions. Waters eligible for reclassification to HQW or ORW may include those designated as native trout waters, critical habitat for threatened or endangered species (as designated by the NC Wildlife Resources Commission), waters having Excellent water quality, or waters used for domestic water supply purposes and classified WS I or II. Portions of the following streams and their tributaries have been identified as potential candidates for reclassification to HQW or ORW. These streams will be evaluated for reclassification during the next basin schedule.

One potential ORW/HQW candidate stream in the Cape Fear basin, based on preliminary water quality assessments is the Cape Fear River at Erwin. DWQ has reviewed this and determined that additional sampling will be necessary before any formal action can be taken to pursue reclassification of this segment.

A portion of the Lower Cape Fear River below Lock and Dam No.1 was being considered for HQW status, but the proposed reclassification was postponed pending additional monitoring data to be collected by the University of North Carolina at Wilmington. The Marine Science Center at UNC-W is currently seeking funding to complete additional monitoring through the proposed Cape Fear River Program. This program represents a unique partnership including industry, local , state, and federal governments, state regulatory agencies, citizens' groups, and the university community collectively working together to preserve and improve the important natural resources of the Cape Fear River Basin while maintaining the economic vitality and well-being of the region. DWQ supports this effort and looks forward to working with UNC-W, Cape Fear River Assembly and dischargers in the Cape Fear Basin on establishing a discharger monitoring network from the Haw and Deep Rivers downstream to the coast.

I. FUTURE INITIATIVES IN THE CAPE FEAR BASIN

NONPOINT SOURCE (NPS) BASIN TEAMS

Nonpoint source pollution has been identified in the plan as the major source of stream impairment. There many programs being administered by numerous agencies at the state, local and federal levels to address the different types of nonpoint source pollution. DWQ is in the process of establishing nonpoint source basin teams for each of the state's major basins in order to improve communication between the various agencies, improve

effectiveness in implementing the programs, and target available resources to address problems in watersheds prioritized by team members.

A team will be formed in the Cape Fear Basin prior to updating the Cape Fear Plan in 2000. The teams will consist of representatives of the lead nonpoint agencies familiar with or working within each basin. Subgroups are formed for each category to include other participants as needed such as industry, producers, special interest groups and other state, federal and local government agencies. The individual members of these subgroups change to reflect the particular basin being considered. The NPS Basin Teams responsibilities include:

- Providing general program and activity descriptions by NPS category and/or pollutant,
- Conducting specific assessments of NPS controls in targeted watersheds driven by water quality data and the basinwide process,
- Develop five year action plans of NPS categories/pollutants (Identify the challenge, schedule for completion, estimated costs, expected pollutant reductions and responsible parties) and,
- Develop Section 319 project proposals for targeted watersheds to be submitted to the NPS Workgroup.

SPECIFIC AREAS IN NEED OF MANAGEMENT STRATEGIES

There are a number of areas within the Cape Fear River Basin in need of future management strategy development that are elaborated on in Chapter 7. The Division of Water Quality has identified areas it would like to target for study during the next basin planning cycle. These areas may be modified based on comments received from the public on the basin plan. In addition, this list contains a number of items that would require much staff time to adequately evaluate, and therefore some of these issues will probably not be addressed in the next basin plan. The Division would anticipate holding meetings approximately three years prior to the due date of the second Cape Fear Basin Plan to inform the public of any changes in priorities in the basin and to obtain feedback on them. The following areas are tentatively prioritized:

- Cape Fear River Below Lock and Dam 1 and Northeast Cape Fear River Below Castle Hayne and the mainstem Cape Fear River - a TMDL for biochemical oxygen-demanding (BOD) wastes is needed for dischargers.
- Jordan Lake NSW Strategy - the existing NSW
- Deep River - need to manage toxicity and nutrients and provide protection of proposed Randleman Reservoir
- Haw River - Lack of BOD assimilative capacity in North and South Buffalo Creeks
- Toxicity Limits in the Cape Fear Estuary
- Reopening and protection of shellfish waters

WATER SUPPLY PLANNING

A water supply plan for the Jordan Reservoir and the Cape Fear River needs to developed. Water quantity in the basin needs to be managed in order to ensure an adequate and clean supply of water and healthy ecosystem while providing adequate waste assimilative capacity for dischargers. As noted in Chapter 2, public water supply users are predicting a doubling of their water supply needs by the year 2020. This is a critical and ongoing issue that needs to be addressed in future updates of the plan. It is anticipated that the Division of Water Resources will take the lead in developing a plan and that it will include input from water authorities, local governments and other basin stakeholders.

GENERAL NPDES PROGRAM INITIATIVES

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

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

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

FUTURE MONITORING PRIORITIES

Monitoring of the chemical and biological status of receiving waters will provide critical feedback on the success of the basin management strategy. As discussed in Chapter 4, monitoring data will be collected from (1) ambient water chemistry, (2) sediment chemistry, (3) biological communities, (4) contaminant concentrations in fish and other biota, (5) ambient toxicity, and (6) facility self-monitoring data. This should also include review of data collected by others including The specific parameters measured will relate directly to the long-term water quality goals and objectives defined within the basinwide management strategy.

FURTHER EVALUATION OF SWAMP SYSTEMS

Many of the waterbodies in the eastern third of the State are classified as swamp waters. It is difficult to evaluate monitoring data in these systems to determine if a waterbody is impaired. DWQ would like to develop a model that can be used in channelized swamps that have some degree of slope to allow for one dimensional flow. Work has begun on reviewing swamp models. In addition, DWQ will begin determining which swamp systems may be modelable. Most likely, early analyses will be limited to black water river systems. The Northeast Cape Fear River may be a good river to study in the Cape Fear River basin.

USE OF DISCHARGER SELF-MONITORING DATA

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

PROMOTION OF NON-DISCHARGE ALTERNATIVES/REGIONALIZATION

NCDWQ requires all new and expanding dischargers to submit an alternatives analysis as part of its NPDES permit application. Non-discharge alternatives, including tying on to an existing WWTP or land-applying wastes are preferred from an environmental standpoint.

If the Division determines that there is no economically reasonable alternative to a discharge, DWQ may recommend issuance of the NPDES permit.

DWQ is also encouraging establishment of regional wastewater facilities. Under this concept, smaller dischargers are encouraged to connect to large municipal systems which would be considered regional facilities. There are a number of benefits to these approach including better plant and effluent monitoring and a more consistent and higher quality effluent. However, before this concept is formalized, impacts on the future expansion potential of the regional plants needs to addressed. The concept must provide an equitable balance between water quality protection and the needs of the prospective regional facilities.

IMPROVED DATA MANAGEMENT AND EXPANDED USE OF GEOGRAPHIC INFORMATION SYSTEM (GIS) COMPUTER CAPABILITIES

INTEGRATE WETLANDS, GROUNDWATER AND ATMOSPHERIC DEPOSITION INTO BASINWIDE PLANNING IN THE CAPE FEAR BASIN

Research is being conducted in other basins to assess the impacts of groundwater and atmospheric deposition of nutrients on water quality. The prime concern is nitrogen loading to lakes and estuaries. Livestock operations are a potential source for both atmospheric and groundwater nutrient loading.

On wetlands, the general assembly passed a bill in 1996 calling for developing of basinwide wetland restoration plans beginning in 1997. As the program develops, its findings will be applied to future updates of the basin plan.

INCREASING PUBLIC PARTICIPATION AND STAKEHOLDER INVOLVEMENT IN THE BASINWIDE PLANNING PROCESS

Protection and enhancement of water quality is a shared need and a responsibility of all those who work, reside or recreate in the basin. Communication of ideas, conducting research, sharing information, solving problems cost-effectively with minimal regulation, and balancing the needs of various stakeholder groups are all necessary for long-term success. Basinwide planning can assist in meeting these needs but the planning process and products will need to be improved. Below are several recommended improvements to be undertaken during the next basinwide planning cycle for the Cape Fear basin.

- More clearly define the role for citizen participation in basinwide planning
- Ensure active interaction between DWQ staff and other stakeholder groups including UNC-Wilmington, discharger associations, citizen organizations such as the Haw River Assembly and others.
- Increase state staff involved in public outreach so as to provide better opportunities for communication between stakeholders and the state.
- Produce more user-friendly basin plans and associated reports in order to enhance public interest and understanding in water quality protection.