The 2002 Section 305(b) Water Quality Assessment Report for South Carolina

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PREFACE

The South Carolina Department of Health and Environmental Control (SCDHEC) prepared this report as a requirement of Section 305(b) of Public Law 100-4, last reauthorized and commonly known as The Clean Water Act (CWA) of 1987, and as a public information document. The report presents a general assessment of water quality conditions and water pollution control programs in South Carolina. SCDHEC has published Watershed Water Quality Management Assessments (WWQA), which contain information pertaining to the specific watersheds and give a more complete picture of the waters referenced in this document. Section 303(d) of the CWA requirements will be submitted separately and are not included in this document.

The determinations of surface water quality were based on data collected by SCDHEC at ambient water quality monitoring stations, point source permit required monitoring and evaluation of nonpoint source (NPS) data. Other information in this report was obtained from SCDHEC programs associated with water quality monitoring and water pollution control.

TABLE OF CONTENTS

PREFACE i

TABLE OF CONTENTS ii

LIST OF TABLES v

LIST OF FIGURES vi

EXECUTIVE SUMMARY 1

BACKGROUND 3
- 1. Resource Overview 3
- 2. Total Waters 3
- 3. Water Pollution Control Program 4
  - A. Watershed Approach 4
  - B. Water Quality Standards and Classifications 5
    - Surface Water Classes - Freshwaters 6
    - Surface Water Classes - Saltwaters 7
    - Groundwater Classes 7
    - Reclassifications 8
  - C. Point Source Program - Municipal Facilities 8
    - Loan Program 9
    - Pretreatment and Toxicity Program 9
    - Stormwater Controls 10
    - Land Application of Treated Waste 10
    - Strategies to Improve the Municipal Permitting Program 10
  - D. Point Source Program - Industrial and Agricultural Facilities 11
    - Industrial Facilities 11
    - Agricultural Facilities 11
    - Toxics Controls 12
    - Land Application of Treated Wastewater 12
    - Stormwater Permits 12
  - E. Permit Compliance and Enforcement 13
  - F. Nonpoint Source Program 14
  - G. Wasteload Allocations and Total Maximum Daily Loads 15
  - H. Special State Concerns and Recommendations 16
    - Bureau of Water Mission 16
    - SCDHEC Values and Visions 16
    - Bureau of Water Goals 17
      - Goal 1. Protect Surface and Groundwater Quality 18
      - Goal 2. Adequately Assess Water Quality 18
      - Goal 3. Reduce and Eliminate Water Pollution 18
      - Goal 4. Protect and Restore Aquatic Habitat 19
      - Goal 5. Provide Safe Drinking Water 19
      - Goal 6. Protect Public Health and Safety 19

Goal 7. Expand the Public=s Knowledge of Water Issues.....19
Goal 8. Plan Effectively for Growth.....20

SURFACE WATER ASSESSMENT.....21
1. Surface Water Monitoring Program.....21
A. Purpose and Design.....21
B. Networks and Programs.....21
C. Laboratory Analytical Support.....21
D. Quality Assurance.....22
E. Data Storage, Management and Interpretation.....24
2. Assessment Methodology.....24
A. Determination of Attainment of Classified Uses.....27
General Considerations.....27
Aquatic Life Use Support.....28
Macroinvertebrate Data Interpretation.....29
Recreational Use Support.....30
Fish/Shellfish Consumption Use Support.....30
Drinking Water Use Support.....30
Potential Sources.....30
B. Additional Screening and Prioritization Tools.....31
Long-Term Trend Assessment.....31
Sediment Screening.....31
3. Rivers and Streams Water Quality Assessment.....32
A. Summary Statistics.....32
4. Lakes Water Quality Assessment.....35
A. Summary Statistics.....35
B. Section 314 Reporting.....37
Background.....37
Trophic Status.....38
Control Methods.....44
Restoration Efforts.....44
Acid Effects on Lakes.....45
Toxic Effects on Lakes.....45
Trends in Lake Trophic Condition.....45
5. Estuary and Coastal Assessment.....45
A. Summary Statistics.....45
6. Wetlands Assessment.....47
A. Summary Statistics.....47
B. Extent of Wetlands Resources.....48
C. Integrity of Wetlands Resources.....48
Section 404 Permit Program.....48
Section 401 Water Quality Certification.....49
Water Quality Certification, Nationwide Permits (NWP).....49
D. Development of Water Quality Standards for Wetlands.....50
E. Additional Protection Activities.....50
7. Public Health - Aquatic Life Concerns.....51
A. Sizes of Water Affected by Toxicants.....51

B. Public Health: Aquatic Life Impacts 51
Pollution Caused Fish Kills/Abnormalities 51
Fish Consumption Advisories 52
Shellfish Restrictions/Closures 62
Restrictions on Bathing Areas 64
Ocean Water Quality Monitoring 64
C. Public Health: Drinking Water 71
Restrictions in Surface Drinking Water Supplies and Incidents of Waterborne Diseases 71

GROUNDWATER ASSESSMENT 72
1. Overview of Groundwater Contamination Sources 72
2. Overview of Groundwater Protection Programs 83
3. Summary of Groundwater Quality 85
4. Summary of Groundwater/Surface Water Interactions 86

References 87

Appendix A A-1

LIST OF TABLES

1. Atlas 3
2. Freshwater Classifications and Descriptions 6
3. Saltwater Classifications and Descriptions 7
4. Groundwater Classifications and Descriptions 7
5. Summary of Supported Classified Uses for South Carolina 8
6. Rivers and Streams Use Support Summary (Miles) 32
7. Summary of Fully Supporting and Impaired Rivers and Streams(Not including Fish Consumption Use) 33
8. Total Sizes of Rivers and Streams Impaired by Various Cause Categories (Miles) 33
9. Total Sizes of Rivers and Streams Impaired by Various Source Categories (Miles) 34
10. Categories of Data Used in Aquatic Life Use Support (ALUS)Assessments for All Rivers and Streams 35
11. Lake Use Support Summary (Acres) 36
12. Summary of Fully Supporting and Impaired Lakes(Not including Fish Consumption Use) .36
13. Total Sizes of Lakes Impaired by Various Cause Categories (Acres) 36
14. Total Sizes of Lakes Impaired by Various Source Categories (Acres) 37
15. Trophic Status of Significant South Carolina Lakes, 2002 38
16. Condition of Significant South Carolina Lakes 38
17. Lake Rehabilitation Techniques 44
18. Estuaries Use Support Summary (Square Miles) 46
19. Summary of Fully Supporting and Impaired Estuaries(Not including Fish/Shellfish Consumption Use) 46
20. Total Sizes of Estuaries Impaired by Various Cause Categories (Square Miles) 46
21. Total Sizes of Estuaries Impaired by Various Source Categories (Square Miles) 47
22. Extent of Wetlands, by Type 47
23. Total Size Affected by Toxicants 51
24. Mercury Advisories for Rivers and Streams 53
25. Mercury Advisories for Lakes and Reservoirs 59
26. Lake Hartwell PCB Advisory South Carolina and Georgia 61
27. Red Bank Creek Organotin Advisory 61
28. South Carolina, North Carolina, Georgia, and FloridaAtlantic King Mackerel Mercury Advisory 61
29. Summary of Shellfish Harvesting Status in South Carolina Shellfish Waters 63
30. Areas of Bathing Restrictions 64
31. Areas Affected by Beach Advisories 65
32. Major Sources of Groundwater Contamination 73
33. Groundwater Contamination Summary 79
34. Groundwater Contamination Summary (above fall line) 80
35. Groundwater Contamination Summary (2) 81
36. Groundwater Contamination Summary (below fall line) 82
37. Summary of State Groundwater Protection Programs 83
38. Aquifer Monitoring Data 85
39. Aquifer Monitoring Data (2) 86

LIST OF FIGURES

1. South Carolina Watershed Water Quality Management Basins 4
2. State Water Quality Monitoring Network 25
3. Generalized Cross-Section Indicating the Spatial Relation
Between the Major Coastal Plain Aquifers 75
4. Location of Geologic Provinces 77

EXECUTIVE SUMMARY

The Clean Water Act (CWA) states "it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water shall be achieved by July 1, 1983."

The State of South Carolina has promulgated S.C. Regulation 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters* which establish specific standards and general rules to protect and maintain these uses and designate classified uses for each waterbody. It is the intent and purpose of the regulations that waters which meet standards shall be maintained and waters which do not meet standards shall be improved.

S.C. Regulation 61-68 was modified effective June 2001 to include numeric total phosphorus, total nitrogen, and chlorophyll *a* criteria for lakes, and numeric turbidity criteria for all waters. This regulation update also changed the basis for several freshwater metals criteria. These modifications have been included in this present assessment, thus making the basis for this assessment different from past '305(b) reports. Therefore, direct comparisons to previous results may be misleading.

Based on modified United States Environmental Protection Agency (USEPA) River Reach File (RF3), within the State of South Carolina's borders, there are approximately 29,794 miles of rivers; 407,505 acres of lakes; and 401 square miles of estuaries. Quality assured water quality data collected from 1996 through 2000 provided the database for this assessment. Physical, chemical, and biological data were available for 15,373 miles of rivers; 308,838 acres of lakes; and 221 square miles of estuaries. SCDHEC monitoring stations provide a representative database due to their strategic locations. Evaluation of these data determines if water quality in rivers, lakes, and estuaries is suitable to support State classified uses. The following tables include the level of use support for the waters of South Carolina and the cause of nonattainment affecting the largest size in each waterbody type for aquatic life and primary contact recreation uses.

Aquatic Life Use Support

Waterbody Type	Fully Supported	Partially Supported	Not Supported	Predominant Cause
Rivers	79%	9%	12%	Dissolved Oxygen
Lakes	83%	4%	13%	Nutrients
Estuaries	81%	8%	11%	Dissolved Oxygen

Recreational Use Support

Waterbody Type	Fully Supported	Partially Supported	Not Supported	Predominant Cause
Rivers	58%	21%	20%	Fecal Coliform
Lakes	99%	1%	<1%	Fecal Coliform
Estuaries	93%	3%	3%	Fecal Coliform

In South Carolina's surface waters, nonpoint sources, rather than point sources, are most responsible for partial or nonattainment of classified uses.

BACKGROUND

1. Resource Overview

The following table gives a representation of state population and geographical information.

Table 1. Atlas

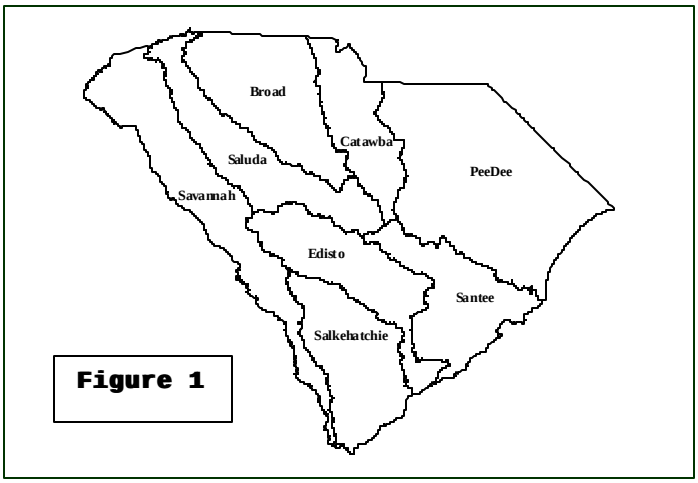
Topic	Value
State Population	3,602,900
State Surface Area (square miles)	30,203
Total miles of rivers and streams	29,794
- Border Miles	408
- Border Rivers: Chattooga, Tugaloo, Savannah, Catawba	
- Border Lakes: Hartwell, Thurmond, Russell, Wylie	
Number of lakes/reservoirs/ponds	
- 10 - 1000 acres (total acreage of 60,335)	1,598
- >1000 acres (total acreage of 461,402)	19
Estuarine waters (square miles)	401
Total miles of Ocean Coast	190
Freshwater wetlands (acreage)	4,146,510
Tidal wetlands (acreage)	512,490

2. Total Waters

The United States Environmental Protection Agency (USEPA) has developed a system to determine estimates of total river miles and total lake acres for the states to use in reporting for 2002 305(b) reports. This system is based on the Digital Line Graph (DLG) database and the River Reach File 3 (RF3), which are in turn based on the United States Geological Survey (USGS) 1:100,000 scale topographic maps. The original DLG database was missing several lakes of relatively recent construction as well as a significant number of streams. Many of these missing features have been added by SCDHEC, with the cooperation and oversight of the USEPA. This revised system was utilized in this 305(b) report to estimate the sizes of the different use support categories, cause sizes, and source sizes for the Rivers and Streams, and Lakes summary statistics. Other base maps were used to estimate sizes for the Clean Lakes Program, Estuaries, and Shellfish Restrictions/Closures. These alternative databases are identified in the appropriate sections.

3. Water Pollution Control Program

A. Watershed Approach



SCDHEC conducts water quality assessment and protection on a watershed basis in order to promote a coordinated approach to river basin development and water quality maintenance or improvement, to better address congressional and legislative mandates, to better utilize current resources, and to better inform the public and regulated community of existing and future water quality issues. Watershed water quality management recognizes the interdependence of water quality and all the activities that occur in the associated drainage basin including: monitoring, assessment, problem identification and prioritization, water quality modeling, planning, permitting , and other activities. In the Watershed Water Quality Assessments (WWQA), these activities are integrated by basin leading to watershed management plans and implementation strategies and serve to appropriately refocus water quality protection efforts.

Watershed water quality management planning and strategy development provides SCDHEC with the tools and information necessary for program implementation. The planning process and the resulting strategy provide a structured and predictable schedule for carrying out program elements to ensure the protection of the State's water resources. While an important aspect of the program is water quality problem identification and problem solving, the emphasis of the program is on problem prevention.

SCDHEC has divided the state into eight major drainage basins along USGS hydrologic units (Figure 1), encompassing approximately 280 Natural Resources Conservation Service (NRCS) watersheds. These watersheds serve as the hydrologic boundaries which guide SCDHEC water quality activities. The majority of water quality activities in these watersheds are based on a five-year rotation.

For most activities the Savannah and Salkehatchie basins are addressed in the same year, as are the Saluda and Edisto basins, and the Catawba and Santee basins. Five years are required to assess all basins in the State, and National Pollutant Discharge Elimination System (NPDES) permits have a five-year lifespan. Each year SCDHEC revises the assessment for the targeted basin(s). Planning on a watershed basis is consistent with basic ecological principles of watershed management. It allows the coordination of implementation activities so that all actual and potential impacts on water quality can be evaluated. Both point source and nonpoint source impacts can be evaluated when making water quality protection decisions. Problem areas in a particular drainage

basin can be identified and existing and potential contributors can be examined. Subsequently, waste assimilative capacities can be determined and allocated in a more equitable fashion.

Proposed permit issuances within a watershed are consolidated and presented to the public in groups rather than one at a time. By issuing all the NPDES permits during the same period, SCDHEC will be able to realize a resource savings and the public will realize an information advantage since all of the permitting activity for a specific area will occur in a specified period of time when public notices and public meetings and hearings will be conducted. To date, two five-year watershed cycles have been completed, and an initial WWQA and an update to each have been published for all basins.

The watershed management process also focuses resources. Limited resources require targeting work efforts in order to maximize useful results. Focusing on specific basins each year allows SCDHEC to coordinate staff activities to make efficient use of available resources. While the statewide ambient monitoring network is maintained, the monitoring strategy has been revised so the district monitoring staff concentrate on the targeted basin(s). The monitoring activities support the development of wasteload allocations and total maximum daily loads (TMDLs). Developing wasteload allocations and TMDLs on a watershed basis allows for an equitable assessment of all actual and potential impacts on the water quality from both point sources and nonpoint sources. Focusing decision making efforts in a single watershed will highlight the need to examine water quality standards and use designation for the appropriate waterbodies. An examination of the water quality and use designations may point to the need for site specific standards or stream classification changes.

In preparing the eight watershed assessments and in updating and revising each one on a five-year rotation, SCDHEC will be able to respond more efficiently, and in a timely manner, to federal requirements. More importantly, SCDHEC will be better able to utilize available resources, coordinate water quality improvement efforts, and protect water quality in South Carolina. These watershed assessments serve as a starting point to fulfill a number of EPA reporting requirements. EPA requires various reporting activities under '303(d), '305(b), '314, and '319 of the Clean Water Act (CWA).

B. Water Quality Standards and Classifications

S.C. Regulations 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters* were promulgated by SCDHEC pursuant to the South Carolina Pollution Control Act (48-1-10, *et seq*, S.C. Code of Laws, 1976).

The water quality standards regulation contains provisions that provide for the protection and maintenance of the existing and classified uses of the waters of the State. The water quality standards include general rules and specific water quality criteria, both narrative and numeric, to protect those classified and existing uses as well as antidegradation rules to protect the public health and welfare and maintain and enhance water quality.

The water quality standards also serve as the basis for decisions in the other water quality program areas. NPDES permit limitations for waste discharges are determined according to the

classification and standards of the receiving water. The standards and classifications also affect the control of toxic substances, thermal discharges, stormwater discharges, dredge and fill activities, and other water related activities. SCDHEC implements the antidegradation rules through its regulatory programs.

S.C. Regulation 61-69 alphabetically lists the waterbodies in South Carolina which have been specifically classified by name, gives the classification, describes the boundaries of the use classification, the county of location, and any applicable site-specific standards.

Revisions to water quality standards and any reclassification of waters of the State require a public hearing process, approval by the Board of SCDHEC, approval by the General Assembly, and publication in the State Register. S.C. Regulation 61-68 and 61-69 were last amended on June 22, 2001.

Surface Water Classes - Freshwaters

Table 2. Freshwater Classifications and Descriptions

Freshwaters	Description
Outstanding National Resource Waters	Exceptional national recreational and/or ecological resource.
Outstanding Resource Waters	Exceptional recreational and/or ecological resource and suitable for drinking water source with minimal treatment.
Trout Waters - (3 types) Natural Put, Grow and Take	Suitable for supporting reproducing and/or stocked trout populations and cold water indigenous aquatic community and the survival and propagation of aquatic life. Primary and secondary recreational contact including fishing and as drinking water source. Suitable for industrial and agricultural uses.
Put and Take	(See Freshwater Description)
Freshwater	Suitable for the survival and propagation of aquatic life; fishing and primary and secondary recreational contact and as drinking water source. Suitable also for industrial and agricultural uses.

Surface Water Classes - Saltwaters

Table 3. Saltwater Classifications and Descriptions

Saltwaters	Description
Outstanding National Resource Waters	Exceptional national recreational and/or ecological resource.
Outstanding Resource Waters	Exceptional recreational and/or ecological resource.
Shellfish Harvesting Waters	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation. Suitable for harvesting of shellfish, crabbing, and fishing for market purposes and/or for human consumption.
Class SA	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation; crabbing and fishing for market purposes and/or human consumption.
Class SB	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation; crabbing and fishing for market purposes and/or human consumption.

Groundwater Classes

Table 4. Groundwater Classifications and Descriptions

Groundwater Type	Description
Class GA	Vulnerable to contamination due to hydrological characteristics.
Class GB	Suitable as an underground source of drinking water. All groundwaters of the State unless otherwise classified.
Class GC	Not suitable for underground drinking water source.

The following table summarizes the uses of each of the surface water classifications. No degradation of existing uses is permitted regardless of classification and no degradation of natural

conditions is allowed in Outstanding Resource Waters or Outstanding National Resource Waters.

Table 5. Summary of Supported Classified Uses for South Carolina

Uses	Description
Fish and wildlife	All classes
Domestic water supply	All freshwater classes
Primary contact recreation	All classes
Secondary contact recreation	All classes
Industrial	All freshwater classes
Agriculture	All freshwater classes
Navigation	All classes

Reclassifications

SCDHEC is presently reclassifying several waterbodies to recognize their best and/or existing uses. Most reclassifications are initiated after receiving a written request from an individual, special interest group, or organization. SCDHEC also proposes waters for reclassification where existing water quality is better than required to protect the classified uses or if there is an existing use not recognized by the present classification. Another addition to the classification system is the designation of No Discharge Zones (NDZs). NDZs relate specifically to the discharge of treated waste from Marine Sanitation Devices (MSDs) and are authorized pursuant to Section 312 of the Federal Clean Water Act. Waters of the State designated as NDZ prohibit any discharge from MSDs into these waters and require that the MSDs be pumped out at an appropriate facility. SCDHEC has designated six waterbodies as NDZs and is currently working on designating several other waters of the State as NDZs.

Water reclassifications and NDZ designations are amendments to state regulation and, as such, are not effective until approved by the South Carolina General Assembly and published in the State Register.

C. Point Source Program - Municipal Facilities

The EPA has delegated the authority to SCDHEC for administering the National Pollutant Discharge Ellimination System (NPDES) Program within the State. As a functional part of this NPDES program, all municipal and private domestic wastewater treatment works that discharge to surface water in South Carolina, whether publicly or privately owned, are monitored by the Bureau of Water (BOW). Permit effluent limits of each surface water discharge are derived using water quality models and other tools.

Loan Program

The State has participated in the EPA 205(g) (P.L. 92-500) construction grant program for wastewater transportation and treatment works. These grants were awarded to publicly owned entities (municipalities, counties, special purpose districts, etc.) through fiscal year 1989.

Beginning with fiscal year 1989, the state established a State Revolving Loan Fund (SRF) program, with EPA providing annual capitalization grants to seed the SRF program. This program is a low-interest, revolving loan program established pursuant to Public Law (P.L. 100-4), Water Quality Act of 1987. The State, in accordance with EPA requirements, has established a project priority rating system. The State's priority list ranks each wastewater treatment project need based on water quality and sludge disposal needs.

Projects receiving SRF loans since fiscal year 1989 have totaled over $300 million through the fall of 2001.

The result of the newly constructed or upgraded treatment works using these funding sources has been improved wastewater treatment resulting in favorable water quality benefits. This construction has eliminated poorly treated effluent from many streams. The improvement of water quality has been seen by routine monthly discharge monitoring reports (DMRs) submitted by each treatment plant owner to SCDHEC. As an overall result, the SRF helps to improve and maintain water quality.

Pretreatment and Toxicity Program

The implementation of SCDHEC pretreatment program continues. The State has approved for implementation a total of 72 pretreatment programs for Publicly Owned Treatment Works (POTWs). This program impacts a total of 99 wastewater treatment plants. In addition, SCDHEC has currently under review, five new pretreatment program submittals. With many of the State's approved pretreatment programs approaching or exceeding five years in age and in consideration of the revision and/or modifications of the pretreatment program and water quality over this period, each of the previously approved programs are being or will be reviewed for possible updating during the immediate future. With the total number of programs requiring updating and considering the limited manpower resources available for the updating of each program, it may be possibly 2 to 3 years before this updating can be completed.

There has been a direct benefit to in-stream water quality demonstrated from many, if not all, of the implemented pretreatment programs. With the implementation of approved programs many industries previously discharging untreated wastewater to a POTW must now pretreat their discharges. This has resulted in a significant reduction in the amounts of materials (contaminants) that POTWs are now receiving from the industries. This allows the POTW to adequately treat all wastewater prior to discharging to a State stream, resulting in the ability to better maintain the existing stream water quality standards.

Since FY 89 all major, significant minor (minors with pretreatment programs) and selected other permits have been issued or reissued with effluent toxicity monitoring requirements to be performed

on a monthly basis. Depending on the in-stream waste concentration and presence or absence of a diffuser, there can be either an acute test, chronic test, or both required.

Stormwater Controls

South Carolina has no known combined stormwater/sanitary sewer discharges associated with POTWs. Combined sewers are usually prohibited by local ordinance to preclude overloading treatment systems with stormwater. Stormwater runoff control on POTW sites is mandatory in some areas of the State.

SCDHEC is implementing a state stormwater permitting program policy in support of EPA guidelines of requirements required by the 1987 amendments to the Clean Water Act. See the Section on Stormwater Permits under "D. Point Source Program - Industrial and Agricultural Facilities."

Land Application of Treated Waste

SCDHEC issues State discharge permits to facilities which discharge directly to land as spray irrigation. This involves the application of at least secondarily-treated wastewater to land surfaces with the applied effluent being further treated as it percolates through the plant-soil matrix. A portion of the applied effluent percolates to groundwater, some is absorbed by vegetation, and some evaporates to the atmosphere.

<u>The primary objectives of this program are:</u>

(a) Treatment and disposal of applied wastewater without exceeding ground-water quality standards as specified in S.C. Regulation 61-68 *Water Classifications and Standards*.

(b) Economic return from use of treated effluent, water and nutrients, to produce marketable crops.

(c) Water conservation by replacing potable water with treated effluent.

(d) Preservation of open space through vegetation.

As a permit requirement, a program for monitoring the quality of ground-water is established and implemented. Proper placement of ground-water monitoring wells will provide a check on the effectiveness of the wastewater renovation and will serve as an early warning system for ground-water quality protection for nearby ground-water users. The direction of ground-water flow determines the placement of ground-water monitoring wells. At least one monitoring well should be located hydraulically upgradient of the spray area and at least two wells should be located downgradient.

Strategies to Improve the Municipal Permitting Program

SCDHEC district personnel inspect the operation and maintenance programs of POTWs on a routine

basis. Deficiencies noted during inspections are conveyed to the POTW and may require SCDHEC to take formal enforcement action. Operational advice is provided on a limited basis by SCDHEC staff. The South Carolina Environmental Training Center at Sumter Area Technical College also provides training for treatment plant operators.

SCDHEC has developed sludge management regulations and guidance for permittees. All NPDES permits issued or reissued have sludge disposal requirements. The permit typically requires the sludge generator to monitor the content of its sludge and to dispose of it in an environmentally acceptable manner. The permit authorizes specific methods (e.g., land application, land filling, etc.) and procedures to be fully implemented.

D. Point Source Program - Industrial and Agricultural Facilities

Industrial Facilities

SCDHEC reviews NPDES permit applications for new and existing facilities and determines whether treatment must be technology-based or based on water quality standards. The more stringent of these derived numbers are used as the applicable permit limits. Effluent guidelines, where promulgated by EPA, are used to determine technology based limits. If EPA effluent guidelines have not been developed, best professional judgement of technology based limits is used. Water quality limits are developed using computerized water quality modeling procedures which result in wasteload allocations for constituents affecting in-stream oxygen levels. South Carolina water quality standards and/or biological monitoring are used to determine limits for potentially toxic constituents. Where appropriate, permit limits are developed using a combination of water quality limitations for specific constituents, whole effluent toxicity limits, and in-stream biological monitoring to insure no adverse impacts from industrial point source dischargers.

Agricultural Facilities

Unregulated wastewater discharges from concentrated animal production or fruit and vegetable processing facilities may affect water quality. Additionally, South Carolina does not allow surface water discharges from these facilities under any circumstances. To ensure these wastes do not enter the waters of the State, SCDHEC requires that both solid and liquid agricultural wastes from these facilities be collected, treated, and disposed in an environmentally acceptable manner. This is accomplished through a State permitting and inspection program requiring recycling or land application of agricultural wastes. This type of disposal eliminates the need for direct surface water discharges of agricultural wastes and is effective in insuring water quality. In accordance with the 25-year, 24-hour storm event discharge exemption in the NPDES regulations for these animal facilities, an NPDES permit is not required as long as the exemption criteria are met. SCDHEC agrees with EPA that animal facilities that have or will have a discharge that was or is not caused by a 25-year, 24-hour storm event must have NPDES permit coverage since these discharges are not eligible for the 25-year, 24-hour storm event discharge exemption. Therefore, a general NPDES permit is being developed for use in this program to cover these situations. The general permit will be a strict no discharge permit and will not allow a discharge to surface water under any circumstances even though the federal effluent guidelines for animal facilities do allow discharges. South Carolina=s state agricultural program is and will continue to be more stringent than the federal NPDES program for animal facilities.

Toxics Controls

Toxic pollutants are generally defined as substances which by themselves or in combination with other chemicals are harmful to animal life or human health. They include some of the metals, pesticides, and other synthetic organic pollutants that have the potential to contaminate water, fish tissue, and bottom sediments. Each NPDES permit application is reviewed for potential toxic pollutants. These pollutants are evaluated for aquatic life and human health concerns. If determined to be potentially toxic, a limitation is placed in the NPDES permit for that specific pollutant using South Carolina water quality standards. SCDHEC has EPA-approved standards for specific pollutants. Whole effluent toxicity testing is placed in many NPDES permits; those tests being for acute and/or chronic monitoring as appropriate. In-stream biological assessments are also being utilized in some cases (i.e., to evaluate stormwater runoff).

Land Application of Treated Wastewater

The process utilized for industrial and agricultural facilities is the same as that for municipal facilities. However, limitations for the spray effluent are not permitted as secondary limits, but are based on site-specific requirements.

Stormwater Permits

SCDHEC regulates storm water discharges associated with industrial activities. The State has issued two general NPDES permits for activities associated with industry. These permits are the Construction Activity NPDES Permit and the Associated with Industrial Activity, except construction, NPDES Permit.

The general permits require permittee's to develop and implement Storm Water Pollution Prevention Plans (SWPPPs) that will minimize pollutants in their storm water discharges. Some industrial activities, except construction, must monitor on either an annual or semiannual basis while all industrial activities, except construction, are required to update their SWPPP's on an annual basis. Industrial construction activities are required to conduct inspections weekly and after every rainfall event of 1 inch or greater.

Where appropriate, individual NPDES permits will be issued in accordance with EPA's tiered permitting strategy. Water quality monitoring will help identify the industrial activities that must receive individual permits instead of general permits. In the watershed approach, the individual permits will be tailored to address the water quality concerns of the storm water discharges from industrial activity.

SCDHEC also regulates Municipal Separate Storm Sewer Systems (MS4s) in the overall storm water program. There were only two MS4s in SC (both counties) that fell under the Phase I Storm Water NPDES program and both of these permits have been issued. With the promulgation of the Phase II Storm Water NPDES Permit regulations, there is an additional MS4 (a city) in South Carolina. SCDHEC has received an application for this MS4 and is presently reviewing the application to determine how to permit the MS4. Either an individual NPDES permit will be issued for this MS4 or the applicant will be made a co-permittee of the applicable county-s existing MS4

permit. These permits help insure water quality protection within the boundaries of the affected municipal governments.

E. Permit Compliance and Enforcement

Compliance tracking is a complex activity which involves various program elements and activities within the Bureau of Water. Regulatory functions require ongoing monitoring of all permits, inspection activities, and investigatory work. A computer based tracking system, the WPC Network, is maintained for the storage, retrieval, and management of permit compliance information for individual permits, including all effluent limits and compliance schedule data, facility operation and maintenance and pretreatment status. The availability of this information and ability to manage the data electronically enhances the Bureau information base providing greater program management capabilities.

All data necessary for issuing permits and tracking the compliance of those individual permits is maintained on the Bureau's network. Staff have access to information on permitting status, compliance monitoring, enforcement status, etc.

The WPC Network is designed to interface with EPA's Permit Compliance System (PCS). Updated compliance data is batched to PCS weekly. The Bureau is continuing its efforts to improve its utilization of the computer generated EPA Quarterly Noncompliance Report (QNCR).

Enforcement activities are performed in order to identify and appropriately respond to facilities in permit noncompliance and other entities found to be in violation of state statutes and regulations. Data accessibility through the Bureau's networking system, as well as organizational changes, have greatly enhanced enforcement staff capabilities for efficient case development and management. Improvements in entry of limits and data will further improve tracking and enforcement efficiency.

An emphasis on enforcement activity will continue in accordance with implementation of the Bureau's Watershed Water Quality Management Program. Appropriate and timely enforcement responses in conjunction with the activities of other program areas are expected to contribute significantly to accomplishment of this program's goals through the development of TMDLs.

Enforcement staff will become more involved in the referral of cases for criminal investigation and providing assistance to criminal investigators. A greater emphasis has been placed upon pursuing prosecution of violators under the criminal statutes and the support and assistance of enforcement staff in this process will continue to be invaluable; however, criminal and administrative investigations must be conducted separately.

It is recognized that aggressive enforcement activity encourages compliance. In this regard, enforcement staff are committed to secure for South Carolina the benefits from these activities to protect our water resources through implementation of appropriate enforcement strategies. The development and continued improvement of automated tools and methodology to accomplish this is considered to be vital to this function and will be given priority.

F. Nonpoint Source Program

Nonpoint Source (NPS) water pollution generally comes from diffuse, numerous sources. Runoff occurring after a rain event may transport sediment from plowed fields, construction sites, or logging operations, pesticides and fertilizers from farms and lawns, motor oil and grease deposited on roads and parking lots, or bacteria containing waste from agricultural animal facilities or malfunctioning septic systems. The rain moves the pollutants across the land to the nearest water body or storm drain where they may impact the water quality in creeks, rivers, lakes, estuaries and wetlands. Nonpoint source pollution may also impact groundwaters when it is allowed to seep or percolate into aquifers. The adverse effects of NPS pollution include physical destruction of aquatic habitat, fish die-offs, interference with or elimination of recreational uses of a water body (particularly lakes), closure of shellfish beds, reduced water supply or taste and odor problems in drinking water, potential human health problems due to bacteria and toxic chemicals in NPS runoff, and increased potential for flooding because water bodies become choked with sediment.

The *South Carolina Nonpoint Source Management Program, 1999 Update* outlines the state's strategic plan for addressing statewide water quality impairments attributable to nonpoint source pollution discharges. To accomplish this strategy, 17 long-term goals for reducing or preventing NPS pollution are enumerated. Throughout the document, five-year action strategies are described that lead to attainment of the long-term goals, and annual milestones leading to attainment of the action strategies are further described. The Program is two-pronged; focusing on reducing NPS impacts in priority watersheds, and implementing activities statewide in order to prevent NPS pollution. Components include both regulatory and voluntary approaches.

To facilitate success in achieving water quality improvements, South Carolina=s NPS program focuses federal Clean Water Act Section 319 funding and state resources on impaired 303(d) listed waterbodies in priority watersheds identified through the Unified Watershed Processes described in the South Carolina Watershed Restoration Action Strategy (WRAS). The state=s Coastal Nonpoint Pollution Control Program under federal Coastal Zone Management legislation is also implemented.

Nine categories of NPS pollution that impact South Carolina=s waters are identified and described: agriculture, forestry, urban areas, marinas and recreational boating, mining, hydrologic modification, wetlands disturbance, land disposal/groundwater impacts, and atmospheric deposition. Technology based controls, or management measures, are employed to address these categorical impacts. The Program describes specific management measures for each category as well as implementation schedules. South Carolina has the legal authority to implement all of the necessary management measures.

SCDHEC is responsible for Program implementation, but is dependent upon the cooperation of all levels of government, private sector stakeholders, and especially the citizens of the State in order to realize positive results. Many organizations have expertise that can be beneficial to the NPS pollution management program. For example, trade and environmental organizations have program delivery mechanisms that reach persons capable of implementing NPS controls, e.g., farmers, contractors, mine operators, and homeowners. These partnership roles are described in the program.

A system of evaluation/monitoring techniques is a necessary component of the NPS Management Program, in order to evaluate its progress and success. Evaluation will show whether the Program is attaining the state=s overall water quality vision, stated long-term goals, and five-year action strategies. In South Carolina, several monitoring and tracking efforts are described that address available information on improvements in water quality, implementation milestones, and available information on reductions in NPS pollution. Evaluation techniques include water quality monitoring, management measure implementation, and stakeholder feedback.

This *South Carolina NPS Management Program Update* fulfills the requirements of both Section 319 of the Clean Water Act Amendments of 1987, and Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. It comprehensively describes a framework for agency coordination and cooperation and serves to implement a strategy for employing effective management measures and programs to control NPS pollution statewide for the next five years.

It incorporates nine key elements that are iterated in Environmental Protection Agency NPS guidance. Through the use of a framework that addresses these key elements, South Carolina will continue to have an effective NPS program that is designed to achieve and maintain beneficial uses of water.

South Carolina receives funding in excess of $3 million annually for implementation of projects to reduce or eliminate NPS pollution through section 319 of the Clean Water Act. Some of these projects are statewide or regional in scope and include activities such as water quality monitoring, NPS education, and best management practice (BMP) compliance. Other projects are watershed based, aimed at remediating NPS related problems from the State=s 303(d) list. A relatively new focus for section 319 funding is the development and implementation of total maximum daily loads (TMDLs). Beginning in FY 2003, one-half of the state=s allocation will be used for this purpose.

G. Wasteload Allocations and Total Maximum Daily Loads

A total maximum daily load (TMDL) is the maximum load of a pollutant that can be assimilated by a waterbody without contravening water quality standards. Section 303(d) of the Clean Water Act requires that TMDLs be developed for waters that are determined to be impaired, that is, not meeting applicable water quality standards. A TMDL is made up of a wasteload allocation (WLA) which is the portion of the assimilative capacity allocated to point sources, a load allocation (LA) which is the portion of the assimilative capacity allocated to nonpoint sources, plus a margin of safety. A TMDL can be developed for an individual pollutant, such as bacteria, or for a category of pollutants, such as oxygen demanding substances. In addition to developing WLAs in conjunction with TMDLs for waters on the State's 303(d) list of impaired waters, SCDHEC also develops WLAs as part of the routine review required for new discharges or for permit reissuance for existing discharges.

Various techniques, ranging from simple mathematical models to complex computer based models, are used by SCDHEC to determine the ability of a waterbody to assimilate various pollutants. TMDLs and WLAs developed using these techniques allow use of the assimilative capacity of a waterbody while ensuring that a level of water quality to protect existing and classified uses is maintained. WLAs are now developed as part of the basin review process as well as in response to proposals for new and expanded projects throughout the State.

WLAs for oxygen demanding substances (carbonaceous and nitrogenous oxygen demand), ammonia toxicity and total residual chlorine are determined by the Water Quality Modeling Section. WLAs for metals, organic pollutants and most toxicants are determined by the individual permitting sections.

Wasteload allocations fall into one of two categories. In instances when the assimilative capacity of a waterbody exceeds the existing or proposed pollutant loading, the waterbody is said to be effluent limited and a TMDL is not required. Effluent limitations for discharges to such waters are determined by the minimum standards required for the type of discharge involved. In instances where the permitted loading is equal to or a proposed loading is greater than the assimilative capacity, the stream is said to be water quality limited. The limits on the discharges to such waters are determined by the water quality of the receiving stream, rather than the minimum standards. TMDLs are not required for water quality limited streams that meet applicable standards. In cases where the water body is meeting standards but a previously permitted or proposed loading would cause the waterbody to be impaired, the new wasteload allocation is a maximum allowable loading. In multiple discharge situations, the load must be divided or allocated among the discharges.

To date, TMDLs have been developed for fecal coliform bacteria, phosphorus, pH, and oxygen demanding substances for several waterbodies. Development of additional TMDLs is currently underway. Wasteload allocations have been developed for numerous waterbodies for ammonia and oxygen demanding substances. While not TMDLs, these WLAs in many cases constitute the maxim allowable loading to the waterbody. Wasteload allocations for metals and toxicants, which in many cases can be considered the maximum available loading to the stream, are now developed on a routine basis. WLAs for phosphorus have been developed for several streams including Eighteen Mile Creek, Reedy River and Catawba River, with efforts underway or planned for development of nutrient TMDLs for the Reedy and Catawba. Development of new TMDLs is expected to play an increasingly important part in the overall wasteload allocation process as SCDHEC continues implementation of the basin planning and permitting strategy with emphasis on restoring the State's impaired waters.

H. Special State Concerns and Recommendations

The Bureau of Water adopted an operational plan in 2001 to implement portions of SCDHEC's and Environmental Quality Control's strategic plans. Elements of the operational plan embrace the mission, values, and visions.

Bureau of Water Mission

The water people drink in South Carolina is safe, and that there is plenty of it. Water resources of South Carolina are of such quality that they are suitable for use by all citizens and that all surface waters are of a quality suitable to support and maintain aquatic flora and fauna.

SCDHEC Values	**SCDHEC Visions**
Customer service	Cultural competence
Teamwork	Excellence in government
Use of applied scientific knowledge	Local solutions

The operational plan presents eight broad goals and all activities to support these goals. The activities represent the daily activities performed by Bureau of Water staff as well as Bureau of Environmental Services staff.

Bureau of Water Goals

The eight goals of the Bureau of Water will ensure that our mission is accomplished while embracing SCDHEC values and visions.

The primary way to accomplish this is reflected in SCDHEC=s stated goals. Goal 1: Protect Surface and Groundwater Quality. Goal 2: Adequately Assess Water Quality allows us to track the progress of achieving the first goal. Goal 3: Reduce and Eliminate Water Pollution offers ways to improve upon the activities supporting Goal 1. Water quality protection includes protecting the habitat necessary for aquatic organisms, indicators of water quality. This is reflected in Goal 4: Protect and Restore Aquatic Habitat. Citizens of the State are the ultimate consumers requiring clean water. Safe, clean drinking water is essential for life and is accomplished through the activities in Goal 5: Provide Safe Drinking Water. Many Bureau of Water Programs provide protection of health and safety for activities undertaken in or on waters. Goal 6: Protect Public Health and Safety accomplishes this goal. It is important for citizens to understand their role in water quality protection as presented in Goal 7: Expand the Public=s Knowledge of Water Issues. Finally, if we implement Goal 8: Plan Effectively for Growth, water pollution impacts can be further minimized and the ability to achieve all other goals will be enhanced.

Each goal is supported by indicators, outcomes, outputs, and inputs. Indicators are statements of how we=ll measure achievement with the goals. Outcomes are measurable achievements and represent formal reporting requirements. Outputs are specific work products and are tangible. Inputs are the efforts or specific tasks that will be needed to obtain outputs. Each staff member=s job is reflected in an input. This will allow us to determine the human and monetary resources necessary to implement the plan.

Program funding continues to be a central concern and overall limiting factor to the development of new programs or enhancement of existing water quality programs. So far this fiscal year, we have taken nearly a 15% reduction in State funding and face the potential for up to 10% more. While additional Federal funding has helped offset the loss of State funds to some extent, maintenance of existing effort in still in jeopardy. SCDHEC's Bureau of Water continues implementation of a Watershed Water Quality Management Program which is designed to maximize the use of resources, equalize workloads on an annual basis, and develop strategies for water quality maintenance or improvement on a priority basis.

Since the implementation of our Watershed Water Quality Management Program during FY 92, we have reduced the backlog of expired permits and significantly reduced the review time for permit applications. Litigation regarding whole effluent toxicity limits on permits and a very complex TMDL have both contributed to an increase in the backlog of expired permits. We are working to resolve these issues to get the permits written. The Watershed Water Quality Management Program also has allowed us to better utilize water quality monitoring resources to evaluate water quality in the State as well as wasteload modeling resources for permit limits development.

Our current or future activities will be focused on implementing the following recommendations and strategies. They are presented according to the goal they will help us attain.

Goal 1: Protect Surface and Groundwater Quality

* SCDHEC will continue to develop protective water quality standards that will meet the goals of South Carolina and the Clean Water Act. The triennial review completed in June 2001 contains some of the most extensive amendments to this regulation. Changes included more stringent criteria for toxics to protect aquatic life and human health, new numeric standards for turbidity and nutrients, and limitations on the use of hydrographic controlled release permit limits.

* SCDHEC will continue an assertive process to evaluate and to properly classify SCDHEC waters, particularly shellfish harvesting waters. We have reclassified several ecologically important waters to Outstanding Resource Waters and have initiated a reclassification for waters supporting a tailwaters trout fishery.

* SCDHEC will continue its point source permitting policy of issuing water quality based NPDES permits.

Goal 2: Adequately Assess Water Quality

* Water quality monitoring efforts must be continually revised and expanded to address the additional potential impacts of increasing population and development. Recent revisions to the monitoring strategy include use of statistically selected stations for lakes and rivers. There is a need for increased analytical capabilities to measure the presence of chemicals at very low concentrations. A greater emphasis on biological integrity is also a recognized need. SCDHEC must continue to seek resources to develop and implement more extensive biological monitoring and assessment.

* While there is limited funding for maintenance of a lake water quality monitoring program to assess trends in water quality in South Carolina lakes, the adoption of new nutrient standards for lakes will assist in this effort.

Goal 3: Reduce and Eliminate Water Pollution

* Improving water quality of impaired waters continues to be a SCDHEC priority. SCDHEC must develop Total Maximum Daily Loads (TMDLs) for all waters listed on the 303(d) list of impaired waters. SCDHEC is using Federal Section 319 funds to assist with TMDL development. With the goal to improve as many waters as possible so that water quality standards are consistently met, we are using Section 319 funds to implement controls for water quality improvement in impaired waters.

* Regulations dealing with Phase II of the National Pollutant Discharge Elimination System (NPDES) storm water permit program have been finalized. To obtain compliance with the program, there must be an increase in SCDHEC inspectors and coordination between SCDHEC and the local governments that are responsible to SCDHEC for their programs.

Funding must be increased significantly if the program is to be successful.

* SCDHEC has adopted and is now updating regulations for agricultural facilities. While SCDHEC has an inspection program on agricultural facilities, more in-depth inspections will be necessary to ensure compliance with new State and Federal requirements. More resources must be sought to effectively implement this program.

* SCDHEC has updated its Nonpoint Source Management Plan to address changing USEPA guidance and has attained Enhanced Benefit Status. Implementation depends upon close cooperation between Federal, State and local entities. Resources must be obtained to move forward with this initiative.

Goal 4: Protect and Restore Aquatic Habitat

* SCDHEC will more aggressively integrate the Shellfish Sanitation Program into its ongoing efforts to maintain and enhance water quality by focusing corrective actions on impaired shellfish harvesting waters.

* SCDHEC will continue to protect wetlands as waters of the State through its water programs including 401 water quality certification, NPDES permitting, and State stormwater permitting. SCDHEC is using State permitting programs in conjunction with the SC Pollution Control Act to protect isolated wetlands since a Supreme Court decision removed them from regulatory jurisdiction of the Corps of Engineers.

Goal 5: Provide Safe Drinking Water

* Source Water Protection and Wellhead Protection Programs will receive priority to insure drinking water uses of surface and ground waters are given the highest levels of protection. SCDHEC completed delineation of all source water protection areas ahead of schedule and has a contractor identifying potential pollution sources in these areas.

Goal 6: Protect Public Health and Safety

* The fish tissue monitoring program was previously expanded, but recent State budget cuts have affected this program greatly. We have maintained the capability to monitor a limited number of fish samples for mercury.

* Ocean water quality monitoring with appropriate advisories to the public has been established but needs to expand. Plans are to implement a program in which SCDHEC will use rainfall levels to predict bacterial levels and issue advisories, reducing the amount of monitoring needed. Additional Federal funding under the BEACHES Act should help this program.

Goal 7: Expand the Public=s Knowledge of Water Issues

* SCDHEC has published three installments of a periodic report, *The Quality of the Environment in South Carolina*, to inform and educate the general public, State legislature,

and State congressional delegation as to the status of our progress to date and other important issues. This effort to increase the general awareness of the citizens of the State of the mission, programs, and achievements of SCDHEC and to help them better understand environmental issues should be expanded through other activities that facilitate interaction between citizens and SCDHEC representatives.

* The Bureau of Water has a stable program to provide education in connection with nonpoint source pollution and drinking water issues. We also have a well-established Water Watch program to work with citizens groups interested in water quality monitoring and a partnership program, Champions of the Environment, for youth.

* The Bureau of Water has developed an excellent Internet web page to facilitate information exchange and to provide public participation in the regulatory process. We continue to provide speakers to address issues of interest to the public and have participated in developing an education program for primary and secondary schools.

* In addition to public education on water quality issues, we also recognize the need to provide public forums for participation in water quality management planning and TMDL development.

* SCDHEC will expand and upgrade its computer and electronic capabilities, including implementation of the new STORET database system. We are also using a LIMS (Laboratory Information Management System) to input data from the lab into STORET. There are numerous areas where electronic management and processing of data and tracking systems would relieve valuable manpower for other activities and allow a more effective use of available resources.

Goal 8: Plan Effectively for Growth

* South Carolina and Georgia are cooperatively studying the upper Floridan aquifer to insure groundwater demands can be met.

* South Carolina and North Carolina share concerns for increased pollutant loadings into the Catawba River and are working on a plan to address future demands on the river.

* Currently the Waccamaw and Low Country regions of the State are designated capacity use areas for groundwater. We have evaluated data and will be proposing to designate the Trident region also.

SURFACE WATER ASSESSMENT

1. Surface Water Monitoring Program

A. Purpose and Design

In an effort to evaluate the State's water quality, SCDHEC operates a permanent Statewide ambient monitoring network of primary and secondary monitoring stations and flexible, rotating watershed monitoring stations.

The ambient monitoring network is directed toward determining current water quality status and long-term water quality trends and identifying locations in need of additional monitoring efforts. The ambient monitoring network, as a program, involves sampling a wide range of physical and chemical parameters and analyzing them for the presence or effects of contaminants and comparing them to criteria to determine use support.

B. Networks and Programs

SCDHEC Water Quality Monitoring Network is comprised of three station types: primary, secondary, and watershed stations. Primary stations are sampled on a monthly basis year round, and are located in high water-use areas or as background stations upstream of high water-use areas. The static primary station network is operated statewide, and receives the most extensive parameter coverage, thus making it best suited for detecting long term trends.

Secondary stations are sampled monthly from May through October, a period critical to aquatic life, characterized by high water temperatures and low flows. Secondary stations are located in areas where specific monitoring is warranted due to point source discharges, or areas with a history of water quality problems. Secondary station parameter coverage is less extensive and more flexible than primary or watershed station coverage. During a basin target year selected secondary stations may have parameter coverage and sampling frequency duplicating that of primary or watershed stations.

Watershed stations are sampled on a monthly basis, year round, during a basin's target year; additional watershed stations may be sampled monthly from May through October to augment the secondary station network. Watershed monitoring stations are added each year within a specific basin or basins for the Watershed Water Quality Assessments following the order of rotation of the Watershed Water Quality Management Program. Watershed stations are located to provide more complete and representative watershed coverage within the larger drainage basin, and to identify additional monitoring needs. The parameter coverage of watershed stations includes the same basic parameters as primary stations.

C. Laboratory Analytical Support

The Analytical Services Division provides laboratory services to the Bureaus of Water and Land and Waste Management. The analytical services offered include bacteriological, chemical, and physical analyses. The types of samples analyzed include water, wastewater, leachate, soil, sediment, chemical wastes, fish, and shellfish.

The laboratory organizational structure encompasses five sections in the Central laboratory and seven regional laboratories. The Central laboratory includes the following analytical sections: Sample Characterization/Automated Analysis/Data Management Section, Metals Analysis Section, GC/MS-HPLC Analysis Section, GC Analysis Section, and the Environmental Microbiology Section. The seven regional laboratories are located in Aiken, Beaufort, North Charleston, Florence, Greenville, Lancaster, and Myrtle Beach.

The regional laboratories, except for Beaufort and Myrtle Beach, initiate all stream and wastewater analysis and the Central laboratory provides support analyses, i.e., metal, nutrient, toxic extraction procedures, and organic analyses. The Beaufort and Myrtle Beach regional laboratories analyze microbiological samples only. The Central laboratory also acts as the regional laboratory for the Central Midlands District, performing the same functions as the other regional laboratories. Drinking water chemical analysis is essentially a Central laboratory program with support from the regional laboratories. All regional laboratories except Myrtle Beach perform microbiological analyses for the Drinking Water Program.

The Division Director and the Quality Assurance Officer coordinate the internal quality assurance program.

D. Quality Assurance

A quality assurance program is essential to produce valid data and to provide a means to systematically demonstrate its validity. It is the policy of Environmental Quality Control (EQC) that necessary quality assurance (QA) activities be conducted within the State of South Carolina to demonstrate that all environmental data generated, processed, or used will be scientifically valid, defensible, and of known and acceptable precision and accuracy. It is also the policy of EQC that all reported data will include documented precision and accuracy and be complete, representative, and comparable. The quality of all data generated shall meet or exceed all EQC and EPA program requirements.

The Deputy Commissioner for Environmental Quality Control has the overall responsibility for the development, implementation, and continued operation of EQC's QA Program. To insure that EQC's QA policy is uniformly applied to the generating and processing of all environmental data, a State Quality Assurance Management Office (SQAMO) has been established.

This office is responsible for the Environmental Quality Control Assurance Program. Environmentally-related measurement activities conducted by or for EQC shall be done only with the approval of the State Quality Assurance Management Office (SQAMO) after assuring that adequate quality assurance guidelines and procedures have been incorporated. This includes study-planning, sample collection, preservation and analysis, data handling, and use of physical, chemical, biological, and other data related to the effects, sources, transport and control of pollution, as well as personnel review and training.

To accomplish these goals the Water Quality Monitoring Section, Aquatic Biology Section, and Pollution Source Compliance Section have developed and instituted SQAMO approved field study procedures and documentation, data review, and routine EPA operating overview. These procedures are documented in SCDHEC's Environmental Investigations Standard Operating Procedures and

Quality Assurance Manual (SOP) (2001), Procedures Manual for Stream and Wastewater Facility Flow Measurement (1981), Standard Operating Procedures: Fish and Shellfish Collection for Tissue Analysis (SCDHEC, Draft Revision 0, December 1994), Standard Operating and Quality Control Procedures for Macroinvertebrate Sampling (SCDHEC, 1998), and Standard Operating and Quality Control Procedures for Phytoplankton and Chlorophyll a (SCDHEC, 2000). These documents describe in detail the field sampling procedures, meter calibration and maintenance procedures, sample chain-of-custody documentation, sample preservation, holding times and recommended sample containers specifications, data sheet examples, and data submission requirements.

At least twice yearly all field personnel are accompanied on sample collection activities by the appropriate program quality assurance officer for evaluation of adherence to standard operating procedures (SOP) for QA/QC. Approximately every other year the EPA conducts on-site routine overviews of SCDHEC's QA/QC procedures.

The Division Director and the Quality Assurance Officer coordinate the internal quality assurance program. The laboratory quality assurance program encompasses every aspect of the laboratory analysis from container preparation through the actual data release from the Analytical Services Division Laboratory to the Environmental Quality Control (EQC) Programs.

The Analytical Services Division has developed two quality control manuals which detail the day-to-day operation of the quality assurance program: (1) Procedures and Quality Control Manual for Chemistry Laboratories--Analytical Services Division; and (2) Laboratory Procedures Manual for Environmental Microbiology--Analytical Services Division. The elements of quality control addressed in the manuals include organization and sample chain of custody; personnel training; quality control of laboratory services, equipment, reagents, solvents, and glassware; methodology; and analytical performance control.

The overall laboratory quality assurance program which includes the previously discussed elements requires a minimum of 25% of allocated resources. The frequency for analysis of replicates and spike recovery samples is noted in the manuals and is in compliance with U.S. EPA guidelines. Performance samples are also analyzed as noted in the manuals. The Environmental Microbiology Laboratories perform replicate analyses, positive test controls, media control tests, equipment control tests, etc., as required by EPA Laboratory Certification and Evaluation guidelines. In addition, the Analytical Services Division and the seven regional laboratories participate in annual Water Supply and Water Pollution Performance Proficiency Testing Programs. All district personnel who collect samples that require field testing participate in either the yearly Water Supply or Water Pollution Proficiency Testing Program, whichever is appropriate.

The laboratory analyses are conducted according to the List of Approved Test Procedures in the Federal Register, Volume 49, No. 209, October 26, 1984, and in the Federal Register, Volume 59, No. 20, January 31, 1994. The Analytical Services Division quality control manuals include a section on methodology designed to reduce variations in applied techniques among the seven laboratories where methods permit analyst interpretation, and thus provide a more uniform approach which will increase the reproducibility of results reported from the laboratory system.

E. Data Storage, Management and Interpretation

Data for samples that are analyzed in the regional laboratories are reported on the appropriate data sheets and released by the sample custodian. These data sheets are sent to the Analytical Services Division in Columbia where they, along with data sheets generated in the Central Laboratory, are sent to the appropriate program areas. All stream and facility data is distributed by the Compliance Assurance Division to the appropriate program areas.

Routine ambient stream and sediment samples are collected by District personnel. Special study and biological samples are generally collected by Water Quality Monitoring Section or Aquatic Biology Section personnel. The physical and chemical data is sent to the Water Quality Monitoring Section through the Analytical Services Division. The data are reviewed by the Water Quality Monitoring Section and physical and chemical data are sent to the Information Services Section for data entry. The data are edited and then stored in EPA's STORET water quality database. Data sheets are kept on file in the Water Quality Monitoring Section.

After biological samples are collected, data sheets are kept on file in the Aquatic Biology Section until sample analysis is completed. Macroinvertebrate taxonomic and habitat assessment data are entered into a computerized in-house database. Data sheets describing biological data are kept on file in the Aquatic Biology Section.

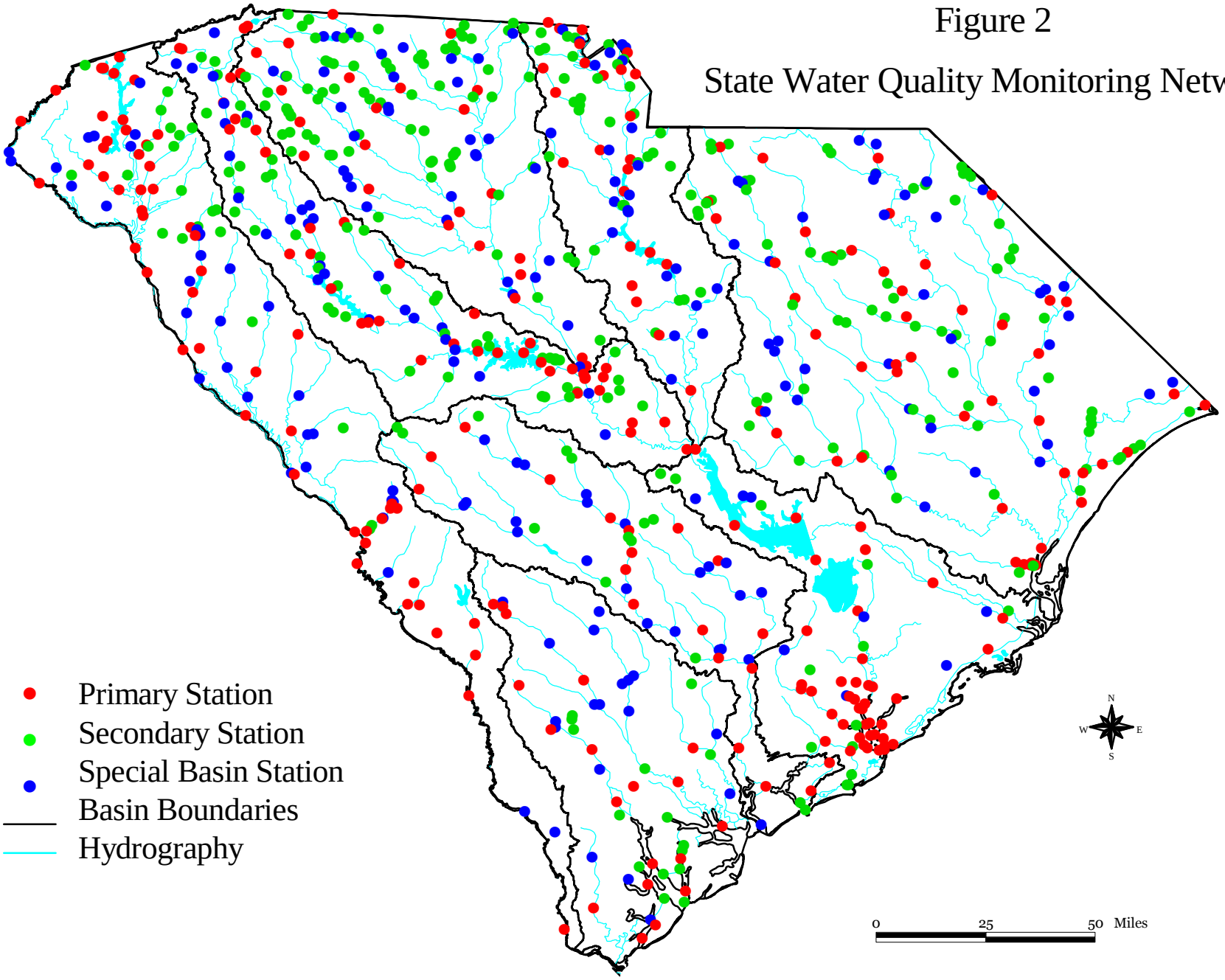
2. Assessment Methodology

In South Carolina, waterbodies are designated using the U.S. Natural Resources Conservation Service (NRCS, formerly the U.S. Soil Conservation Service) eleven-digit watersheds indicated on a U.S. Geological Survey (USGS) map based on the 1:100,000 scale Digital Line Graph base and associated Arc/Info coverage. Each eleven-digit NRCS watershed depicted on this map is designated as a unique waterbody. All data are tied to each individual, geographically defined waterbody. Three key elements which can be tracked for each waterbody are water quality status, causes of nonattainment (stressors), and possible sources of pollution. Water quality status is a measure of the extent to which designated uses are supported. Stressors are the types of pollution causing water quality problems, and sources are the types of point or nonpoint sources suspected to be responsible for the pollution.

Assessed waters are those waters directly monitored as part of SCDHEC ambient surface water monitoring network, during special Watershed Water Quality Assessment (WWQA) data collection activities, or quality assured data from other agencies. Data from 800 SCDHEC monitoring stations were assessed. These monitoring sites consisted of 254 primary stations, 187 WWQA stations, 292 secondary stations, 1 currently inactive station which had data for at least part of the assessment period, and 66 macroinvertebrate sites without long-term water chemistry data. Seventy-six of the water chemistry sites also had associated macroinvertebrate data which was also assessed. Data from an additional 30 sites sampled by the Santee-Cooper Public Service Authority were also assessed. Quality assured physical, chemical, and biological water quality data collected from 1996 through 2000 at each station were reviewed for the current assessment. Because of the data quality assurance and quality control process outcome, only total phosphorus data collected from 1996 through June 1998 were included in this assessment. Figure 2 shows the location of primary, secondary and watershed monitoring stations.

Figure 2

State Water Quality Monitoring Network



Stream mileage and lake area assessed was determined using SCDHEC's Geographical Information System (GIS) and modifications of USEPA's Reach File 3 (RF3) hydrographic coverage at a scale of 1:100,000. The RF3 database includes only those stream reaches and portions of lakes that are within the state of South Carolina's borders. For streams the process involved the use of a program which automatically traces hydrographic features upstream of a specified SCDHEC monitoring station. Then each automatic trace was evaluated individually, with reaches being added or deleted based on changes in hydrologic character or predominant adjacent land use or for reasons arising from an intimate knowledge of the area. The conditions at the monitoring station were used to represent the entire trace reach size. A monitoring site represented conditions of all mainstem reaches upstream of the site to the next monitoring site, to a major change in land use type (i.e., rural to urban, agriculture to forest, etc.), or to the headwaters of the stream as determined by best professional judgement. A monitoring site also represented mainstem reaches downstream of the site to the next major confluence. Portions of tributary streams were considered represented by mainstem data where predominant land use was consistent with the mainstem. Most assignments of which reaches are represented by each monitoring site were arrived at by consensus of two or more individuals with some knowledge of the area and reference to other existing maps indicating major land use types. The GIS then calculated the total length of stream, in miles, represented by each monitoring site.

Lake area represented by individual monitoring sites was determined by partitioning each lake into areas around individual monitoring locations where conditions of depth and shoreline development are similar or where relatively homogenous water quality might be expected. The GIS then calculated the surface area represented by each area.

Estuarine areas were delineated similarly to lakes, however the National Wetlands Inventory (NWI) digital files at a scale of 1:24,000 were used as the basemaps.

The maps of aquatic life use and recreational use support in Appendix 1 illustrate how SCDHEC has interfaced GIS with RF3 and NWI files in a basin such that classified use support can be geographically illustrated.

A. Determination of Attainment of Classified Uses

General Considerations

Physical, chemical and biological data were evaluated, as described below, to determine if water quality met the water quality criteria established to protect the State classified uses defined in S.C. Regulation 61-68, *Water Classifications and Standards*. Some waters may exhibit characteristics outside the appropriate criteria due to natural conditions. Such natural conditions do not constitute a violation of the water quality criteria. To determine the appropriate classified uses and water quality criteria for specific waterbodies and locations, refer to S.C. Regulation 61-69, *Classified Waters*, in conjunction with S.C. Regulation 61-68.

At the majority of SCDHEC's monitoring stations, water samples for analysis are collected as surface grab samples once per month, quarter, or year, depending on the parameter. Grab samples collected at a depth of 0.3 meters are considered to be a surface measurement. At most stations

sampled by boat, dissolved oxygen and temperature are sampled as a water column profile, with measurements being made at either a depth of 0.3 meters below the water surface and at one-meter intervals to the bottom or at 0.3 meters, bottom and mid-depth. At stations sampled from bridges, these parameters are measured only at a depth of 0.3 meters. For the purpose of assessment, only surface samples are used in standards comparisons and trend assessments. All water and sediment samples are collected and analyzed according to standard procedures (SCDHEC 1981a, 1987, 2001).

Results from water quality samples can be compared to state standards and USEPA criteria, with some restrictions due to time of collection and sampling frequency. For certain parameters, the monthly sampling frequency employed in the ambient monitoring network is insufficient for strict interpretation of the standards. The USEPA does not define the sampling method or frequency other than indicating that it should be "representative.@ The grab sample method is considered to be representative for the purpose of indicating excursions relative to criteria, within certain considerations. A single grab sample is more representative of a one-hour average than a four-day average, more representative of a one-day average than a one-month average, and so on; thus, when inferences are drawn from grab samples relative to criteria, sampling frequency and the intent of the criteria must be weighed. When the sampling method or frequency does not agree with the intent of the particular standard, any conclusion about water quality should be considered as only an indication of conditions, not as a proven circumstance. Regardless of the number of samples, no monitoring site will be listed as partially or not supporting for any pollutant based a single sample result because of the possibility of an anomalous event.

Macroinvertebrate community structure is analyzed routinely at selected stations as a means of detecting adverse biological impacts on the aquatic fauna of the state's waters due to water quality conditions which may not be readily detectable in the water column chemistry.

This statewide assessment is based on the last complete five years of available quality assured physical, chemical and biological water quality data (1996 - 2000). Because of the data quality assurance and quality control process outcome, only total phosphorus data collected from 1996 through June 1998 were included in this assessment.

Aquatic Life Use Support - One important goal of the Clean Water Act and the South Carolina Pollution Control Act and water quality standards is to maintain the quality of surface waters to provide for the survival and propagation of a balanced indigenous aquatic community of fauna and flora. The degree to which aquatic life is protected (Aquatic Life Use Support) is assessed by comparing important water quality characteristics and the concentrations of potentially toxic pollutants with numeric criteria.

Support of aquatic life uses is determined based on the percentage of numeric criteria excursions and, where data are available, the composition and functional integrity of the biological community. A number of waterbodies have been given waterbody-specific criteria for pH and dissolved oxygen, which reflect natural conditions. To determine the appropriate numeric criteria and classified uses for specific waterbodies and locations, please refer to S.C. Regulation 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters*.

For DO and pH, if 10 percent or less of the samples contravene the appropriate criterion, then the criterion is said to be fully supported. A percentage of criterion excursions between 11-25 is

considered partial support of the criterion, unless excursions are due to natural conditions. A percentage greater than 25 is considered to represent nonattainment of the criterion, unless excursions are due to natural conditions. The decision that criteria excursions are due to natural conditions is determined by consensus and/or the professional judgement of SCDHEC staff with specific local knowledge.

For toxicants (heavy metals, priority pollutants, chlorine, ammonia), for any individual pollutant, if the appropriate acute aquatic life criterion is exceeded more than once in five years, representing more than 10 percent of the samples collected, the criterion is not supported. If the acute aquatic life criterion is exceeded more than once, but in less than or equal to 10 percent of the samples, the criterion is partially supported.

The USEPA criteria to protect aquatic life for most toxicants are specified as a four-day average and a one-hour average, and have been adopted as state criteria. Because samples are collected as grab samples, and because if sampling frequency, comparisons to chronic toxicity criteria (four-day average concentration) are considered inappropriate; therefore, only the acute criterion (one-hour average) for the protection of aquatic life is used in the water quality assessment.

For heavy metals, the total recoverable metals criteria are adjusted to account for solids partitioning following the approach set forth in the Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria, October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington, DC 20460; and 40CFR ' 131.36(b)(1). Under this approach a default TSS value of 1 mg/L is used. Where the metals criteria are hardness based, a default value of 25 mg/L is used for waters where hardness is 25 mg/l or less.

For turbidity in all waters, and for waters with numeric total phosphorus, total nitrogen, and chlorophyll-a criteria, if the appropriate criterion is exceeded in more than 25 percent of the samples, the criterion is not supported. If the criterion is exceeded #25 percent of the samples, then the criterion is fully supported.

If the conclusion for any single parameter is that the criterion is not supported, then it is concluded that aquatic life uses are not supported. If the conclusion for at least one of the parameters is that the criterion is partially supported and no other parameter criterion is not supported, then it is concluded that aquatic life uses are partially supported. Regardless of the number of samples, no monitoring site will be listed as partially or not supporting for any pollutant based a single sample result because of the possibility of an anomalous event.

For aquatic life uses, the goal of the standards is the protection of a balanced indigenous aquatic community. Therefore, biological data is the ultimate deciding factor, regardless of chemical conditions. If biological data showed a healthy, balanced community, the use is considered supported even if chemical parameters do not meet the applicable criteria.

Macroinvertebrate Data Interpretation - Macroinvertebrate community assessment data are used to directly determine Aquatic Life Use Support and to support determinations based on water chemistry data. Macroinvertebrate community data may also be used to evaluate potential impacts from the presence of sediment contaminants. Aquatic and semi-aquatic macroinvertebrates are identified to

the lowest practical taxonomic level depending on the condition and maturity of specimens collected.

The EPT Index and the North Carolina Biotic Index (BI) are the main indices used in analyzing macroinvertebrate data. To a lesser extent Taxa Richness and sometimes total abundances may be used to help interpret data. The EPT Index or the Ephemeroptera (mayflies) - Plecoptera (stoneflies) - Trichoptera (caddisflies) Index is the total taxa richness of these three generally pollution-sensitive orders. EPT values are compared with least impacted regional sites. The biotic index for a sample is the average pollution tolerance of all organisms collected, based on assigned taxonomic tolerance values.

Taxa richness is the number of distinct taxa collected and is the simplest measure of diversity. High taxa richness is generally associated with high water quality. Increasing levels of pollution progressively eliminate the more sensitive taxa, resulting in lower taxa richness. Total abundance is the enumeration of all macroinvertebrates collected at a sampling location. When gross differences in abundance occur between stations, this metric may be considered as a potential indicator.

Recreational Use Support - The degree to which the swimmable goal of the Clean Water Act is attained (Recreational Use Support) is based on the frequency of fecal coliform bacteria excursions.

For fecal coliform bacteria, an excursion is an occurrence of a bacteria concentration greater than 400/100 ml for all Classes. Comparisons to the bacteria geometric mean criterion are not considered appropriate based on sampling frequency and the intent of the criterion.

If 10 percent or less of the samples are greater than 400/100 ml then recreational uses are said to be fully supported. A percentage of criteria excursions between 11-25 is considered partial support of recreational uses, and greater than 25% is considered to represent nonattainment of recreational uses.

Fish/Shellfish Consumption Use Support - Fish/shellfish consumption use support is determined by the occurrence of advisories or bans on consumption or harvesting for a waterbody. For the support of fish consumption uses, an advisory restricting fish consumption or conditionally approved or restricted shellfish harvesting status indicates partial use support, an advisory against eating any fish or prohibition of shellfish harvesting indicates nonattainment of uses.

Drinking Water Use Support - Nonattainment of drinking water use is indicated if the median concentration of the ambient surface water data for any pollutant exceeds the appropriate drinking water Maximum Contaminant Level (MCL), based on a minimum of three samples. Where MCLs do not exist, SCDHEC may use or develop other criteria such that pollutant concentrations or amounts do not interfere with drinking water use, actual or intended, as determined by SCDHEC.

Potential Sources - The identification of potential sources of nonattainment is based on suggestions from individuals with local knowledge, and professional judgement. The identified potential sources are not based on actual data, but range from particular activities in the immediate vicinity of the monitoring site to general activities within the watershed. The identification of a potential source does not necessarily mean it is responsible for criteria excursions, only that the activity could add

to the overall loading of the pollutant of concern. No regulatory action will be taken based solely on this identification. Specific source identification will be undertaken during TMDL development.

B. Additional Screening and Prioritization Tools

Although not used directly in making use support assessments, the following tools are useful in ranking and prioritizing waterbodies for implementation of corrective actions.

Long-Term Trend Assessment - As part of the watershed assessments, surface data from each station are analyzed for statistically significant long-term trends using a modification of Kendall's tau (Bauer *et al.* 1984, Hirsch *et al.* 1982, Smith *et al.* 1982, Smith *et al.* 1987), which is a nonparametric test removing seasonal effects. The basic methodology utilized is that of Smith *et al.* (1982). Stream flows are not available for most stations, and the parametric concentrations are not flow-corrected. Seasonal Kendall's tau analysis is used to test for the presence of a statistically significant trend of a parameter, either increasing or decreasing, usually over a twelve to fifteen year period. It indicates whether the concentration of a given parameter is exhibiting consistent change in one direction over the specified time period. A two sided test at $p=0.1$ is used to determine statistically significant trends, and the direction of trend. An estimate of the magnitude of any statistically significant trend is calculated as in Smith *et al.* (1982).

A rigorous evaluation for trends in time-series data usually includes a test for autocorrelation. The data are not tested for autocorrelation prior to the trend analysis. It is felt that autocorrelation would not seriously compromise a general characterization of water quality trends based on such a long series of deseasonalized monthly samples.

One of the advantages of the seasonal Kendall test is that values reported as being below detection limits (DL) are valid data points in this nonparametric procedure, since they are all considered to be tied at the DL value. When the DL changed during the period of interest, all values are considered to be tied at the highest DL occurring during that period as suggested by Hirsch et al. (1982). Since it is possible to measure concentrations equal to the value of the DL, values reported as less than DL are reduced by subtraction of a constant so that they remain tied with each other, but are less than the values equal to the DL. Since fecal coliform bacteria detection limits vary with sample dilution, there is no set DL; therefore, for values reported as less than some number, the value of the number is used.

Sediment Screening - Since there are no numeric criteria for sediment, to identify sediments with elevated metals concentrations, percentiles are constructed using five years of statewide sediment data (SCDHEC, 1998). Only values greater than the detection limit were used for chromium, copper, nickel, lead, and zinc. Because so few concentrations of cadmium and mercury are measured above the detection limit, all samples were pooled for these metals. A sediment metal concentration is considered to be high if it is in the top 10% of the pooled results, and very high if it is in the top 5%.

Any analytical result above detection limits is flagged for pesticides, PCBs, and other priority pollutants. Sites with noted high metals concentrations or the occurrence of other contaminants above detection limits are prioritized for the collection of biological data, or additional monitoring and investigation, to verify the true situation.

3. Rivers and Streams Water Quality Assessment

The U.S. Environmental Protection Agency has developed a system to determine estimates of total river miles and total lake acres for the states to use in reporting for 305(b) reports. The estimates are based on the Digital Line Graph (DLG) database and the River Reach File 3 (RF3), which are in turn based on the U.S. Geological Survey 1:100,000 scale hydrol ogic maps. The original DLG database was missing a significant number of South Carolina streams. Many of these missing features have been added by SCDHEC, with the cooperation and oversight of the USEPA. This revised system was utilized in this 305(b) report to estimate the total number of stream miles, as well as the sizes of the different use support categories, cause sizes, and source sizes for the Rivers and Streams summary statistics. Because of recent changes in the criteria in S.C. Regulation 61 -68 direct comparisons of these assessment results and past 305(b) reports is not prudent.

Based on the modified USEPA Reach File 3 hydrologic database, South Carolina has approximately 29,794 miles of freshwater rivers and streams within the borders of th e State. Although 15,373 miles were assessed using data collected at 632 SCDHEC water quality monitoring stations, the strategic location of these monitoring stations allows these data to provide a representative assessment of water quality for the entire state. Data collected at 6 additional sites by the Santee -Cooper Public Service Authority are also included in this assessment.

A. Summary Statistics

A summary of classified use support statewide, along with causes and so urces for partial or nonattainment, is presented below. In instances where no potential source of observed fecal coliform bacteria excursions was apparent, the source was listed as natural conditions, but because of the potential for human health concerns the use support determination was still listed as partial or nonattainment of recreational uses as the frequency of excursions dictated.

Table 6. Rivers and Streams Use Support Summary (Miles)

Use	Size Assessed	Size Fully Supported	Size Partially Supported	Size Not Supported	Percent Fully Supported
Aquatic Life	15,373.27	12,195.22	1,316.49	1,861.56	79%
Recreation	14,707.50	8,592.02	3,107.61	3,007.86	58%
Drinking Water Supply	15,373.27	15,371.55	0.00	1.72	>99%
Agriculture	15,373.27	15,373.27	0.00	0.00	100%

Table 7. Summary of Fully Supporting and Impaired Rivers and Streams (Not including Fish Consumption Use)

Degree of Use Support	Size (Miles)
Size Fully Supporting All Assessed Uses	7,332.21
Size Impaired for One or More Uses	8,041.05
Total Assessed	15,373.27

Table 8. Total Sizes of Rivers and Streams Impaired by Various Cause Categories (Miles)

Cause Category	Size of Waters by Contribution to Impairment
Metals	383.97
pH	373.20
Dissolved Oxygen	2,040.53
Turbidity	214.26
Fecal Coliform Bacteria	6,115.48
Macroinvertebrate Community Impacts Cause Unknown	466.14

Table 9. Total Sizes of Rivers and Streams Impaired by Various Source Categories* (Miles)

Potential Sources by Category	Size of Waters by Contribution to Impairment
Industrial Point Sources	118.46
Municipal Point Sources	563.64
Collection System Failures	268.06
Agriculture (Total)	1,239.83
Grazing Related Specifically	420.73
Intensive Animal Feeding Operations Specifically	233.92
Construction	83.32
Urban Runoff	2,238.23
Resource Extraction	23.48
Land Disposal	166.18
Hydromodification	35.55
Debris and Bottom Deposits	8.4
Natural Sources	362.87
Recreation and Tourism Activities (Golf Course)	4.06
Groundwater Loadings	10.43
Unknown Sources	4,716.39

*Potential Sources range from specific activities in the immediate vicinity of the monitoring site to general activities within the watershed, see Assessment Methodology.

The following table summarizes the use of macroinvertebrate data in the preparation of this report. Although macroinvertebrate data are available for other locations in South Carolina, no estimates of the mileage represented by these sites were available. The River Reach File 3 (RF3) does not contain attributes by which determination of which stream reaches are wadeable could be made, so the following table represents all stream miles in the State.

Table 10. Categories of Data Used in Aquatic Life Use Support (ALUS) Assessments for All Rivers and Streams

Degree of ALUS	Miles Assessed Based on Physical/ Chemical Data Only	Miles Assessed Based on Biological/ Habitat Data Only	Miles Assessed Based on Physical/Chemical and Biological/Habitat Data	Total Miles Assessed for ALUS
Fully Supporting	10,354.11	584.29	1,256.82	12,195.22
Partially Supporting	930.24	41.49	344.75	1,316.48
Not Supporting	1,781.66	39.98	39.91	1,861.55

4. Lakes Water Quality Assessment

A. Summary Statistics

Based on the modified USEPA River Reach File 3 (RF3), South Carolina has approximately 407,505 acres of lakes within its State boundaries. For lakes along the State boundary, the Reach File 3 database included only lake acres actually within the State of South Carolina. The original USGS DLG files used to develop the RF3 database were missing many lakes constructed in recent decades. Many of these missing lakes have been added by SCDHEC, with the cooperation and oversight of the USEPA. This revised system was utilized in this 305(b) report to estimate the total number of lake acres, as well as the sizes of the different use support categories, cause sizes, and source sizes for the Lakes summary statistics. Because of recent changes in the criteria in S.C. Regulation 61-68, direct comparisons of these assessment results and past 305(b) reports is unadvisable.

The assessment in the next four tables is based on data collected at 101 SCDHEC water quality monitoring stations and 24 sites sampled by the Santee-Cooper Public Service Authority (SCPSA), representing 308,838 acres. Because the sites sampled by SCPSA are in two major lakes with little SCDHEC monitoring, the addition of their data allows us to assess significantly more lake acres. A summary of classified use support statewide, along with causes and sources for partial or nonattainment, is presented below.

Table 11. Lake Use Support Summary (Acres)

Use	Size Assessed	Size Fully Supported	Size Partially Supported	Size Not Supported	Percent Fully Supported
Aquatic Life	308,838.52	257,903.67	11,429.57	39,505.28	84%
Recreation	308,838.52	305,109.11	3,713.74	15.67	99%
Drinking Water Supply	308,838.52	308,838.52	0.00	0.00	100%
Agriculture	308,838.52	308,838.52	0.00	0.00	100%

Table 12. Summary of Fully Supporting and Impaired Lakes (Not including Fish Consumption Use)

Degree of Use Support	Size (Acres)
Size Fully Supporting All Assessed Uses	257,614.22
Size Impaired for One or More Uses	51,224.3
Total Assessed	308,838.52

Table 13. Total Sizes of Lakes Impaired by Various Cause Categories (Acres)

Cause Category	Size of Waters by Contribution to Impairment
Metals	132.33
Nutrients	39,002.77
Chlorophyll *a*	1,072.08
pH	31,472.41
Dissolved Oxygen	354.32
Fecal Coliform Bacteria	3,729.41

Table 14. Total Sizes of Lakes Impaired by Various Source Categories* (Acres)

Potential Source by Category	Size of Waters by Contribution to Impairment
Industrial Point Source	14,534.09
Municipal Point Source	18,225.49
Collection System Failure	32.27
Agriculture	18,225.49
Urban Runoff	18,229.74
Land Disposal	32.27
Hydromodification	21.76
Internal Nutrient Cycling	2,020.41
Unknown Source	43,856.99

*Potential Sources range from specific activities in the immediate vicinity of the monitoring site to general activities within the watershed, see Assessment Methodology.

B. Section 314 Reporting

Note: Lake areas reported in this section were obtained from Inventory of Lakes in South Carolina (SCDNR 1991). Total lake area is included for border lakes.

Section 314(a) of the Clean Water Act of 1987 directs each State to prepare or establish: (1) an identification and classification according to trophic condition of publicly-owned freshwater lakes within such State; (2) procedures, processes, and methods to control sources of pollution of such lakes; (3) methods and procedures, in conjunction with appropriate Federal agencies, to restore the quality of such lakes; (4) a list and description of lakes for which uses are known to be impaired; and (5) an assessment of the status and trends of water quality in lakes. Further, States are required to submit a biennial assessment of lake trophic condition as part of their '305(b) report.

Background

Forty significant lakes were included in South Carolina's Clean Lakes Classification Survey of 1980-81. For the purposes of this report, significant lakes refers to those freshwater lakes with at least 40 acres surface area. These lakes were classified according to trophic state and ranked in order of priority for restoration. The 40 lakes were divided into major and minor classes, and ranked within each class. This survey was updated in FY 1986-87 for major lakes and some minor lakes. In FY 1989, the classification

survey was updated through a reassessment of all lakes. The information collected facilitated trend detection and was used in the FY 1990 '305(b) report.

SCDHEC conducted lake trophic condition assessments each year during FY 1991-2000. Monthly sampling is conducted each year in lakes throughout the state. Beginning in FY 1991, additional data collection for lake trophic condition assessments was coordinated with SCDHEC's Watershed Water Quality Assessments. Information on trophic status is updated for each significant lake at least every five years as part of the WWQA. In 2001, South Carolina adopted numeric nutrient criteria for lakes by ecoregion. Beginning FY 2002, trophic condition assessment was based upon the criteria for Total Phosphorus, Total Nitrogen and Chlorophyll *a*.

Trophic Status

Southeastern lakes tend to be more turbid and more nutrient-rich than northern lakes; therefore many South Carolina lakes can be classified Aeutrophic.@ The overall trophic status of significant South Carolina lakes is summarized in the following table. Trophic status was determined using a median total phosphorus concentration of 0.025 mg/l as the threshold of mesotrophy.

Table 15. Trophic Status of Significant South Carolina Lakes, 2002

	Number of Lakes	Acreage of Lakes
Total	59	479,413
Assessed	42	472,584
Oligotrophic/Mesotrophic	27	316,783
Eutrophic/Hypereutrophic	15	155,801
Unknown	17	6,829

Table 16. Condition of Significant South Carolina Lakes

Lake Sites Not Attaining Numeric Nutrient Criteria				
Station	Location Description--Blue Ridge	TP	TN	CHL-A
SV-358	LAKE YONAH, 50% BETWEEN CENTER OF SPILLWAY AND OPPOSITE SHORE	X		
Station	Location Description--Middle Atlantic Coastal Plain	TP	TN	CHL-A
ST-033	GOOSE CK RESERVOIR AT 2ND POWERLINES US OF BOAT RAMP			X
ST-032	GOOSE CREEK RESERVOIR 100 M US OF DAM	X		
Station	Location Description--Piedmont	TP	TN	CHL-A

Lake Sites Not Attaining Numeric Nutrient Criteria				
CW-016F	FISHING CK RES 2 MI BL CANE CREEK	X		
S-097	FISHING CRK RESERVOIR AT SC 72 3.1 MI SW CROSS HILL	X		
CW-057	FISHING CK RES 75 FT AB DAM NR GREAT FALLS	X		
CW-174	CEDAR CRK RESERVOIR AT UNIMP RD AB JCT WITH ROCKY CK	X		
CW-033	CEDAR CK RESERVOIR 100 M N OF DAM	X		
CW-175	CEDAR CRK RESERVOIR AT S-12-141 SE OF GREAT FALLS	X		
CW-207	LK WATEREE AT END OF S-20-291	X		
CW-208	LK WATEREE AT S-20-101 11 MI ENE WINNSBORO	X		X
CW-209	LK WATEREE AT SMALL ISLAND 2.3 MI N OF DAM	X		
SV-268	LAKE HARTWELL EIGHTEEN-MILE CRK ARM AT 2-04-1098	X		X
S-022	REEDY FORK OF LK GREENWOOD AT S-30-29	X		
S-131	LK GREENWOOD AT US 221 7.6 MI NNW 96	X		
S-308	LAKE GREENWOOD, REEDY RVR ARM, 150 YDS US RABON CK	X		
S-222	LAKE MURRAY, LITTLE SALUDA ARM AT SC 391	X		
S-223	BLACKS BR, LK MURRAY AT SC 391	X		
S-279	LK MURRAY AT MARKER 63	X		
S-309	LAKE MURRAY, BUSH RVR ARM, 4.6 KM US SC 391	X		
SV-331	LK SECESSION, 1 1/4 MI BELOW SC ROUTE 28	X		
S-311	BOYD MILL POND .6 KM W DAM	X		
Station	Location Description--Southeastern Plains	TP	TN	CHL-A
SC-014	LAKE MARION, HEADWATERS OF CHAPEL BRANCH CR.	X	X	X
SC-008	LAKE MARION AT SEABOARD RR TRESTLE AT LONESTAR	X		
ST-025	LK MARION AT OLD US 301/15 BRDG AT SANTEE	X		
SC-040	LAKE MARION AT CHANNEL MARKER 79	X		
CL-064	LAKE EDGAR BROWN IN FOREBAY NEAR DAM			X
Lake Sites Attaining Numeric Nutrient Criteria				
Station	Location Description--Blue Ridge	TP	TN	CHL-A
S-291	TABLE ROCK RESERVOIR AT WATER INTAKE			
S-292	NORTH SALUDA RESERVOIR AT WATER INTAKE			

Lake Sites Attaining Numeric Nutrient Criteria				
SV-334	LK JOCASSEE, MAIN BODY			
SV-335	LK JOCASSEE AT TOXAWAY, HORSE PASTURE, & LAUREL FORK CONFLUENCE			
SV-336	LK JOCASSEE AT CONFLUENCE OF THOMPSON AND WHITEWATER RVRS			
SV-337	LK JOCASSEE OUTSIDE COFFER DAM AT BAD CK PROJECT			
SV-359	TUGALOO LAKE, FOREBAY EQUIDISTANT FROM SPILLWAY AND SHORELINES			
Station	Location Description--Middle Atlantic Coastal Plain	TP	TN	CHL-A
CSTL-075	LAKE WARREN, BLACK CK ARM, AT S-25-41 5 MI SW OF HAMPTON			
CL-062	LAKE GEORGE WARREN IN FOREBAY NEAR DAM			
SC-027	LAKE MOULTRIE SW QUADRANT 1.2 KM E OF SHORELING			
SC-028	LAKE MOULTRIE NW QUADRANT OF LAKE			
SC-030	LAKE MOULTRIE AT CHANNEL MARKER 17			
SC-031	LAKE MOULTRIE NORTHERN QUADRANT OF LAKE			
SC-032	LAKE MOULTRIE SE QUADRANT OF LAKE			
SC-046	LAKE MOULTRIE IN SOUTHEASTERN QUADRANT OF LAKE			
Station	Location Description--Piedmont	TP	TN	CHL-A
B-099B	AT DAM LK LANIER IN GREENVILLE CO			
SV-321	BROADWAY LAKE FOREBAY, 50% BETWEEN SPILLWAY AND OPPOSITE LAND			
SV-319	BROADWAY LAKE, BROADWAY CK ARM UPSTREAM OF PUBLIC ACCESS			
SV-258	BROADWAY LAKE, NEALS CK ARM 50% BETWEEN BANKS AT GOLF COURSE			
CL-023	CHESTER STATE PARK LAKE 100 M EAST OF SPILLWAY			
CL-039	LITTLE RIVER ARM OF CLARKS HILL RESERVOIR			
SV-294	CLARKS HILL RESERVOIR AT DAM AT US 221 SW CLARKS HILL			
SV-291	CLARKS HILL RESERVOIR AT US 378 7 MI SW MCCORMICK			
CL-040	CLARKS HILL RESERVOIR HEADWATERS (SAVANNAH RVR)			
CL-041	CLARKS HILL RESERVOIR IN FOREBAY NEAR DAM			
B-735	DUNCAN CREEK RESERVOIR 6B IN FOREBAY NEAR DAM			
B-110	ELIZABETH LAKE AT SPILLWAY ON US 21			
B-347	LAKE BLALOCK IN FOREBAY NEAR DAM			

Lake Sites Attaining Numeric Nutrient Criteria				
B-339	LAKE BOWEN IN FOREBAY NEAR DAM			
B-340	LAKE BOWEN NEAR HEADWATERS, 0.4 KM W OF S-42-37			
B-343	LAKE CHEROKEE IN FOREBAY NEAR DAM			
B-348	LAKE COOLEY IN FOREBAY NEAR DAM			
CL-033	LAKE CRAIG 45 M NORTHWEST OF DAM			
B-341	LAKE CUNNINGHAM IN FOREBAY NEAR DAM			
S-303	LAKE GREENWOOD 200 FT US OF DAM			
S-024	LAKE GREENWOOD, HEADWATERS, JUST US S-30-33			
S-307	LAKE GREENWOOD, RABON CK ARM, .8 KM N RD S-30-307			
SV-360	LAKE ISSAQUEENA, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
B-344	LAKE JOHN D. LONG IN FOREBAY NEAR DAM			
CL-035	LAKE JOHNSON AT SPILLWAY AT S-42-359			
CL-021	LAKE OLIPHANT, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
S-798	LAKE OOLENOY AT DRAIN NEAR SPILLWAY AT SC 11			
S-296	LAKE RABON 300 FT US OF DAM			
S-313	LAKE RABON, N RABON CK ARM, 2.5 MI US DAM			
S-312	LAKE RABON, S RABON CK ARM, JUST DS S-30-312			
CL-100	LAKE ROBINSON, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
SV-100	LAKE RUSSELL AT SC 181 6.5 MI SW STARR			
SV-098	LAKE RUSSELL AT SC 72 3.1 MI SW CALHOUN FALLS			
SV-357	LAKE RUSSELL, ROCKY RVR ARM BETWEEN MARKERS 48 & 49, DS FELKEL			
B-342	LAKE THICKETTY IN FOREBAY NEAR DAM			
CW-197	LAKE WYLIE AB MILL CK ARM AT END OF S-46-557			
CW-230	LAKE WYLIE AT DAM, UNDER POWERLINES			
CW-198	LAKE WYLIE OUTSIDE MOUTH OF CROWDERS CK ARM			
CW-245	LAKE WYLIE, CROWDERS CK ARM AT FIRST POWERLINES US OF MAIN POOL			
B-737	LAKE YORK IN KINGS MOUNTAIN STATE PARK			
SV-236	LK HARTWELL AT S-37-184 6.5 MI SSE OF SENECA			

Lake Sites Attaining Numeric Nutrient Criteria				
SV-106	MARTIN CK ARM OF LAKE HARTWELL AT S-37-65 N OF CLEMSON			
SV-107	LK HARTWELL TWELVE MI CK ARM AT SC 133			
SV-340	LK HARTWELL, MAIN BODY AT USACE WQ BUOY BTWN MRKRS 11 & 12			
SV-288	LK HARTWELL, SENECA RVR ARM AT USACE BUOY BTWN MRKRS S-28A & S-29			
SV-339	LK HARTWELL, SENECA RVR ARM AT USACE BUOY BTWN S-14 AND S-15			
SV-200	TUGALOO RVR ARM OF LAKE HARTWELL AT US 123			
SV-338	LK KEOWEE ABOVE SC ROUTE 130 AND DAM			
SV-311	LK KEOWEE AT SC 188 - CANE CK ARM 3.5 MI NW SENECA			
SV-312	LK KEOWEE AT SC 188 - CROOKED CK ARM 4.5 MI N SENECA			
S-212	MACEDONIA LANDING LK MURRAY AT END OF S-36-26 MACEDONIA			
S-213	LAKE MURRAY AT S-36-15			
S-310	LAKE MURRAY, SALUDA RVR ARM, US BUSH RVR, 3.8 KM US SC 391			
S-280	LK MURRAY AT MARKER 102			
S-274	LK MURRAY AT MARKER 143			
S-211	HOLLANDS LANDING LK MURRAY OFF S-36-26 AT END OF S-36-3			
S-204	LK MURRAY AT DAM AT SPILLWAY (MARKER 1)			
S-273	LK MURRAY AT MARKER 166			
SV-332	LK SECESSION APPROX 400 YDS ABOVE DAM			
CW-200	LK WYLIE AT SC 274 9 MI NE OF YORK			
CW-201	LK WYLIE N LAKEWOODS S/D AT EBENEZER ACCESS			
CW-027	LK WYLIE, CROWDERS CK ARM AT SC 49 AND SC 274			
B-099A	ON # 1 INLET LK LANIER IN GREENVILLE CO			
B-346	PARR RESERVOIR 4.8 KM N OF DAM, UPSTREAM MONTICELLO RESERVOIR			
B-327	MONTICELLO LK-LOWER IMPOUNDMENT BETWEEN LARGE ISLANDS			
B-328	MONTICELLO LK-UPPER IMPOUNDMENT AT BUOY IN MIDDLE OF LAKE			
B-345	PARR RESERVOIR IN FOREBAY NEAR DAM			
S-314	SALUDA LAKE, .5 MI US OF LANDING			
S-250	SALUDA RVR AT FARRS BRDG ON SC 183 7 MI NE EASLEY			
B-113	SPARTANBURG RESERVOIR #1 ON S-42-213 NE OF INMAN			

Lake Sites Attaining Numeric Nutrient Criteria				
Station	Location Description--Southeastern Plains	TP	TN	CHL-A
CL-078	ADAMS MILLPOND, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
CL-088	LAKE JUNIPER, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
SV-686	FLAT ROCK POND IN FOREBAY NEAR DAM			
C-068	FOREST LAKE AT DAM			
SV-722	GRANITEVILLE POND #2 IN FOREBAY NEAR DAM			
CL-077	LAKE ASHWOOD, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
SC-044	LAKE MARION 0.5 KM NE OF STUMP HOLE LANDING			
SC-036	LAKE MARION 0.6KM S OF MOUTH OF TAW CAW CR			
SC-012	LAKE MARION 1.0KM SW MOUTH OF JACKS CR EMBAYMENT			
SC-005	LAKE MARION 1.5 KM NW SEABOARD TRESTLE AT RIMINI			
SC-039	LAKE MARION 2.0KM SE OF RIMINI TRESTLE			
SC-041	LAKE MARION 3.2KM N OF CHANNEL MARKER 79			
SC-035	LAKE MARION AT MOUTH OF WYBOO CR			
SC-016	LAKE MARION AT SERVICE CHANNEL MARKER 69			
SC-038	LAKE MARION AT THE MOUTH OF HALFWAY SWAMP CR			
SC-017	LAKE MARION MID-STREAM TAW CAW CR 1.0 KM GOAT IS			
SC-010	LAKE MARION OLD RV CHANNEL AT CHANNEL MARKER 150			
SC-022	LAKE MARION OLD RV CHANNEL AT CHANNEL MARKER 44			
SC-019	LAKE MARION POTATO CREEK FLOODED EMBAYMENT			
ST-024	LK MARION AT END OF S-14-64 AT CAMP BOB COOPER			
SC-021	LAKE MARION, 1.5 NE OF ROCK'S POND CAMPGROUND			
SC-023	LAKE MARION, WYBOO CR FLOODED EMBAYMENT			
CL-086	LAKE WALLACE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES			
CL-069	LANGLEY POND IN FOREBAY NEAR DAM			
PD-327	LK ROBINSON AT S-13-346 5 MI E MCBEE			
PD-081	PRESTWOOD LK AT US 15			
PD-268	SONOVISTA CLUB HARTSVILLE OFF DOCK OF PRESTWOOD LK			
CL-067	VAUCLUSE POND IN FOREBAY NEAR DAM			
C-048	WINDSOR LK SPILLWAY ON WINSDOR LK BLVD			

Control Methods

NPDES permits and nonpoint source control programs, which were previously described in the Municipal and Industrial permitting sections, are designed to protect lake water quality. South Carolina's water classifications and criteria are applicable to lakes.

Restoration Efforts

Plans to restore and/or protect lake quality are integrated with the watershed water quality management approach and other watershed pollution control plans. Table 17 contains information regarding the general restoration techniques that have recently been applied in South Carolina. There are other recognized restoration techniques.

Table 17. Lake Rehabilitation Techniques

Rehabilitation Technique	Number of Lakes Where Technique Has Been Used	Acres of Lakes Where Technique Has Been Used
In-Lake Treatments		
Sediment Removal/Dredging	1	300
Aquatic Macrophyte Harvesting	1	600
Application of Aquatic Plant Herbicides	6	2308
Hypolimnetic Aeration	2	38,050
Biological Controls	7	173,956
Watershed Treatments		
Sediment Traps/Detention Basins	1	300
Integrated Pest Management Practices Applied	1	1,600
Animal Waste Management Practices	1	51,000
Unspecified Type of Best Management Practice Installed	1	1,600
Oxygen Injection System in Upstream Lake	1	70,000
Other Lake Protection/Restoration Controls		
Public Information/Education Program/Activities	11	266,017
Point Source Controls	6	85,462

Acid Effects on Lakes

SCDHEC assessed 59 lakes in South Carolina for acidity, totaling 479,413 acres. Acidic conditions, for the purposes of this report, existed in any lake for which pH was less than the appropriate State standard in more than 10% of samples. Ten lakes, Lake Ashwood (75 acres) in Lee County, Lake Wallace (416 acres) in Marlboro County, Lake Warren (600 acres) in Hampton County, Adams Mill Pond (160 acres) in Kershaw County, Lake Juniper (260 acres) in Chesterfield County, Lake Windsor (100 acres) in Richland County, and Flat Creek Pond (80 acres), Graniteville Pond #2 (60 acres), Langley Pond (250 acres), and Vaucluse Pond (125 acres) all in Aiken County were found to experience acidic conditions. The watersheds of these lakes contain swamp drainage; therefore it is very likely that the acidity observed in these clear blackwater lakes is natural.

State water quality criteria specify, with few exceptions, a pH of at least 6.0 SU to protect classified and existing uses. EPA's Eastern Lake Survey reported high acid neutralizing capacity in Southern Blue Ridge region lakes, including those in northwestern South Carolina.

Toxic Effects on Lakes

As part of the State's long-term trend monitoring, 53 lakes totaling 477,522 acres are monitored for metals and/or ammonia. In the Summary Statistics for this section, Table 13 lists causes for partial or non-support of lake classified uses, Table 14 lists potential sources of partial or non-support and Tables 23 lists the total size affected by toxicants. The section on Public Health: Aquatic Life Impacts contains a discussion of fish consumption advisories issued in South Carolina.

Trends in Lake Trophic Condition

Due to the transition from Legacy STORET to Modernized STORET and data incompatibility with in-house trend analysis software, trend analysis for nutrient concentrations could not be conducted for this report.

5. Estuary and Coastal Assessment

A GIS coverage of the National Wetlands Inventory maps was utilized in this 305(b) report for estimating total square miles of estuary. South Carolina has approximately 401 square miles of estuaries based on the GIS coverage of the NWI maps. These estuaries were assessed using water quality data collected at 79 SCDHEC monitoring stations representing 221 square miles. The strategic location of these monitoring stations allows the determination of water quality for these waters to provide a representative picture of the overall water quality of South Carolina's estuarine systems.

A. Summary Statistics

A summary of classified use support statewide, along with causes and sources for partial or nonattainment, is presented below. In instances where no potential source of observed fecal coliform bacteria excursions was apparent, the source was listed as natural conditions, but because of the potential for human health concerns the use support determination was still listed as partial or nonattainment of recreational uses as the frequency of excursions dictated.

Table 18. Estuaries Use Support Summary (Square Miles)

Use	Size Assessed	Size Fully Supported	Size Partially Supported	Size Not Supported	Percent Fully Supported
Aquatic Life	221.11	179.90	17.67	23.54	81%
Recreation	221.11	206.39	7.57	7.14	93%
Shellfish Harvesting*	892.25	587.99	186.34	117.92	66%

*Shellfish Harvesting area includes intertidal habitats. Aquatic Life and Recreational area includes only open water areas.

Table 19. Summary of Fully Supporting and Impaired Estuaries (Not including Fish/Shellfish Consumption Use)

Degree of Use Support	Size (Square Miles)
Size Fully Supporting All Assessed Uses	171.42
Size Impaired for One or More Uses	49.69
Total Assessed	221.11

Table 20. Total Sizes of Estuaries Impaired by Various Cause Categories (Square Miles)

Cause Category	Size of Waters by Contribution to Impairment
Metals	4.08
pH	1.87
Turbidity	7.05
Dissolved Oxygen	36.50
Fecal Coliform Bacteria	14.71

Table 21. Total Sizes of Estuaries Impaired by Various Source Categories* (Square Miles)

Potential Sources by Category	Size of Waters by Contribution to Impairment
Industrial Point Sources	13.92
Municipal Point Sources	0.54
Collection System Failures	0.06
Intensive Animal Feeding Operations	0.14
Urban Runoff	4.63
Land Disposal	1.56
Habitat Modification	0.06
Natural Sources	16.57
Unknown Sources	13.96

*Potential Sources range from specific activities in the immediate vicinity of the monitoring site to general activities within the watershed, see Assessment Methodology.

6. Wetlands Assessment

A. Summary Statistics

Table 22. Extent of Wetlands, by Type

Wetland Type	Historical Extent in Acreage	1980's Reported Acreage	1994 Reported Acreage	Most Recent Acreage
Saturated Bottomland Forest	6,414,000	4,659,000	1,804,884	1,804,884
Nonforested Wetlands/Marsh			485,314	485,314

SCDHEC and S.C. Department of Natural Resources (SCDNR) have derived land use/land cover data from SPOT satellite imagery from December 1988 to March 1990. This data provides the best statistics to date for wetlands statewide, but are only for two major wetland types. SCDHEC and SCDNR are working together to provide a more detailed land use/land cover map for South Carolina using Landsat Thematic Mapper satellite imagery to identify seven classes of wetlands which include: low marsh, high marsh, fresh marsh, deciduous wetland forest, coniferous wetland forest,

bottomland hardwoods and scrub/shrub. This approach was determined to be the easiest way to attain statewide wetlands data for use in a GIS since the more detailed National Wetlands Inventory mapping is not complete for the state.

B. Extent of Wetlands Resources

To date, South Carolina has not conducted an assessment of wetland acreage changes over time. The Water Quality Certification, Standards, and Wetlands Programs Section has developed a computer tracking system into which all Section 10 and Section 404/401 projects are entered. This tracking system includes information on project location (latitude/longitude, basin, and watershed unit), purpose, types of impacts, acreage of wetland and non-wetland impacts, mitigation requirements and location (latitude/longitude, basin, and watershed unit) and remediation requirements. Information regarding projects from the years of 1983 to the present has been entered into this tracking system and is currently being verified. Once this data has been verified, statistics on the location and types of wetland impacts in South Carolina will be available. Currently, maps of compensatory mitigation sites (1990 to present) are being digitized and entered into GIS for future analyses.

C. Integrity of Wetlands Resources

There is no specific legislation authorizing a statewide wetlands protection program. The primary mechanisms for wetlands protection in the state are federal and state regulatory programs for the discharge of dredged or fill material into waters of the state and for activities in the critical areas of the coastal zone.

Section 404 Permit Program - Section 404 of the Clean Water Act requires a permit for the discharge of dredged or fill material into navigable waters, including wetlands, throughout the United States. Certain activities, such as normal agriculture, silviculture and ranching activities, are exempt from such permit requirements. The United States Army Corps of Engineers (ACE) administers the Section 404 permitting program, but, the EPA exercises final authority. The Agency can prohibit the use of a disposal area if the discharge will have an adverse impact on municipal water supplies, shellfish beds, fishing areas, wildlife, or recreational areas. No permit can be issued without a Section 401 Certification from SCDHEC's Division of Water Quality, and in coastal areas, a determination of consistency with the Coastal Zone Management Program (CZM) from SCDHEC's Office of Ocean and Coastal Resource Management (OCRM) is required. Other state and federal natural resource agencies, such as DNR, U. S. Fish and Wildlife Service, and National Marine Fisheries Service, provide input to decisions of the federal permitting agency and the state certifying agencies on proposed activities.

Section 404 permit authority can be delegated to states but South Carolina has elected not to assume that authority. In 1986, SCDHEC completed a study to determine the feasibility of assuming the Section 404 program. The study concluded that although SCDHEC had the legal authority and the technical expertise, it was not advisable to assume that authority because of the limited area of the jurisdiction involved. Perhaps more importantly, there would be no new funding from EPA to support assumption.

Section 401 Water Quality Certification - Section 401 of the Clean Water Act requires any applicant for a federal permit or license involved in an activity that may result in a discharge to navigable waters to receive certification from the state that the discharge will not cause violations of the state's water quality standards. Consequently, 401 Certification is required for all activities requiring a Section 404 permit from the ACE. This mechanism provides a State position on wetlands alterations.

The Division of Water Quality evaluated 605 projects which required a 401 Water Quality Certification in FYs 2000 through 2002. Approximately 23% of these projects involved impacts to wetlands. SCDHEC routinely requires compensation for wetland impacts at greater than a one to one basis. This compensation may be in the form of preservation, lineation, enhancement, or restoration and may not strictly meet the State and Federal Ano net loss@ goals.

SCDHEC administers certification programs using as guidance the South Carolina Pollution Control Act. S. C. Regulation 61-101, *Water Quality Certification*, guides the administration and technical review for the 401 Certification Program which determines if the standards of S. C. Regulation 61-68 will be met.

The S. C. Pollution Control Act provides authority for regulation of wetlands since it defines waters of the State as:

"lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial limits of the State and all other bodies of surface or underground water, natural or artificial, public or private, inland or coastal, fresh or salt, which are wholly or partially within or bordering the State or within its jurisdiction."

This definition does not specifically list wetlands, but wetlands are included through the generic use of the word "marshes" as well as within the broad inclusion of the phrase "all other bodies of surface or underground water." Therefore, all water pollution control programs administered by SCDHEC apply to activities in wetlands.

During review of applications for 401 Certification, SCDHEC, with authority from S.C. Regulation 61-101, evaluates whether or not there are feasible alternatives to the activity that reduce adverse consequences on water quality and classified water uses, if the activity is water dependent, and the intended purpose of the activity. Certification is denied if the activity will adversely affect existing or designated uses. Certification is granted if water quality standards, which includes protection of existing uses, will not be violated. The federal permit cannot be issued if certification is denied.

Water Quality Certification, Nationwide Permits (NWP) - SCDHEC sent a Notice of Proposed Decision for the 2002 NWPs on February 28, 2002 to the ACE. SCDHEC proposed to deny NWPs: 15, 16, 17, 21, 34, and 35. In regard to NWP 17, SCDHEC currently reviews all applications for FERC licenses. The following NWPs were proposed for issuance with conditions: 3, 7, 12, 13, 14, 18, 19, 20, 22, 23, 27, 29, 30, 31, 32, 33, and 36 through 44. The most shared condition states that proposed impacts will not exceed 0.10 ac or 50 linear ft. of special aquatic sites including wetlands, or if exceeded a mitigation plan will be required; and, depending on the NWP some allowed impacts are capped at 0.25 ac or 100 linear ft. of stream. In March of 2000, the ACE proposed to replace NWP 26 with several Aactivity specific@ NWPs and NWP 26 was placed on reserve. To take advantage of

a NWP permit, the applicant must submit a wetlands delineation and, in some cases, a pre-construction notification to the ACE.

Wetlands losses can cause significant adverse, but avoidable, cumulative environmental impacts. Wetlands losses may lead to increased costs to the public for flood control and drinking water treatment. Moreover, wetlands are especially important in providing storm water filtration to maintain surface and ground water quality. Protection of wetlands is imperative if South Carolina is to achieve the goals of the Clean Water Act to restore and maintain the chemical, physical, and biological integrity of its waters.

D. Development of Water Quality Standards for Wetlands

S.C. Regulation 61-68 provides that waters not classified by name assume the classification of the waterbody to which they are adjacent. Wetlands contiguous to a stream or lake assume the classification of the waterbody to which they are contiguous. The standards allow variation from specific numeric standards if those variations are due to natural conditions. SCDHEC is continuing to evaluate the development of water quality classifications and standards specifically applicable to wetlands.

With funding from the EPA, SCDHEC developed classifications and standards for wetlands. The intent was that the system would augment the State=s existing water quality classifications and standards to ensure greater protection of the State's wetlands through Clean Water Act programs.

Before proceeding with regulation development for the proposed classifications and standards for wetlands, there is the need to gain general agreement regarding wetlands protection policy and mechanisms in the State. Consensus-building among Federal, State, and local regulators with developers, farmers, forestry industry, and environmental groups would ensure acceptance of a clearly defined South Carolina wetlands protection policy. In 1993, SCDHEC received additional funding from EPA to further determine wetlands protection mechanisms and encourage consensus-building through education.

E. Additional Protection Activities

SCDHEC also uses antidegradation rules in S.C. Regulation 61-68 to evaluate applications for Water Quality Certification. The basic tenet of antidegradation is:

"existing uses and the level of water quality necessary to protect existing uses in all segments of a water body must be maintained"

Strict application of this water quality standard is impossible if there is to be any fill in wetlands. Therefore, the federal government determined that some fill in wetlands may be allowed pursuant to Section 404 of the Clean Water Act. S.C. Regulation 61-68 provided for this by adding a provision that states,

ADischarge of fill into waters of the State is not allowed unless the activity is consistent with Department regulations and will result in enhancement of classified uses with no significant degradation to the aquatic ecosystem or water quality.@

Fill may only be allowed if it does not cause or contribute to significant degradation of the aquatic environment which can be determined by whether or not the activity will cause adverse effects on:

1. Human health or welfare;

2. Life stages of aquatic life or wildlife dependent upon the aquatic ecosystem;

3. Ecosystem diversity, productivity, and stability;

4. Recreational, aesthetic, and economic values.

7. Public Health - Aquatic Life Concerns

A. Sizes of Water Affected by Toxicants

Toxic pollutants in South Carolina's surface waters were assessed for this report through the evaluation of data collected statewide at SCDHEC monitoring stations. Monthly ammonia data from 587 SCDHEC monitoring sites and quarterly metals data from 550 SCDHEC monitoring sites statewide were evaluated for this assessment. Monthly ammonia data from 30 additional sites collected by the Santee-Cooper Public Service Authority are also included in this assessment.

SCDHEC also annually collects sediment samples for toxics analyses at approximately 191 monitoring sites. There are no State standards for sediment.

Table 23. Total Size Affected by Toxicants

Waterbody Type	Size Monitored for Toxicants	Size with Elevated Levels of Toxicants
Rivers (miles)	13,009.77	383.97
Lakes (acres)	304,293.15	132.33
Estuaries (square miles)	187.44	4.08

B. Public Health: Aquatic Life Impacts

Pollution Caused Fish Kills/Abnormalities

During 2000 there were 75 investigations of fish kills reported to SCDHEC and in 2001, 96 investigations. Dissolved oxygen depletion, weather conditions, and other natural causes accounted for approximately 54 % of all fish kills in 2000 and 73% in 2001. In approximately 11% of the fish

kills reported, the cause could not be determined. Approximately 16% of the fish kills investigated in 2001 were from unnatural causes. Unnatural causes ranged from fish being caught and dumped back into lakes and streams to runoff of pesticides. One fish kill of an estimation of 1000 fish occurred in Peeples Creek in Gaffney as a result of a 30% aqueous ammonia spill. Two minor kills of <1000 fish occurred in 2001 as a result of sewage overflow. Four fish kill investigations in 2001 showed evidence of pesticide or herbicide spraying as the cause.

Most investigations were conducted a day or more after the initial occurrence of the fish kill. Late reporting of fish kills to SCDHEC investigators hinders accurate determination of the cause of the fish kills.

The *Pfiesteria* program continues to be an important program in South Carolina with the coastal regional offices maintaining trained personnel to investigate *Pfiesteria* related incidents. For the 2000 FY, no fish kills could be linked directly to *Pfiesteria*. In the 2001 FY, one kill may have been linked when the presence of *Pfiesteria shumwayae* and *P. cryptoperidiniopsis* were discovered in waters around Hilton Head, South Carolina in March 2001 after the kill was reported. *Pfiesteria piscicida*, the only known form to kill fish, has not been detected in South Carolina waters.

There are no waters in the State that routinely experience fish kills or fish abnormalities due to toxics. When fish kills do occur that can be attributed to other than natural causes, enforcement action is taken. The action usually takes the form of an administrative order and includes penalties commensurate with the violation. Schedules for corrective actions are included in the order along with appropriate assessment of monetary damage of the fish killed. As of May 31, 2001, SCDHEC required that its Field Manual for Investigation of Fish Kills be used by all of its staff.

Fish Consumption Advisories

SCDHEC uses a risk-based approach to evaluate contaminant concentrations in fish tissue and to issue consumption advisories in affected waterbodies. This approach contrasts the average daily exposure dose to the reference dose (RfD). Using these relationships, fish tissue data are interpreted by determining the consumption rates that would not be likely to pose a health threat to adult males and nonpregnant adult females. Because an acceptable RfD for developmental neurotoxicity has not been developed and because scientific studies suggest that exposure before birth may have adverse effects the health of infants, pregnant women, infants, and children are advised to avoid consumption of fish from any waterbody where an advisory has been issued.

Fish consumption advisories are updated annually in March. The following tables list the most current information SCDHEC has issued to the public. For background information and the most current advisories please visit the Bureau of Water homepage at http://www.scdhec.net/eqc/admin/html/fishadv.html or call SCDHEC's Division of Health Hazard Evaluation toll-free at (888) 849-7241.

Table 24. Mercury Advisories for Rivers and Streams

Waterbody	Location	Kinds of Fish	Consumption Advice
Ashepoo River	From Walterboro to U.S. Hwy. 17	Bluegill Redear Sunfish Redbreast Sunfish	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week
Black Creek	Entire Creek - Florence County	Bluegill Redbreast Sunfish Redear Sunfish	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
Black River	Entire River	Bluegill Redear Sunfish Redbreast Sunfish Warmouth Black Crappie Blue Catfish	1 meal a week
		Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY
Chessie Creek	Colleton County	Redear Sunfish	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week
Clarks Creek	Williamsburg County	All Species	1 meal a month
Combahee River	County Road 756 to U.S. Hwy. 17	Redear Sunfish Redbreast Sunfish	No Restrictions
		Bowfin (Mudfish)	1 meal a week
		Largemouth Bass	1 meal a month
Congaree River	From U.S. Hwy. 601 to the Santee River	Catfish Redear Sunfish Bluegill	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week
Cooper River	Lake Moultrie Dam to Bushy Park	Redear Sunfish Bluegill Largemouth Bass Black Crappie Chain Pickerel Warmouth	No Restrictions
		Bowfin (Mudfish)	1 meal a week
	Downstream of Bushy Park	Red Drum Seat Trout Southern Flounder	No Restrictions

Waterbody	Location	Kinds of Fish	Consumption Advice
East Fork Cooper River	Quinby Creek to the Cooper River	Redear Sunfish Bluegill Warmouth	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week
Coosawhatchie River	Jasper County	Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY
		All Other Fish	1 meal a week
Durham Creek	Entire Creek - Berkeley County	Bluegill Redear Sunfish Redbreast Sunfish Blue Catfish	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week
Edisto River	From U.S. Hwy. 78 to Willtown Bluff (Ace Basin)	Bluegill Channel Catfish Redear Sunfish Redbreast Sunfish Black Crappie	1 meal a week
		Largemouth Bass Chain Pickerel	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
North Fork Edisto River	Orangeburg County	Redear Sunfish Redbreast Sunfish	1 meal a week
		Largemouth Bass Warmouth Chain Pickerel	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
South Fork Edisto River	From Aiken State Park to Claude-s Boat Ramp - Bamberg County	Redear Sunfish Redbreast Sunfish Chain Pickerel	1 meal a week
		Largemouth Bass	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
Horseshoe Creek	Colleton County	Bowfin (Mudfish)	DO NOT EAT ANY
Intracoastal Waterway	Horry County	Bluegill Redear Sunfish Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
Lumber River	From NC/SC State Line to the Little Pee Dee River	Bluegill Redear Sunfish	1 meal a week
		Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY

Waterbody	Location	Kinds of Fish	Consumption Advice
Lynches River	From U.S. Hwy. 15 to the Great Pee Dee River	Redear Sunfish Redbreast Sunfish	1 meal a week
		Largemouth Bass	1 meal a month
		Bowfin (Mudfish) smaller than 19 inches	1 meal a week
		Bowfin (Mudfish) larger than 19 inches	DO NOT EAT ANY
Mingo Creek	Entire Creek - Georgetown County	Redear Sunfish	No Restrictions
		Largemouth Bass	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
New River	Jasper County to Cook Landing	Redear Sunfish Bluegill	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	DO NOT EAT ANY
Great Pee Dee River	Entire River in SC	Redear Sunfish Bluegill Black Crappie Blue Catfish Channel Catfish	No Restrictions
	From Cheraw to I-95	Largemouth Bass Bowfin (Mudfish)	1 meal a week
	From I-95 to Winyah Bay	Largemouth Bass Bowfin (Mudfish)	1 meal a month
Little Pee Dee River	From NC/SC State Line to the Great Pee Dee River	Warmouth	1 meal a month
		Flathead Catfish Largemouth Bass Bowfin (Mudfish) Chain Pickerel	DO NOT EAT ANY
		All Other Fish	1 meal a week
Pocotaligo River	From Sumter to the Black River (Entire River)	Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY
		All Other Fish	1 meal a week
Salkehatchie River	From U.S. Hwy. 301 to SR 63	Largemouth Bass Bowfin (Mudfish)	1 meal a week
Little Salkehatchie River	Entire River	Redbreast Sunfish	1 meal a week
		Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY

Waterbody	Location	Kinds of Fish	Consumption Advice
Saluda River	Upstream of Lake Greenwood	Redear Sunfish Bluegill White Bass Black Crappie	No Restrictions
	Downstream of Lake Greenwood to S.C. Hwy. 395	Largemouth Bass Bowfin (Mudfish)	1 meal a week
Sampit River	Georgetown County	Largemouth Bass Pumpkinseed Sunfish Bluegill Mullet	No Restrictions
		Bowfin (Mudfish)	1 meal a week
Santee River	From Lake Marion to the South Santee River	Bluegill Redear Sunfish Redbreast Sunfish Striped Mullet Black Crappie Blue Catfish Channel Catfish	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
North Santee River	From the Santee River to U.S. Hwy. 17/701 Bridge	Bluegill Blue Catfish Striped Mullet	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
South Santee River	From the Santee River to U.S. Hwy. 17/701 Bridge	Largemouth Bass Blue Catfish	1 meal a week
		Bowfin (Mudfish)	DO NOT EAT ANY
Santee River	From Lake Marion to the South Santee River	Bluegill Redear Sunfish Redbreast Sunfish Striped Mullet Black Crappie Blue Catfish Channel Catfish	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
North Santee River	From the Santee River to U.S. Hwy. 17/701 Bridge	Bluegill Blue Catfish Striped Mullet	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month

Waterbody	Location	Kinds of Fish	Consumption Advice
South Santee River	From the Santee River to U.S. Hwy. 17/701 Bridge	Largemouth Bass Blue Catfish	1 meal a week
		Bowfin (Mudfish)	DO NOT EAT ANY
Savannah River Some of the data for the Savannah River was provided courtesy of the Georgia Department of Natural Resources. Some fish also contain cesium-137 and strontium-90.	From Lake J. Strom Thurmond to Stevens Creek	All Kinds of Fish	No Restrictions
	From Stevens Creek in Edgefield County to SC Hwy. 119 in Jasper County	Channel Catfish Redbreast Sunfish Redear Sunfish Bluegill Black Crappie Warmouth Yellow Perch Chain Pickerel	No Restrictions
		Largemouth Bass Spotted Sucker	1 meal a week
		Bowfin (Mudfish)	1 meal a month
	From SC Hwy. 119 in Jasper County to U.S. Hwy. 17	Bluegill Redbreast Sunfish Redear Sunfish Channel Catfish White Catfish Black Crappie	1 meal a week
		Largemouth Bass Bowfin (Mudfish)	1 meal a month
	Downstream of U.S. Hwy. 17	Red Drum	No Restrictions
		Largemouth Bass Channel Catfish White Catfish	1 meal a week
Waccamaw River	From the NC/SC State Line to the Intracoastal Waterway	Redear Sunfish Bluegill Warmouth	1 meal a week
		Chain Pickerel	1 meal a month
		Largemouth Bass Bowfin (Mudfish)	DO NOT EAT ANY
Wadboo Creek	Berkeley County	Redear Sunfish Chain Pickerel	No Restrictions
		Largemouth Bass	1 meal a week
		Bowfin (Mudfish)	1 meal a month
Wambaw Creek	Charleston County	Redear Sunfish Catfish Black Crappie	No Restrictions
		Largemouth Bass Bowfin (Mudfish)	1 meal a week

Waterbody	Location	Kinds of Fish	Consumption Advice
Wateree River	Downstream of Lake Wateree to U.S. Hwy. 1	Redear Sunfish Bluegill Channel Catfish Blue Catfish Largemouth Bass Striped Bass	No Restrictions
		Bowfin (Mudfish)	1 meal a month
	U.S. Hwy. 1 to the Congaree River	Redear Sunfish Bluegill Blue Catfish Channel Catfish Striped Bass White Perch Largemouth Bass	No Restrictions
		Bowfin (Mudfish)	1 meal a month

Table 25. Mercury Advisories for Lakes and Reservoirs

Waterbody	Kinds of Fish	Consumption Advice
Back River Reservoir	Redear Sunfish Chain Pickerel Bluegill	No Restrictions
	Largemouth Bass Bowfin (Mudfish)	1 meal a week
Cary-s Lake	Largemouth Bass	1 meal a week
Flat Rock Pond	Channel Catfish	No Restrictions
	Largemouth Bass Warmouth	1 meal a week
Lake Jocassee	Rainbow Trout Brown Trout Smallmouth Bass Redbreast Sunfish Bluegill	No Restrictions
	Largemouth Bass Spotted Bass	1 meal a week
Lake Marion	Blue Catfish Channel Catfish Redear Sunfish Redbreast Sunfish Black Crappie Bluegill Warmouth Yellow Perch Chain Pickerel	No Restrictions
	Largemouth Bass	1 meal a week
	Bowfin (Mudfish) smaller than 20 inches	1 meal a week
	Bowfin (Mudfish) larger than 20 inches	DO NOT EAT ANY
Diversion Canal	Redear Sunfish Redbreast Sunfish Largemouth Bass	No Restrictions
	Bowfin (Mudfish)	1 meal a week
Rediversion Canal	Largemouth Bass Bowfin (Mudfish)	1 meal a week
Lake Moultrie	Redear Sunfish Redbreast Sunfish Bluegill Black Crappie Largemouth Bass Chain Pickerel Channel Catfish	No Restrictions
	Bowfin (Mudfish)	1 meal a week

Waterbody	Kinds of Fish	Consumption Advice
Lake H.B. Robinson (Chesterfield County)	Redear Sunfish Bluegill	No Restrictions
	Largemouth Bass	1 meal a month
	Bowfin (Mudfish)	DO NOT EAT ANY
Lake Russell	Redear Sunfish Bluegill Black Crappie Chain Pickerel	No Restrictions
	Largemouth Bass	1 meal a week
Lake Tugaloo ++Data provided courtesy of the Georgia Department of Natural Resources.	Bluegill Redbreast Sunfish White Catfish	No Restrictions
	Largemouth Bass	1 meal a month
Lake Yonah	Bluegill	No Restrictions
	Largemouth Bass	1 meal a week
Langley Pond	Largemouth Bass	DO NOT EAT ANY
	All Other Fish	1 meal a week
Louthers Lake	Bluegill	No Restrictions
	Largemouth Bass Bowfin (Mudfish)	1 meal a week
Sesquicentennial State Park	Redear Sunfish Bluegill	No Restrictions
	Largemouth Bass	1 meal a month
Vaucluse Pond	Redear Sunfish Bluegill	No Restrictions
	Largemouth Bass	1 meal a week
Windsor Lake	Largemouth Bass	1 meal a week

Table 26. **Lake Hartwell PCB Advisory South Carolina and Georgia**

Location	Kinds of Fish	Consumption Advice
Seneca River Arm of Lake Hartwell	ALL SPECIES	DO NOT EAT ANY
12 Mile Creek	ALL SPECIES	DO NOT EAT ANY
Lake Hartwell (Remaining waters of Lake Hartwell)	Hybrid Bass/Striped Bass	DO NOT EAT ANY
	Largemouth Bass Channel Catfish	1 meal a month

Table 27. **Red Bank Creek Organotin Advisory**

Location	Kinds of Fish	Consumption Advice
From S.C. Hwy. 6 to Durham Pond (including Crystal Lake)	All Kinds of Fish	1 meal a week

Table 28. **South Carolina, North Carolina, Georgia, and Florida Atlantic King Mackerel Mercury Advisory**

Affected Population	+ <33 Inches	+33 - 39 Inches	+ > 39 Inches
Women of childbearing age and Children 12 and under	No Restrictions	1 meal a month	DO NOT EAT ANY
Other Adults	No Restrictions	4 meals a month	DO NOT EAT ANY

+ Length refers to fork-length (from nose to where the tail forks).

Shellfish Restrictions/Closures

The goal of SCDHEC's Shellfish Sanitation Program (SSP) is to ensure that molluscan shellfish and areas from which they are harvested meet the health and environmental quality standards provided by federal and state regulations, laws, and guidelines. Additionally, SCDHEC promotes and encourages coastal quality management programs consistent with protected uses established through the S.C. Regulation 61-68, *Water Classifications and Standards*. SSP management policy is primarily determined by S. C. Regulation 61-47, *Shellfish*, as well as other State legislation. The National Shellfish Sanitation Program (NSSP) Model Ordinance, developed through participation in the Interstate Shellfish Sanitation Conference (ISSC) and endorsed by all shellfish producing states and the United States Food and Drug Administration (USFDA), is used as primary guidance for shellfish regulation development.

Sanitary surveys are conducted by SCDHEC to assess the quality of the coastal waters. These surveys result in shellfish harvesting classifications described as follows:

Approved: Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. Approved area classification shall be determined upon a sanitary survey which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty-three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Guidelines.

Conditionally Approved: Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department, prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted: Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved area classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Guidelines.

Prohibited: Growing areas shall be classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

As a matter of SCDHEC policy, prohibited areas are established adjacent to all point source and/or marinas as a precaution to protect public health. These prohibited areas are not necessarily an indication of lesser water quality or that standards are not being met; rather, they are areas which have the potential for variable water quality.

South Carolina currently has approximately 571,040 estuarine/riverine surface acres classified for the harvest of shellfish. Of this total, Approved accounts for 65.9% of total acreage, Conditionally Approved - 2.4%, Restricted -18.5%, and Prohibited - 13.2

Table 29. Summary of Shellfish Harvesting Status in South Carolina Shellfish Waters

Harvesting Status	Acreage	Percent
Approved	376309	65.9%
Conditionally Approved	13827	2.4%
Restricted	105435	18.5%
Prohibited	75469	13.2%
Total Assessed	571040	

Restrictions on Bathing Areas

There are currently sixty (60) Natural Public Swimming Areas permitted for operation by SCDHEC. These areas are tested for Fecal Coliform (FC) bacteria prior to obtaining a yearly operating permit and are tested twice per month during the swimming season. The following swimming areas exceeded acceptable fecal coliform levels as specified in S.C. Regulation 61-50, *Natural Public Swimming Area*. Areas exceeding the specified parameters are closed until satisfactory sample results are collected. These are all fresh waters. Salt water areas are addressed in the Ocean Water Quality Monitoring section.

One outbreak was linked to a natural swimming area in mid-July 2001. Five confirmed cases of E. Coli infection were linked to the natural swimming area at Table Rock State Park. SCDHEC worked in conjunction with the local County Health Department, the Bureau of Disease Control, and State Park employees to determine the cause of the outbreak. SCDHEC conducted extensive sampling of the swimming area to determine levels of fecal coliform bacteria. SCDHEC also inspected the park sewer system as a possible source of contamination. The source of contamination could not be determined.

Table 30. Areas of Bathing Restrictions

Natural Area	Frequency
Awanita Valley Christian	one time 07/26/01
YMCA - Camp Greenville	one time 07/13/00
Pleasant Ridge County Park	recurrent 07/05/00, 08/30/00, 05/23/01
Table Rock State Park	recurrent 07/26/01, 08/01/01
McCall RA Camp	one time 07/26/01
Richardsons Lake	recurrent 06/06/00, 06/19/00
Gem Lakes	recurrent 05/22/01, 07/03/01, 08/20/01
The Outing Club	one time 09/05/00
Camp Coker	one time 05/17/00
Somerset Point	one time 07/23/01

Ocean Water Quality Monitoring

Ocean water quality is currently monitored at a total of 110 sample sites along the South Carolina coast. Sampling frequency is based on season, with monthly sampling in the winter months (November-March) and bi-monthly sampling in the summer months (April-October). Sampling is also conducted following significant rainfall. Advisories are issued based on EPA guidelines of 104 Enterococci per 100 ml or greater from two consecutive samples taken within 24 hours. Advisories

are issued following a single sampling event if the Enterococcus level exceeds 500 colonies per 100 ml. Advisories are retracted when Enterococcus counts return to below 104 colonies per 100 ml.

Table 31. Areas Affected by Beach Advisories

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
Town of Atlantic Beach	0.27	1	July/2000
Town of Atlantic Beach	0.27	1	July/2000
Town of Atlantic Beach	0.27	1	September/2000
Town of Atlantic Beach	0.27	9	September/2000
Town of Atlantic Beach	0.27	2	July/2001
Town of Atlantic Beach	0.27	2	July/2001
Town of Atlantic Beach	0.27	3	September/2001
Arcadia Beach	2.4	1	July/2000
Arcadia Beach	2.4	1	July/2000
Arcadia Beach	0.076	1	July/2000
Arcadia Beach	2	1	July/2000
Arcadia Beach	0.076	2	August/2000
Arcadia Beach	2.25	1	September/2000
Arcadia Beach	0.689	1	September/2000
Arcadia Beach	2.4	9	September/2000
Arcadia Beach	0.418	2	September/2000
Arcadia Beach	0.076	1	May/2001
Arcadia Beach Arcadia Beach	0.076 0.076	1 1	July/2001 August/2001
Arcadia Beach	0.152	1	Aug-Sept/2001
Arcadia Beach	2.4	3	September/2001
Arcadia Beach	0.076	3	September/2001
Town of Briarcliffe Acres	1.54	1	July/2000
Town of Briarcliffe Acres	1.54	1	July/2000
Town of Briarcliffe Acres	1.54	1	July/2000

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
Town of Briarcliffe Acres	0.076	2	September/2000
Town of Briarcliffe Acres	1.54	9	September/2000
Town of Briarcliffe Acres	1.54	2	July/2001
Town of Briarcliffe Acres	1.54	2	July/2001
Town of Briarcliffe Acres	1.54	3	September/2001
Town of Surfside Beach	2.14	1	July/2000
Town of Surfside Beach	2.14	1	July/2000
Town of Surfside Beach	2.14	1	July/2000
Town of Surfside Beach	0.076	2	August/2000
Town of Surfside Beach	0.076	1	August/2000
Town of Surfside Beach	0.152	1	September/2000
Town of Surfside Beach	0.201	1	September/2000
Town of Surfside Beach	0.076	1	September/2000
Town of Surfside Beach	2.14	9	September/2000
Town of Surfside Beach	0.076	2	May/2001
Town of Surfside Beach	0.266	1	May/2001
Town of Surfside Beach	0.076	3	May-June/2001
Town of Surfside Beach	0.076	1	June/2001
Town of Surfside Beach	2.14	3	September/2001
Town of Surfside Beach	0.36	1	September/2001
Springmaid Beach	0.335	1	July/2000
Springmaid Beach	0.335	1	July/2000
Springmaid Beach	0.335	9	September/2000
Springmaid Beach	0.335	3	September/2001
City of Myrtle Beach	9.68	1	July/2000
City of Myrtle Beach	6.00	1	July/2000
City of Myrtle Beach	3.977	1	July/2000

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
City of Myrtle Beach	9.68	1	July/2000
City of Myrtle Beach	0.076	1	July/2000
City of Myrtle Beach	0.152	1	July-August/2000
City of Myrtle Beach	6.48	1	August/2000
City of Myrtle Beach	2.15	1	August/2000
City of Myrtle Beach	0.076	1	August/2000
City of Myrtle Beach	0.076	4	August/2000
City of Myrtle Beach	0.152	1	August/2000
City of Myrtle Beach	0.152	1	September/2000
City of Myrtle Beach	9.68	2	September/2000
City of Myrtle Beach	4.98	1	September/2000
City of Myrtle Beach	7.4	1	September/2000
City of Myrtle Beach	0.076	1	September/2000
City of Myrtle Beach	9.68	9	September/2000
City of Myrtle Beach	0.152	2	September/2000
City of Myrtle Beach	0.152	1	May/2001
City of Myrtle Beach	8.39	2	May-June/2001
City of Myrtle Beach	0.076	3	June/2001
City of Myrtle Beach	0.152	1	June/2001
City of Myrtle Beach	0.228	1	June/2001
City of Myrtle Beach	0.076	1	June/2001
City of Myrtle Beach	0.076	1	July/2001
City of Myrtle Beach	0.228	1	July/2001
City of Myrtle Beach	0.228	1	July/2001
City of Myrtle Beach	0.152	1	July/2001
City of Myrtle Beach	0.076	2	July/2001
City of Myrtle Beach	0.076	1	July/2001

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
City of Myrtle Beach	0.304	1	July/2001
City of Myrtle Beach	0.076	1	July/2001
City of Myrtle Beach	0.076	2	July/2001
City of Myrtle Beach	0.152	1	July/2001
City of Myrtle Beach	0.076	1	July/2001
City of Myrtle Beach	0.076	2	August/2001
City of Myrtle Beach	0.076	1	August/2001
City of Myrtle Beach	0.228	2	Aug-Sept/2001 September/2001- /er
City of Myrtle Beach	0.152	1	September/2001
City of Myrtle Beach	0.076	1	September/2001
City of Myrtle Beach	9.68	2	September/2001
City of Myrtle Beach	9.604	1	September/2001
City of Myrtle Beach	0.304	1	September/2001
City of Myrtle Beach	0.076	1	September/2001
City of Myrtle Beach	0.304	1	September/2001
City of Myrtle Beach	0.152	1	September/2001
City of Myrtle Beach	0.304	3	September/2001
City of Myrtle Beach	0.076	4	September/2001
Horry County Campground Beaches	3.3	1	July/2000
Horry County Campground Beaches	3.3	1	July/2000
Horry County Campground Beaches	0.076	1	July/2000
Horry County Campground Beaches	3.02	1	July/2000
Horry County Campground Beaches	3.3	1	July/2000
Horry County Campground Beaches	0.076	1	July/2000
Horry County Campground Beaches	3.30	1	August/2000
Horry County Campground Beaches	0.076	1	August/2000
Horry County Campground Beaches	0.076	4	August/2000

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
Horry County Campground Beaches	0.076	7	August/2000
Horry County Campground Beaches	3.1	2	September/2000
Horry County Campground Beaches	3.3	2	September/2000
Horry County Campground Beaches	3.3	9	September/2000
Horry County Campground Beaches	0.076	2	September/2000
Horry County Campground Beaches	0.076	2	May-June/2001
Horry County Campground Beaches	0.076	10	July/2001
Horry County Campground Beaches	0.189	1	July/2001
Horry County Campground Beaches	0.152	1	July/2001
Horry County Campground Beaches	0.076	1	July/2001
Horry County Campground Beaches	0.076	2	Aug-Sept/2001
Horry County Campground Beaches	0.076	2	August/2001
Horry County Campground Beaches	3.30	3	September/2001
Horry County Garden City Beach	5.11	1	July/2000
Horry County Garden City Beach	5.11	1	July/2000
Horry County Garden City Beach	5.11	9	September/2000
Horry County Garden City Beach	0.433	1	May/2001
Horry County Garden City Beach	5.11	2	September/2001
City of North Myrtle Beach	3.03	1	July/2000
City of North Myrtle Beach	2.37	1	July/2000
City of North Myrtle Beach	1.12	1	July/2000
City of North Myrtle Beach	0.152	2	July/2000
City of North Myrtle Beach	1.59	1	July/2000
City of North Myrtle Beach	0.802	1	July/2000
City of North Myrtle Beach	0.076	1	July/2000
City of North Myrtle Beach	1.27	1	July/2000
City of North Myrtle Beach	1.27	1	July/2000

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
City of North Myrtle Beach	0.076	1	August/2000
City of North Myrtle Beach	0.076	2	August/2000
City of North Myrtle Beach	3.03	9	September/2000
City of North Myrtle Beach	0.076	2	September/2000
City of North Myrtle Beach	2.01	1	September/2000
City of North Myrtle Beach	0.076	1	September/2000
City of North Myrtle Beach	2.37	9	September/2000
City of North Myrtle Beach	0.316	4	September/2000
City of North Myrtle Beach	0.076	2	September/2000
City of North Myrtle Beach	1.59	1	September/2000
City of North Myrtle Beach	1.59	9	September/2000
City of North Myrtle Beach	1.27	1	September/2000
City of North Myrtle Beach	1.27	9	September/2000
City of North Myrtle Beach	0.152	2	October/2000
City of North Myrtle Beach	3.03	2	July/2001
City of North Myrtle Beach	3.03	2	July/2001
City of North Myrtle Beach	2.37	2	July/2001
City of North Myrtle Beach	0.152	1	July/2001
City of North Myrtle Beach	2.37	2	July/2001
City of North Myrtle Beach	0.331	1	July/2001
City of North Myrtle Beach	0.331	1	July/2001
City of North Myrtle Beach	0.076	1	July/2001
City of North Myrtle Beach	0.152	1	July/2001
City of North Myrtle Beach	0.076	1	July/2001
City of North Myrtle Beach	0.076	1	August/2001
City of North Myrtle Beach	0.076	1	August/2001
City of North Myrtle Beach	0.076	1	August/2001

Area Affected	Miles of Beach Affected	Days Posted	Month/Year
City of North Myrtle Beach	0.076	1	August/2001
City of North Myrtle Beach	2.37	3	September/2001
City of North Myrtle Beach	0.076	2	May-June/2001
City of North Myrtle Beach	1.59	2	July/2001
City of North Myrtle Beach	1.59	2	July/2001
City of North Myrtle Beach	1.59	3	September/2001
City of North Myrtle Beach	1.27	2	July/2001
City of North Myrtle Beach	1.27	2	July/2001
City of North Myrtle Beach	0.076	1	August/2001
City of North Myrtle Beach	1.27	3	September/2001
Tower Beach, Hilton Head Island	>1	2	August/2000
Land=s End, St. Helena Island	>1	1	October/2000
Land=s End, St. Helena Island	>1	1	July/2001
Isle of Palms	2	2.5	August/2001

C. Public Health: Drinking Water

Restrictions in Surface Drinking Water Supplies and Incidents of Waterborne Diseases

There were six (6) Notices of Violation (NOV) issued to two (2) systems during the period of July 1999 - June 2000 for Treatment Technique or Surface Water Treatment Rule Filtration Monitoring violations. The State reported no exceedances of the Maximum Contaminant Level (MCL) for Trihalomethanes (THMs). The state reported no incidences of waterbourne disease during the same period.

GROUNDWATER ASSESSMENT

Groundwater is the source of drinking water for more than 40 percent of the population of the State. This resource is also used by agricultural, industrial, and commercial interests. The policy of the State of South Carolina, with respect to groundwater protection, is founded on the belief that there is a direct connection between land use and groundwater quality, and that at least some activities of man will always impact groundwater, regardless of the regulatory safeguards employed. Because it is an expensive and technologically complex task to restore contaminated groundwater to its original pristine state within a reasonable time frame, a justifiable goal of any groundwater protection strategy is to protect the present and future uses of the resource.

SCDHEC maintains a primary long term objective for groundwater protection. As expressed in the S.C. Regulation 61-68, *Water Classifications and Standards*.

"It is the goal of the Department to maintain or restore groundwater quality so it is suitable as a drinking water source without any treatment. Recognizing the technical and economic difficulty in restoring groundwater quality, the Department will emphasize a preventive approach in protecting groundwater."

This goal fulfills the Core Adequacy Criteria #1 of Strategic Activity 1 in the implementation of the Comprehensive State Groundwater Protection Program (CSGWPP).

The groundwater quality data are to be presented in a series of tables and it is recognized that all states do not have all the information requested at this time. Therefore this year's report serves as a template by which future monitoring and reporting can be designed. The data presented were assembled from existing reports: the state wide ambient groundwater quality monitoring network, the groundwater contamination inventory which is updated annually, the volatile organic compound (VOC) monitoring program for public supply wells, and reports from domestic well owners.

1. Overview of Groundwater Contamination Sources

The major sources of contamination impacting groundwater are presented in Table 32. Underground storage tank (UST) releases account for 3494 of the 4174 total instances. The additional nine sources indicated were the next most numerous instances. Another factor indicated was human health and/or environmental risk for those sources for petroleum products and hazardous waste. The size of the population at risk was also indicated for USTs given the large number of releases. The next column on Table 32 indicates the contaminants associated with the highest priority sources. Petroleum compounds, halogenated solvents, metals and nitrates are the contaminants most frequently detected.

Table 32. Major Sources of Groundwater Contamination

Contaminant Source	Ten Highest-Priority Sources (T)	Factors Considered in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
Storage and Treatment Activities			
Land application	**T**	**D**	**E**
Material stockpiles			
Storage tanks (above ground)	**T**	**D,A**	**D**
Storage tanks (underground)	**T**	**D,A,B**	**D**
Surface impoundments	**T**	**D**	**C,E**
Waste piles			
Waste tailing			
Disposal Activities			
Deep injection wells			
Landfills	**T**	**D**	**C,D,H**
Septic systems			
Shallow injection wells			
Other			
Hazardous waste generators	**T**	**D,A**	**C,H**
Hazardous waste sites	**T**	**D,A**	**C,H**
Industrial facilities	**T**	**D**	**C,E**
Material transfer operations			
Mining and mine drainage	**T**	**A,C**	**A,M** Acid mine drainage
Pipeline and sewer lines			

Contaminant Source	Ten Highest-Priority Sources (T)	Factors Considered in Selecting a Contaminant Source	Contaminants
Salt storage and road salting			
Salt water intrusion			
Spills	T	D	D
Transportation of materials			
Urban runoff			
Other sources (please specify)			
Other sources (please specify)			

1. Check (T) up to 10 contaminant sources identified as highest priority in your State.

2. Specify the factor(s) used to select each of the contaminant sources. Denote the following factors by their corresponding letter (A through G) and list in order of importance. Describe any additional or special factors that are important within your State in the accompanying narrative.

   A. Human health and/or environmental risk (toxicity)
   B. Size of the population at risk
   C. Location of the sources relative to drinking water sources
   D. Number and/or size of contaminant sources
   E. Hydrogeologic sensitivity
   F. State findings, other findings
   G. Other criteria (please add or describe in the narrative)

3. List the contaminants/classes of contaminants considered to be associated with each of the sources that was checked. Contaminants/contaminant classes should be selected based on data indicating that certain chemicals may be originating from an identified source. Denote contaminants/classes of contaminants by their corresponding letter (A through M).

   A. Inorganic pesticides
   B. Organic pesticides
   C. Halogenated solvents
   D. Petroleum compounds
   E. Nitrate
   F. Fluoride
   G. Salinity/brine
   H. Metals
   I. Radionuclides
   J. Bacteria
   K. Protozoa
   L. Viruses
   M. Other (please add or describe in the narrative)

Tables 33, 34, 35 and 36 were designed to report the stress that contaminated sites place on individual aquifers or hydrogeologic settings. The report on each identified aquifer is further subdivided by type of source based on program area, contaminants present, and degree of remediation accomplished thus far. South Carolina's major drinking water aquifers are in the subsurface of the Coastal Plain (Figure 3). The sources and contaminants indicated in Table 32 are generally present in the near surface, shallowest aquifers. At this point, contamination data is gathered on a site by site basis, rather than by aquifer. Thus, portions of these tables can be completed for the Piedmont saprolite/bedrock and the Coastal Plain water table aquifers only. The location

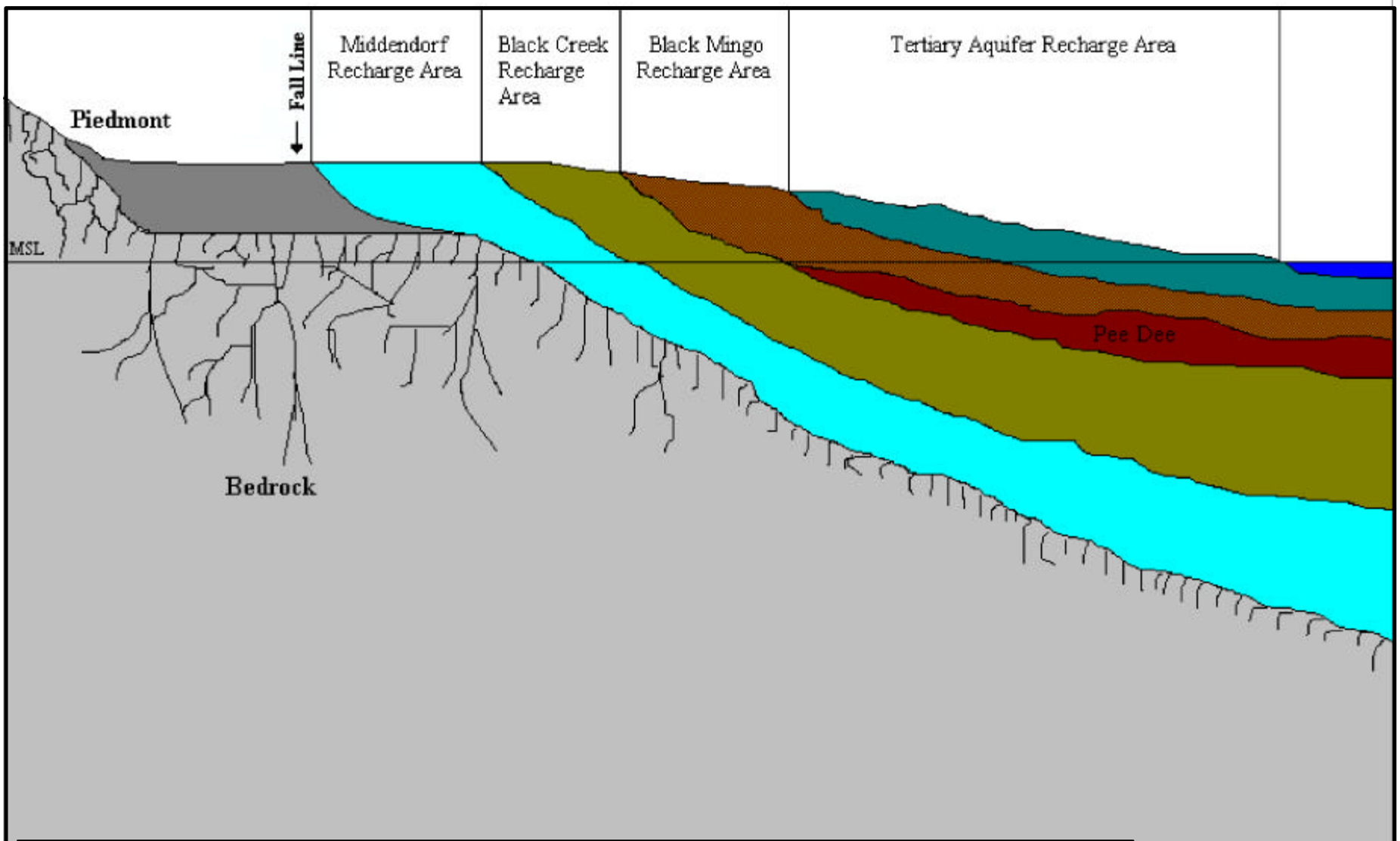


Figure 3. Generalized cross-section indicating the spatial relations between the major coastal plain aquifers.

South Carolina's Geologic Provinces

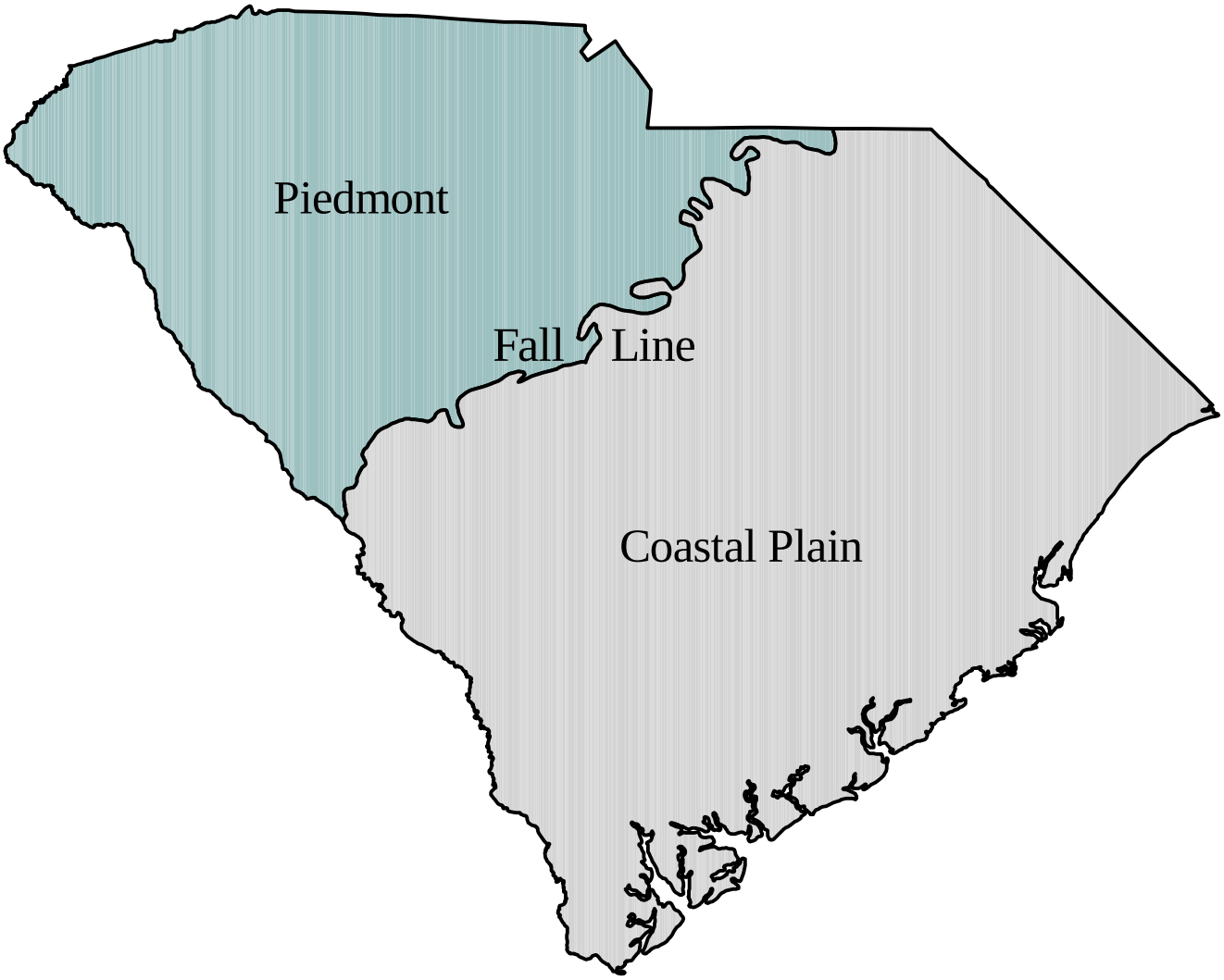


Figure 4

Table 33. Groundwater Contamination Summary

Aquifer Description: Above Fall Line
Aquifer Setting: Saprolite/Bedrock Aquifer
Data Reporting Period: Ending July 2001

Source Type	Present in reporting area	Number of sites in area	Number of sites that are listed and/or have confirmed releases	Number with confirmed ground water contamination	Contaminants
NPL	**YES**		**8**	**8**	**C,H**
CERCLIS (non-NPL)	**YES**		**17**	**17**	**C,H**
DOD/DOE	**YES**		**1**	**1**	**D,C,H**
LUST	**YES**		**1075**	**1075**	**D**
RCRA Corrective Action	**YES**		**27**	**27**	**C,H**
Underground Injection	**NO**	**0**	**0**	**0**	
State Sites	**YES**		**45**	**45**	**C,H,A,B,D**
Nonpoint Sources	**YES**		**2**	**2**	**E**
Other (specify)	**YES**		**147**	**147**	**C,D,E,H**
Totals			**1322**	**1322**	

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tanks
RCRA - Resource Conservation and Recovery Act

List of Contaminants:

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Flouride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other (please add or describe in the narrative)

Table 34. Groundwater Contamination Summary (above fall line)

Source Type	Number of Site Investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of sites with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL					
CERCLIS (non-NPL)					
DOD/DOE					
LUST					
RCRA Corrective Action					
Underground Injection					
State Sites					
Nonpoint Sources					
Other (specify)					

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tanks
RCRA - Resource Conservation and Recovery Act

Table 35. Groundwater Contamination Summary (2)

Aquifer Description: Below Fall Line
Aquifer Setting: Coastal Plain
Data Reporting Period: Ending July 2001

Source Type	Present in reporting area	Number of sites in area	Number of sites that are listed and/or have confirmed releases	Number with confirmed ground water contamination	Contaminants
NPL	**YES**		**14**	**14**	**C,H**
CERCLIS (non-NPL)	**YES**		**22**	**22**	**C,H**
DOD/DOE	**YES**		**10**	**10**	**C,D,H**
LUST	**YES**		**2310**	**2310**	**D**
RCRA Corrective Action	**YES**		**19**	**19**	**C,H**
Underground Injection	**NO**	**0**	**0**	**0**	
State Sites	**YES**		**85**	**85**	**C,D,A,B,D**
Nonpoint Sources	**YES**		**16**	**16**	**E**
Other (specify)	**YES**		**248**	**248**	**C,D,E,H**
Totals			**2724**	**2724**	

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tanks
RCRA - Resource Conservation and Recovery Act

List of Contaminants:

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Flouride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other (please add or describe in the narrative)

Table 36. Groundwater Contamination Summary (below fall line)

Source Type	Number of Site Investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of sites with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL					
CERCLIS (non-NPL)					
DOD/DOE					
LUST					
RCRA Corrective Action					
Underground Injection					
State Sites					
Nonpoint Sources					
Other (specify)					

NPL - National Priority List
CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System
DOE - Department of Energy
DOD - Department of Defense
LUST - Leaking Underground Storage Tanks
RCRA - Resource Conservation and Recovery Act

Each source type is listed in each area with the exception of underground injection as waste or contaminant injection, which is not permitted in this state. The "state" sites are state Superfund sites. The "Nonpoint Source" category contains spray irrigation sites only at this time. Pesticide and nitrate monitoring data is gathered by Clemson University, Department of Fertilizer and Pesticide Control. The "other" category includes spills and leaks; pits, ponds and lagoons; landfills; unpermitted disposal; aboveground storage tanks; and septic tanks/tile fields. The "number of sites in the area" is left blank because any number of facilities can be potential sources and that data is not tracked at this time. The number of sites that have confirmed groundwater contamination are listed along with the contaminants (using the contaminant classes from Table 32). The remediation status represented by Tables 34 and 36 is not fully completed because that information is not recorded in that format in all program areas.

2. Overview of Groundwater Protection Programs

The state's groundwater protection programs are summarized and characterized in Table 37. The Groundwater Working Group, which is comprised of SCDHEC's groundwater program managers, was formed to provide consistency across the programs.

Table 37. Summary of State Groundwater Protection Programs

Programs or Activities	Check (U)	Implementation Status	Responsible State Agency
Active SARA Title III Program	U	**Fully Established**	**SCDHEC/BL&WM/Emergency Response**
Ambient groundwater monitoring system	U	**Fully Established**	**SCDHEC/BOW/GWM**
Aquifer vulnerability assessment	U	**Under Development**	**SCDHEC/BOW/GWM**
Aquifer mapping	U	**Continuing Efforts**	**DNR-SCDHEC/BOW/GWM**
Aquifer characterization	U	**Continuing Efforts**	**DNR-SCDHEC/BOW/GWM**
Comprehensive data management system	U	**Under Development**	**DNR-SCDHEC**
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	U	**Under Development**	**SCDHEC/BOW/GWM**
Groundwater discharge permits	U	**Fully Established**	**SCDHEC/BOW**
Groundwater Best Management Practices	U	**Under Development**	**SCDHEC/BOW/IAWD**
Groundwater legislation	U	**Continuing Efforts**	**SCDHEC-DNR**
Groundwater classification	U	**Fully Established**	**SCDHEC/BOW**
Groundwater quality standards	U	**Under Revision**	**SCDHEC**
Interagency coordination for groundwater protection initiatives	U	**Under Development**	**SCDHEC-DNR-Clemson Univ.**
Nonpoint source controls	U	**Under Development**	**SCDHEC/BOW**
Pesticide State Management Plan	U	**Under Development**	**SCDHEC/BOW/GWM-Clemson Univ.**
Pollution Prevention Program	U	**Fully Established**	**SCDHEC/BL&WM**

Programs or Activities	Check (U)	Implementation Status	Responsible State Agency
Resource Conservation and Recovery Act (RCRA) Primacy	U	**Fully Established**	**SCDHEC/BL&WM**
State Superfund	U	**Fully Established**	**SCDHEC/BL&WM/CERCLA**
State RCRA Program incorporating more stringent requirements than RCRA primacy		**Not Applicable**	
State septic system requirements	U	**Fully Established**	**SCDHEC/ENV. HEALTH**
Underground storage tank installation requirements	U	**Fully Established**	**SCDHEC/BL&WM/UST Program**
Underground Storage Tank Remediation Fund	U	**Fully Established**	**SCDHEC/BL&WM/UST Program**
Underground Storage Tank Permit Program	U	**Fully Established**	**SCDHEC/BL&WM/UST Program**
Underground Injection Control Program	U	**Fully Established**	**SCDHEC/BOW/GWM**
Vulnerability assessment for drinking water/wellhead protection	U	**Fully Established**	**SCDHEC/BOW/GWM**
Well abandonment regulations	U	**Fully Established**	**SCDHEC/BOW**
Wellhead Protection Program (EPA-approved)	U	**Fully Established**	**SCDHEC/BOW/GWM**
Well installation regulations	U	**Fully Established**	**SCDHEC/BOW**

Implementation of the Comprehensive State Ground-Water Protection Program (CSGWPP) is the major initiative undertaken since the last 305(b) report. The draft Core CSGWPP was completed and submitted to the Region IV EPA, Groundwater 106 Program, comments from EPA have been received. The Source Water Assessment and Protection Plan was approved to EPA Region IV. The Groundwater Contamination Inventory and the Ambient Groundwater Quality Monitoring Report were also completed last quarter.

3. Summary of Groundwater Quality

Aquifer Monitoring Data are presented in Tables 38 and 39. The state's ambient quality monitoring network is designed to develop a baseline for groundwater quality for each of the aquifers within the state (Figure 3). The wells were selected in areas to avoid known or potential contamination in order to test the assumption that variability in water chemistry reflects differences in geologic framework and/or spatial setting. In addition, neither VOCs nor SOCs are included in the analytical parameters. Accordingly, no data from the ambient monitoring network is included in Tables 38 and 39.

Table 38. Aquifer Monitoring Data

Aquifer Description_____ County(ies) (optional)
Aquifer Setting _____ Longitude/Latitude (optional)
Data Reporting Period

			Number of Wells			
Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	No detections of Parameters above MDLs of background levels		No detections of parameters above MDLs or background levels and nitrate concentrations range from background levels to less than or equal to 5 mg/l.	
			ND	Number of Wells in Sensitive or Vulnerable Areas (optional)	ND/Nitrate # 5 mg/l	Number of wells in sensitive or vulnerable areas (optional)
Ambient Monitoring Network (optional)		VOC				
		SOC				
		NO;				
		Other				
Raw Water Quality Data from Public Water Supply Wells		VOC				
		SOC				
		NO;				
		Other				
Finished Water Quality Data from Public Water Supply Wells		VOC	1314		41	
		SOC	1252		22	
		NO;	4343		4222	
		Other				

Table 39. Aquifer Monitoring Data (2)

Aquifer Description _____
Aquifer Setting _____

County(ies) (optional) _____
Longitude/Latitude (optional) _____
Data Reporting Period _____

Number of Wells				
Parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs and/or nitrate ranges from greater than 5 to less than or equal to 10 mg/l	Parameters are detected at concentrations exceeding the MCLs	Removed from Service	Special Treatment	Background parameters exceed MCLs
Finished Water Quality Data from Public Water Supply Wells	VOC			
	SOC			
	NO;			
	Other			

4. Summary of Groundwater/Surface Water Interactions

The Drinking Water Program reports that no Public Water Supply well is under the influence of surface water. Although there are anecdotal reports of groundwater in wells being heavily pumped showing signs of influence by surface water, no instance of groundwater being impacted by surface water has been confirmed.

As groundwater serves to recharge most of the streams in South Carolina, instances where contaminated groundwater impacts surface water are more prevalent. In the Groundwater Contamination Inventory 10 6 cases of contaminated groundwater discharging from the surficial aquifer to surface water have been noted. A table was not included in this report because contaminant concentration levels in both the aquifer and surface water are not available. It is surmised that, due to dilution, levels in the surface water are very low or not detectable in most cases.

References

Bauer, K.M., W.M. Glauz and J.D. Flora. 1984. Methodologies for Determining Trends in Water Quality Data. Draft copy of Appendix III in USEPA Guidance for Determining Trends in Water Quality Data.

Hirsch, R.M., J.R. Slack and R.A. Smith. 1982. Techniques of trend analysis for monthly water quality data. Water Resources Research 18:107-121.

Smith, R.A., R.M. Hirsch and J.R. Slack. 1982. A study of trends in total phosphorus measurements as NASQAN stations. U.S. Geological Survey Water Supply Paper 2190, Reston, VA.

Smith, R.A., R.B. Alexander, and M.G. Wolman. 1987. Water quality trends in the nation's rivers. Science 235:1607-1615.

South Carolina Department of Health and Environmental Control. 1981. Procedures Manual for Stream and Wastewater Facility Flow Measurement. Technical Report 06-81. Bureau of Water Pollution Control, Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1994. Standard Operating Procedures: Fish and Shellfish Collection for Tissue Analysis. Bureau of Water. Columbia, SC.

South Carolina Department of Health and Environmental Control. 1997. Laboratory Procedures Manual for Environmental Microbiology. Bureau of Environmental Services, Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1997. Procedures and Quality Control Manual for Chemistry Laboratories. Bureau of Environmental Services, Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1997. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Office of Environmental Quality Control. Columbia, SC.

South Carolina Department of Health and Environmental Control. 1998. Water Classifications and Standards (Regulation 61-68) and Classified Waters (Regulation 61-69) for the State of South Carolina. Office of Environmental Quality Control, Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1998. Standard Operating and Quality Control Procedures for Macroinvertebrate Sampling. Technical Report No. 004-98. Bureau of Water. Columbia, SC.

South Carolina Department of Health and Environmental Control. 1998. Summary of Selected Water Quality Parameter Concentrations in South Carolina Waters and Sediments January 1, 1993 - December 31, 1997. Technical Report 004-98. Bureau of Water, Columbia, S.C.

South Carolina Department of Health and Environmental Control. 1999. State of South Carolina Monitoring Strategy for Fiscal Year 2000. Technical Report 008-99. Bureau of Water Pollution

Control, Columbia, S.C.

Standard Operating and Quality Control Procedures for Phytoplankton and Chlorophyll a. 2000. South Carolina Department of Health and Environmental Control, Bureau of Water. Technical Report No. 014-00.

United States Environmental Protection Agency. 1986. Quality Criteria for Water 1986. Publication No. EPA 440/5-86-001. Office of Water Regulations and Standards, Washington, D.C.

United States Environmental Protection Agency. 1992. National Toxics Rule, December 22, 1992. Federal Register Reference 57FR60848.