

State of South Carolina
Integrated Report for 2010

Part II: *Section 305(b) Assessment and Reporting*

March 31, 2010



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), that contain information pertaining to the specific watersheds and give a more complete picture of the waters referenced in this document. While the title page states that this is an integrated report, Section 303(d) of the CWA requirements are submitted separately as a companion 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.

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EXECUTIVE SUMMARY

The Clean Water Act (CWA) states "it is the national goal that wherever attainable, an interim goal of water quality that 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* that 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 that meet standards shall be maintained and waters that do not meet standards shall be improved.

The statewide Probability-Based, or random sampling, component of the ambient monitoring program is designed to make statewide estimates of water quality. The data derived from those monitoring activities is used to develop the stream, lake/reservoir, and estuarine summary information presented in this report. A probability-based monitoring design is a type of a survey design in that the population of interest is sampled in a fashion that allows statements to be made about the whole population based on a subsample. The advantage of the probability-based sampling design is that statistically valid statements about water quality can be made about large areas based on a relatively small subsample. Based on the modified USEPA National Hydrography Dataset (NHD) and the results of probability site selection validation, South Carolina has an estimated 22,915 miles of freshwater rivers and streams representing the stream sampling design frame, and 327,714 acres of lake and reservoir representing the lake/reservoir sampling design frame. Based on a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina Department of Natural Resources and the results of probability site selection validation, South Carolina has an estimated 274 combined square miles of tide creek and open water habitat representing the estuarine sampling design frame.

Quality assured water quality data collected as part of the probability network from 2004 through 2008 provided the database for this assessment. Evaluation of these data determines if water quality in rivers, lakes, and estuaries is suitable to support State classified uses. The tables on the following page 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 | 66% | 1% | 33% | Macroinvertebrate Community |
| Lakes | 92% | 4% | 4% | pH |
| Estuaries | 91% | 1% | 8% | Turbidity |

Recreational Use Support

| Waterbody Type | Fully Supported | Partially Supported | Not Supported | Predominant Cause |
|-----------------------|------------------------|----------------------------|----------------------|--------------------------|
| Rivers | 42% | 11% | 47% | Fecal Coliform |
| Lakes | 100% | 0% | 0% | Fecal Coliform |
| Estuaries | 98% | 2% | 0% | Fecal Coliform |

BACKGROUND

1. Resource Overview

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

Table 1. Atlas

| Topic | Value |
|--|-----------|
| State Population | 4,321,429 |
| 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 §305(b) reports.

This system is based on the Digital Line Graph (DLG) database and the USEPA National Hydrography Dataset (NHD), that 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 and cause 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 185, 10-digit National Watershed Boundary Data Set watersheds. These watersheds serve as the hydrologic boundaries that 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 updates 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

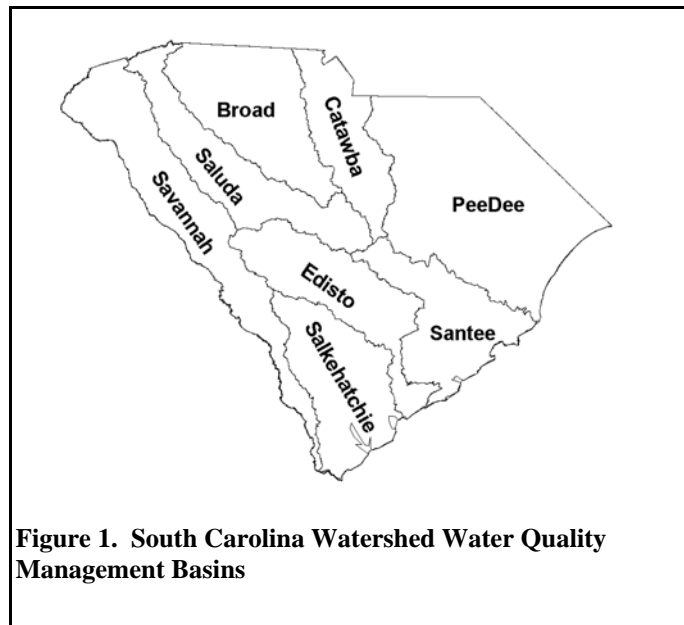


Figure 1. South Carolina Watershed Water Quality Management Basins

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

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

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.

R.61-69 alphabetically lists the waterbodies in South Carolina that 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 SCDHEC Board, approval by the General Assembly, publication in the State Register, and approval by the U.S.EPA. R.61-68 was last amended on April 25, 2008 and R. 61-69 was last amended June 23, 2006.

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 and Site-Specific Criteria

SCDHEC is currently reviewing several waterbodies for possible reclassification 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. Also added 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 §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 seven waterbodies as NDZs. All of South Carolina’s site-specific criteria are found in R.61-69. SCDHEC is currently proposing to include additional site-specific criteria for specific waterbodies that have already been approved by the U.S.EPA in this next year and S.C. Legislative Session. Water reclassifications, NDZ designations, and site-specific criteria 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 Elimination 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 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

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 as well as other projects based on water quality and sludge disposal needs.

Projects receiving SRF loans since fiscal year 1989 have totaled over \$587,402,714.00 through June 30, 2007.

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 and provided improvements to facility capacity. 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 approves implementation pretreatment programs for Publicly Owned Treatment Works (POTWs). The pretreatment programs are typically updated upon permit renewal or when the facility expands the discharge. An assessment of program requirements is conducted to insure that the latest pretreatment regulation requirements are in place. 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 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 appropriate majors, significant minors (minors with pretreatment programs) and selected other permits have been issued or reissued with effluent toxicity monitoring requirements to be performed as appropriate based on the information related to the discharge characteristics. 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. The toxicity testing typically will be multi concentration tests that will allow an assessment of the potential toxicity of the effluent at varying concentrations.

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 that discharge directly to land as spray irrigation. This involves the application of, at least, secondary-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.

The primary objectives of this program are:

- (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 groundwater is typically 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 groundwater flow determines the placement of ground-water monitoring wells.

Strategies to Improve the Municipal Permitting Program

SCDHEC regional 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 judgment 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 agricultural animal facilities 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. Land application of wastes to viable crops at agronomic rates eliminates direct surface water discharges of agricultural wastes and is effective in insuring water quality.

Toxics Controls

Toxic pollutants are generally defined as substances that 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- Industrial

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 SWPPPs on an annual basis. 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.

Stormwater Permits -Construction

In addition to regulating storm water discharges associated with industrial activities, SCDHEC is charged with regulation storm water discharges originating from construction sites. This is done through the NPDES General Permit for Storm Water Discharges from Large and Small Construction Sites (SCR100000). The newest version of the General Permit was issued in February of 2006 and is anticipated to become effective in the spring of 2006. The permit includes additional inspection and reporting requirements. SWPPPs are to be prepared and submitted to the Department for review.

Plans are to be updated and must reflect the activities, from initial clearing to final stabilization, that are to take place on the construction site. Plans must also reflect any controls necessary to keep the site in compliance with existing TMDLs or other water quality concerns.

Stormwater Permits- MS4

SCDHEC also regulates Municipal Separate Storm Sewer Systems (MS4s) in the overall storm water program. There were three two medium-sized MS4s in SC and all of these permits have been issued. There are over 70 small MS4's the Phase II Storm Water NPDES Permit regulations. These permits help insure water quality protection within the boundaries of the affected municipal governments. Most of those have received coverage under the Small MS4 General Permit. All of these programs are working on practices to improve water quality on a local basis.

E. Permit Compliance and Enforcement

Compliance tracking is a complex activity that 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 Environmental Facility Information System (EFIS), 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 has access to information on permitting status, compliance monitoring, enforcement status, etc.

The EFIS 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 prioritizes federal Clean Water Act §319 funding and state resources on impaired §303(d) listed waterbodies in priority watersheds through the implementation of approved NPS Total Maximum Daily Loads (TMDLs). 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, level of participation in 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. The USEPA has also designated South Carolina as an “Enhanced Benefits” State.

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 outreach and education, and best management practice (BMP) compliance. Other projects are watershed based, aimed at remediation of NPS related problems from the State’s §303(d) list. The current focus for §319 funding is the development and implementation of watershed-based plans. Highest priority is given to watershed-based plans for waterbodies with approved total maximum daily loads (TMDLs). Since FY 2003, approximately one-half of the state’s allocation has been 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) that is the portion of the assimilative capacity allocated to point sources, a load allocation (LA) that 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 to impaired waters.

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), and ammonia toxicity 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. 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 many 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 maximum allowable loading to the waterbody. Wasteload allocations for metals and other toxicants, that 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, Bush River, Saluda River above Lake Greenwood, and Catawba River. There are efforts underway for development of formal nutrient TMDLs for the Reedy River, Catawba River and a tributary of Lake Marion. 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.

SURFACE WATER ASSESSMENT

1. Surface Water Monitoring Program

A. Purpose and Design

State administrators need to assess the quality of the aquatic environment so that they can make decisions concerning water program priorities and provide reports to the public on the state of the environment, important trends over time, and accomplishments. They also need to evaluate the effectiveness of control measures. Water quality monitoring data provide information necessary to meet these needs.

The SCDHEC operates and collects data from a statewide network of ambient monitoring sites. The ambient monitoring network is directed toward determining long-term water quality trends, assessing attainment of water quality standards, identifying locations in need of additional attention, and providing background data for planning and evaluating stream classifications and standards. 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.

There are several major components to SCDHEC's ambient water quality monitoring activities, including ongoing fixed-location monitoring, cyclic watershed monitoring, and statewide probability-based monitoring, each designed to provide data for water quality assessment of major water resource types at different spatial and temporal scales. For a detailed discussion of each of these components, please see the most recent version of the State of South Carolina Monitoring Strategy at <http://www.scdhec.gov/environment/water/docs/strategy.pdf>.

B. Networks and Programs

The statewide Probability-Based, or random sampling, component of the ambient monitoring program is designed to make statewide estimates of water quality. The data derived from those monitoring activities is used to develop the stream, lake/reservoir, and estuarine summary information presented in this report. A probability-based monitoring design is a type of a survey design in that the population of interest is sampled in a fashion that allows statements to be made about the whole population based on a subsample, and produces an estimate of the accuracy of the assessment results. The advantage of the probability-based sampling design is that statistically valid statements about water quality can be made about large areas based on a relatively small subsample.

Separate monitoring schemes have been developed for stream, lake/reservoir, and estuarine resources. Site selection is done in association with the U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, Oregon. Random Sites are sampled once a month for one year, and a new statewide set of probability-based random sites is selected for each waterbody type every year.

Please refer to the State of South Carolina Monitoring Strategy for details of parameters sampled at

<http://www.scdhec.gov/environment/water/docs/strategy.pdf>.

Although statements about resource conditions can theoretically be made based on data from a single year, the compilation of data from multiple years increases the confidence and accuracy of statements about water quality. An additional advantage of the probability-based approach is that it presents the opportunity for previously unsampled locations to be selected for data collection.

C. Laboratory Analytical Support

The Analytical and Radiological Environmental Services Division (ARESD) in the Bureau of Environmental Services (BES) 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 waste, fish, and shellfish.

The BES organizational structure encompasses five sections and seven regional laboratories. ARESD, also known as the Central Laboratory includes the following Sections: Sample Characterization/Environmental Microbiology, Data Management/Automated Analysis, Metals Analysis, and Organic Analysis, which are located in the Hayne Building in Columbia. The Radiochemistry Section is located in the Sims/Aycock Building in Columbia. The seven regional laboratories are located in Aiken, Beaufort, North Charleston, Florence, Greenville, Lancaster, and Myrtle Beach. Other facilities which only collect samples and perform field analyses (pH, conductivity, temperature, residual chlorine, and dissolved oxygen) are located in Anderson, Greenwood, Spartanburg, Columbia, and Sumter. The Columbia facility is separate from ARESD, but collects samples for this Lab. ARESD, in turn, performs the same functions as the other Regional Laboratories for the Columbia facility

The Regional Laboratories, except for Beaufort and Myrtle Beach, initiate all stream and wastewater analysis. 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. Drinking Water Chemical Analysis is essentially a Central Laboratory program with support from the Regional Laboratories. All regional laboratories perform microbiological analyses for the Drinking Water Program.

D. Quality Assurance

SCDHEC's Quality System is the means by which the Department implements the quality management process. The Quality System encompasses a variety of technical and administrative elements which are outlined in the SCDHEC Quality Assurance Management Plan, 2003. This plan describes how programs within Environmental Quality Control (EQC) will plan, implement, and assess the quality of environmental work to be performed as part of the various programs' functions within the Agency.

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 Quality 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 the QA objectives cited above, the Water Quality Monitoring Section and Water Pollution Compliance Section have developed and instituted SQAMO approved field study procedures and documentation, data review, and routine EPA operating overview. Some specifics of these Sections' QA/QC activities include:

- Submission of all study plans to SQAMO or designee for review and approval prior to implementation.
- Regular reviews and updates of SCDHEC's Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (SOP) and Procedures Manual for Stream and Wastewater Facility Flow Measurement.
- At least once yearly all water quality monitoring personnel are accompanied on sample collection activities by the Water Quality Monitoring Section quality assurance officer for evaluation of adherence to standard operating procedures (SOP) for QA/QC.
- Water Pollution Compliance Section program staff routinely accompany facility compliance monitoring personnel to ensure adherence to standard operating procedures (SOP) during sample collection activities for QA/QC.
- All SC DHEC EQC laboratories in the State are expected to participate in Proficiency Testing as a requirement for their Certification.
- Field staff are also required to participate in either analyzing blind QC samples or PT samples if they perform field analysis for residual chlorine, conductivity and/or pH.
- Approximately every three years EPA Region 4 Office conducts an on-site routine audit of the Analytical and Radiological Environmental Services Division (ARESD), the Central Laboratory in Columbia and also reviews the Laboratory SOPs.
- Every two years the Office of Quality Assurance performs internal audits on the Regional Labs. These audits include both a technical systems audit as well as a Data Quality Audit In addition; OQA performs an abbreviated Data Quality Audit on field staff. The reports go to the SQAMO (Sandra Flemming), the Assistant Bureau Chief for the Regional Labs (Richard Caldwell), the Regional lab directors and the Regional Laboratory Manager. The regional

lab is given approximately thirty days to respond to and/or correct any findings. Once their response is submitted, and appropriate corrections have been made; the original report, their response and a letter recommending certification are sent to Carol Smith in SCDHEC Office of Laboratory Certification. Carol is the certifying authority over the Regional Laboratories.

- Internal assessments are also performed on ARES D Laboratories. These are conducted by the Office of Quality Assurance, but these are not certifying audits. EPA Region 4 is the certifying authority over the ARES D Laboratories.

Analytical Services 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; and (2) Laboratory Procedures Manual for Environmental Microbiology-- Analytical Services. The elements of quality control addressed in the manuals include organization and sample chain of custody; personnel training; quality control of laboratory services, scope and application, equipment and supplies, reagents, standards, methodology, preservation and storage, calibration, performance criteria and quality assurance, and waste management.

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. Acceptance criteria for each QC check is detailed in each procedure of the SOP Manual. 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, Analytical Services and the seven regional laboratories participate in annual Water Supply and Water Pollution 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. Occasionally, field or other non-laboratory staff may assist the Microbiologist in setting up samples or reading them. Anyone participating in this way must demonstrate proficiency in any activity they will perform. Their proficiency is assessed through use of blind sample obtained from either a QC Sample Vendor or made in-house. This proficiency is documented and kept in the Regional Office.

The laboratory analyses for water quality monitoring are conducted according to the List of Approved Test Procedures in the 40CFR Parts, 122, 136, et al. "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; National Primary Drinking Water Regulations; and National Secondary Drinking Water Regulations; Analysis and Sampling Procedures; Final Rule" published March 12, 2007; and 40 CFR Parts 136 and 503 "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Wastewater and Sewage Sludge; Final Rule" published March 26, 2007. The Analytical Services quality control manuals include a section on methodology designed to reduce variations in applied techniques among the State 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. Analytical SOPs are identified by number and date of revision. Each SOP includes the approved method reference. SOPs are reviewed every two years.

SOPs include instrument calibration and maintenance procedures as well as corrective actions for any deficiencies or problems encountered.

E. Data Storage, Management and Interpretation

Routine ambient stream and sediment samples are collected by Regional Office personnel with some analyses conducted in the Regional Laboratories and others by the Central Laboratory. Data for samples that are analyzed in the Regional Laboratories are reported on the appropriate data sheets and released by the sample custodian for the region. These data sheets are sent to the Analytical and Radiological Environmental Services Division in Columbia where they are sent to the appropriate program areas. All Ambient Surface Water Physical & Chemical Monitoring data are distributed by the Water Pollution Control Division to the Data Administration Section where the data are reviewed, edited and stored into the LIMS/SIMS Process database. Then the Water Quality Monitoring Section performs a 10 percent review of all data to ensure quality assurance of the data.

The data are stored on at least an annual basis in the EPA's STORET distributed water quality database. Data sheets are kept on file in the Water Quality Monitoring Section.

Macroinvertebrate and habitat data are entered into an in-house relational database program. This database program generates metric calculations and reports. All data are available to the public through the Freedom of Information Act. A coverage of the macroinvertebrate monitoring stations is available through an in-house Geographic Information System.

2. Assessment Methodology

A. Probability-Based §305(b) Assessment Approach

The initial selection of prospective probability-based, or random, monitoring site locations is conducted by the U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, Oregon. Independently for each waterbody type, rivers and streams, lakes and reservoirs, and estuarine habitat, a statewide grid system and computer selection program is used to randomly select a particular grid to achieve a statewide spatial distribution of sites, and then a specific location within a selected grid is chosen according to the specifics of each waterbody design as described below.

The basic starting dataset for stream and lake site selection is the USEPA National Hydrography Dataset (NHD) coverage at a scale of 1:100,000, which is based on the U.S. Geological Survey (USGS) Digital Line Graph map base. Because of stream density inconsistencies in NHD some missing stream reaches in part of the state were added by digitization for a more consistent statewide representation. Similarly some important reservoirs that are missing in NHD were also added.

Estuarine sites selection uses a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina Department of Natural Resources from the National Wetlands Inventory (NWI) digital files at a scale of 1:24,000.

Rivers and Streams

Streams of different sizes may be more or less sensitive to different types of environmental perturbations. Because of this, three stream sizes have been specifically targeted to ensure

they are represented in the selected random sites. Approximately 30 total randomly selected stream sites are sampled each year. Each site is sampled monthly for one year.

1. First Order streams, or headwater streams, are targeted because these represent streams with the least dilution capacity and therefore are most immediately impacted by adjacent land use activities and associated runoff. These streams may also serve as spawning areas for fish and refuge areas for young from larger aquatic predators.
2. Second Order streams, are also streams with relatively small dilution capacity and represent important habitat for reproduction and survival of aquatic life. They may also reflect the direct impacts of major land use activities.
3. Third Order and larger streams, that include the major rivers of the State. In general these streams have greater dilution capacity and are less affected by small scale land use perturbations and may be heavily utilized for contact recreation.

These different sizes do not occur in equal proportions in the state, therefore an unequal weighting procedure is used in the site selection process to guarantee inclusion of approximately equal numbers of sites in all three stream sizes. These differential weights are based on the relative proportions of these three size classes in the streams of the state and are used in the assessment to adjust the contribution of each stream site to the statewide resource size.

Lakes and Reservoirs

Eligible lakes/reservoirs are restricted to “significant lakes,” defined as those freshwater lakes/reservoirs with at least 40 acres surface area that offer public access. The size of significant lakes/reservoirs varies immensely; therefore two size classes of lakes/reservoirs have been specifically targeted to ensure that the smaller lakes/reservoirs are represented in the selected random sites. Approximately 30 total randomly selected lake and reservoir sites are sampled each year. Each site is sampled monthly for one year.

1. Major Lakes/Reservoirs greater than 850 acres surface area.
2. Minor Lakes/Reservoirs greater than 40 acres surface area, but less than or equal to 850 acres.

These different sizes do not occur in equal proportions in the state, therefore an unequal weighting procedure is used in the site selection process to guarantee inclusion of approximately equal numbers of sites in both sizes. These differential weights are based on the relative proportions of these two size classes in the lakes and reservoirs of the state and are used in the assessment to adjust the contribution of each lake site to the statewide resource size.

Estuaries

The coastal estuarine probability-based monitoring scheme has been developed jointly by SCDHEC, Bureau of Water, and the South Carolina Department of Natural Resources (SCDNR), Marine Resources Research Institute (MRRI). This effort has been dubbed the

South Carolina Estuarine and Coastal Assessment Program (SCECAP) and sampling of the probability-based coastal estuarine sites is a cooperative venture between SCDHEC and SCDNR-MRRI. To ensure inclusion of a variety of estuarine ecosystems and habitats, the coastal estuaries have been divided into two discrete categories (strata) based on a common GIS cover developed and utilized by both agencies.

1. Tidal Creeks, identified as less than 100 meters wide on the GIS cover, serve as nursery areas for important marine species and are most immediately affected by upland land use activities and associated runoff.
2. Open Water areas, identified as greater than 100 meters wide on the GIS cover, represent larger estuarine rivers and sounds.

Within these waterbody types there are two distinct types of monitoring sites based on sampling frequency, Core Sites and Supplemental Sites. Core Sites are sampled monthly for one year by SCDHEC for water column physical and chemical parameters and are used for §305(b) reporting purposes.

The Supplemental Sites are sampled one time by SCDNR-MRRI and SCDHEC and are used in conjunction with one time samples collected at the Core Sites in the SCECAP reports and USEPA

National Coastal Assessment

Each year there will be approximately 15 Core Tidal Creek sites and 15 Core Open Water sites. Differential weights are based on the relative proportions of these two size classes in the estuarine areas of the state and are used in the assessment to adjust the contribution of each estuary site to the statewide resource size.

B. 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.

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 many 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. Because of the inability to target individual high or low flow events on a statewide basis these data are considered to represent typical physical conditions and chemical concentrations in the waterbodies sampled. All samples are collected and analyzed according to standard procedures (SCDHEC 2006).

Results from water quality samples can be compared to State and USEPA criteria, with some restrictions due to time of collection and sampling frequency. For certain parameters, the monthly sampling frequency employed is insufficient for strict interpretation of the standards. 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.

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

The following statewide assessment information is based on the available quality assured physical, chemical and biological water quality data collected through the probability-based monitoring design from 2002-2006.

Aquatic Life Use Support

One important goal of the Clean Water Act, the South Carolina Pollution Control Act, and the State Water Quality Classifications and 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 that 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 exceedances and, where data are available, the composition and functional integrity of the biological community. The term exceedance is used to describe a measured pollutant concentration that is outside of the acceptable range as defined by the appropriate criterion. 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. A number of waterbodies have been given waterbody-specific criteria for pH and dissolved oxygen, to 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*.

If the appropriate criterion for dissolved oxygen and pH are contravened in 10 percent or less of the

samples, the criterion is said to be fully supported. If the percentage of criterion excursions is greater than 10 percent, but less than or equal to 25 percent, the criterion is partially supported, unless excursions are due to natural conditions. If there are more than 25 percent excursions, the criterion is not supported, 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 judgment of SCDHEC staff with specific local knowledge.

If the appropriate acute or chronic aquatic life criterion for any individual toxicant (heavy metals, priority pollutants, ammonia) is exceeded more than once, representing more than 10 percent of the samples collected, the criterion is not supported. If the acute or chronic 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 total recoverable metals criteria for heavy metals 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 40CFR131.36(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 ammonia, the calculation of the appropriate criterion value requires the values of several associated field parameters measured concurrent with the ammonia sample collection. Where direct measurements of any of the parameters are lacking the ammonia value will not be used to determine compliance with the standards.

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 in more than 10 but less than 25 percent, sites are evaluated on a case-by-case basis to determine if local conditions indicate that classified uses are impaired. Among the characteristics considered are: hydrology and morphometry of the waterbody, existing and projected trophic state, characteristics of pollutant loadings and ongoing pollutant control mechanisms. If the criterion is exceeded in less than 10 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 in the waterbody, at that monitoring location. If there are no criteria that are “not supported”, but the conclusion for at least one parameter criterion is “partially 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 water chemistry 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 are the ultimate deciding factor, regardless of chemical conditions. If biological data shows 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 that 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 surface water classes. Comparisons to the bacteria geometric mean standard are not considered appropriate based on sampling frequency and the intent of the standard.

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 greater than 10 and less than or equal to 25 is considered partial support of recreational uses, and greater than 25 percent is considered to represent nonsupport of recreational uses.

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 National Hydrography Dataset (NHD), that are in turn based on the U.S. Geological Survey 1:100,000 scale hydrologic 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.

A. Summary Statistics

Based on the modified USEPA National Hydrography Dataset (NHD) and the results of probability site selection validation, South Carolina has an estimated 22,915 miles of freshwater rivers and streams representing the stream sampling design frame previously described. Because of the inability to reach some selected locations, the 148 probability-based monitoring sites sampled from 2004-2008 represent 11,620 total stream miles.

A summary of classified use support statewide based on these data, along with causes for partial or nonattainment, is presented below. The Lower and Upper 95 Percent Confidence Intervals for the probability-based estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

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

| Indicator | Category | Probability-Based Estimated Percent of Total Resource | Probability-Based Estimated Miles of Total Resource | Lower 95 Percent Confidence Interval (Miles) | Upper 95 Percent Confidence Interval (Miles) |
|------------------|----------------------|--|--|---|---|
| Aquatic Life Use | Fully Supporting | 65.7 | 7,640 | 6,533 | 8,747 |
| | Partially Supporting | 1.0 | 113 | 0 | 249 |
| | Not Supporting | 33.3 | 3,867 | 2,836 | 4,898 |
| Recreational Use | Fully Supporting | 42.0 | 4,881 | 4,047 | 5,715 |
| | Partially Supporting | 11.4 | 1,327 | 803 | 1,850 |
| | Not Supporting | 46.6 | 5,412 | 4,163 | 6,662 |

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

| Category | Probability- Based Estimated Percent of Total Resource | Probability- Based Estimated Miles of Total Resource | Lower 95 Percent Confidence Interval (Miles) | Upper 95 Percent Confidence Interval (Miles) |
|---------------------------------------|---|---|---|---|
| Fully Supporting All Assessed Uses | 31.0 | 3,600 | 2,912 | 4,287 |
| Impaired for One or More Use | 69.0 | 8,021 | NA | NA |

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

| Cause Category | Probability- Based Estimated Miles of Total Resource | Lower 95 Percent Confidence Interval (Miles) | Upper 95 Percent Confidence Interval (Miles) |
|-----------------------------|---|---|---|
| Macroinvertebrate Community | 2,699 | 1,830 | 3,567 |
| Turbidity | 0 | 0 | 0 |
| Dissolved Oxygen | 723 | 268 | 1,177 |
| pH | 255 | 0 | 626 |
| Chromium | 55 | 0 | 146 |
| Copper | 55 | 0 | 146 |
| Nickel | 55 | 0 | 146 |
| Zinc | 504 | 129 | 879 |
| Fecal Coliform Bacteria | 6,739 | 5,495 | 7,983 |

4. Lakes Water Quality Assessment

A. Summary Statistics

Based on the modified USEPA National Hydrography Dataset (NHD) and the results of probability site selection validation, South Carolina has an estimated 327,714 acres of lake and reservoir representing the lake/reservoir sampling design frame previously described. Because of the inability to reach some selected locations, the 139 probability-based monitoring sites sampled from 2004-2008 represent 316,927 total acres. A summary of classified use support statewide based on these data, along with causes for partial or nonattainment, is presented below. The Lower and Upper 95 Percent Confidence Intervals for the probability-based estimates signify that it is 95% certain that the true acreage is between the upper and lower confidence limits.

Table 9. Lake Use Support Summary (Acres)

| Indicator | Category | Probability-Based Estimated Percent of Total Resource | Probability-Based Estimated Acres of Total Resource | Lower 95 Percent Confidence Interval (Acres) | Upper 95 Percent Confidence Interval (Acres) |
|------------------|----------------------|---|---|--|--|
| Aquatic Life Use | Fully Supporting | 91.9 | 291,221 | 246,514 | 335,928 |
| | Partially Supporting | 4.5 | 14,193 | 2,350 | 26,036 |
| | Not Supporting | 3.6 | 11,513 | 468 | 22,558 |
| Recreational Use | Fully Supporting | 100.0 | 316,927 | 271,467 | 362,387 |
| | Partially Supporting | 0% | 0 | 0 | 0 |

Table 10. Summary of Fully Supporting and Impaired Lakes (Not including Fish Consumption Use)

| Category | Probability-Based Estimated Percent of Total Resource | Probability-Based Estimated Acres of Total Resource | Lower 95 Percent Confidence Interval (Acres) | Upper 95 Percent Confidence Interval (Acres) |
|------------------------------------|---|---|--|--|
| Fully Supporting All Assessed Uses | 91.9 | 291,221 | 246,514 | 335,928 |
| Impaired for One or More Use | 8.1 | 25,706 | NA | NA |

Table 11. Total Sizes of Lakes Impaired by Various Cause Categories (Acres)

| Cause Category | Probability-Based Estimated Acres of Total Resource | Lower 95 Percent Confidence Interval (Acres) | Upper 95 Percent Confidence Interval (Acres) |
|-------------------------|---|--|--|
| Turbidity | 356 | 15 | 698 |
| Dissolved Oxygen | 387 | 128 | 646 |
| pH | 15,474 | 3,474 | 27,475 |
| Total Phosphorus | 9,651 | 0 | 20,449 |
| Total Nitrogen | 92 | 7 | 178 |
| Chlorophyll- <i>a</i> | 550 | 131 | 969 |
| Copper | 163 | 0 | 445 |
| Zinc | 0 | 0 | 0 |
| Fecal Coliform Bacteria | 0 | 0 | 0 |

B. Section 314 Reporting

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 that 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

Monthly sampling is conducted each year in lakes throughout the state as part of SCDHEC’s ambient water quality monitoring activities, including ongoing fixed-location monitoring, cyclic watershed monitoring, and statewide probability-based monitoring.

Trophic Status

In 2001, South Carolina adopted numeric nutrient criteria for lakes by ecoregion and beginning FY 2002, trophic condition assessment was based upon the criteria for Total Phosphorus (TP), Total Nitrogen (TN) and Chlorophyll *a* (CHL-A). Table 12 lists those lake sites that were identified as not meeting one or more of these numeric criteria as part of the current §303(d) assessment reported in *Part I: Listing of Impaired Waters* of this Integrated Report. The second part of the same table lists all other sites that were assessed and found to meet the numeric criteria.

Table 12. Summary of Lake Conditions

| Lake Sites Not Attaining Numeric Nutrient Criteria | | |
|---|---|------------|
| PIEDMONT | | |
| Station ID(s) | Location | Parameters |
| RL-05403 | BOYD MILL POND 0.5 MI NW OF BRIDGE OVER REEDY RIVER ON SC 252 | TP |
| RL-08047 | BOYD MILL POND 0.22 MI NW OF DAM, NW OF HOUSE ON POINT | TN, TP |
| CW-033 | CEDAR CK RESERVOIR 100 M N OF DAM | TP |
| CW-174 | CEDAR CK RESERVOIR AT UNIMP RD AB JCT WITH ROCKY CK | TP |
| CW-175 | CEDAR CK RESERVOIR/ROCKY CK AT S-12-141 SE OF GREAT FALLS | TN, TP |
| RL-01007 | CEDAR CK RES 2.15 M SE OF GREAT FALLS | TP |
| RL-04375 | CEDAR CREEK RESERVOIR 2.2 MI SE OF GREAT FALLS SE OF BOWDEN ISLAND | TP |
| RL-04379 | CEDAR CREEK RESERVOIR 1.25 MI ESE OF GREAT FALLS NW OF HILL ISLAND | TP |
| RL-05391 | CEDAR CREEK RESERVOIR 0.42 MI NNW OF S-29-405 ON LANCASTER CHESTER COUNTY LINE | TP |
| RL-05416 | CEDAR CREEK RESERVOIR DEBUTARY CREEK BRANCH 0.4 MI E OF DEBUTARY CREEK AND S-20-268 | TP |
| RL-06431 | CEDAR CREEK RESEVOIR 1.6 MI SE OF GREAT FALLS E OF BIG ISLAND | TP |

| RL-08046 | CEDAR CREEK RESERVOIR 0.27 MI SE OF S-12-141BELOW TAILRACE FROM GREAT FALLS DAM | TN, TP |
|-------------------------------|---|------------|
| RL-06438 | LAKE AT CHESTER STATE PARK 0.8 MI SE OF ENTRANCE | CHL-A |
| RL-06468 | CHESTER SATE PARK LAKE 2.5 MI SW OF CHESTER | CHL-A |
| CW-016F | FISHING CK RES 2 MI BL CANE CREEK | TN, TP |
| CW-057 | FISHING CK RES 75 FT AB DAM NR GREAT FALLS | TN, TP |
| RL-05414 | GREAT FALLS RESERVOIR 1 MI EAST OF JUNCTION OF SC 99 AND US 21 | TP |
| RL-06429 | GREAT FALLS RESERVOIR 1.2 MI SE OF GREAT FALLS W OF BIG ISLAND | TP |
| RL-08062 | GREAT FALLS RESERVOIR 0.9 MI E OF NITROLEE W SIDE OF CUT BTWN 2 ISLANDS | TN, TP |
| S-308 | LAKE GREENWOOD, REEDY RVR ARM, 150 YDS US RABON CK | TP |
| SV-268 | LAKE HARTWELL - EIGHTEEN MILE CK ARM AT S-04-1098 | TN, TP |
| CL-035 | LAKE JOHNSON AT SPILLWAY AT S-42-359 | TP, CHL-A |
| S-222 | LAKE MURRAY, LITTLE SALUDA ARM AT SC 391 | TP |
| S-309 | LAKE MURRAY, BUSH RVR ARM, 4.6 KM US SC 391 | TP, CHL-A |
| CL-021 | LAKE OLIPHANT, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES | TP |
| B-346 | PARR RESERVOIR 4.8 KM N OF DAM, UPSTREAM MONTICELLO RESERVOIR | TP |
| CW-231 | LK WATEREE HEADWATERS APPROX 50 YDS DS CONFL CEDAR CK | TP |
| RL-08035 | DUTCHMANS CREEK ARM OF LAKE WATEREE 0.4 MI E OF S-20-101 BRIDGE | TP |
| CW-200 | LK WYLIE AT SC 274 9 MI NE OF YORK | TP, CHL-A |
| SOUTHEASTERN PLAINS | | |
| Station ID(s) | Location | Parameters |
| CL-064 | LAKE EDGAR BROWN IN FOREBAY NEAR DAM | TP, CHL-A |
| C-058 | LK INSPIRATION - ST MATTHEWS (FRONT OF HEALTH DEPT) | TP, CHL-A |
| RL-01011 | LAKE MARION 1.10 M SSE OF SANTEE NAT. WILDLIFE REFUGE AND 1MI S OF EAGLE POINT (SC-035) | TP |
| RL-02306 | LK MARION @ JACK'S CK EMBAYMENT; USE SANTEE COOPER SC-012 | TP |
| RL-02308 | LK MARION @ CHANNEL MARKER 69; USE SANTEE COOPER SC-016 | TP |
| RL-04388 | LAKE MARION 0.5 MI NE OF CALHOUN LANDING (USE SC-044) | TP |
| RL-06422 | LAKE MARION SANTEE RIVER ARM 6 MI NE OF ELLOREE | TP |
| SC-005 | UPPER LAKE MARION NEAR PACK'S LANDING | TP |
| SC-010 | UPPER LAKE MARION AT CHANNEL MARKER 150 | TP |
| SC-036 | MID LAKE MARION @ THE MOUTH OF TAW CAW CREEK | TP |
| SC-038 | UPPER LAKE MARION @ THE MOUTH OF HALFWAY SWAMP CREEK | TP |
| SC-039 | UPPER LAKE MARION 2.0 KM BELOW RIMINI RAILROAD TRESTLE | TP |
| SC-040 | MID LAKE MARION @ CHANNEL MARKER 79 | TP |
| SC-041 | MID LAKE MARION 3.2 KM NORTH OF CHANNEL MARKER 79 | TP |
| SC-042 | MID LAKE MARION @ NORTH END OF I-95 / U.S. 301 BRIDGES | TP |
| ST-034 | LAKE MARION AT RR TRESTLE AT LONE STAR (SC-008) | TP |
| SC-014 | UPPER LAKE MARION @ HEADWATERS OF CHAPEL BRANCH CREEK | TP |
| SC-017 | MID LAKE MARION @ TAW CAW CREEK EMBAYMENT | TP |
| RL-05398 | LAKE WALLACE EAST SHORE NEAR PICNIC AREA | TP, CHL-A |
| MIDDLE ATLANTIC COASTAL PLAIN | | |

| Station ID(s) | Location | Parameters |
|---|--|------------|
| ST-032 | GOOSE CREEK RESERVOIR 100 M US OF DAM | TP |
| ST-033 | GOOSE CK RESERVOIR AT 2ND POWERLINES US OF BOAT RAMP | TP |
| CSTL-075 | LAKE WARREN, BLACK CK ARM, AT S-25-41 5 MI SW OF HAMPTON | TP, CHL-A |
| RL-07033 | LAKE WARREN IN SMALL EMBAYMENT NEAR NW END OF S-25-41 BRIDGE | CHL-A |
| RL-08049 | LAKE WARREN IN SMALL BAY ALONG N SHORE APPROX 0.4 MI W OF DAM OUTFLOW | TP |
| Lake Sites Attaining Numeric Nutrient Criteria | | |
| BLUE RIDGE | | |
| Station ID(s) | Location | |
| CL-019 | LK JOCASSEE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES | |
| RL-06430 | LAKE JOCASSEE 1 MI SSE OF DOUBLE SPRINGS MOUNTAIN | |
| RL-07024 | LAKE JOCASSEE MOUTH OF TOXAWAY RIVER ARM 2.1 MI NNW OF DAM | |
| 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 | |
| RL-04380 | LAKE KEOWEE, EASTATOE CREEK ARM 0.5 MI N OF KEOWEE/TOXAWAY STATE PARK | |
| RL-04376 | LAKE YONAH 0.65 MI NNE OF SPILLWAY | |
| RL-08044 | LAKE YONAH 125 YDS BELOW BATTLE CREEK | |
| SV-358 | LAKE YONAH, 50% BETWEEN CENTER OF SPILLWAY AND OPPOSITE SHORE | |
| S-292 | NORTH SALUDA RESERVOIR AT WATER INTAKE | |
| S-291 | TABLE ROCK RESERVOIR AT WATER INTAKE | |
| SV-359 | TUGALOO LAKE, FOREBAY EQUIDISTANT FROM SPILLWAY AND SHORELINES | |
| PIEDMONT | | |
| Station ID(s) | Location | |
| S-311 | BOYD MILL POND .6 KM W DAM | |
| B-347 | LAKE BLALOCK IN FOREBAY NEAR DAM | |
| RL-04363 | LAKE BLALOCK 0.3 MI UPLAKE OF US 221 | |
| RL-04367 | LAKE BLALOCK 0.9 MI UPLAKE OF US 221 | |
| RL-04389 | LAKE BLALOCK 0.6 MI UPLAKE OF US 221 | |
| RL-04461 | LAKE BLALOCK AT US 221 | |
| RL-06447 | LAKE BLALOCK 0.8 MI SE OF BRIDGE US 221 OVER LAKE | |
| RL-08053 | LAKE BLALOCK 0.9 MI NW OF S-42-189 NEAR N SHORELINE | |
| B-339 | LAKE BOWEN 0.3 MI W OF SC 9 | |
| B-340 | LAKE BOWEN NEAR HEADWATERS, 0.4 KM W OF S-42-37 | |
| RL-08048 | LAKE BROADWAY 0.14 MI SE OF W SHORELINE COVE 0.7 MI NW OF DAM 0.1 MI E OF HAMMOND CIRCLE | |
| RL-06421 | BROADWAY LAKE 1 MI SW OF JUNCTION OF US HWY 178 AND US HWY 76 | |
| SV-258 | BROADWAY LAKE, NEALS CK ARM 50% BETWEEN BANKS AT GOLF COURSE | |
| SV-319 | BROADWAY LAKE, BROADWAY CK ARM UPSTREAM OF PUBLIC ACCESS | |
| SV-321 | BROADWAY LAKE FOREBAY, 50% BETWEEN SPILLWAY AND OPPOSITE LAND | |
| RL-06443 | CEDAR CREEK RESEVOIR 2.3 MI SE OF GREAT FALLS S OF PICKET ISLAND | |
| RL-07003 | CEDAR CK RESERVOIR NEAR E SHORE OF PICKETT ISLAND 0.5 MI NNW OF S-29-405 | |
| B-343 | LAKE CHEROKEE IN FOREBAY NEAR DAM | |
| CL-023 | CHESTER STATE PARK LAKE 100 M EAST OF SPILLWAY | |

| | |
|----------|--|
| CL-039 | LITTLE RIVER ARM OF CLARKS HILL RESERVOIR |
| CL-040 | CLARKS HILL RESERVOIR HEADWATERS (SAVANNAH RVR) |
| CL-041 | CLARKS HILL RESERVOIR IN FOREBAY NEAR DAM |
| RL-04385 | CLARKS HILL RESERVOIR COVE 0.5 MI SW OF HAMILTON BRANCH STATE PARK |
| RL-05405 | CLARKS HILL RESERVOIR 1.25 MI S OF THE END OF S-33-337 |
| RL-05407 | CLARKS HILL RESERVOIR 0.3 MI S OF BOAT RAMP AT THE END OF S-33-366 |
| RL-05463 | CLARKS HILL RESERVOIR 0.67 MI NW OF US 378 |
| RL-06423 | CLARKS HILL RESERVOIR 6.9 MI SSE OF MCCORMICK |
| RL-07004 | LONG CANE CREEK ARM OF CLARKS HILL RESERVOIR 1 MI SSW OF SC 28 BRIDGE |
| SV-291 | CLARKS HILL RESERVOIR AT US 378 7 MI SW MCCORMICK |
| B-348 | LAKE COOLEY IN FOREBAY NEAR DAM |
| RL-05399 | LAKE COOLEY 2.5 MI N OF WELLFORD |
| CL-033 | LAKE CRAIG 45 M NORTHWEST OF DAM |
| B-341 | LAKE CUNNINGHAM IN FOREBAY NEAR DAM |
| B-735 | DUNCAN CREEK RESERVOIR 6B IN FOREBAY NEAR DAM |
| B-110 | ELIZABETH LAKE AT SPILLWAY ON US 21 |
| RL-04387 | LAKE GREENWOOD 2.2 MI NW OF LAKE GREENWOOD STATE PARK |
| RL-07020 | LAKE GREENWOOD MOUTH OF COVE NEAR END OF S-30-87 (ANGLERS HAVEN) |
| RL-08063 | LAKE GREENWOOD NEXT SMALL ARM EAST OF CANE CREEK ARM IN SMALL EMBAYMENT SW OF POINT OFF S-30-742 |
| S-022 | REEDY FORK OF LK GREENWOOD AT S-30-29 |
| S-024 | LAKE GREENWOOD, HEADWATERS, JUST US S-30-33 |
| S-097 | LAKE GREENWOOD - CANE CK ARM AT SC 72 3.1 MI SW CROSS HILL |
| S-131 | LK GREENWOOD AT US 221 7.6 MI NNW 96 |
| S-303 | LAKE GREENWOOD 200 FT US OF DAM |
| S-307 | LAKE GREENWOOD, RABON CK ARM, .8 KM N RD S-30-307 |
| RL-04371 | LAKE HARTWELL COVE 0.75 MI SE OF SADLERS CREEK STATE PARK |
| RL-04378 | LAKE HARTWELL, SENECA RVR ARM 0.8 MI WNW OF CLEMSON LOOKOUT TOWER |
| RL-05392 | LAKE HARTWELL 5.96 MI SSW OF PENDELTON |
| RL-05417 | LAKE HARTWELL 0.3 MI SOUTH OF SC 24 BRIDGE OVER SENECA RIVER ARM |
| RL-06444 | LAKE HARTWELL 8.9 MI WSW OF WESTMINISTER |
| RL-07012 | LAKE HARTWELL COVE TOWARD EAST SIDE 0.6 MI NE OF S-37-37 BRIDGE |
| RL-07016 | LAKE HARTWELL MOUTH LITTLE BEAVERDAM CK COVE 1.8 MI SE OF I-85 BRIDGE |
| RL-07032 | LAKE HARTWELL AT MOUTH OF COVE NORTH OF END OF S-04-182 |
| RL-08060 | EMBAYMENT ON TUGALOO RIVER ARM OF LAKE HARTWELL N SIDE OF SMALL ISLAND OFF END OF DURHAM RD 1.7 MI SE OF FAIR PLAY |
| SV-106 | MARTIN CK ARM OF LAKE HARTWELL AT S-37-65 N OF CLEMSON |
| SV-200 | TUGALOO RVR ARM OF LAKE HARTWELL AT US 123 |
| SV-236 | LAKE HARTWELL AT S-37-184 6.5 MI SSE OF SENECA |
| SV-249 | LAKE HARTWELL, KEOWEE RVR HEADWATERS AT SC 183 3.8 MI WSW SIX MILE |
| 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-340 | LK HARTWELL, MAIN BODY AT USACE WQ BUOY BTWN MRKRS 11 & 12 |
| SV-363 | LAKE HARTWELL OFF GLENN FORD LANDING US BEAVERDAM CK COVE |
| RL-06432 | LAKE ISSAQUEENA 0.1 MI N OF SPILLWAY |
| SV-360 | LAKE ISSAQUEENA, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| CL-100 | LAKE J. ROBINSON, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| RL-04361 | LAKE J. ROBINSON 2.3 MI NNW OF DAM |

| | |
|----------|--|
| RL-04365 | LAKE J. ROBINSON 1 MI NNW OF DAM |
| RL-05395 | LAKE J. ROBINSON 0.77 MI NNW OF BRIDGE OVER BEAVERDAM CREEK ON S-23-92 |
| RL-06445 | LAKE J. ROBINSON 0.92 MI S BRIDGE S-23-113 OVER LAKE |
| RL-06449 | LAKE J. ROBINSON 1.7 MI NNE BRIDGE S-23-113 OVER LAKE |
| RL-07013 | LAKE J. ROBINSON FOREBAY 16 METERS SW OF CORNER OF SAFETY BUOYS |
| RL-07021 | LAKE J. ROBINSON ALONG SHORE OF DEVELOPMENT 0.9 MI SSE OF S-23-113 |
| RL-07029 | LAKE J. ROBINSON IN SOUTH FINGER OF SMALL COVE ON WESTERN SHORE |
| RL-08069 | LAKE JOHNSON 35 YARDS SOUTH OF THE LAKE EDWIN JOHNSON BOAT LANDING 25 YARDS OFF THE RIGHT BANK WHILE FACING DOWNSTREAM |
| RL-05394 | LAKE KEOWEE 5.06 MI NNW OF SECEA |
| RL-05466 | LAKE KEOWEE 0.25 MI NWN OF S-37-340 AND S-37-588 |
| RL-07028 | LAKE KEOWEE 0.1 MI NE OF PENINSULA TIP 0.3 MI NW OF 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 |
| SV-338 | LK KEOWEE ABOVE SC ROUTE 130 AND DAM |
| SV-361 | LK KEOWEE IN FOREBAY OF LITTLE RIVER DAM |
| B-099A | ON # 1 INLET LK LANIER IN GREENVILLE CO |
| B-099B | AT DAM LK LANIER IN GREENVILLE CO |
| B-344 | LAKE JOHN D. LONG IN FOREBAY NEAR DAM |
| RL-05413 | JOHN D. LONG LAKE 0.2 MI NW OF DAM |
| B-327 | MONTICELLO LK-LOWER IMPOUNDMENT BETWEEN LARGE ISLANDS |
| B-328 | MONTICELLO LK-UPPER IMPOUNDMENT AT BUOY IN MIDDLE OF LAKE |
| RL-04370 | MONTICELLO LAKE 1.7 MI NW OF MONTICELLO |
| RL-04374 | MONTICELLO LAKE 3.5 MI N OF JENKINSVILLE |
| RL-08055 | LAKE MONTICELLO AS CLOSE TO OUTFLOW AT DAM AS POSSIBLE |
| CL-083 | LK MURRAY IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| RL-04372 | LAKE MURRAY HOLLOW/HORSE CREEKS ARM 1.75 MI NNE OF US 378 CROSSING |
| RL-05410 | LAKE MURRAY AT END OF SHULL ISLAND AT THE END OF S-32-115 |
| RL-05418 | LAKE MURRAY 0.38 MI SSE OF S-32-1322 |
| RL-05420 | LAKE MURRAY 0.7 MI NNW OF LAKE MURRAY SHORES |
| RL-06440 | LAKE MURRAY 0.95 MI NE OF END S-32-1239 |
| RL-06442 | LAKE MURRAY 0.65 MI NW JUNCTION OF S-32-109 AN S-32-38 |
| RL-07007 | LAKE MURRAY IN SMALL COVE BETWEEN S-32-1405 & S-32-1406 |
| RL-07023 | LAKE MURRAY 1.5 MI NNE OF END OF S-32-690 |
| RL-08039 | MIDDLE FINGER OF COVE IN BEAR CREEK ARM OF LAKE MURRAY 0.25 MI SW OF END OF ISLE OF PINES DR OFF S-32-51 (AMICKS FERRY ROAD) |
| RL-08051 | LAKE MURRAY 0.4 MI SE OF E TIP OF DREHER ISL 0.5 MI ENE OF S-280 |
| S-204 | LK MURRAY AT DAM AT SPILLWAY (MARKER 1) |
| S-211 | HOLLANDS LANDING LK MURRAY OFF S-36-26 AT END OF S-36-3 |
| S-212 | MACEDONIA LANDING LK MURRAY AT END OF S-36-26 MACEDONIA |
| S-213 | LAKE MURRAY AT S-36-15 |
| S-223 | BLACKS BR, LK MURRAY AT SC 391 |
| S-273 | LK MURRAY AT MARKER 166 |
| S-274 | LK MURRAY AT MARKER 143 |
| S-279 | LK MURRAY AT MARKER 63 |
| S-280 | LK MURRAY AT MARKER 102 |
| S-310 | LAKE MURRAY, SALUDA RVR ARM, US BUSH RVR, 3.8 KM US SC 391 |
| S-798 | LAKE OOLENOY AT DRAIN NEAR SPILLWAY AT SC 11 |

| | |
|----------------------------|---|
| B-345 | PARR RESERVOIR IN FOREBAY NEAR DAM |
| RL-05411 | LAKE RABON, N RABON CK ARM, 2.8 MI UPSTREAM FROM DAM |
| RL-07015 | LAKE RABON SOUTH RABON CK ARM 100 METERS SE OF S-30-592 BRIDGE |
| RL-07031 | LAKE RABON SOUTH RABON CK ARM 0.6 MI SSE OF BRIDGE S-30-592 SE OF MIDLAKE ISLAND AT MOUTH OF COVE |
| S-296 | LAKE RABON 300 FT US OF DAM |
| S-312 | LAKE RABON, S RABON CK ARM, AT S-30-312 |
| S-313 | LAKE RABON, N RABON CK ARM, 2.5 MI US DAM |
| RL-05409 | RICHARD B. RUSSELL LAKE 3.85 MI WSW OF END OF S-1-169 |
| RL-06439 | RICHARD B. RUSSELL LAKE 0.2 MI S OF BRIDGE SC HWY 71 |
| RL-06441 | RICHARD B. RUSSELL LAKE 5.8 MI WSW OF IVA |
| RL-08064 | LAKE RUSSELL IN SMALL FINGER EMBAYMENT NW OF MOHAWK IND ROCKY RVR PLANT |
| SV-098 | LAKE RUSSELL AT SC 72 3.1 MI SW CALHOUN FALLS |
| SV-100 | LAKE RUSSELL AT SC 181 6.5 MI SW STARR |
| SV-357 | LAKE RUSSELL, ROCKY RVR ARM BETWEEN MARKERS 48 & 49, DS FELKEL |
| RL-08045 | SALUDA LAKE IN FOREBAY 65 YDS NE OF SAFETY BUOYS |
| RL-08056 | SALUDA LAKE NEAR SHORE OF THE POINT NEAR THE END OF CLUB CIRCLE |
| RL-05401 | SALUDA LAKE 0.13 MI NE OF DAM |
| RL-06427 | SALUDA LAKE 0.7 MI N OF DAM |
| S-250 | SALUDA LAKE AT FARRS BRDG ON SC 183 7 MI NE EASLEY |
| S-314 | SALUDA LAKE, .5 MI US OF LANDING |
| SV-331 | LK SECESSION, 1 1/4 MI BELOW SC ROUTE 28 |
| SV-332 | LK SECESSION APPROX 400 YDS ABOVE DAM |
| B-113 | SPARTANBURG RESERVOIR #1 ON S-42-213 NE OF INMAN |
| SV-294 | STEVENS CK RESERVOIR HEADWATERS AT CLARKS HILL DAM BOAT RAMP |
| RL-08068 | STROM THURMOND LAKE 0.1 MILE SE OF PARKSVILLE BOAT LANDING |
| B-342 | LAKE THICKETTY IN FOREBAY NEAR DAM |
| CL-089 | LK WATEREE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| CW-207 | LK WATEREE AT END OF S-20-291 |
| CW-208 | LK WATEREE AT S-20-101 11 MI ENE WINNSBORO |
| CW-209 | LK WATEREE AT SMALL ISLAND 2.3 MI N OF DAM |
| RL-06435 | LAKE WHELCHER 3 MI NE OF GAFFNEY |
| CW-197 | LAKE WYLIE AB MILL CK ARM AT END OF S-46-557 |
| CW-198 | LAKE WYLIE OUTSIDE MOUTH OF CROWDERS CK ARM |
| CW-201 | LK WYLIE N LAKEWOODS S/D AT EBENEZER ACCESS |
| CW-230 | LAKE WYLIE AT DAM, UNDER POWERLINES |
| CW-245 | LAKE WYLIE, CROWDERS CK ARM AT FIRST POWERLINES US OF MAIN POOL |
| RL-06433 | LAKE WYLIE 0.5 MI W OF TEGA CAY SAMPLE CLOSER TO TEGA CAY SIDE |
| B-737 | LAKE YORK IN KINGS MOUNTAIN STATE PARK |
| RL-08061 | CLARK FORK (WESTERN) ARM OF LAKE YORK 0.4 MI SE OF CAMP YORK CK RD XSING |
| SOUTHEASTERN PLAINS | |
| Station ID(s) | Location |
| CL-077 | LAKE ASHWOOD, FOREBAY MOVED TO CATWALK NEAR DAM |
| RL-06437 | LAKE BROWN 0.3 MI NNE OF BRIDGE S-6-488 |
| RL-03346 | EUREKA LAKE IN CHERAW STATE PARK APPROX MID-LAKE |
| RL-06436 | EUREKA LAKE 5 MI SW OF CHERAW |

| | |
|--------------------------------------|--|
| RL-06448 | EUREKA LAKE 4.2 MI SW OF CHERAW |
| CL-088 | JUNIPER LAKE, 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-069 | LANGLEY POND IN FOREBAY NEAR DAM |
| RL-04373 | LANGLEY POND 0.85 MI UPLAKE (NE) OF SPILLWAY |
| RL-07011 | LANGLEY POND NEAR SHORE NEAR END OF S-02-488 |
| CL-042 | LAKE MARION FOREBAY, SPILLWAY MARKER 44 (SC-022) |
| RL-04382 | LAKE MARION 1 MI DOWNLAKE OF I-95 BRIDGE IN OLD RIVER CHANNEL |
| RL-04384 | LAKE MARION 3.8 MI W OF EADYTOWN |
| RL-04386 | LAKE MARION EUTAW CREEK ARM NEAR CATHEAD BOAT RAMP |
| RL-05402 | LAKE MARION 3.5 MI NNW OF BRIDGE OVER DIVERSION CANAL ON SC 45 |
| RL-05406 | LAKE MARION 3.25 MI S OF LOG JAM LANDING |
| RL-05464 | LAKE MARION 4.97 MI SE OF I-95 BRIDGE OVER LAKE |
| RL-06424 | LAKE MARION 11 MI SSW OF SUMMERTON |
| RL-06426 | LAKE MARION 9.3 MI ESE OF SUMMERTON |
| RL-06428 | LAKE MARION 4.9 MI S OF END OF S-14-64 |
| RL-08054 | LAKE MARION APPROX 3 MI W OF CENTER OF DAM DOUBLE CHECK WITH SANTEE-COOPER |
| SC-021 | LOWER LAKE MARION, 1.5 KM NE OF ROCK'S POND CAMPGROUND |
| ST-025 | LK MARION AT OLD US 301/15 BRDG AT SANTEE (SC-015) |
| ST-036 | LK MARION, WYBOO CREEK ARM DS OF CLUBHOUSE BR (SC-023A) |
| SC-019 | LOWER LAKE MARION @ POTATO CREEK FLOODED EMBAYMENT |
| PD-081 | PRESTWOOD LK AT US 15 |
| PD-268 | SONOVISTA CLUB HARTSVILLE OFF DOCK OF PRESTWOOD LK |
| CL-094 | LK ROBINSON IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES FROM PRIVATE ACCESS |
| PD-327 | LK ROBINSON AT S-13-346 5 MI E MCBEE BY BOAT |
| CL-067 | VAUCLUSE POND IN FOREBAY NEAR DAM |
| CL-086 | LAKE WALLACE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| RL-04368 | LAKE WALLACE 0.4 MI NNE OF FISHING PIER |
| C-048 | WINDSOR LK SPILLWAY ON WINDSOR LK BLVD |
| MIDDLE ATLANTIC COASTAL PLAIN | |
| Station ID(s) | Location |
| CSTL-124 | BACK RIVER RES IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES |
| RL-02454 | LAKE MOULTRIE SW IN OPEN WATER |
| RL-04362 | LAKE MOULTRIE 2.2 MI SE OF CROSS |
| RL-04364 | LAKE MOULTRIE 3.3 MI NW OF BONNEAU BEACH |
| RL-04462 | LAKE MOULTRIE 4.2 MI SW OF RUSSELLVILLE |
| RL-05396 | LAKE MOULTRIE 6.25 MI WNW OF BONNEAU |
| RL-05400 | LAKE MOULTRIE 3.7 MI WNW OF BONNEAU |
| RL-06450 | LAKE MOULTRIE 1.7 MI WSW OF BONNEAU |
| RL-07014 | LAKE MOULTRIE NE QUADRANT APPROX 3 MI W OF JAHOVAH AND GOOD SHEPARD CHURCHES |
| RL-07018 | LAKE MOULTRIE APPROX 2.3 MI SE OF DIVERSION CANAL |
| RL-07022 | LAKE MOULTRIE N END APPROX 1.6 MI SE OF OLD CANAL |
| RL-07030 | LAKE MOULTRIE APPROX 0.6 MI SSW OF REDIVERSION CANAL MOUTH |

| | |
|----------|---|
| RL-08066 | LAKE MOULTRIE WESTERN SIDE 1 MI E OF FRED L DAY LANDING DOUBLE CHECK WITH SANTEE-COOPER |
| ST-037 | LAKE MOULTRIE AT CHANNEL MARKER 17 (SC-030) |
| SC-027 | SW QUADRANT OF LAKE MOULTRIE 1.2 KM EAST OF SHORELINE |
| SC-032 | SE QUADRANT OF LAKE MOULTRIE @ CHANNEL MARKER 2 |
| SC-046 | SE QUADRANT OF LAKE MOULTRIE AT PINOPOLIS EMBAYMENT |
| SC-031 | NORTH QUADRANT OF LAKE MOULTRIE @ MOUTH OF REDIVERSION CANAL |
| SC-028 | NW QUADRANT OF LAKE MOULTRIE NEAR ANGEL'S LANDING COVE |
| CL-062 | LAKE WARREN IN FOREBAY NEAR DAM |

Control Methods

NPDES permits and nonpoint source control programs, that 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.

Acid Effects on Lakes

SCDHEC measures pH as part of its routine monitoring program at all lake sites and includes any lakes with a pH less than the appropriate State standard in more than 10% of samples in the current §303(d) assessment reported in *Part I: Listing of Impaired Waters* of this Integrated Report.

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 probability-based monitoring all lake sites are monitored for metals and/or ammonia. In the Summary Statistics for this section, Table 9 lists causes for partial or non-support of lake classified uses, and Table 11 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.

5. Estuary and Coastal Assessment

A. Summary Statistics

Based on a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina

Department of Natural Resources and the results of probability site selection validation, South Carolina has an estimated 274 combined square miles of tide creek and open water habitat representing the estuarine sampling design frame previously described. Because of the inability to reach some selected locations, the 147 probability-based monitoring sites sampled from 2004-2008 represent 264 total square miles.

A summary of classified use support statewide based on these data, along with causes for partial or nonattainment, is presented below. The Lower and Upper 95 Percent Confidence Intervals for the probability-based estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

Table 13. Estuaries Use Support Summary (Square Miles)

| Indicator | Category | Probability-Based Estimated Percent of Total Resource | Probability-Based Estimated Square Miles of Total Resource | Lower 95 Percent Confidence Interval (Square Miles) | Upper 95 Percent Confidence Interval (Square Miles) |
|------------------|----------------------|--|---|--|--|
| Aquatic Life Use | Fully Supporting | 90.5 | 239 | 225 | 253 |
| | Partially Supporting | 1.2 | 3 | 0 | 8 |
| | Not Supporting | 8.3 | 22 | 9 | 35 |
| Recreational Use | Fully Supporting | 98.2 | 259 | 253 | 265 |
| | Partially Supporting | 1.8 | 5 | 0 | 11 |
| | Not Supporting | 0% | 0 | 0 | 0 |

Table 14. Summary of Fully Supporting and Impaired Estuaries (Not including Fish/Shellfish Consumption Use)

| Category | Probability-Based Estimated Percent of Total Resource | Probability-Based Estimated Square Miles of Total Resource | Lower 95 Percent Confidence Interval (Square Miles) | Upper 95 Percent Confidence Interval (Square Miles) |
|------------------------------------|--|---|--|--|
| Fully Supporting All Assessed Uses | 88.8 | 234 | 220 | 249 |
| Impaired for One or More Use | 11.2% | 29 | NA | NA |

Table 15. Total Sizes of Estuaries Impaired by Various Cause Categories (Square Miles)

| Cause Category | Probability-Based Estimated Square Miles of Total Resource | Lower 95 Percent Confidence Interval (Square Miles) | Upper 95 Percent Confidence Interval (Square Miles) |
|-------------------------|---|--|--|
| Turbidity | 14 | 3 | 24 |
| Dissolved Oxygen | 4 | 0 | 9 |
| Ammonia | 4 | 0 | 10 |
| Copper | 4 | 0 | 9 |
| Zinc | 0 | 0 | 0 |
| Fecal Coliform Bacteria | 5 | 0 | 11 |

6. Wetlands Assessment

A. Summary Statistics

Table 16. 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 maintains a number of GIS land use coverages that include wetland acreages. 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.

The National Land Cover Dataset or NLCD (SCDHEC GIS coverage last edited March 16, 2003) includes 15 classes (2 wetland classes) and was compiled from Landsat 5 Thematic Mapper satellite imagery with a spatial resolution of 30 meters and supplemented by a host of ancillary data. The NLCD was produced as a cooperative effort between the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (US EPA) to produce a consistent, land cover data layer for the coterminous U.S. using early 1990s (1991-1993) Landsat Thematic Mapper data purchased by the Multi-Resolution Land Characteristics (MRLC Consortium. The MRLC Consortium is a partnership of federal agencies that produce or use land cover data. Partners include the USGS (National Mapping, Biological Resources, and Water Resources Divisions), U.S. EPA, the U.S. Forest Service, and the National Oceanic and Atmospheric Administration.

Multi-Resolution Land Characteristics (MRLC) Consortium Home:

<http://www.mrlc.gov/index.asp>

National Land Cover Dataset Home:
<http://landcover.usgs.gov/natl/landcover.asp>

The SC-GAP project mapped the State's natural and man-made vegetation to two classifications, a general 27-class (8 wetland classes) habitat map that was used in modeling vertebrate distributions, and a more detailed 54-class map (at least 21 wetland classes) in accordance with the National GAP guidelines of mapping to the alliance level where possible. The initial data used in developing the map was remotely sensed satellite data from the Multi-Resolution Land Characteristics (MRLC) Consortium. Ancillary data included detailed soil surveys, National Wetlands Inventory surveys, and elevation maps to improve this classification and develop the 54-class land cover. This was aggregated into the habitat map for use in producing vertebrate distributions. From: "A Gap Analysis of South Carolina, 2001 Final Report"

A detailed National Wetlands Inventory mapping is current, but not yet complete for the State.

B. Extent of Wetlands Resources

A tracking system called Environmental Facilities Information System or EFIS has been adopted agency-wide. The Water Quality Certification, Standards, and Wetlands Programs Section has developed a module into which all Section 10 and Section 404/401 projects are entered. This module includes information on project location (latitude/longitude, basin, and watershed unit), purpose, types of impacts, acreage of wetland and non-wetland impacts, compensation 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. We are currently working to get this system operational and the data 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 691 projects that required a §401 Water Quality Certification in FYs 2006 through 2007. 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 "no 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 that 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, that 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, that 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 2007 NWPs on April 25, 2007 to the ACOE. SCDHEC proposed to deny NWPs: 16, 17, 21, 34, 46, 49, and 50. In regard to NWP 17, SCDHEC currently reviews all applications for FERC licenses. The following NWPs were proposed for issuance with conditions: 3-7, 12-15, 18, 19, 20, 22, 23, 25, 27, 29, 30, 31, 32, 33, and 36-45, 47, and 48. The most shared condition states that proposed impacts will not exceed 0.10 ac or 300 linear feet. The ACOE proposed to replace NWP 26 with several “activity 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 ACOE.

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 that they are adjacent. Wetlands contiguous to a stream or lake assume the classification of the waterbody to that 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.

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.

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,

“Discharge 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 that 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 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 through the statewide probability-based ambient monitoring program.

Table 17. Total Size Affected by Toxicants

| Waterbody Type | Size Monitored for Toxicants | Probability-Based Estimate of Total Resource | Lower 95 Percent Confidence Interval | Upper 95 Percent Confidence Interval |
|--------------------------|-------------------------------------|---|---|---|
| Rivers (miles) | 11,620 | 668 | NA | NA |
| Lakes (acres) | 316,927 | 163 | NA | NA |
| Estuaries (square miles) | 264 | 8 | NA | NA |

B. Public Health Impacts

Pollution Caused Fish Kills/Abnormalities

There was a total of 71 fish kill investigations conducted by SCDHEC in each of 2007 and 2008. Dissolved oxygen depletion, weather conditions, and other natural causes accounted for

approximately 63% in 2007 and 70% in 2008. In 2008 nearly 70% of the kills occurred in ponds or brackish lagoons, in 11%, the kills could not be determined and approximately 19% of the fish kills investigated in 2008 were from unnatural causes. Unnatural causes ranged from fish being caught and dumped back into lakes and streams to the runoff of pesticides and pollution. Through nine months of 2009, there have been 58 kills following the trend of 2007 and 2008.

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.

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 by SCDHEC. 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 entire staff use its Field Manual for Investigation of Fish Kills. SCDHEC's computer system, EFIS (Environmental Facility Information System) acts as the official fish kill report.

SCDHEC now has teamed up with NOAA and all Fish kill data are feed into a Statewide Environmental Surveillance Network. It is now a SCDHEC policy to acquire GPS coordinates on all fish kills to pinpoint fish kill location.

Fish Consumption Advisories

The 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. An acceptable RfD for developmental neurotoxicity has not been determined and scientific studies suggest that exposure before birth may have adverse effects on the developing fetus. For these reasons infants, pregnant women, nursing mothers, 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 April. For background information and the most current advisories, please visit the Bureau of Water homepage at <http://www.scdhec.gov/fish> or call SCDHEC's Division of Health Hazard Evaluation, toll-free, at (888) 849-7241.

Shellfish Restrictions/Closures

The goal of SCDHEC's Shellfish Sanitation Program (SSP) is to ensure that mollusk and 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 that would render shellfish unsafe for human consumption. Approved area classification shall be determined upon a sanitary survey that 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 that 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 that 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 that 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 that have the potential for variable water quality.

South Carolina currently (March, 2010) is approximately 578,052 estuarine/riverine surface acres classified for the harvest of molluscan shellfish. Of this total, Approved accounts for 69.0% of total acreage, Conditionally Approved - 1.6%, Restricted - 17.2%, and Prohibited - 12.2%.

Table 18. Summary of Shellfish Harvesting Status in South Carolina Shellfish Waters

| Harvesting Status | Acreage | Percent |
|------------------------|---------|---------|
| Approved | 399,030 | 69.0% |
| Conditionally Approved | 9479 | 1.6% |
| Restricted | 99,230 | 17.2% |
| Prohibited | 70,313 | 12.2% |
| Total Assessed | 578,052 | 100.0% |

Ocean Water Quality Monitoring

South Carolina’s annual program for monitoring bacteria content of recreational waters along the Atlantic coast takes place from May 15th to Oct. 15th. A partnership between the state’s Department of Health and Environmental Control and local governments provides residents and visitors with specific and timely information about beach water quality along the state’s 180 miles of coastline.

Ocean water quality is currently monitored at a total of 129 sample sites along the South Carolina

coast. Sampling frequency is based on beach Tier level. Tier 1 beaches are high use, high risk beaches (WAC-001-WAC-035). Tier 2 beaches are lower use and/or lower risk beaches. Tier 1 beaches are sampled weekly; Tier 2 beaches are sampled twice per month

Water is collected from each beach either weekly or twice per month during the season. Samples are analyzed for enterococcus content with results available through local media outlets and on www.earth911.com. When bacteria levels exceed the standard of 500 colonies per 100ml of water sampled, advisory signs are posted to alert the public of potential health hazards. Should a beach water sample exceed 104 colonies per 100ml another sample is immediately taken. If the second sample exceeds 104/100mL, an advisory is posted. Samples will be taken every day until acceptable readings occur at which time the advisory is removed.

The following is a summary of the advisory data. Data is listed by station number. The stations begin in North Myrtle with WAC-001 and end at Hilton Head with LC-111. Not all stations had an advisory. When an advisory is issued it covers 400 total feet of beach – two hundred feet on either side of the sampling site. For ease of reading the advisory summary, here is a table of SC beaches with their station numbers.

Table 19. Areas Affected by Beach Advisories

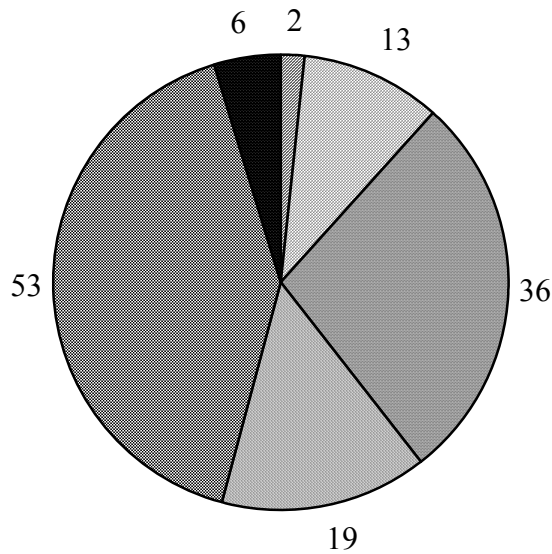
| Locations | Station |
|---|----------------|
| City of North Myrtle Beach | WAC-001-008 |
| Horry County – White Point Swash | WAC-009 |
| Town of Briarcliffe Acres | WAC-009A-010 |
| Horry County – Arcadia | WAC-011-015 |
| City of Myrtle Beach | WAC-016-025 |
| Horry County – Springmaid Beach | WAC-026 |
| Horry County – State Park and Campgrounds | WAC-027-029 |
| Town of Surfside Beach | WAC-030-035 |
| Horry County – Garden City Beach | WAC-036-037 |
| Georgetown County – Garden City Beach | WAC-038 |
| Georgetown County – Huntington Beach State Park | WAC-039-040 |
| Georgetown County – Litchfield Beach | WAC-041-043A |

| Locations | Station |
|-------------------------------------|----------------|
| Town of Pawley's Island | WAC-044A-046 |
| Georgetown County – Debordieu Beach | WAC-047-048 |
| Isle of Palms | TRI-050-056 |
| Sullivans Island | TRI-057-059 |
| Folly Beach | TRI-060-067 |
| Kiawah Island | TRI-068-072 |
| Seabrook Island | TRI-073-074 |
| Edisto Island | LC-075-082 |
| Harbor Island | LC-083-085A |
| Hunting Island State Park | LC-086-091 |
| Fripp Island | LC-092-096 |
| Hilton Head Island | LC-098-111 |

Chart 2. below shows the number number of samples which exceeded the 104 CFU/ml standard by month in 2008. As might be expected the warmer months had the highest number of exceedences. Graph 3. on the following page shows the number of exceedences by station codes.

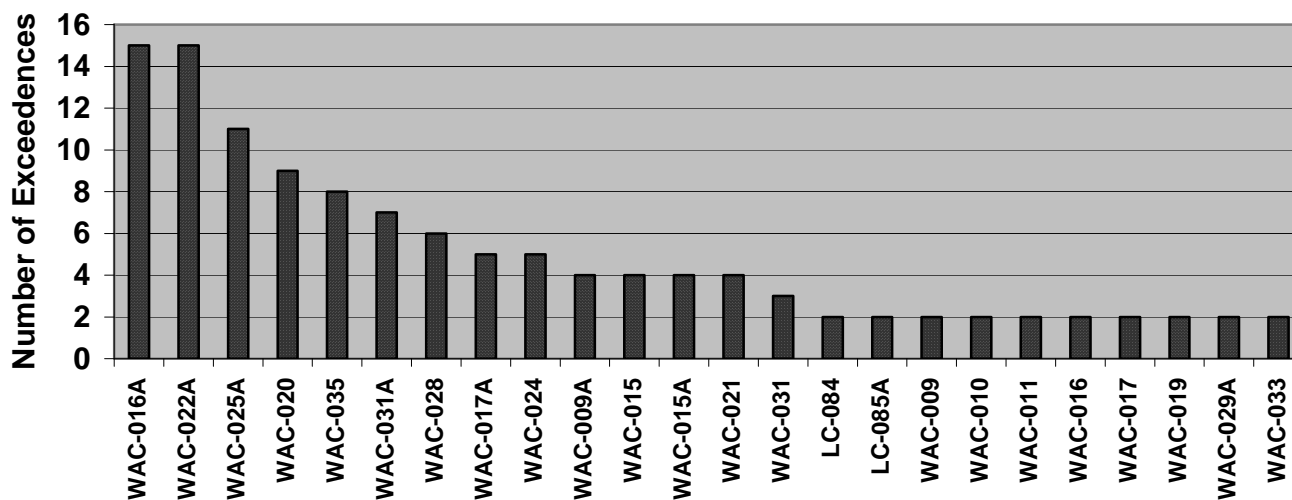
Exceedences by Month 2008

■ May ■ June ■ July ■ August ■ September ■ October



| | 2008 | May | June | July | August | September | October |
|-------------------|-------|-------|-------|-------|--------|-----------|---------|
| Total Samples | 1961 | 172 | 334 | 397 | 390 | 448 | 221 |
| Total Exceedences | 129 | 2 | 13 | 36 | 19 | 53 | 6 |
| % exceedence | 6.58% | 1.16% | 3.89% | 9.07% | 4.87% | 11.83% | 2.71% |

Graph 3. 2008 Exceedences by Station



These stations had one exceedence each in 2008: LC-076, LC-082, LC-085, LC-087, LC-089, TRI-059, WAC-007, WAC-018, and WAC-032.

More information regarding sample results for all monitored beaches and about the program’s other activities is available at the S.C. Department of Health and Environmental Control’s Web site at www.scdhec.gov/beach.

C. Public Health: Drinking Water

Restrictions in Surface Drinking Water Supplies and Incidents of Waterborne Diseases

There were fourteen (14) Notices of Violation (NOV) issued to seven (7) systems during the period of January 1, 2008 – December 31, 2008 for Treatment Technique and Monitoring and Reporting violations under the Surface Water Treatment Rule and the Stage 1 Disinfectants/Disinfection Byproducts Rule. The state reported no incidences of waterborne disease during the same period.

GROUNDWATER ASSESSMENT

Groundwater is the source of drinking water for 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 that 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 that 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 20. Underground storage tank (UST) releases account for 3766 of the 4529 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 20 indicates the contaminants associated with the highest priority sources. Petroleum compounds, halogenated solvents, metals and nitrates are the contaminants most frequently detected.

Table 20. Major Sources of Groundwater Contamination

| Contaminant Source | Ten Highest-Priority Sources (T) | Factors Considered in Selecting a Contaminant Source | Contaminants |
|---|---|---|---------------------|
| <i>Agricultural Activities</i> | | | |
| Agricultural chemical facilities | | | |
| Animal feedlots | | | |
| Drainage wells | | | |
| Fertilizer applications | | | |
| Irrigation practices | | | |
| Pesticide applications | | | |
| <i>Storage and Treatment Activities</i> | | | |
| 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 | | | |
| <i>Disposal Activities</i> | | | |
| Deep injection wells | | | |
| Landfills | T | D | C,D,H |
| Septic systems | | | |
| Shallow injection wells | | | |
| <i>Other</i> | | | |
| Hazardous waste generators | T | D,A | C,H |
| Hazardous waste sites | T | D,A | C,H |

| Contaminant Source | Ten Highest-Priority Sources (T) | Factors Considered in Selecting a Contaminant Source | Contaminants |
|--------------------------------|----------------------------------|--|---------------------------|
| 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 | | | |
| 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 (X) 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
 - H. Metals

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

Tables 21, 22, 23, 24 and 25 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. The sources and contaminants indicated in Table 20 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 number of confirmed groundwater contamination cases that have been identified in the Coastal Plain are 2988 and 1506 has been confirmed in the Piedmont. This number was obtained by counting the sites county by county.

Table 21. Groundwater Contamination Summary

Aquifer Description: Above Fall Line
 Aquifer Setting: Saprolite/Bedrock Aquifer
 Data Reporting Period: Ending July 2008

| 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 | | 4 | 4 | A,B,C,H,M(PC Bs) |
| CERCLIS (non-NPL) | YES | | 1 | 1 | A,B,C,D,E,H, M(PCBs) |
| DOD/DOE | YES | | 3 | 3 | D |
| LUST | YES | | 1205 | 1205 | A,B,C,D |
| RCRA Corrective Action | YES | | 28 | 28 | C,D,H |
| Underground Injection | NO | 0 | 0 | 0 | |

| | | | | | |
|------------------|-----|--|------|------|--------------|
| State Sites | YES | | 81 | 81 | A,B,C,D,E H, |
| Nonpoint Sources | YES | | 2 | 2 | E |
| Other (specify) | YES | | 186 | 186 | C,D,E,H |
| Totals | | | 1510 | 1510 | |

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 22. 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 23. Groundwater Contamination Summary (2)

Aquifer Description: Below Fall Line

Aquifer Setting: Coastal Plain

Data Reporting Period: Ending July 2008

| 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 | | 20 | 20 | A,B,C,D,H |
| CERCLIS (non-NPL) | YES | | 24 | 24 | A,B,C,D,H |
| DOD/DOE | YES | | 40 | 40 | A,B,C,D,H,I |
| LUST | YES | | 2467 | 2467 | A,B,C,D |
| RCRA Corrective Action | YES | | 141 | 141 | A,B,C,D,E,H |
| Underground Injection | NO | 0 | 0 | 0 | |
| State Sites | YES | | 100 | 100 | C,D,A,B,D,E |
| Nonpoint Sources | YES | | 16 | 16 | E |
| Other (specify) | YES | | 299 | 299 | C,D,E,H |
| Totals | | | 3107 | 3107 | |

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

Table 24. 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, that 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 20). The remediation status represented by Tables 22 and 24 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 25. The Groundwater Working Group, that is comprised of SCDHEC's groundwater program managers, was formed to provide consistency across the programs.

Table 25. Summary of State Groundwater Protection Programs

| Programs or Activities | Check (Y) | Implementation Status | Responsible State Agency |
|---------------------------------------|-------------------|------------------------------|---------------------------------|
| Active SARA Title III Program | Y | Fully Established | SCDHEC/BL&WM/Emergency Response |
| Ambient groundwater monitoring system | Y | Fully Established | SCDHEC/BOW/GWM |
| Aquifer vulnerability assessment | Y | Under Development | SCDHEC/BOW/GWM |
| Aquifer mapping | Y | Continuing Efforts | DNR-SCDHEC/BOW/GWM |
| Aquifer characterization | Y | Continuing Efforts | DNR-SCDHEC/BOW/GWM |
| Comprehensive data Management system | Y | Under Development | DNR-SCDHEC |
| EPA-endorsed Core Comprehensive State | Y | Under Development | SCDHEC/BOW/GWM |

| Programs or Activities | Check (Y) | Implementation Status | Responsible State Agency |
|--|------------------|------------------------------|---------------------------------|
| Groundwater Protection Program (CSGWPP) | | | |
| Groundwater discharge permits | Y | Fully Established | SCDHEC/BOW |
| Groundwater Best Management Practices | Y | Under Development | SCDHEC/BOW/IAWD |
| Groundwater legislation | Y | Continuing Efforts | SCDHEC-DNR |
| Groundwater classification | Y | Fully Established | SCDHEC/BOW |
| Groundwater quality standards | Y | Under Revision | SCDHEC |
| Interagency coordination for groundwater protection initiatives | Y | Under Development | SCDHEC-DNR-Clemson Univ. |
| Nonpoint source controls | Y | Under Development | SCDHEC/BOW |
| Pesticide State Management Plan | Y | Under Development | SCDHEC/BOW/GWM-Clemson Univ. |
| Pollution Prevention Program | Y | Fully Established | SCDHEC/BL&WM |
| Resource Conservation and Recovery Act (RCRA) Primacy | Y | Fully Established | SCDHEC/BL&WM |
| State Superfund | Y | Fully Established | SCDHEC/BL&WM/CERCLA |
| State RCRA Program incorporating more stringent requirements than RCRA primacy | | Not Applicable | |
| State septic system requirements | Y | Fully Established | SCDHEC/ENV. HEALTH |
| Underground storage tank installation requirements | Y | Fully Established | SCDHEC/BL&WM/UST Program |
| Underground Storage Tank Remediation Fund | Y | Fully Established | SCDHEC/BL&WM/UST Program |
| Underground Storage Tank Permit Program | Y | Fully Established | SCDHEC/BL&WM/UST Program |

| Programs or Activities | Check (Y) | Implementation Status | Responsible State Agency |
|---|------------------|------------------------------|---------------------------------|
| Underground Injection Control Program | Y | Fully Established | SCDHEC/BOW/GWM |
| Vulnerability assessment for drinking water/wellhead protection | Y | Fully Established | SCDHEC/BOW/GWM |
| Well abandonment regulations | Y | Fully Established | SCDHEC/BOW |
| Wellhead Protection Program (EPA-approved) | Y | Fully Established | SCDHEC/BOW/GWM |
| Well installation regulations | Y | 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 26 and 27. The state's ambient quality monitoring network is designed to develop a baseline for groundwater quality for each of the aquifers within the state. 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 26 and 27.

Table 26. Aquifer Monitoring Data

Aquifer Description _____
 Aquifer Setting _____

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

| Monitoring Data Type | Total No. of Wells Used in the Assessment | Parameter Groups | Number of Wells | | | |
|--|---|------------------|---|--|----|---|
| | | | 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) |
| Ambient Monitoring Network (optional) | | VOC | | | | |
| | | SOC | | | | |
| | | NO3 | | | | |
| | | Other | | | | |
| Raw Water Quality Data from Public Water Supply Wells | | VOC | | | | |
| | | SOC | | | | |
| | | NO3 | | | | |
| | | Other | | | | |
| Finished Water Quality Data from Public Water Supply Wells | | VOC | | | | |
| | | SOC | | | | |
| | | NO3 | | | | |
| | | Other | | | | |

Table 27. 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 | | | |
| | NO3 | | | |
| | 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 132 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.

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