

National Water-Quality Assessment Program—The Santee Basin and Coastal Drainage, N.C. and S.C.

In 1991, the U.S. Geological Survey (USGS), U.S. Department of the Interior, began a National Water-Quality Assessment Program (NAWQA). The long-term goals of NAWQA are to describe the status of and trends in the quality of a large representative part of the Nation's surface- and ground-water resources and to identify all the major factors that affect the quality of these resources. In addressing these goals, NAWQA produces water-quality information that is useful to policymakers and managers at State, Federal, and local levels.

NAWQA emphasis is on regional scale water-quality problems. The program does not diminish the need for smaller scale studies and monitoring designed and conducted by State, Federal, and local agen-

cies. NAWQA, however, provides a large-scale framework for conducting many of these activities and an understanding about regional and national water-quality conditions that cannot be acquired from these other programs and studies.

Studies of 60 hydrologic systems that include parts of most major river basins and aquifer systems are the building blocks of the national assessment. The areas of the 60 study units range in size from 1,000 to more than 60,000 square miles (mi^2) and represent 60 to 70 percent of the Nation's water use and population served by public water supplies. Twenty investigations were begun in 1991, 20 investigations began in 1994, and 20 are planned to begin in 1997. The assessment

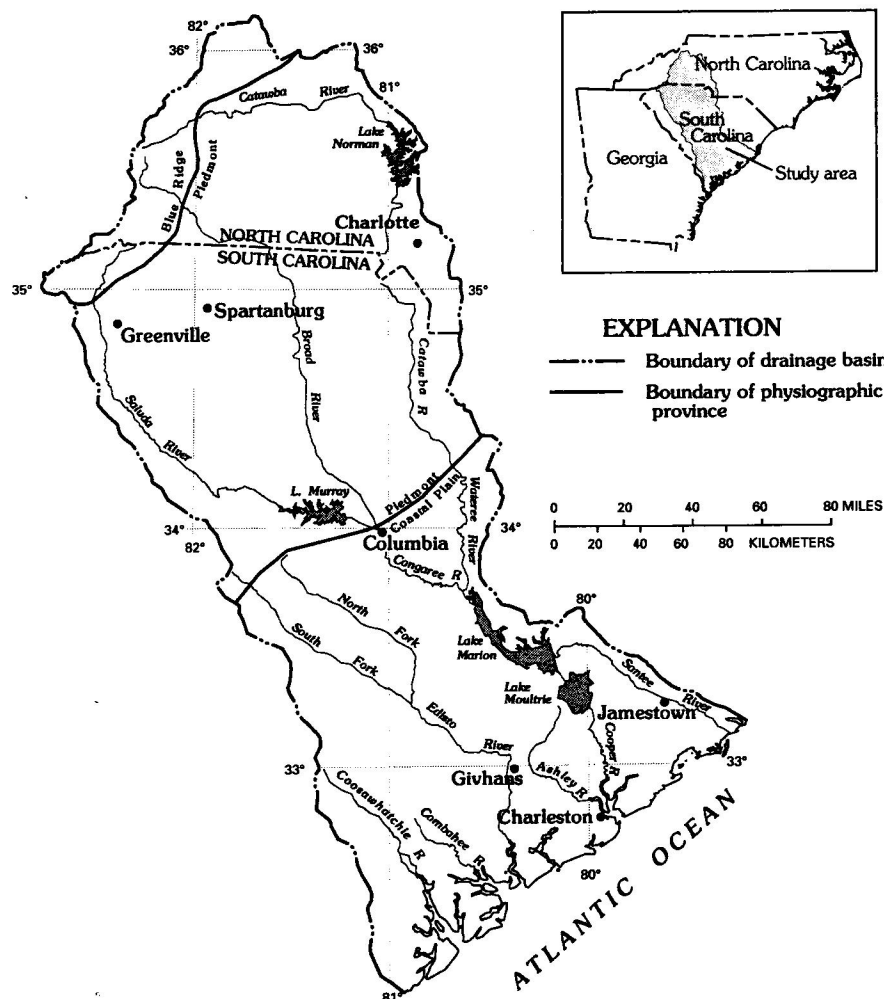
activities in the Santee River Basin and Coastal Drainage began in 1994.

The Santee Basin And Coastal Drainage

The 24,868- mi^2 study area includes parts of North Carolina (4,695 mi^2) and South Carolina (20,173 mi^2) and extends across parts of three physiographic provinces—the Blue Ridge, the Piedmont, and the Coastal Plain. In 1990, it had a population of 3,618,755 and contained four major metropolitan areas—Greenville-Spartanburg, Columbia, Charleston, and Charlotte. Surface and ground water provided 86 and 14 percent, respectively, of the public water supply in 1990. According to 1970 data, the study area is about 63 percent forested; 7 percent, urban; 18 percent, cropland; 7 percent, pasture; and 4 percent, water. The largest industries are textile, paper, and chemical.

About 65 percent of the study area lies in the Santee River Basin, and 35 percent, in the basins of smaller streams that drain coastal areas of southeastern South Carolina. The Santee River is the second largest river on the east coast of the United States, second only to the Susquehanna River in drainage area and flow. The headwaters of the Santee River are in the mountains of North Carolina, and the river flows about 413 miles across the Piedmont and the Coastal Plain to the Atlantic Ocean. The coastal drainage consists of the Ashley, the Cooper, the Edisto, the Combahee, and the Coosawhatchie River Basins. These streams originate in the Coastal Plain and range in length from less than 10 miles (mi) for some of the smaller creeks to 150 mi for the Edisto. The waters in the lower reaches of the rivers are brackish and affected by tides.

The flow in the Santee River near Jamestown, S.C., averaged 11,408 cubic feet per second (ft^3/s) during 1987–91, and the highest and lowest daily mean flows were 89,500 and 460 ft^3/s , respectively. Much of the flow from the river is diverted across a drainage divide from



Lake Marion to Lake Moultrie in the Cooper River Basin. Consequently, the flow in the Cooper River Basin is high in relation to its drainage area. During 1987–91, the mean annual flow in the Cooper River below the Lake Moultrie tailrace canal was 5,349 ft³/s, and the highest and lowest daily mean flows were 26,800 and 0 ft³/s, respectively. The flows in the coastal drainage rivers are smaller because of their smaller drainage areas. The mean annual flow of the Edisto River near Givhans for 1939–91 was 2,609 ft³/s, and the highest and lowest daily mean flows were 24,100 and 252 ft³/s, respectively.

The largest surface-water impoundments in the Santee Basin are Lakes Norman (32,510 acres), Murray (51,000 acres), Moultrie (60,400 acres), and Marion (110,600 acres). Much of the sediment transported by the Santee River is deposited in Lakes Marion and Moultrie; however, some fine-grained sediment moves through the Lake Moultrie spillway and increases the sediment load in the Cooper River. The diversion of water from the Santee Basin into the Cooper Basin in 1941 caused a large increase in flow in the Cooper River and an increase in erosion and sediment load transported by the river. Because much of the increased sediment load was deposited in Charleston Harbor, water from Lake Moultrie was diverted into the Santee Basin in 1986.

About 50 percent of the study area is in the Piedmont, 40 percent is in the Coastal Plain, and 10 percent is in the Blue Ridge. The ground-water resources are dependent on the lithology of the rocks that underlie the area, which differs among the three physiographic provinces. The Piedmont is underlain by metamorphosed igneous and sedimentary rocks, with a thick layer of saprolite, or weathered rock that covers the bedrock. Industrial and municipal supplies of ground water in the Piedmont generally are obtained from deep wells that tap joints and fractures in the bedrock. Small supplies of ground water, primarily for domestic uses, are obtained from shallow wells that tap pore spaces in saprolite. The Coastal Plain is underlain by seaward-thickening layers of sand, silt, clay, and limestone. Usable ground water in the Coastal Plain is located within the pore spaces of coarse-

grained deposits and is extensively developed as a water supply for industrial and municipal uses. The Blue Ridge is underlain by consolidated rock and saprolite. Ground water is obtained from wells that intersect fractures and joints in this part of the study area, although well yields commonly are small.

In 1990, withdrawals of ground and surface water for municipal, power generation, agricultural, and industrial uses totaled 6.5 billion gallons per day (Bgal/d). Power generation was the largest water use and accounted for 5.6 Bgal/d. Industrial use accounted for 425 million gallons per day (Mgal/d); municipal use, 273 Mgal/d; and agricultural use, 70 Mgal/d. About 3 percent of the withdrawals were for consumptive uses. Instream use by hydroelectric plants was 49.3 Bgal/d in 1990.

Major Water-Quality Issues

The following water-quality issues have been tentatively identified as high-priority, regional scale issues of concern to State and local water-resource managers and are addressed by the Santee-Coastal NAWQA study:

- Enrichment by nitrogen and phosphorus has caused algal populations in many lakes and rivers in the study area to increase dramatically. The eventual death and decomposition of the algae reduces the quantity of dissolved oxygen and adversely affects fish and other aquatic biota. Determining the capacity of rivers to assimilate wastewater from treatment plants without causing environmental degradation and the contribution of point- and nonpoint-source pollution to nutrient enrichment has been a major task for environmental agencies.
- Sediment erosion due to agricultural practices of the 19th and early 20th centuries has an environmental effect today. Sediment eroded at that time was temporarily stored in riverbanks and flood plains. Erosion of these and other deposits increases turbidity in surface water, which, in turn, increases the cost of treatment for public consumption and industrial use, deposits silt in reser-

voirs, covers fish spawning beds, and causes aesthetic problems.

- Runoff from urban areas can transport trace elements and synthetic organic compounds that can lead to the deterioration of water quality and wildlife habitats in receiving streams.
- Pesticides and nutrients can contaminate surface and ground water. Although farming in the Piedmont has steadily declined since the 1920's, agriculture accounted for 18 percent of the land use within the study area in 1970.
- Mercury is present in elevated concentrations in fish that inhabit streams in the Coastal Plain of South Carolina.

Communication and Coordination

Communication and coordination between the USGS and the public and private sectors are critical components of NAWQA. Study-unit liaison committees have proved highly effective and consist of representatives from Federal, State, and local agencies; universities; and the private sector who have water-resources responsibilities or interests. Specific activities of each liaison committee include:

- Exchange of information on and prioritization of water-quality issues of regional and local interest.
- Identification of sources of water-quality data and other information.
- Assistance in design and scope of project elements.
- Review of project planning activities, findings, and interpretations, including reports.

—W. Brian Hughes

Information on technical reports and hydrologic data related to NAWQA can be obtained from:

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