DEVELOPMENT OF WATER-USE PROJECTIONS FOR GROUNDWATER FLOW MODELS IN THE COASTAL PLAIN OF GEORGIA AND SOUTH CAROLINA

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Abstract. Future water use in the Coastal Plain of Georgia and South Carolina was estimated as part of the development of groundwater flow and solute-transport models. Two areas are being modeled—one focusing on the coastal area of Georgia and adjacent parts of South Carolina and Florida, the other focusing on the U.S. Department of Energy (USDOE) Savannah River Site (SRS) and surrounding area in Georgia and South Carolina (Fig. 1). Estimates of future water use in the two study areas are needed for prediction of possible future groundwater conditions. Accurately predicting future water use is important to provide meaningful results from groundwater model simulations. Several methods were used to project future water use in the two study areas.

As part of the Georgia Coastal Sound Science Initiative, the U.S Geological Survey (USGS), in cooperation with the Georgia Environmental Protection Division (GaEPD), is developing numerical models to simulate groundwater flow and solute transport (saltwater contamination) in the Floridan aquifer system in the coastal area of Georgia and adjacent parts of South Carolina and Florida (Fig. 1). The GaEPD defines the 24-county coastal area of Georgia to include the 6 coastal Georgia counties and 18 adjacent inland counties, an area encompassing about 12,240 square miles (Fig. 1). Total water use in this area during 2000 was about 900 million gallons per day (Mgal/d) of which about 370 Mgal/d were from groundwater sources and 530 Mgal/d were from surface-water sources.

Future water use in the coastal area was estimated based on projected growth in total population and employment population derived from the Regional Economic Models, Incorporated database (Phyllis Isley, Bureau of Business Research and Economic Development, Georgia Southern University, Statesboro, Ga., written commun., 2004). Because there is a direct correlation between population change and the amount of water withdrawn for public supply, a population percent change was calculated for each year from 2001 through 2035; this percentage change was then applied to reported water withdrawal data for 2000 (Fanning, 2003). Similarly, for industry, percentage change in employment population was used to estimate future growth in industrial water use. Growth in agricultural use was derived using a projected 5-percent annual growth in irrigation (Kerry Harrison, Georgia Cooperative Extension Service, oral commun., Tifton, Ga., 2003).

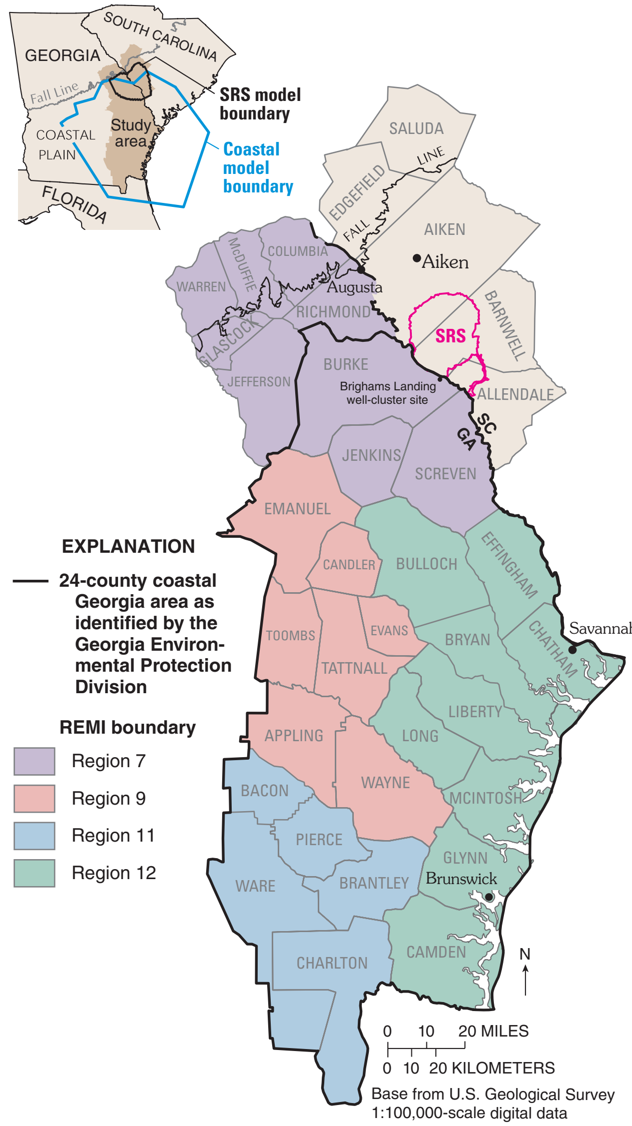

Figure 1. Twenty-four county coastal Georgia area, Regional Economic Models, Incorporated (REMI) boundaries, and the Savannah River Site (SRS) of Georgia and South Carolina.

Water use in the coastal area is projected to increase by about 136 Mgal/d from 2000 to 2035. Of the total 136 Mgal/d growth, about 94 Mgal/d is from groundwater sources and 42 Mgal/d is from surface-water sources.

In the SRS area, the USGS—in cooperation with the USDOE—developed a digital groundwater flow model to assess the potential for groundwater to flow from the SRS beneath the Savannah River and into Georgia (transriver flow) for a variety of pumping scenarios during 2002–2020 (Cherry, 2004). The SRS study area includes three counties in South Carolina and five counties in Georgia with a total estimated groundwater use of 115 Mgal/d during 2002. Future public-supply water use was estimated using projected population growth from a variety of sources multiplied by per capita usage on a county-by-county basis. During 2002–2020, public-supply groundwater use in the SRS area was projected to increase by 5 Mgal/d, for a total withdrawal of 39 Mgal/d.

Future irrigation use was estimated by examining past irrigation practices during a 20-year period (Fanning, 2003) and projecting a 5-percent increase in irrigated acreage to the year 2020. Because irrigation withdrawal can be significant during periods of drought, two projections were completed to the year 2020—one for average climatic conditions and one for dry climatic conditions. Estimated values for 2020 were derived by multiplying the projected 106,000 acres of irrigated land by county average application rates for average (1980–2000) and typical dry conditions. These estimates were adjusted using existing ratios of surface water (39 percent) to groundwater (61 percent) irrigation pumpage to determine the percentage of irrigation usage from groundwater sources. Projected annual groundwater use for irrigation for average conditions during 2020 is 38 Mgal/d and for dry conditions is 43 Mgal/d. These values both represent a decrease from the estimated irrigation use of 63 Mgal/d during the drought of 2002. The severity of the 2002 drought was considered extreme; therefore, the application rate for dry conditions was adjusted to represent a 60:40 mix of average and dry conditions.

LITERATURE CITED

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