

Development of a 14-digit Hydrologic Unit Code Numbering System for South Carolina

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Abstract

A Hydrologic Unit Map showing the cataloging units, watersheds, and subwatersheds of South Carolina has been developed by the U.S. Geological Survey in cooperation with the South Carolina Department of Health and Environmental Control, funded through a U.S. Environmental Protection Agency 319 Grant, and the U.S. Department of Agriculture, Natural Resources Conservation Service. These delineations represent 8-, 11-, and 14-digit Hydrologic Unit Codes, respectively. This map presents information on drainage, hydrography, and hydrologic boundaries of the water-resources regions, subregions, accounting units, cataloging units, watersheds, and subwatersheds. The source maps for the basin delineations are 1:24,000-scale 7.5-minute series topographic maps and the base maps shown on figure 1 are from 1:100,000-scale Digital Line Graphs; however, the data are published at a scale of 1:500,000. In addition, an electronic version of the data is provided on a compact disc.

Of the 1,022 subwatersheds delineated for this project, 1,004 range in size from 3,000 to 40,000 acres (4.69 to 62.5 square miles). Seventeen subwatersheds are smaller than 3,000 acres and one subwatershed, located on St. Helena Island, is larger than 40,000 acres.

This map and its associated code provide a standardized base for use by water-resource managers and planners in locating, storing, retrieving, and exchanging hydrologic data. In addition, the map can be used for cataloging water-data acquisition activities, geographically organizing hydrologic data, and planning and describing water-use and related land-use activities.

INTRODUCTION

In recent years, South Carolina has experienced a significant increase in the development of urban and suburban areas. Along with the economic benefits that accompany such urbanization comes increased pressure on design engineers, urban planners, and regulatory agencies to assure that this growth has minimal adverse effect on the State's natural resources, and in particular, its water resources.

Although many factors must be examined for the proper development and management of the State's water resources, the drainage area for a basin of interest is one of the most important factors to be considered. Presently (1998) in South Carolina, several State and Federal agencies and many private consultants use drainage areas on a regular basis. Engineers use the drainage area in the design of various hydrologic structures such as bridges, culverts, dams, and storm-sewer systems, and water- and wastewater-treatment plants. In addition, regulatory and management authorities use drainage-area data to help assess the effect of a proposed development on the peak flow, flood elevation, and water quality of a selected stream.

In 1972, the U.S. Geological Survey (USGS) Office of Water Data Coordination, the U.S. Water Resources Council, and the USGS Resources and Land Information program initiated the production of the standard map series called "hydrologic unit maps," which present codes, names, and boundaries of hydrologic units in the United States and U.S. territories in the Caribbean area (Seacher and others, 1975). The map series shows the United States divided into 21 major regions, of which South Carolina is almost entirely within region 03. Three areas in the northwestern part of the State are in region 06. These regions (2 digits) were then subdivided into 222 subregions, 352 accounting units, and 2,150 cataloging units (2 digits each to establish the original 8-digit Hydrologic Unit Code (HUC) (U.S. Geological Survey, 1974).

In the late 1970's, the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) issued a policy that all resource investigations and surveys were to be coded to allow the resulting data to be retrieved by HUC, and initiated a national program to further subdivide HUC's into watersheds for use in water-resource planning. An extension of 3-digits was added to the 8-digit HUC to designate watersheds (U.S. Department of Agriculture, 1991). An 11-digit watershed hydrologic unit is approximately 250,000 acres, or approximately 391 square miles (mi²).

In 1998, the USGS, South Carolina District, developed a statewide data base, in written and digital formats, which divides 11-digit watersheds into 14-digit subwatersheds. These subwatersheds generally range in size from 3,000 to 40,000 acres (4.69 to 62.5 mi²) and serve as a reference for drainage-area information. These delineations were made to provide water-resources managers and regulators with more-detailed data, which can be used in water-quality assessments and basin protection plans. This project was conducted by the USGS in cooperation with the South Carolina Department of Health and Environmental Control (SCDHEC), funded through a U.S. Environmental Protection Agency 319 Grant, and with the NRCS.

Purpose and Scope

The purpose of this report is to describe the 1998 update to the South Carolina part of the USGS standard hydrologic unit map series and to include the addition of the 11-digit watershed and 14-digit subwatershed numbers. This information is presented at a scale of 1:500,000 (fig. 1) and is available in digital format on a compact disc (CD) as an ARC/INFO® Export (E00) file and as a Portable Document Format (PDF) file. This study encompasses the entire State of South Carolina and parts of North Carolina and Georgia, where the 14-digit subwatersheds extend into those States.

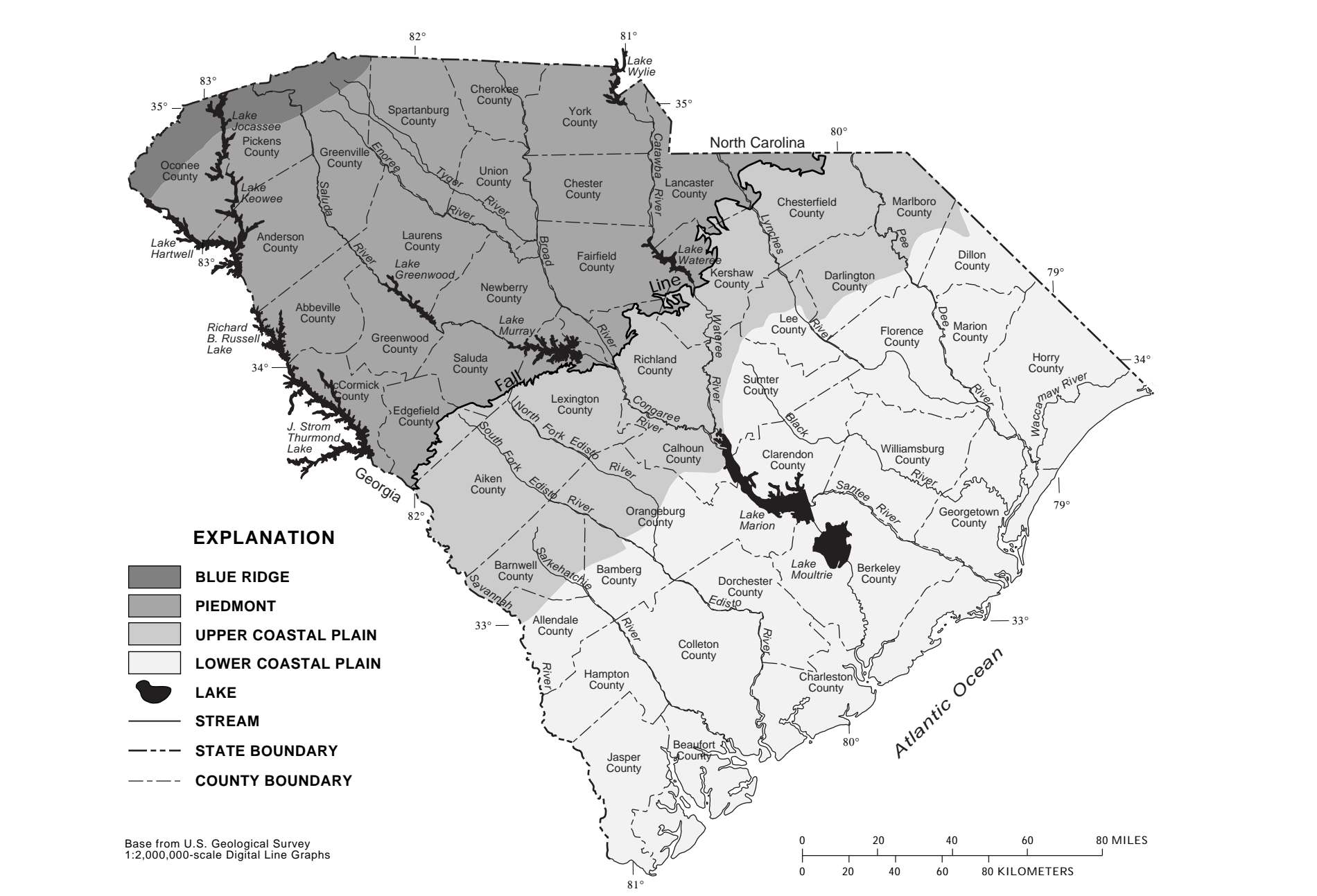


Figure 2. Physiographic provinces of South Carolina.

Description of Study Area

South Carolina has an area of 31,055 mi² and includes parts of three physiographic provinces, the Blue Ridge, Piedmont, and Coastal Plain. The Coastal Plain is informally further divided into upper and lower Coastal Plain areas (fig. 2).

The Blue Ridge Province makes up only 2 percent of the land area of South Carolina and is located in the mountainous area in the northwestern part of the State. Land-surface elevations range from 1,000 to more than 3,500 feet (ft). The Blue Ridge is geologically characterized by intrusive granite and metamorphosed volcanic rock in a steep terrain, where the stream gradients sometimes exceed 250 feet per mile (ft/mi) (Guimaraes and Bohman, 1992).

The Piedmont Province makes up approximately 35 percent of the State, and land-surface elevations range from 200 ft near the Fall Line (Coastal Plain-Piedmont Province boundary) to 1,000 ft near the boundary with the Blue Ridge Province. Rolling hills, elongated ridges, and moderately deep to shallow valleys are typical land forms. The drainage pattern is well developed, with stream gradients ranging from about 5 to 50 ft/mi. Piedmont geology consists mainly of fractured crystalline rocks and metamorphosed volcanic rocks of low permeability, but also includes highly permeable deposits of sand, silt, and clay along the valley floors (Bloxham, 1981).

The upper Coastal Plain covers about 20 percent of the State. This area ranges from 20 to 50 miles in width and is located just east of the Piedmont Province. The general topography consists of rounded hills with gradual slopes; land-surface elevations range from approximately 200 ft along the Fall Line to less than 200 ft near the boundary with the lower Coastal Plain. However, isolated hills in this region have elevations exceeding 700 ft. The geology of this area consists primarily of sedimentary rocks composed of layers of sand, silt, clay, and gravel underlain by igneous rock (Zalants, 1991a). Stream slopes range from 5 to 20 ft/mi (Guimaraes and Bohman, 1992), and many of the large drainage features are bordered by swamps with extensive flood plains. In addition, bedrock crops out in the stream beds of the upper Coastal Plain near the Fall Line (Hurley, 1996).

The lower Coastal Plain covers about 43 percent of the State. Land-surface elevations range from sea level to nearly 200 ft at the boundary with the upper Coastal Plain. The lower Coastal Plain is underlain by loose, consolidated sedimentary rocks of silt, sand, clay, and gravel overlain by permeable sandy soils (Zalants, 1991b). Stream slopes range from 1 to 20 ft/mi, and streamflow patterns become tidally influenced near the coast. Most streams in the lower Coastal Plain have large swamps with wide flood plains or marshes (Guimaraes and Bohman, 1992).

DEVELOPMENT OF A 14-DIGIT HYDROLOGIC UNIT CODE NUMBERING SYSTEM FOR SOUTH CAROLINA

In 1996, the 11-digit HUC watersheds in South Carolina were divided into subwatersheds and assigned unique 3-digit codes to be identified by a specific 14-digit HUC. The 14-digit code identifies each of the six levels of classification within 4-digit and two 2-digit fields. An example is given below and on figure 3 using HUC 03050108040010.

- 03 - Region: South Atlantic U.S.*
- 0305 - Subregion: Edisto-Santee, drainage area 23,600 mi²*
- 030501 - Accounting Unit: Santee, drainage area 15,300 mi²*
- 03050108 - Cataloging Unit: Enoree, drainage area 731 mi²*
- 03050108040 - Watershed: unnamed, drainage area 82.4 mi²*
- 03050108040010 - Subwatershed: unnamed, drainage area 40.6 mi²*

A 00 in the 2-digit accounting unit indicates that the accounting unit and the subregion are the same. Likewise, if the cataloging unit is 00, it is the same as the accounting unit. A hierarchical breakdown of the number of assigned Hydrologic Unit Codes for South Carolina is shown on figure 4.

Methods and Approach

The NRCS used 1:24,000-scale topographic maps to complete the initial delineation of subwatershed boundaries. The USGS and NRCS worked jointly to delineate additional subwatersheds and to assign 14-digit codes to these subwatersheds. Of the 1,022 subwatersheds in South Carolina, 1,004 range in size from 3,000 to 40,000 acres (4.69 to 62.5 square miles). Seventeen subwatersheds are smaller than 3,000 acres and one subwatershed, which is located on St. Helena Island, is larger than 40,000 acres. The 8-, 11-, and 14-digit hydrologic unit boundaries are shown on figure 1. In addition, the hydrologic unit codes, boundary, and drainage area data are stored in a Geographic Information System data base, which has been loaded on a compact disc located in the back of the report. The hydrologic unit map and data base depict basic hydrologic and political area planning units of South Carolina, thus providing a standard geographical framework for water-resources and selected land-resource planning.

When the NRCS delineated the 11-digit HUC's in the late 1970's, 7.5-minute topographic quadrangles were not available for several areas of the State. In these areas, 15-minute topographic quadrangles were used to delineate watersheds. Aerial photographs were used in areas where 15-minute quadrangles were not available. The increased availability of 7.5-minute topographic quadrangles at the time the 14-digit subwatersheds were delineated, resulted in several of the original 11-digit watersheds (and thus the 11-digit HUC's) being changed in an effort to conform to the 7.5-minute quadrangles. In addition, many of the original 11-digit HUC's were changed in an effort to conform to the 7.5-minute quadrangles. Table 2 lists the original 11-digit HUC for these watersheds along with the revised 11-digit HUC.

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