

MAGNITUDE AND FREQUENCY OF FLOODS IN RURAL BASINS OF GEORGIA, SOUTH CAROLINA, AND NORTH CAROLINA

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Abstract. The U.S. Geological Survey (USGS)—in cooperation with the Departments of Transportation in Georgia, South Carolina, and North Carolina, and the North Carolina Floodplain Mapping Program—conducted an investigation using a multi-state approach to update methods for estimating the magnitude and frequency of floods in rural ungaged basins in Georgia, South Carolina, and North Carolina that are not significantly affected by regulation, tidal backwater fluctuations, or urban development. Annual peak-flow data through September 2006 were analyzed for 943 streamflow gaging stations having 10 or more years of record on rural streams in Georgia, South Carolina, North Carolina and adjacent parts of Alabama, Florida, Tennessee, and Virginia. Flood-frequency estimates were computed for the gage stations by fitting the logarithms of annual peak flows for each station to a log-Pearson Type III distribution using the guidelines described in Bulletin 17B of the Hydrology Subcommittee of the Inter-agency Advisory Committee on Water Data (Interagency Advisory Committee on Water Data, 1982). As part of the computation of flood-frequency estimates for gaged stations, new values for generalized skew coefficients were developed using a Bayesian generalized least-squares regression model. Additionally, basin characteristics for these gaged stations were computed by using geographical information systems and automated computer algorithms.

Regional regression analysis, using generalized least-squares regression, was used to develop a set of predictive equations that can be used to estimate the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year recurrence interval peak-flows for rural ungaged basins in Georgia, South Carolina, and North Carolina. Five hydrologic regions were developed for these three States (Figure 1). The final predictive equations are all functions of drainage area and percentage of the drainage basin within each hydrologic region. Historically, the hydrologic regions were determined individually by each State, which often led to differences in hydrologic regions at the State boundaries. These differences cause some discontinuity and confusion on appropriate flood-frequency techniques and results for drainage basins near or crossing State boundaries. In this investigation, a multi-State approach with hydrologic regions that cross State boundaries is used in order to maintain continuity.

The investigation includes (1) regional equations for estimating the magnitude and frequency of peak-flows on

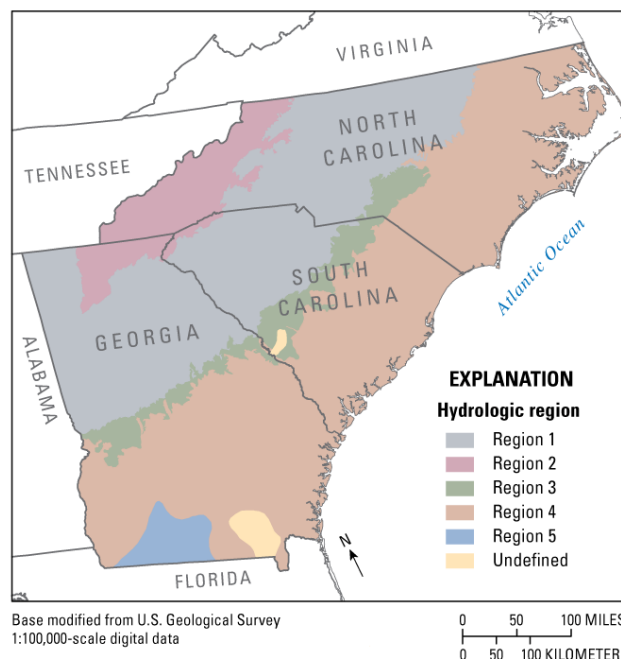


Figure 1. Map of the five hydrologic regions for Georgia, South Carolina, and North Carolina.

rural, ungaged, non-regulated streams in Georgia, South Carolina, and North Carolina; (2) estimates of the magnitude of floods at the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year recurrence intervals determined for 772 streamgaging stations located in the three States; (3) the accuracy and limitations of the equations; and (4) example applications of the methods. The results will be published in the USGS Scientific Investigations Report series as three separate volumes: North Carolina (volume 1), Georgia (volume 2) and South Carolina (volume 3). The regression techniques will be the same for all three States but the individual volumes will present information that is unique to each State.

REFERENCES

Interagency Advisory Committee on Water Data, 1982, Guidelines for determining flood flow frequency: Hydrology Subcommittee Bulletin 17B, 28 p., 14 appendixes, 1 plate.