Nutrient Mass in Fertilizer and Manure

Nitrogen and phosphorus mass in fertilizer and manure were calculated for nonfarm and farmland for each catchment in the SAGT area. Estimates of nitrogen and phosphorus were based on county-level estimates compiled from fertilizer sales, census of agriculture, and population estimates, updated for 2002 (Ruddy and others, 2006). To more accurately represent the spatial distribution of the county-level data, nitrogen and phosphorus estimates for fertilizer and manure for farmland were applied only to agricultural land, and nonfarm estimates were distributed to landcover classes of developed, forest, shrub/scrub, and grasslands. Water, barren, and wetland classes were not used in this analysis. The total amount of nitrogen or phosphorus for farmland for each county was divided by the number of 30-meter cells within the county that contained agricultural land. Each cell of agricultural land in the county was assigned the proportional value. Areas that were not farmland were assigned values of 0. Nonfarm estimates of nitrogen and phosphorus from fertilizer were apportioned within each county to areas that were defined as nonfarm land from the NLCD, with values of 0 assigned to other cells. The apportioned amounts then were combined and summed for each ERF1_2 catchment area. The catchment level estimates of nitrogen and phosphorus mass in fertilizer applied to farmland in 2002 (variable names wffert_n_2002 and wffert_p_2002) and nitrogen and phosphorus mass in manure (variable names wlvtotal_n_2002 and wlvtotal_p_2002) are included in the file *SAGT_ERF1_input.xls.zip* (2.1 MB). Spatial distributions of nutrient mass in fertilizer application and manure production are illustrated in figures 3F–3G and 4A–4B; each catchment-level estimate is normalized by the total area of the catchment and expressed as kilograms per hectare.

Nitrogen Mass Point-Source Wastewater Discharge

McMahon and others (2007) estimated total nitrogen and total phosphorus loads for 2002 for approximately 3,000 point-source dischargers of municipal and industrial wastewater in the southeastern United States, for use in calibration and application of the SAGT nutrient SPARROW models. Locations of point-source discharges permitted under the National Pollutant Discharge Elimination System were obtained from the USEPA Permit Compliance System database and from individual site databases. For dischargers with a complete effluent monitoring record, effluent-flow and nutrient-concentration data were used to develop estimates of nitrogen and phosphorus loads for 2002. When effluent-flow data were available but nutrient-concentration data were missing or incomplete for 2002, typical pollutant-concentration values of total nitrogen and total phosphorus were used to estimate load. Detailed descriptions of the approach for developing typical pollutant-concentration values and of the complete procedure for estimating effluent load are given in McMahon and others (2006). Each point-source discharge location was assigned to a SAGT ERF1_2 catchment, and nutrient load estimates (in kilograms per year) were summed by catchment. The catchment-level estimates (variable names kgn_02 and kgp_02 for total nitrogen and total phosphorus, respectively) are included in the file *SAGT_ERF1_input.xls.zip* (2.1 MB). Spatial distribution of point-source wastewater discharge is illustrated in figures 3H and 4C.

Nutrient-Transport Attributes

The watershed attributes considered as nutrient-transport predictors for the SAGT SPARROW models, and the spatial datasets that were used to represent their distribution, are described in the following paragraphs. In contrast to the datasets used to describe distribution of nutrient sources, these datasets are not restricted to representing conditions in a single time period because these attributes are, for the most part, physical properties that do not change over the period of time (30 years) for which these datasets have been compiled.

The catchment-level estimates of nutrient-transport attributes are included in the file *SAGT_ERF1_input.xls.zip* (2.1 MB). Variability across the SAGT area in catchment-level estimates for each attribute is described in table 1 and illustrated, for selected attributes, in figure 5. In general, watershed attributes considered as candidate nutrient-transport variables do not range in value as greatly as attributes considered as nutrient-source predictors; that is, ratio of the 90 percentile of the distribution to the 10 percentile is less than 5 for most attributes (last column, table 1).

Soil Characteristics

Soil properties considered as candidate nutrient-transport predictors include hydrologic soil group classification (hsg), soil permeability (perm), available water-holding capacity (awc), clay content (clay), depth to bedrock (rockdep), and soil erodibility (kfact). Estimates of all these properties were derived from the 1:250,000-scale Natural Resources Conservation Service State Soil Geographic (STATSGO) data (U.S. Department of Agriculture, 1994). Information on variability of these properties at the soil-component scale is generalized to the broader scale of soil mapping unit (MU) to allow for georeferencing; such generalization is considered acceptable for modeling variability of soil properties for regional- or national-scale assessments. The composition of each MU with respect to hydrologic soils group is described as the areal percentage of soil components classed in five groups according to infiltration rate (U.S. Department of Agriculture, 1994). For the other soil properties (perm, awc, clay, rockdep, and kfact), the information on variability of the property within a MU was processed by Wolock and others (1997) into a set of weighted average values for each MU. The MU values for all soil properties were aggregated to the SAGT ERF1_2 catchment grid to derive catchment-level estimates; these estimates are presented, along with more detailed definitions of each variable, in the file *SAGT_ERF1_input.xls.zip* (2.1 MB). Spatial distributions of catchment-level estimates of soil permeability, available water-holding capacity, depth to bedrock, and erodibility are illustrated in figures 5A–D.

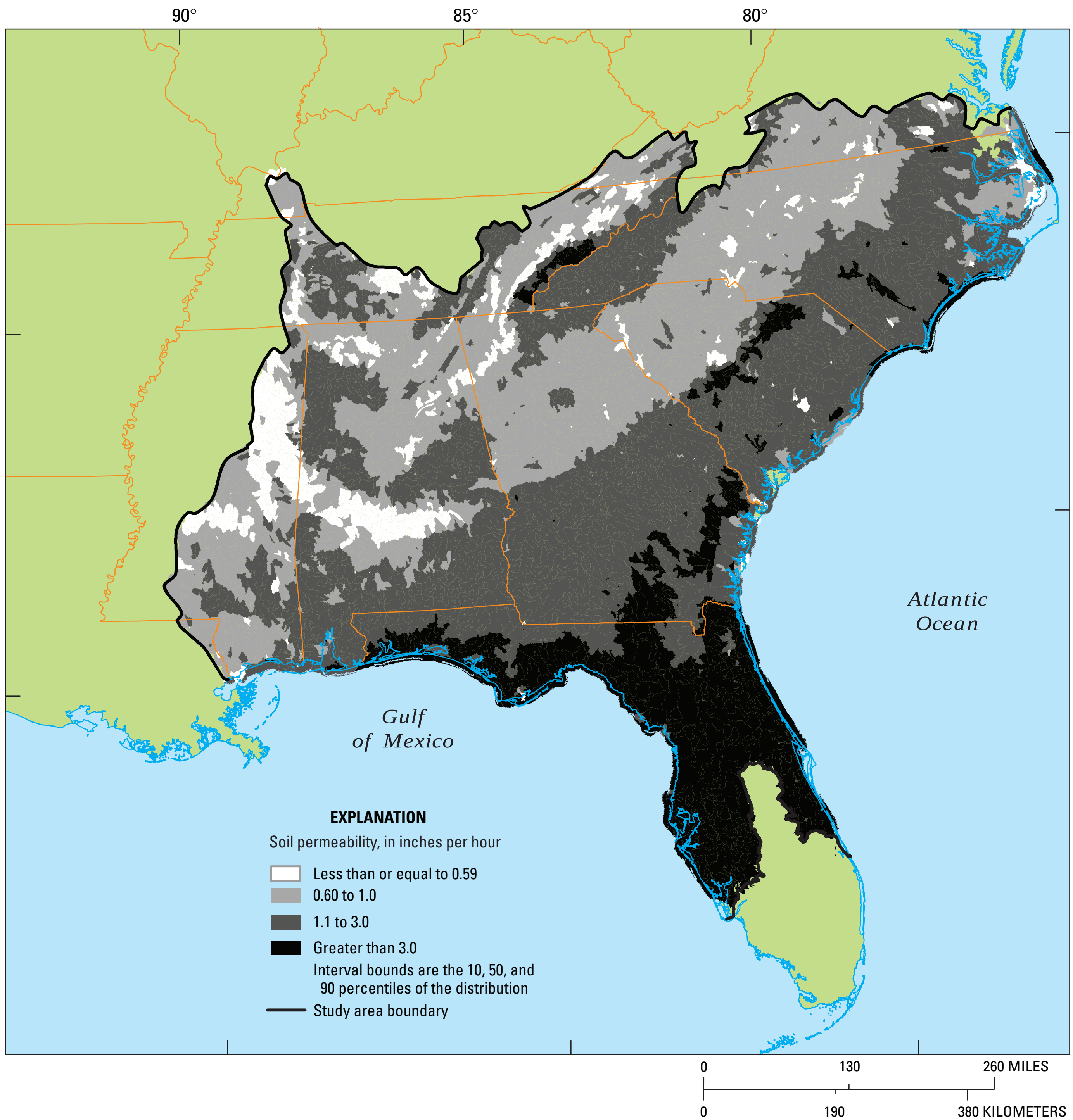

Figure 5A. Estimates of soil permeability for individual catchments in the SAGT SPARROW model area, 2002.

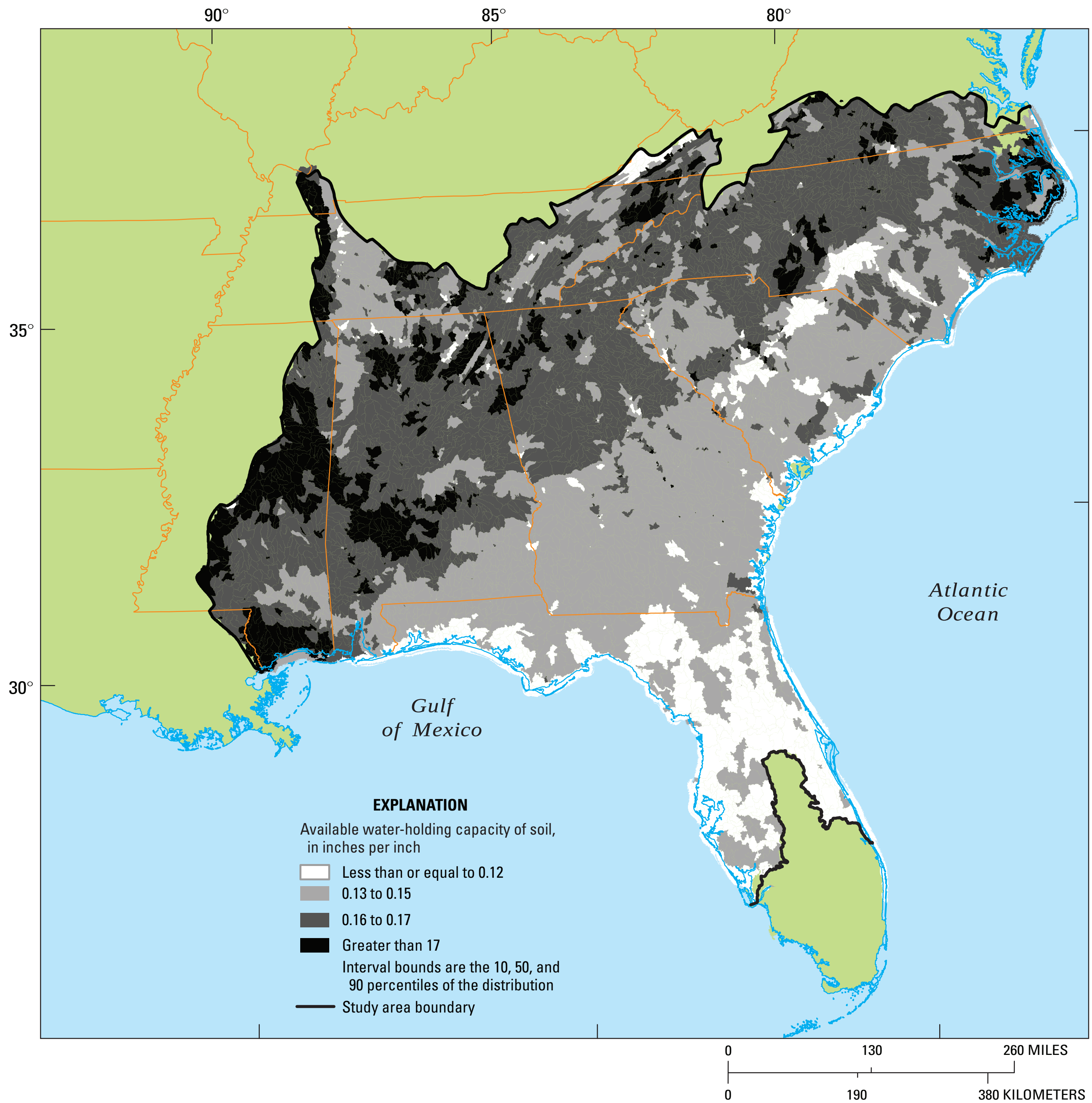

Figure 5B. Estimates of available water-holding capacity of soil for individual catchments in the SAGT SPARROW model area, 2002.

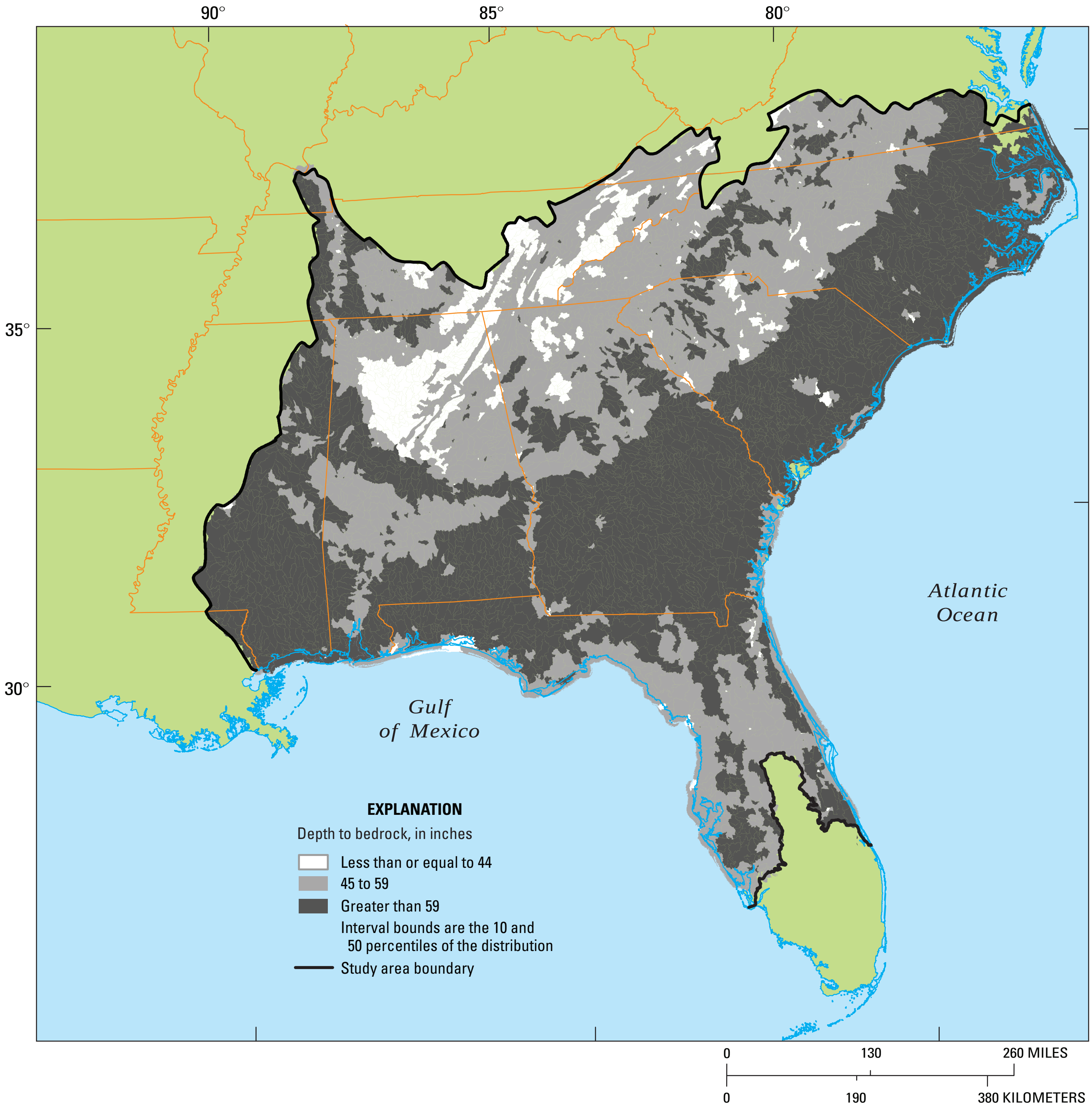

Figure 5C. Estimates of depth to bedrock for individual catchments in the SAGT SPARROW model area, 2002.

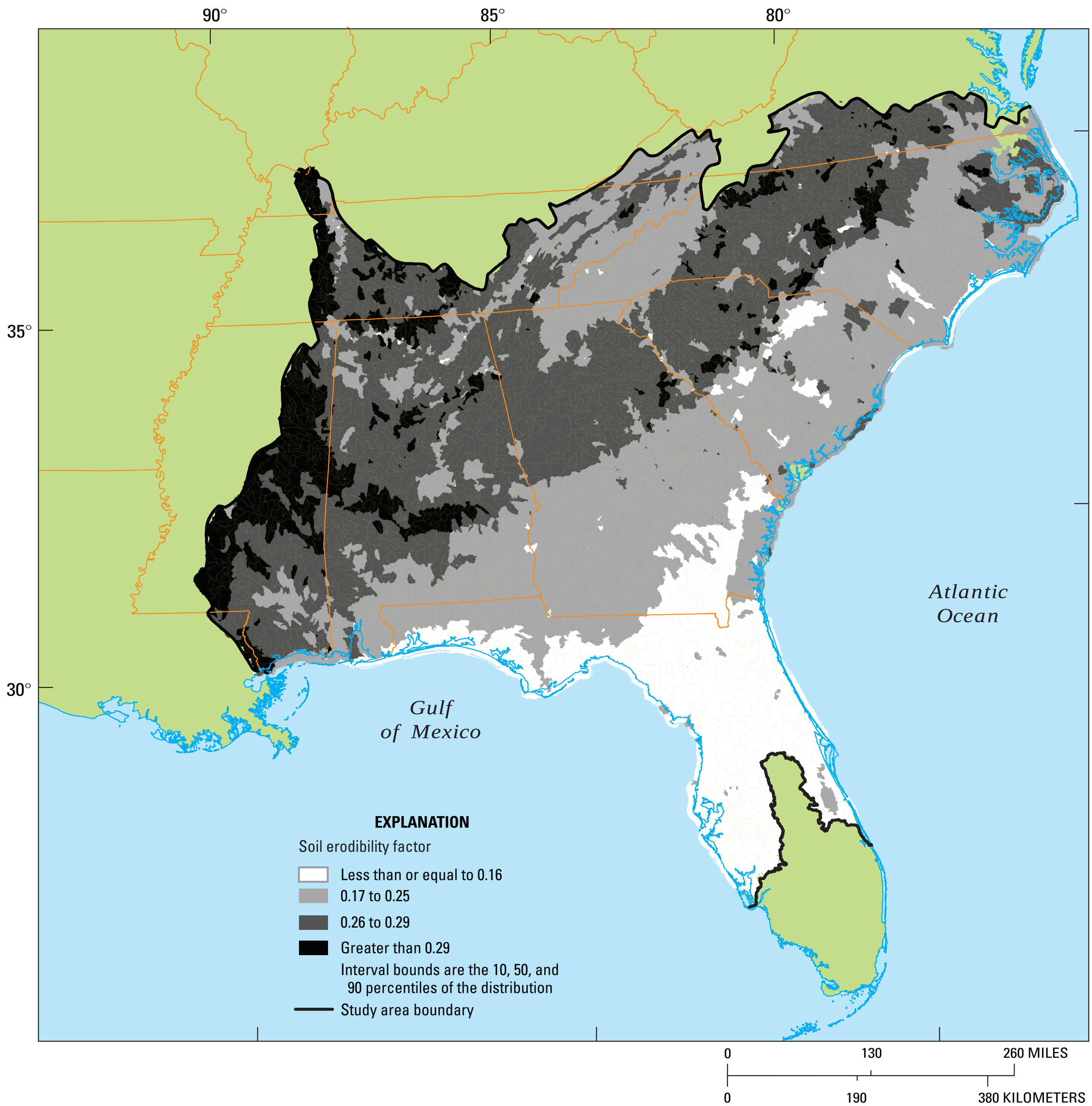

Figure 5D. Estimates of soil erodibility for individual catchments in the SAGT SPARROW model area, 2002.