

Sulfate

The concentration of dissolved sulfate in water from the lower Wilcox aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 6.1 mg/L in outcrop areas in western Tennessee and eastern Mississippi to 486 mg/L near the outcrop in southeastern Arkansas (table 1). The concentration in the outcrop area ranges from about 1 mg/L in Tennessee and Mississippi to more than 100 mg/L in southeastern Arkansas (fig. 13). Across the northern part of the aquifer area the concentration ranges from about 1 to 50 mg/L with the larger values occurring west of the Mississippi River. Across the southern part of the aquifer area that is east of the Mississippi River the concentration ranges from 1 to 10 mg/L and there is no discernible areal trend. Across the southern part that is west of the Mississippi River the concentration ranges from about 1 to 100 mg/L with the larger values occurring in isolated areas.

Chloride

The concentration of dissolved chloride in water from the lower Wilcox aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 0.9 mg/L near the outcrop in northwestern Tennessee to 63,000 mg/L down dip in southern Mississippi (table 1). The concentration in the outcrop area ranges from about 5 to 100 mg/L with large and small values occurring throughout the outcrop area (fig. 14). Across the northern part of the aquifer area the concentration ranges from about 5 mg/L to 100 mg/L with the larger values near the outcrop and the smaller values in the central part of the area. Across the southern part east of the Mississippi River the concentration ranges from about 5 mg/L near the outcrop to more than 40,000 mg/L in southern Mississippi. Across the southern part west of the Mississippi River the concentration ranges from about 10 to more than 300 mg/L with no indicated areal trend.

Silica

The concentration of dissolved silica in water from the lower Wilcox aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 1.4 mg/L in north-central Mississippi to 117 mg/L in southern Mississippi (table 1). The concentration in the outcrop area ranges from about 10 to 30 mg/L with large and small values occurring across the outcrop area (fig. 15). The concentration across the rest of the aquifer area ranges from about 10 mg/L to more than 30 mg/L and there appears to be no areal trend.

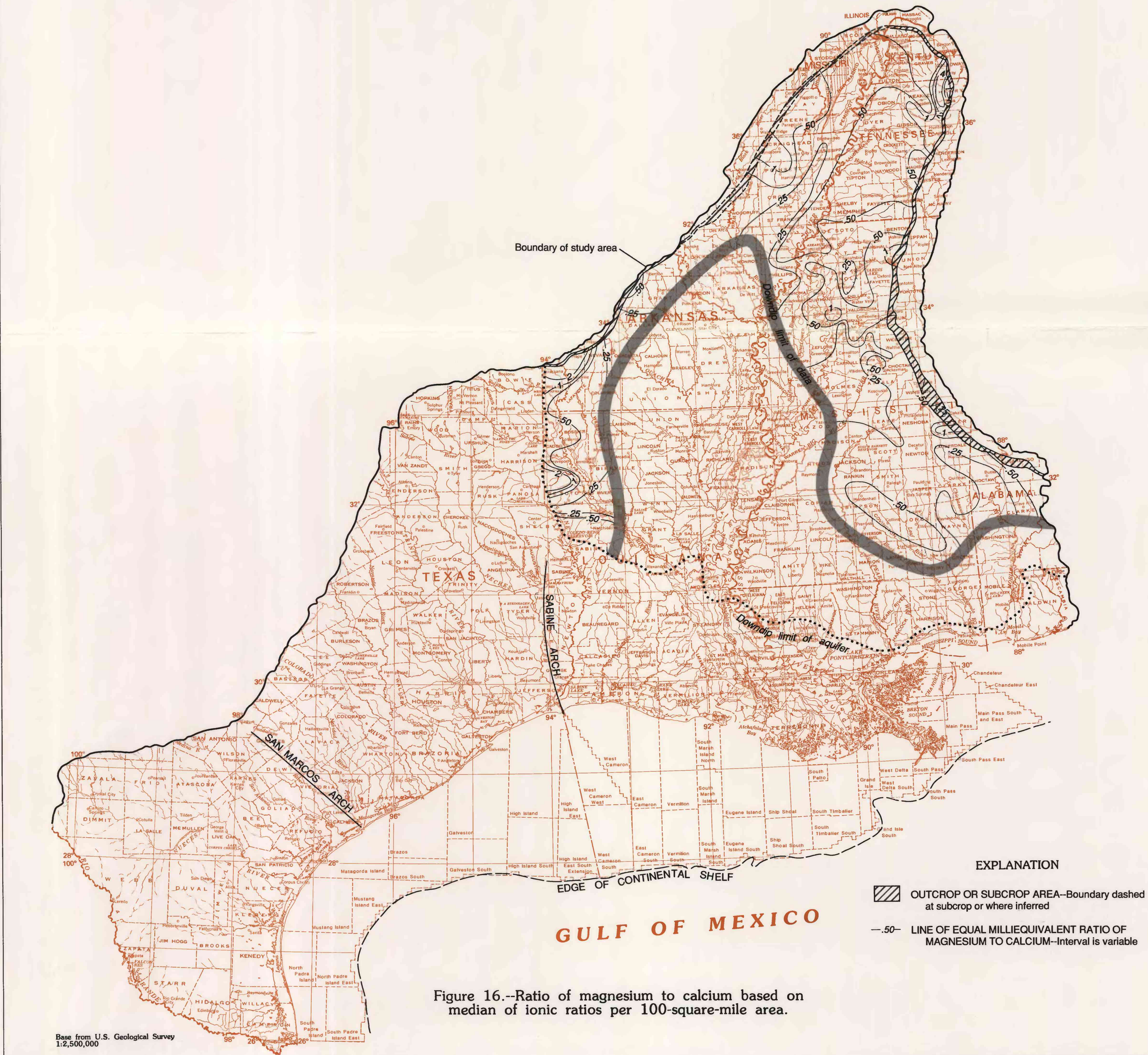
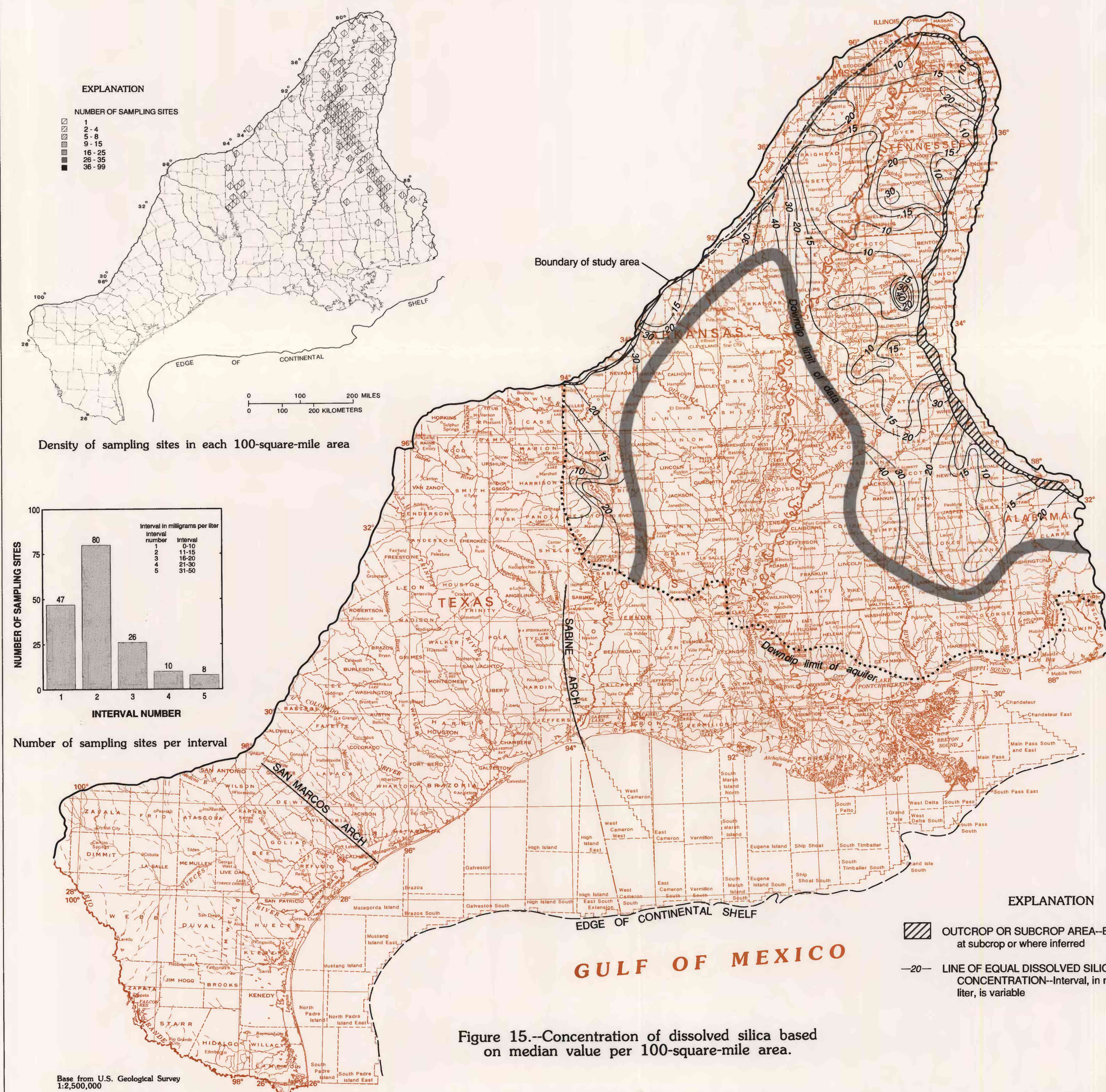
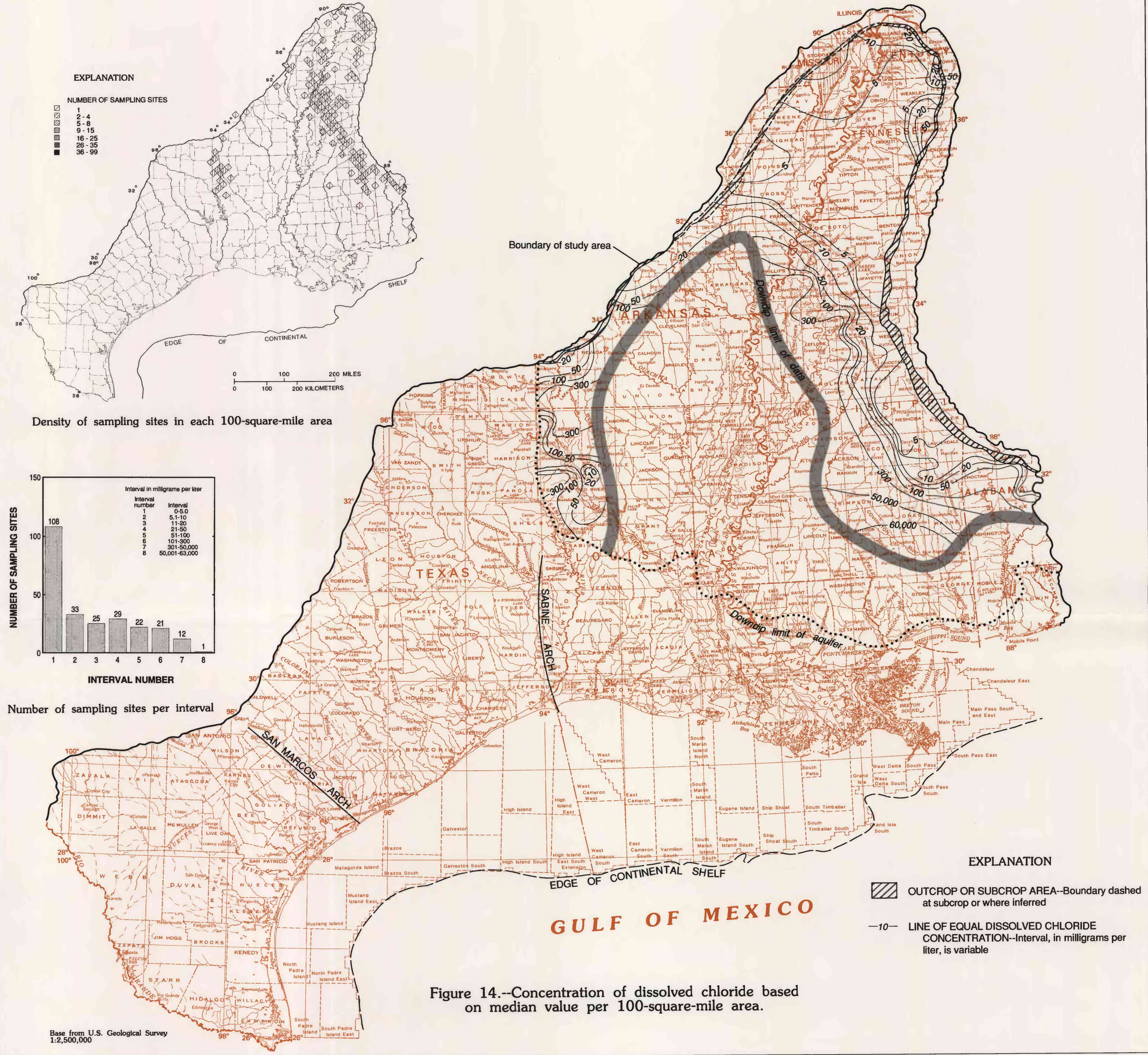
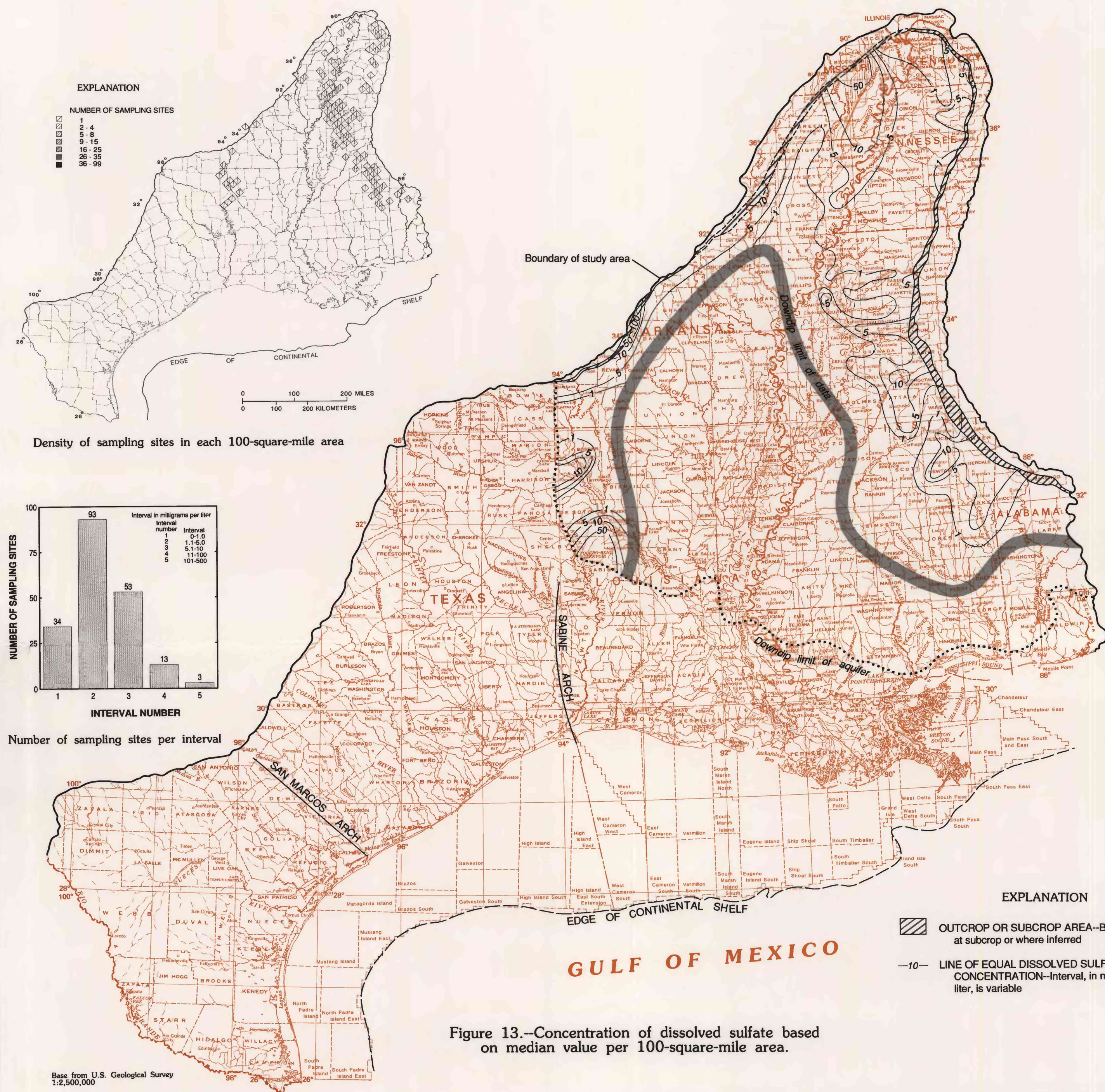
IONIC RATIOS

Selected ionic ratios were mapped to show any trends from up dip to the down dip limit of the data. A characteristic of ionic ratios is that they are not affected by dilution, assuming that all constituents are diluted to the same degree. Consequently upward leakage of brine into a freshwater aquifer would not mask the signature of the brine. For example, if the brine were seawater trapped in deep sediments, the ionic ratio would remain that of seawater. Whereas if the ionic ratio is different from seawater and the relative concentrations of sodium and chloride are larger than for seawater, the brine could be the product of dissolution of evaporites composing salt domes.

Mapped ionic ratios can be used to show trends that may indicate processes or mechanisms that have major control on the water chemistry from up dip to down dip limit of the data. For example, an ionic ratio of magnesium plus calcium to bicarbonate that is equal to 1 in outcrop areas indicates the dissolution of dolomite or calcite, whereas down dip of the outcrop the same ionic ratio greater than 1 indicates an additional source of calcium or magnesium ions such as would result from the dissolution of gypsum. If the down dip area is in a salt dome basin, dissolution of evaporites could provide the additional calcium and magnesium ions. However, if this same ratio were less than 1, it would indicate an increase in bicarbonate ions due to a process such as the alteration of silicates. The ionic ratio maps were constructed by calculating the indicated ratio for each sample within each 100-square-mile area. The median value of all ratios for each 100-square-mile area was then plotted and used as the basis for drawing the lines of equal median ionic ratio.

Magnesium to Calcium

The areal distribution of the milliequivalent ratio of magnesium to calcium (Mg/Ca) in water from the lower Wilcox aquifer, based on the median Mg/Ca ratio in each 100-square-mile area, shows that the ratio ranges from 0.65 in central Mississippi to 5 in northwestern Tennessee (table 1). The ratio in the outcrop area ranges from 0.25 to 2 with large and small values occurring across the outcrop area (fig. 16). The Mg/Ca ratio ranges from 0.25 to 4 in the rest of the aquifer area and no areal trend in the ratio is evident from the map. However, for most of the mapped area the ratio ranges from 0.25 to 0.50.



PROPERTIES AND CHEMICAL CONSTITUENTS IN GROUND WATER FROM THE LOWER WILCOX AQUIFER,
MISSISSIPPI EMBAYMENT AQUIFER SYSTEM, SOUTH-CENTRAL UNITED STATES

by
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