Magnesium

The concentration of dissolved magnesium in water from the middle Claiborne aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 0.10 mg/L in middip areas between the Sabine uplift and the southwestern corner of Alabama to 520 mg/L near the downdip limit of the data in southwestern Louisiana (table 1). The concentration pattern is similar to that of calcium in that the concentration generally decreases from updip to middip and then increases from middip to the downdip limit of the data (fig. 9).

From the Sabine uplift eastward to the southwestern corner of Alabama the concentration of dissolved magnesium in the middle Claiborne aquifer generally ranges from 5 to 10 mg/L in the outcrop and in the northern part of the Mississippi embayment aquifer system area, from 0.50 to 1 mg/L in the middip areas, and from 10 to more than 100 mg/L in areas near the downdip limit of the data. From the Sabine uplift southwestward to the San Marcos arch the concentration generally ranges from 5 to 10 mg/L in the outcrop area, 1 to 10 mg/L in middip areas, and from 10 to more than 100 mg/L in areas near the downdip limit of the aquifer. From the San Marcos arch southwestward to the Rio Grande the concentration ranges from about 10 to 50 mg/L in the outcrop, from less than 5 to 10 mg/L near middip, and 10 to more than 100 mg/L downdip in southern Texas.

Sodium

The concentration of dissolved sodium in water from the middle Claiborne aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 1 mg/L in the outcrop area east of the Mississippi River to 54,000 mg/L near the downdip limit of the data in southeastern Mississippi (table 1). The concentration generally increases from the outcrop area to the downdip limit of the data (fig. 10).

From the Sabine uplift eastward to the southwestern corner of Alabama the concentration of dissolved sodium in the middle Claiborne aquifer generally ranges from about 1.0 to 10 mg/L in the outcrop and in the northern part of the Mississippi embayment aquifer system area. The concentration, which increases in a downdip direction, ranges from 50 to 200 mg/L near middip and from 200 to more than 10,000 mg/L near the downdip limit of the data. From the Sabine uplift southwestward to the San Marcos arch the concentration ranges from 10 to 200 mg/L in the outcrop area, from 200 to 1,000 mg/L in the middip area, and from 500 to more than 10,000 mg/L along the downdip limit of the aquifer. From the San Marcos arch southwestward to the Rio Grande the concentration generally ranges from 200 to 1,000 mg/L in both the outcrop area and in the middip area and 1,000 to more than 10,000 mg/L in the area near the downdip limit of the aquifer. Much of the area having a large concentration of dissolved sodium is coincident with the deeper part of the aquifer and with the location of salt domes (fig. 4).

Potassium

The concentration of dissolved potassium in water from the middle Claiborne aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 0.10 mg/L in western Kentucky to 160 mg/L in southeastern Louisiana (table 1). The concentration appears to increase from middip to the downdip limit of the data in the area east of the Sabine uplift and decreases from updip to the downdip limit of the data in the area between the San Marcos arch and the Rio Grande (fig. 11).

From the Sabine uplift eastward to the southwestern corner of Alabama the concentration of dissolved potassium in the middle Claiborne aquifer generally ranges from 1 to 5 mg/L in both the outcrop area and the area extending from the outcrop southward to middip. From middip southward the concentration increases to about 100 mg/L near the downdip limit of the data. From the Sabine uplift southwestward to the San Marcos arch the concentration generally ranges from 2.5 to 10 mg/L and shows no areal trend or pattern. From the San Marcos arch southwestward to the Rio Grande the concentration is greater than 10 mg/L in the outcrop area, ranges from 5 to 10 mg/L near middip, and is less than 5 mg/L along the downdip limit of the data.

Bicarbonate

The concentration of dissolved bicarbonate in water from the middle Claiborne aquifer, based on the median values of all samples in each 100-square-mile area, ranges from 2 mg/L in an outcrop area in eastern Texas to 2,280 mg/L in an area near the downdip limit of the data in southeast Texas (table 1). The concentration generally increases from the outcrop area to the downdip limit of the data (fig. 12).

From the Sabine uplift eastward to the southwestern corner of Alabama the concentration of dissolved bicarbonate in the middle Claiborne aquifer generally ranges from 100 to 200 mg/L in both the outcrop area and the area extending from the outcrop to about middip. Exceptions are two areas, one in the outcrop in southwestern Alabama and the other near middip in eastern Arkansas where the concentration exceeds 500 mg/L. From middip to the downdip limit of the data the concentration increases to more than 1,000 mg/L in two areas in southern Mississippi. From the Sabine uplift southwestward to the San Marcos arch the concentration ranges from about 10 to more than 200 mg/L in the outcrop area and increases to more than 1,000 mg/L in the area between middip and the downdip limit of the data in southeastern Texas. From the San Marcos arch southwestward to the Rio Grande the concentration ranges from 200 to 500 mg/L in the outcrop, from 500 to 1,000 near middip, and greater than 1,000 mg/L near the downdip limit of the aquifer in southern Texas.

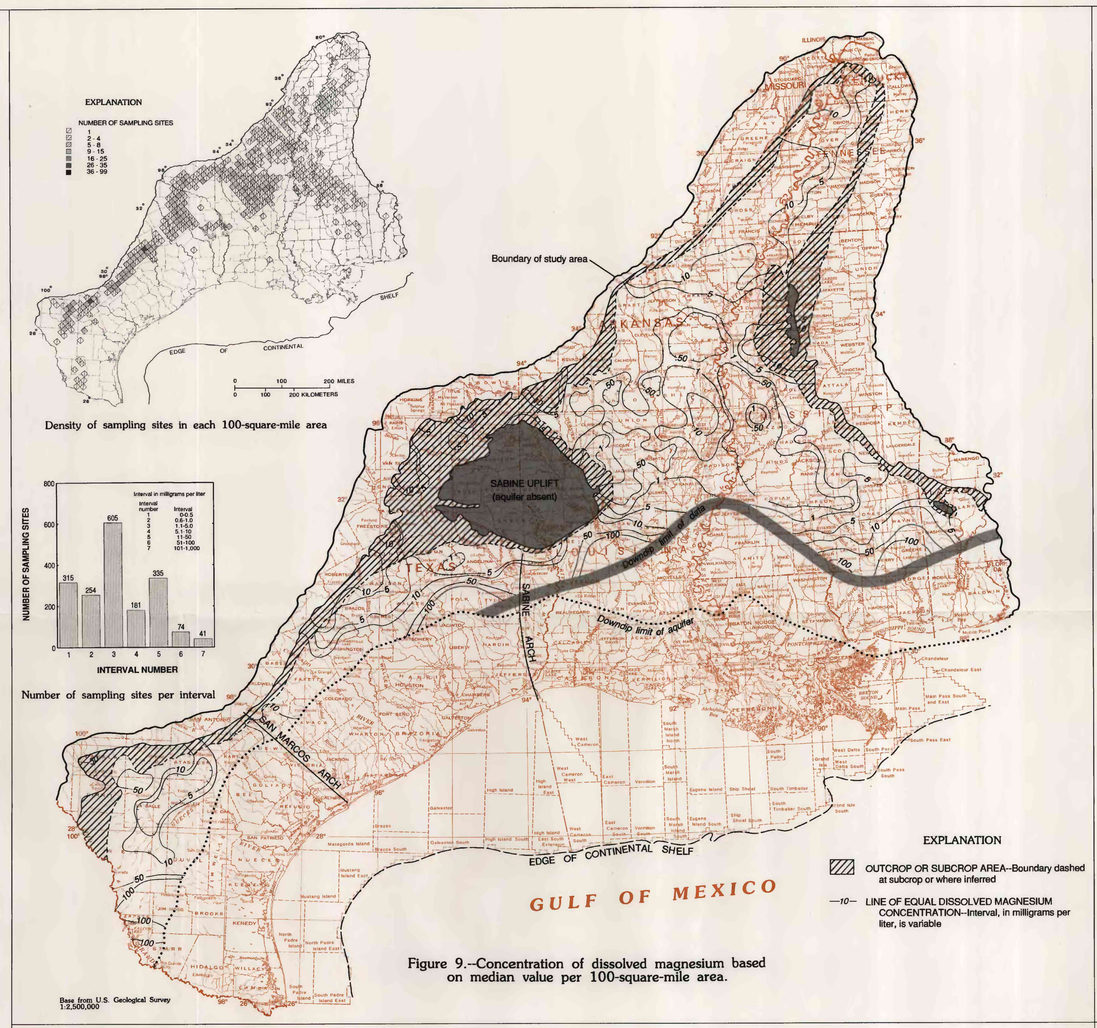

Figure 9.--Concentration of dissolved magnesium based on median value per 100-square-mile area.

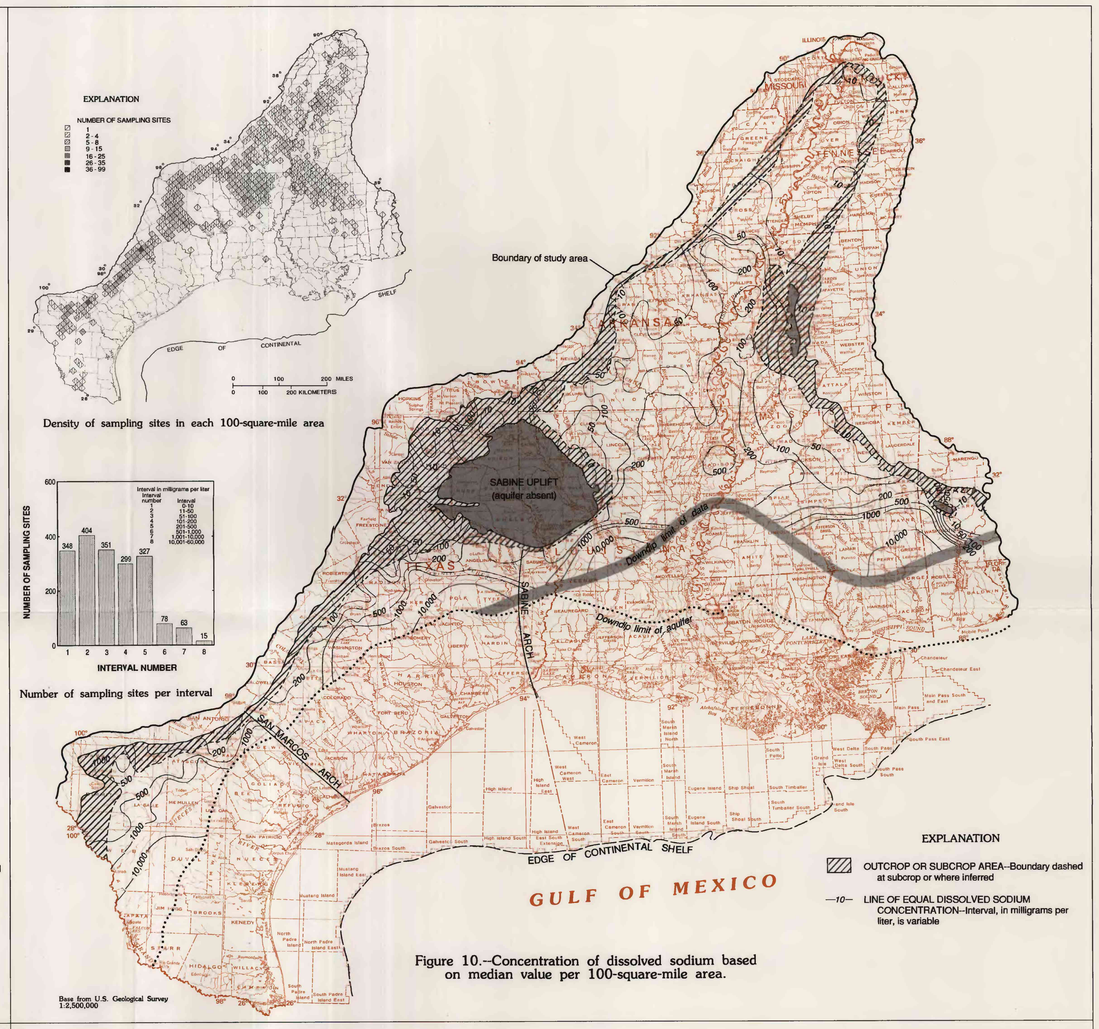

Figure 10.--Concentration of dissolved sodium based on median value per 100-square-mile area.

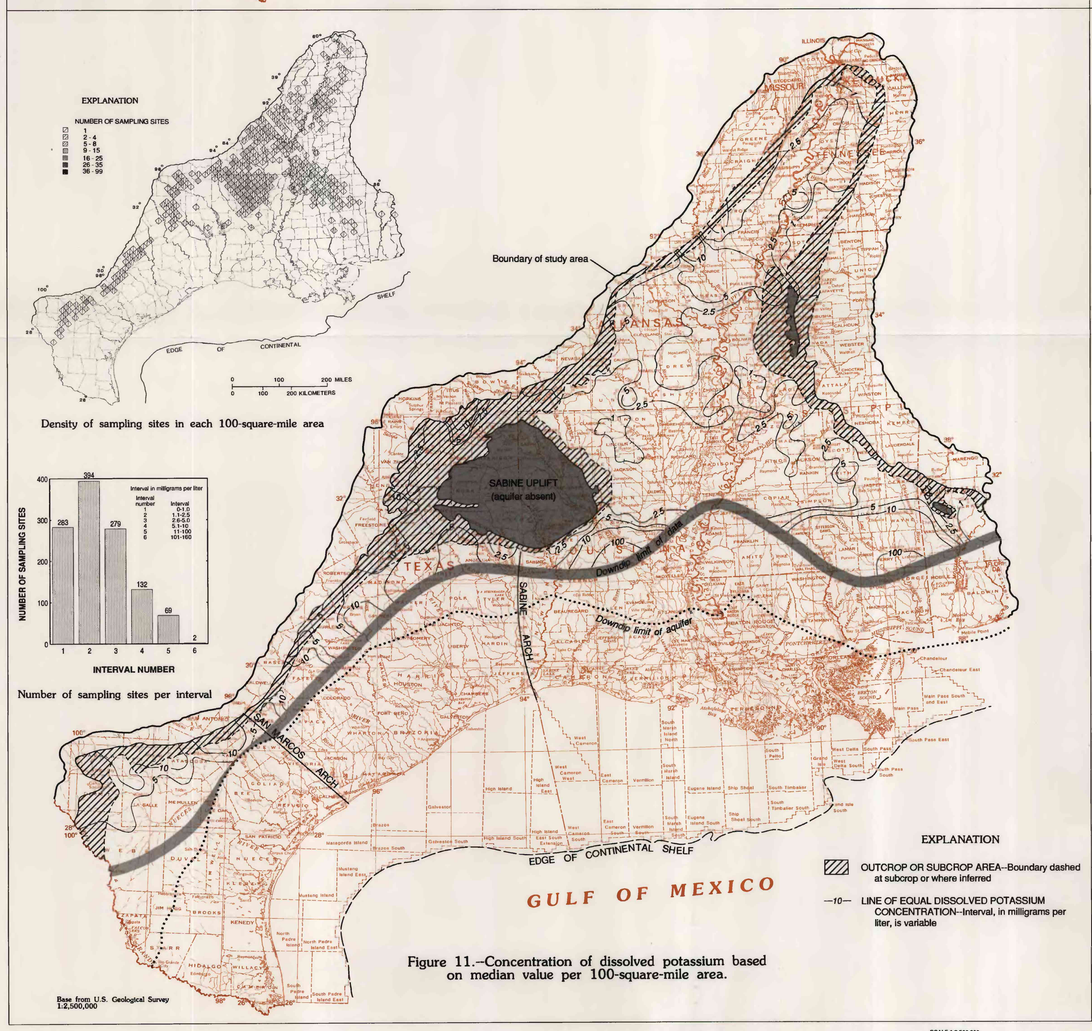

Figure 11.--Concentration of dissolved potassium based on median value per 100-square-mile area.

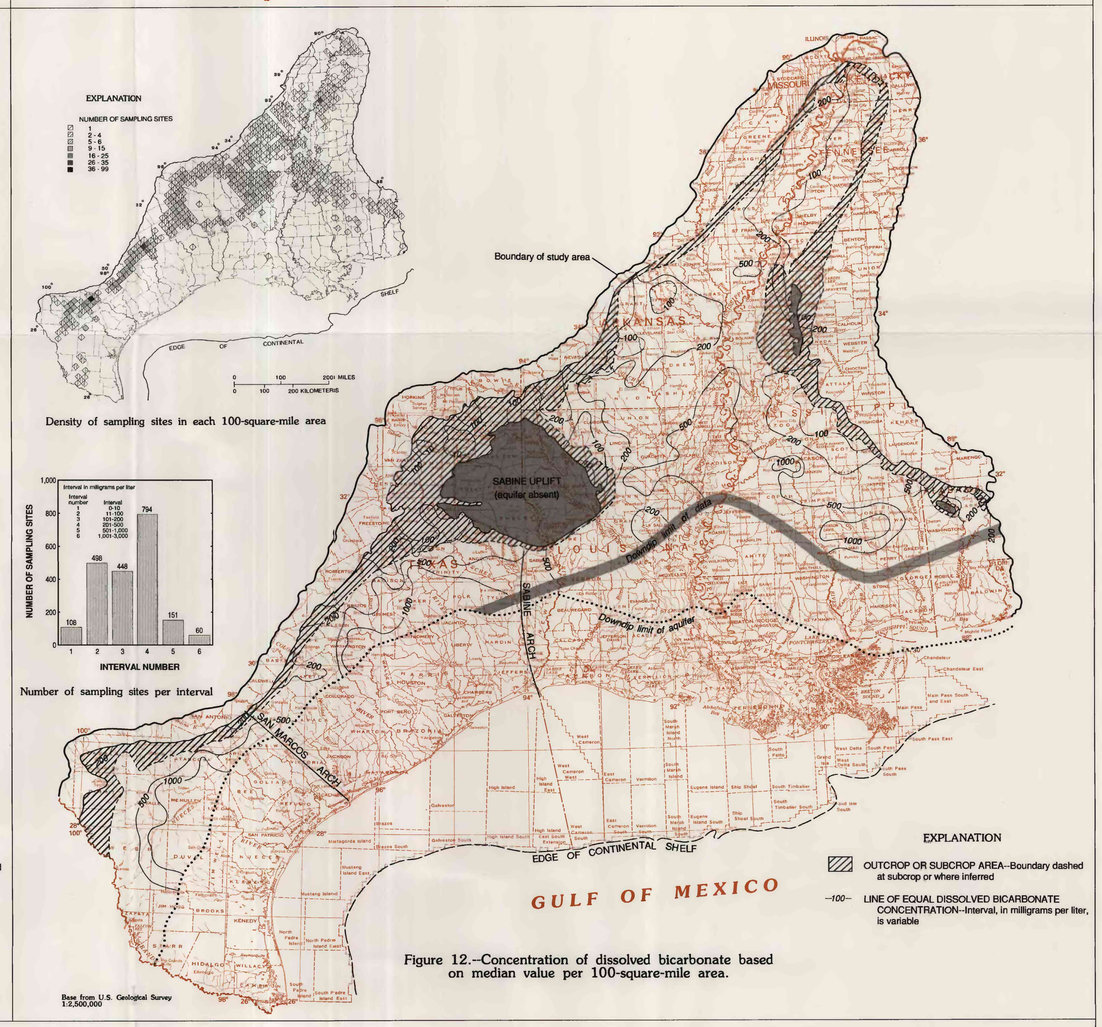

Figure 12.--Concentration of dissolved bicarbonate based on median value per 100-square-mile area.

SCALE 1:3 500 000

PROPERTIES AND CHEMICAL CONSTITUENTS IN GROUND WATER FROM THE MIDDLE CLAIBORNE AQUIFER, GULF COAST REGIONAL AQUIFER SYSTEMS, SOUTH-CENTRAL UNITED STATES

by

ROBERT A. PETTIJOHN, JOHN F. BUSBY, AND MICHAEL A. CERVANTES

1993