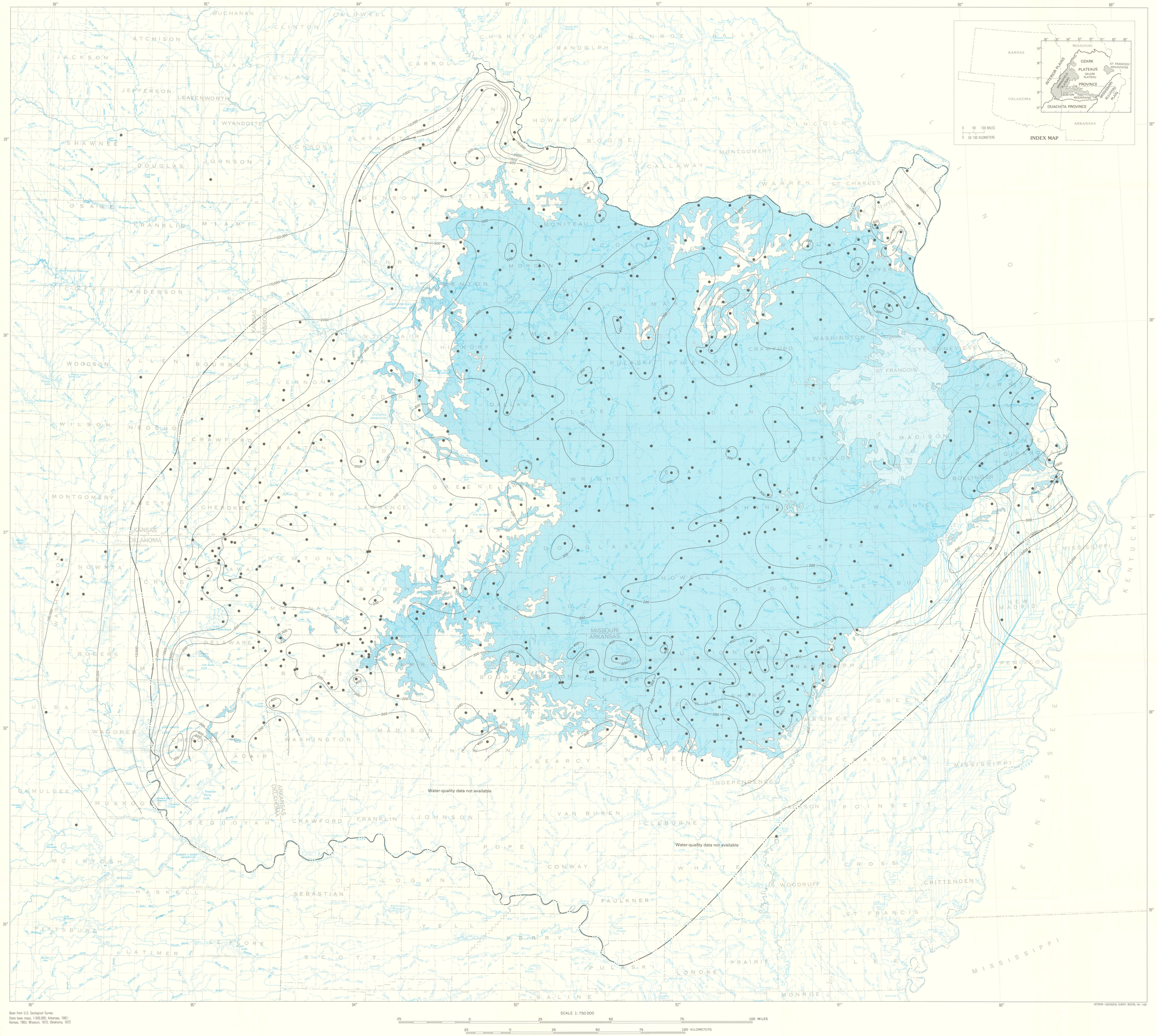
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA–711–K (SHEET 2 OF 4)



DISSOLVED SOLIDS

The dissolved-solids concentration in fresh ground water is a general measure of the quantity of minerals that may have been dissolved from the rock matrix. Saline ground water can also contain minerals that were dissolved in the original sea water in which the sediments that formed the rock matrix were deposited. The dissolved-solids concentration of a water sample can be measured directly as the residue obtained after evaporation of the fluid or calculated as the sum of the concentrations of the individual chemical components in the water sample. The data used in this report represent both types of dissolved-solids analyses.

The dissolved-solids concentration of water in the Ozark aquifer generally reflects the movement of the water from regional ground-water divides toward major discharge areas. The dissolved-solids concentration generally ranges from less than 200 to about 300 mg/L (milligrams per liter) along two major ground-water divides, one coinciding with crest of the Boston Mountains and the second coinciding with a topographic ridge extending from northeastern Oklahoma to the St. Francois Mountains of southeastern Missouri (index map). Between the two divides, ground water flows to the White River and tributaries, and the dissolved-solids concentration increases to more than 300 mg/L along the White River valley. Areas in the north-central part of the Salem Plateau (index map) that contain dissolved-solids concentrations larger than 500 mg/L are associated with recharge of ground water through overlying deposits of Pennsylvanian clay, shale, and sandstone and clay-filled sinkholes.

At the extreme northeastern edge of the Ozark Plateaus the dissolved-solids concentration exceeds 1,000 mg/L where fresh-water from the Ozark aquifer mixes with saline water from regional aquifers that border the eastern Ozark area. A similar situation occurs along the western edge of the plateaus where westward-flowing fresh ground water from the Ozark Plateaus meets eastward-flowing saline water in the lower units of the Western Interior Plains aquifer system (Jorgensen and others, in press). Dissolved-solids concentration increases to more than 1,000 mg/L in this mixing zone. Two areas can be identified where saline water mixes with freshwater in the Ozark aquifer and discharges into eastward-flowing rivers. One area is recognizable by the converging of contours of dissolved-solids concentrations along the southern edge of the Missouri River in Saline and Cooper Counties, Missouri. In this area, saline ground water discharges into the Missouri River downstream of the eastern margin of the thick Western Interior Plains confining system [Imes, 1990 (c)]. To a lesser degree the same process occurs in Bates and Henry Counties, Missouri, where saline ground water discharges into the South Grand River.

Generally, the increased dissolved-solids concentration of water in the Ozark aquifer at the western boundary of the aquifer system is nearly coincident with the eastern terminus of the Western Interior Plains confining system. However, in extreme southeastern Kansas, fresh ground water moves westward beneath the confining system toward a regional topographic low and discharges into the Neosho River.

In the southeast, fresh ground water flows from the Ozark Plateaus province to the Mississippi Alluvial Plain where most of the water discharges through shallower aquifers into the Black and Current Rivers. Contours of hydraulic head (not shown) and dissolved-solids concentration indicate that the St. Francis River valley in the alluvial plain, not the Mississippi River, is the discharge area for the smaller quantity of water that flows southeast beneath the Mississippi Alluvial Plain. Few water-quality data were available for the area south of the Boston Mountains, the location of the southernmost regional ground-water divide. However, estimates of dissolved-solids concentration based on geophysical log analysis (Freiwald, D.A., U.S. Geological Survey, written commun., 1984) indicate the dissolved-solids concentration probably exceeds 1,000 mg/L throughout most of the area south of the Boston Mountains. Dissolved-solids concentrations are believed to be large in this area because of the large thickness of shale in the Western Interior Plains confining system [Imes, 1990 (c)] that is encountered by ground water as it moves from the surface to recharge the deeply buried Ozark aquifer.

The U.S. Environmental Protection Agency (1986) recommends an upper limit of 500 mg/L dissolved-solids concentration for potable drinking water. Larger concentrations of dissolved solids can cause an unpleasant taste and cause corrosion and encrustation of metal water pipes, depending on the composition of the dissolved solids. However, no obvious detrimental effect has been noted on the health of populations that must, through lack of alternative supplies, drink water containing more than 500 mg/L dissolved-solids concentration (Hem, 1985). Sodium commonly is a primary constituent in water containing a large concentration of dissolved solids. Drinking water that contains a large sodium concentration may be detrimental to the health of persons who require a low-sodium diet.

Base from U.S. Geological Survey
State base maps, 1:500,000; Arkansas, 1967; Kansas, 1983; Missouri, 1973; Oklahoma, 1972

SCALE 1:750 000
25 0 25 50 75 100 MILES
25 0 25 50 75 100 KILOMETERS

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Dissolved-solids concentration

WATER TYPE AND CONCENTRATION OF DISSOLVED SOLIDS, CHLORIDE, AND SULFATE IN WATER FROM THE OZARK AQUIFER IN MISSOURI, ARKANSAS, KANSAS, AND OKLAHOMA

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