

DISSOLVED SOLIDS IN WATER FROM THE UPPER PART
OF THE FLORIDAN AQUIFER IN FLORIDABy
William J. Shampine

The Floridan aquifer, which underlies all of Florida, yields water containing less than 250 parts per million dissolved solids in the northwestern part and throughout much of the center of the State. In the southern part of Florida and along most of the east coast, the dissolved solids in the water exceed 1,000 parts per million and are as much as 23,000 parts per million.

Water from deep zones of the aquifer usually contains more dissolved solids than water from shallower zones. Only the dissolved solids content of water from the upper part of the aquifer is shown on the map.

Dissolved solids are found in all natural water and consist mainly of carbonates, bicarbonates, chlorides, sulfates, phosphates, fluorides, and nitrates of calcium, magnesium, sodium, and potassium. Iron, manganese, strontium, and sulfide normally are present only in small amounts; however, each is occasionally found in relatively large quantities. Some solids are dissolved from impurities in the atmosphere by rain and some are dissolved from surface materials. The amount of dissolved solids derived from these sources generally is small. After the water enters the ground, the dissolved solids generally increase. This increase may result from solution of the rocks and minerals through which the water percolates, mixing with highly mineralized connate water (water that was trapped in the rocks when they were formed), encroachment of salt water from the ocean, or by pollution.

The water in the Floridan aquifer in Florida usually contains at least some of each constituent mentioned above. There are, however, two or three of the constituents that are much more concentrated than the others. The predominant constituents are calcium carbonate, sodium carbonate, sodium chloride, and calcium and magnesium sulfate (see small inset map). The solution of limestone causes calcium carbonate to predominate in a large area. Natural water softening probably causes sodium carbonate to predominate in some areas. The sodium chloride water is the result of encroachment of salt water from the ocean or of mixing with connate water. Solution of the mineral gypsum at least partly causes the predominantly calcium and magnesium sulfate water. Water from the aquifer south of Lake Okeechobee is classified as sodium chloride water, but the sulfate concentration is also high.

The U.S. Public Health Service (1962, p. 34) recommends that the dissolved solids in drinking water not exceed 500 parts per million if other, less mineralized, supplies are available. This recommended maximum is based primarily on taste rather than health requirements; however, there may be a great difference in the concentration between a detectable taste and an objectionable taste of dissolved solids. The factor of acclimatization is particularly important. More than 100 public supplies in the United States provide water with more than 2,000 parts per million of dissolved solids. Newcomers and visitors would certainly find these waters almost intolerable and, although some of the residents use other supplies for drinking, many are able to tolerate, if not enjoy, these highly mineralized waters. (USPHS, 1962, p. 33)

Water containing dissolved solids in excess of 2,000 parts per million may not quench thirst and may have a laxative effect on new users; however, no harmful physiological effects of a permanent nature have been called to the attention of health authorities.

Dissolved solids in industrial waters can cause foaming in boilers and interference with clearness, color, or taste of many finished products. Concentrations that have been recommended for various industrial uses are shown in the following tabulation (McKee and Wolf, 1963, p. 182):

Industry	Limiting or Recommended Values in ppm
Boiler feed water	50-3,000 (according to pressure)
Brewing, light beer	500
Brewing, dark beer	1,000
Canning and freezing	850
Carbonated beverages	850
Dairy washwaters	850
Food equipment, washing	850
Food processing, general	850
Ice manufacture	170-1,300
Plastics, clear	200
Paper manufacture	
Fine papers	200
Kraft paper, bleached	300
Kraft paper, unbleached	500
Soda and sulfate pulp	250
Rayon manufacture	100-200

McKee and Wolf (1963, p. 184) report that dissolved solids up to the following limits should not interfere with the specified use:

Domestic water supply	1,000 parts per million
Irrigation	700 parts per million
Stock watering	2,500 parts per million
Fresh-water fish and aquatic life	2,000 parts per million

Selected References

- Black, A. P.
1951.
(and Brown, Eugene) Chemical Character of Florida's Waters, 1951: Florida State Board Cons., Div. Water Survey and Research, Paper 6.
Brown, Eugene (see Black, A.P.)
McKee, J. E.
1963
(and Wolf, H. W.) Water Quality Criteria, 2nd E.: State Water Quality Control Board, Water Resources Agency of California, Publication 3A.
U.S. Public Health Service
1962.
Drinking Water Standards: Public Health Service Publication no. 958.
Wolf, H. W. (see McKee, J. E.)

PREDOMINANT CONSTITUENTS

- Calcium and carbonate
- Sodium and carbonate
- Sodium and chloride
- Calcium, magnesium and sulfate

DATA AVAILABILITY

- EXCELLENT
(Information taken from detailed studies)
- GOOD
(More than two samples per 250 square miles)
- POOR
(Less than two samples per 250 square miles)

EXPLANATION

PARTS PER MILLION

- Less than 250
- 251-500
- 501-1000
- Greater than 1000

1 part per million = 17.1 grains
per gallon = 1 milligram per liter

0 10 20 30 40 50 MILES

Prepared by
U. S. GEOLOGICAL SURVEY
in cooperation with the
FLORIDA GEOLOGICAL SURVEY
Tallahassee, Florida
1964

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Prepared by
UNITED STATES GEOLOGICAL SURVEY
in cooperation with the
BUREAU OF GEOLOGY
FLORIDA DEPARTMENT OF NATURAL RESOURCES
TALLAHASSEE, FLORIDA

1965
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1963 (and Wolf, H. W.) *Water Quality Criteria, 2nd E.*: State Water Quality Control Board, Water Resources Agency of California, Publication 3A.

U. S. Public Health Service
1962 *Drinking Water Standards*: Public Health Service Publication no. 956.

Wolf, H. W. (see McKee, J. E.)

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FLORIDA DEPARTMENT OF NATURAL RESOURCES
BUREAU OF GEOLOGY

This public document was promulgated at a total cost of \$325.00 or a per copy cost of \$.13 for the purpose of disseminating hydrologic data.

0 10 20 30 40 50 MILES