DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA–645

DISSOLVED–SOLIDS CONCENTRATIONS OF GROUND WATER IN THE SACRAMENTO VALLEY, CALIFORNIA

The Sacramento Valley comprises about 6,000 square miles in the northern third of the Central Valley of California. As of 1975, about 44 percent of the area in the Sacramento Valley was irrigated and about 40 percent of this area was irrigated by ground water (California Department of Water Resources, 1978, p. 11). Ground-water use at that time was nearly 2 million acre-feet per year. Most ground water in the Sacramento Valley is obtained from wells tapping unconsolidated continental deposits of Pleistocene and Holocene age. River flood-plain, flood-basin, low alluvial-plain, and alluvial-fan deposits yield most of the ground water. The general quality of the ground water in terms of dissolved-solids concentration is considered good for irrigation, domestic, and most other uses.

Dissolved solids refers to the total concentration of dissolved material in water. High dissolved-solids concentrations may be objectionable to domestic users because of taste, odor, staining, or accumulation of precipitates in pipes. Also, water having a high concentration of dissolved solids has a greater chance of containing some substances physiologically harmful to humans than does water with a low concentration of dissolved solids. The U.S. Environmental Protection Agency (1977) has published guidelines that recommend a 500-mg/L (milligrams per liter) limit for dissolved solids in public-water supplies. The California Domestic Water Quality Regulations also recommend a 500-mg/L limit; but, if it is not reasonably feasible to provide more suitable water, then water containing up to 1,000 mg/L dissolved solids may be used. For existing water systems, a short-term maximum of 1,500 mg/L is allowed pending development of a better water source or of treatment facilities (California Department of Health, 1977). From a practical standpoint, the usability of any domestic water having a dissolved-solids concentration in excess of 500 mg/L should be evaluated on the basis of the presence and concentration of each chemical constituent.

The effects of dissolved-solids concentration of irrigation water on crops is given in table 1. Chapman and others (1949, p. 136) indicated that 1,000 mg/L dissolved solids in irrigation water is near the maximum for optimum crop growth in California.

TABLE 1.—*Effect of dissolved-solids concentrations on crop productivity*

[Modified from National Academy of Sciences and National Academy of Engineering, 1973, p. 335]

Crop response	Dissolved solids (mg/L)
No detrimental effects noted	Less than 500
Detrimental effects on sensitive crops	500–1,000
May have adverse effects on many crops; use requires careful management practices	1,000–2,000
Can be used on salt-tolerant plants on permeable soils with careful management	2,000–5,000

This map shows the distribution of dissolved–solids concentrations in the alluvium of the Sacramento Valley. It is based on 1,330 chemical analyses collected from about 900 wells between 1974 and 1978. Dissolved–solids concentrations were determined by the residue-on-evaporation method (Brown and others, 1970, p. 145) for about 650 of the wells. By using dissolved–solids and specific-conductance values from the 650 wells, a ratio of dissolved solids to conductance was determined from a regression analysis. This ratio was used to convert specific conductance values to dissolved–solids concentrations for each of the remaining 250 wells.

The small colored circles on the map represent wells with anomalous dissolved–solids concentrations. They account for about 11 percent of the wells sampled. These anomalies generally occur in wells located adjacent to rivers or streams, suggesting a ground-water and surface-water exchange. On the west side of the valley some of the smaller streams are known to carry water of dissolved-solids concentrations higher than that of the surrounding ground water, which may account for those anomalies that are greater than the background concentration. The source of this water is thought to be the Upper Cretaceous Chico Formation or marine deposits of Early Cretaceous age that are exposed in the Coast Ranges.

CONVERSION FACTORS

For those readers who may prefer to use SI (International System) units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply	By	To obtain
acre-feet	0.001233	cubic hectometers
miles	1.609	kilometers
square miles	2.59	square kilometers

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EXPLANATION

DISSOLVED–SOLIDS CONCENTRATION
(Milligrams per liter)

- Less than 200
- 200 to 500
- 501 to 1,500
- More than 1,500

Small circles indicate the location of wells from which the dissolved–solids concentration is anomalous; or, where the number of samples or variance of concentration values does not justify grouping as a common area.

INDEX MAP

CONTOUR INTERVAL 100 FEET
CONTOURS AT 20 FOOT INTERVAL ARE SHOWN IN VALLEY AREA WHERE SPACE PERMITS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Base from U.S. Geological Survey
Central Valley, California: North area and Delta area, 1958

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By
Ronald P. Fogelman

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