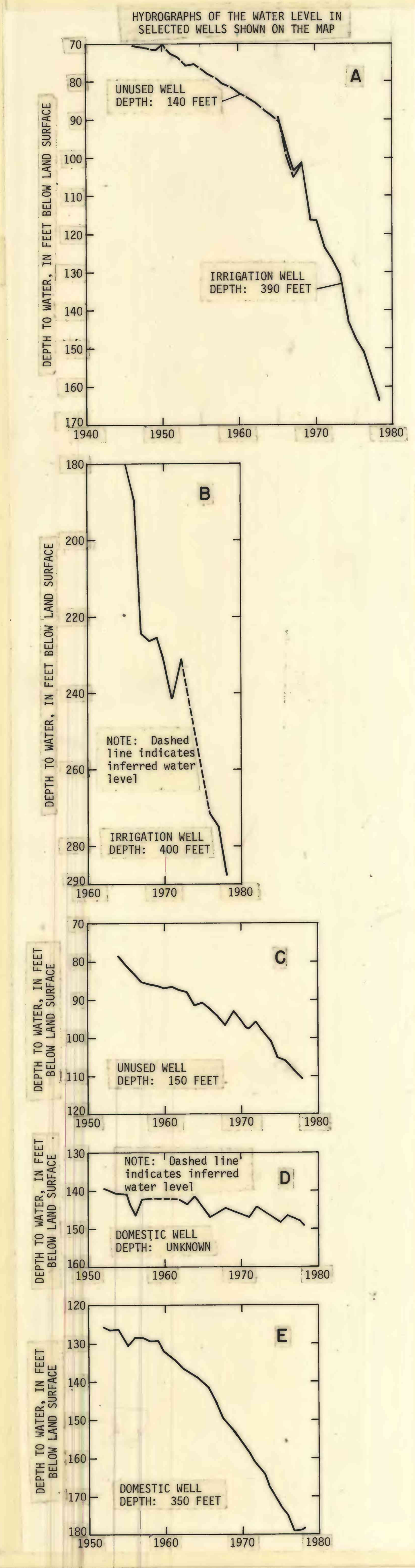
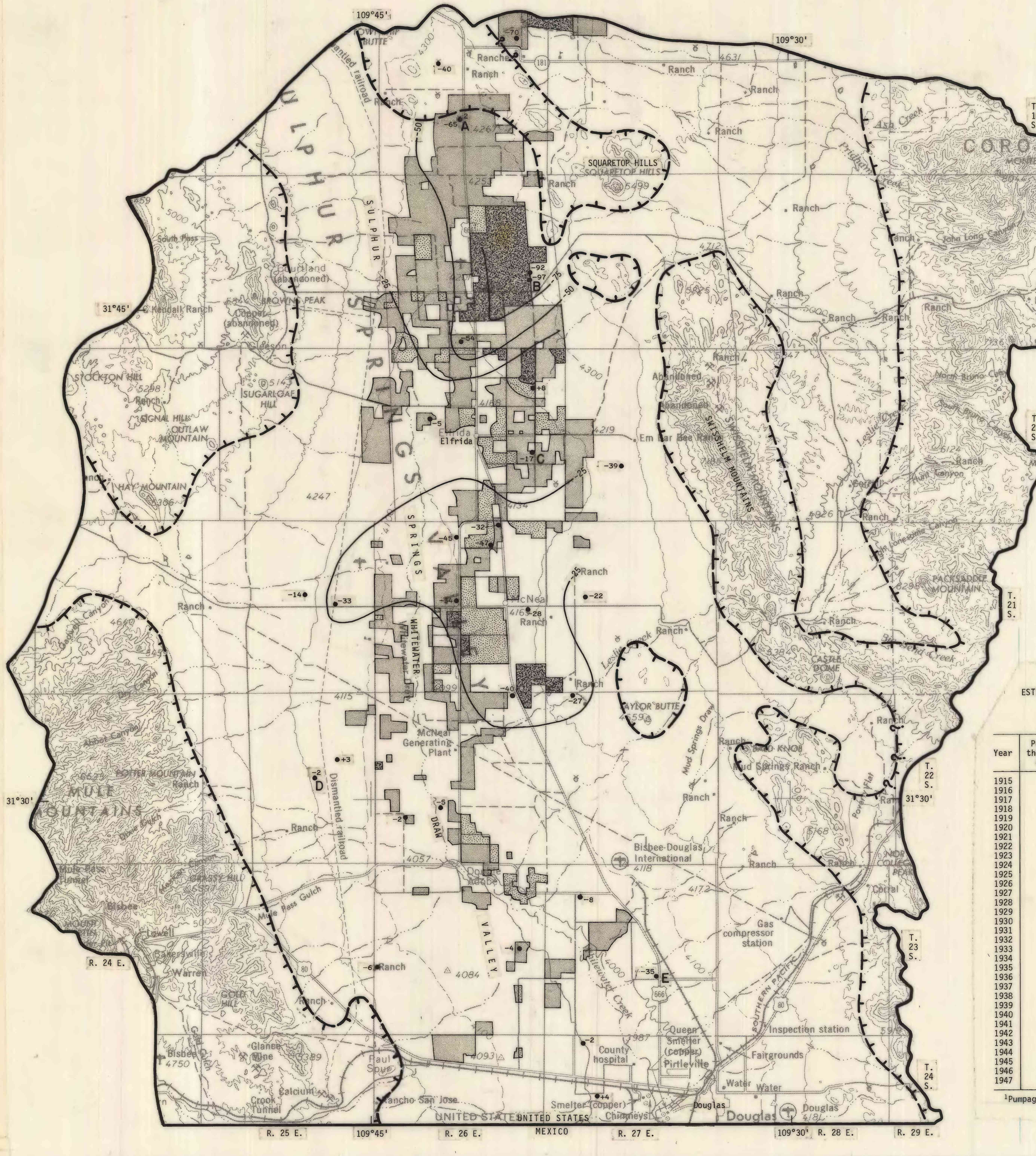
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARIZONA WATER COMMISSION

WATER-RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 80-700
SHEET 1 OF 3
CHANGE IN WATER LEVEL AND IRRIGATED AREA

HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS SHOWN ON THE MAP





E X P L A N A T I O N

-25 — APPROXIMATE LINE OF EQUAL WATER-LEVEL CHANGE, 1966-78—Interval 25 feet

-65 ●2 WELL IN WHICH DEPTH TO WATER WAS MEASURED IN 1966 AND 1978—Number, 2, indicates number of wells at this location. Number, -65, is the difference in feet between the 1966 and 1978 measurements

●C WELL FOR WHICH A HYDROGRAPH IS SHOWN

▨ IRRIGATED AREA AS OF 1972-73—Based on data from the Arizona Crop and Livestock Reporting Service (1974); not field checked. Land under cultivation or that prepared for cultivation was considered irrigated

▨ FALLOWED AREA AS OF 1978—Area not irrigated in 1978 that was irrigated in 1972-73

▨ AREA IRRIGATED IN 1978 THAT WAS NOT IRRIGATED IN 1972-73

⊥ ⊥ ⊥?⊥ APPROXIMATE BOUNDARY OF THE MAIN WATER-BEARING UNIT—The main water-bearing unit is principally alluvium, which consists of permeable lenses of gravel and sand interbedded with silt and clay. The igneous, metamorphic, and sedimentary rocks, which make up the surrounding mountains, yield less than 50 gallons per minute where fractured. Queried where uncertain

━━ ARBITRARY BOUNDARY OF GROUND-WATER AREA

The Douglas basin area includes about 1,200 mi^2 in the southern part of Sulphur Springs Valley in southeastern Arizona. The valley floor, which occupies about 500 mi^2, is underlain by alluvium that consists of permeable lenses of gravel and sand interbedded with relatively impermeable silt and clay. The surrounding mountains are made up of igneous, metamorphic, and sedimentary rocks. The area is drained by Whitewater Draw, which heads in the northeastern part of the area, flows westward into the valley, southward through the valley, and across the international boundary into Mexico. In most of the area Whitewater Draw and its tributaries flow only in response to precipitation and snowmelt.

The main source of water is the ground water in the alluvium that underlies Sulphur Springs Valley. The alluvium is at least 1,600 ft thick in the central part of the valley and thins to a few feet along the mountain fronts (Coates, 1952, p. 188). In general, ground water in the alluvium is under unconfined, or water-table, conditions; however, in places the silt and clay beds form confining layers or perch water.

Yields of wells in the alluvium range from a few gallons per minute for domestic and livestock wells to more than 2,000 gal/min for irrigation wells. East of the Squaretop Hills and Swisshelm Mountains, the water-yielding potential of the alluvium is not known, but yields of several tens to a few thousand gallons per minute probably can be obtained from wells. In some places, such as in the Squaretop Hills, the igneous, metamorphic, and sedimentary rocks are hydraulically connected to the alluvium, but these rocks generally do not yield more than 50 gal/min to wells and springs. The water-bearing and water-yielding characteristics of the rocks depend on the degree of fracturing.

The main use of ground water is for irrigation. For 1955-77, the estimated ground-water pumpage equaled or exceeded 50,000 acre-ft/yr, and for 1966-77 the ground-water pumpage averaged about 109,000 acre-ft/yr. Ground-water withdrawals have resulted in water-level declines in most of the area. For 1966-78, water levels declined more than 20 ft in 18 of the 31 wells in which periodic water-level measurements were made; however, small rises were measured in 3 of the wells.

The hydrologic data on which these maps are based are available, for the most part, in computer-printout form and may be consulted at the Arizona Water Commission, 222 North Central Avenue, Suite 850, Phoenix, and at U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and Valley Center, Suite 1880, Phoenix. Material from which copies can be made at private expense is available at the Tucson and Phoenix offices of the U.S. Geological Survey.

ESTIMATED GROUND-WATER PUMPAGE IN THE DOUGLAS AREA

[Numbers rounded to nearest thousand acre-feet]

Year	Pumpage, in thousands of acre-feet	Year	Pumpage, in thousands of acre-feet
1915	1	1948	22
1916	1	1949	30
1917	([1])	1950	35
1918	([1])	1951	38
1919	([1])	1952	42
1920	([1])	1953	45
1921	([1])	1954	42
1922	([1])	1955	50
1923	([1])	1956	60
1924	([1])	1957	55
1925	([1])	1958	55
1926	([1])	1959	55
1927	([1])	1960	60
1928	([1])	1961	65
1929	([1])	1962	65
1930	1	1963	65
1931	1	1964	60
1932	2	1965	90
1933	2	1966	105
1934	2	1967	120
1935	2	1968	120
1936	2	1969	104
1937	2	1970	103
1938	2	1971	95
1939	2	1972	89
1940	5	1973	110
1941	5	1974	138
1942	5	1975	118
1943	5	1976	112
1944	5	1977	89
1945	8		
1946	12		
1947	17	TOTAL	2,319

[1] Pumpage was 500 acre-feet or less.

SELECTED REFERENCES

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Coates, D. R., 1952, Douglas basin, Cochise County, in Ground water in the Gila River basin and adjacent areas, Arizona—a summary, by L. C. Halpenny and others: U.S. Geological Survey open-file report, p. 187-194.

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__________1977a, National interim primary drinking water regulations: U.S. Environmental Protection Agency Report, EPA-570/9-76-003, 159 p.

__________1977b, National secondary drinking water regulations: Federal Register, v. 42, no. 62, March 31, 1977, p. 17143-17147.

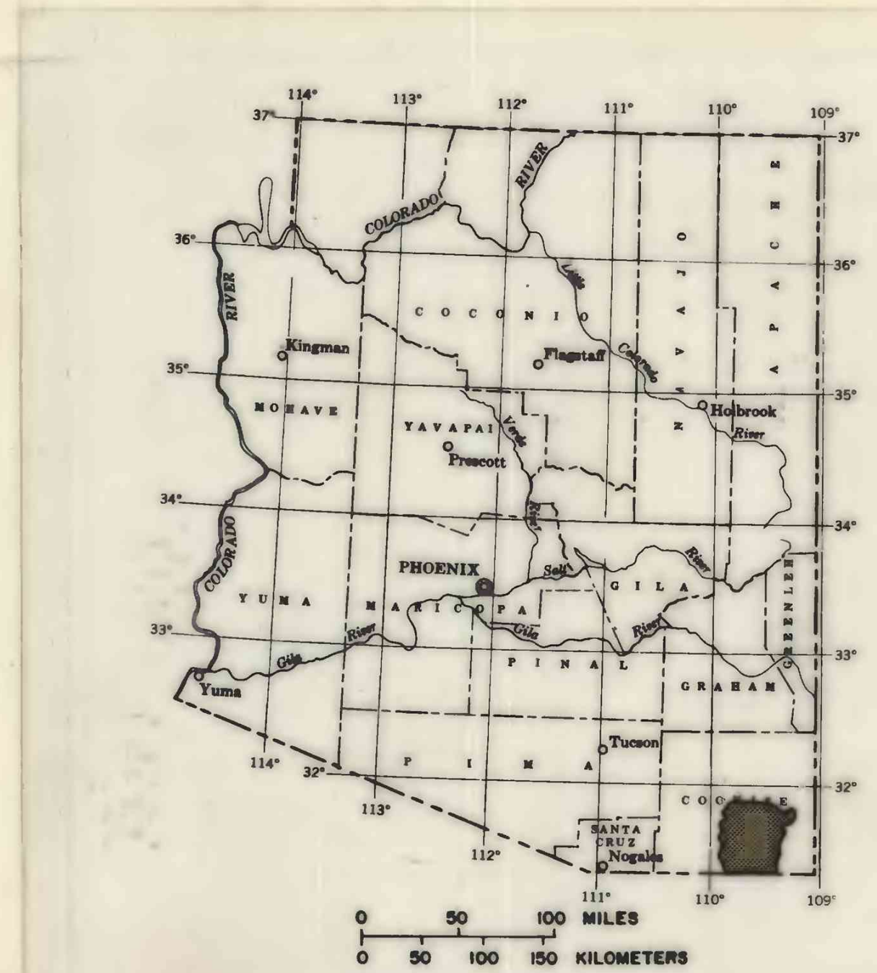
U.S. Salinity Laboratory Staff, 1954, Diagnosis and improvement of saline and alkaline soils: U.S. Department of Agriculture Handbook 60, 160 p.

White, N. D., and Childers, Dallas, 1967, Hydrologic conditions in the Douglas basin, Cochise County, Arizona: Arizona State Land Department Water-Resources Report 30, 26 p.

CONVERSION FACTORS

For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
square mile (mi^2)	2.590	square kilometer (km^2)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
gallon per minute (gal/min)	0.06309	liter per second (L/s)



INDEX MAP SHOWING AREA OF REPORT (SHADED)

5 0 5 MILES
5 0 5 10 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL

BASE FROM U.S. GEOLOGICAL SURVEY
DOUGLAS 1:250,000, 1959

CHANGE IN WATER LEVEL, 1966-78, IRRIGATED AREA, AND HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS

MAPS SHOWING GROUND-WATER CONDITIONS IN THE DOUGLAS BASIN AREA, COCHISE COUNTY, ARIZONA—1978

BY

LARRY J. MANN AND C. S. ENGLISH