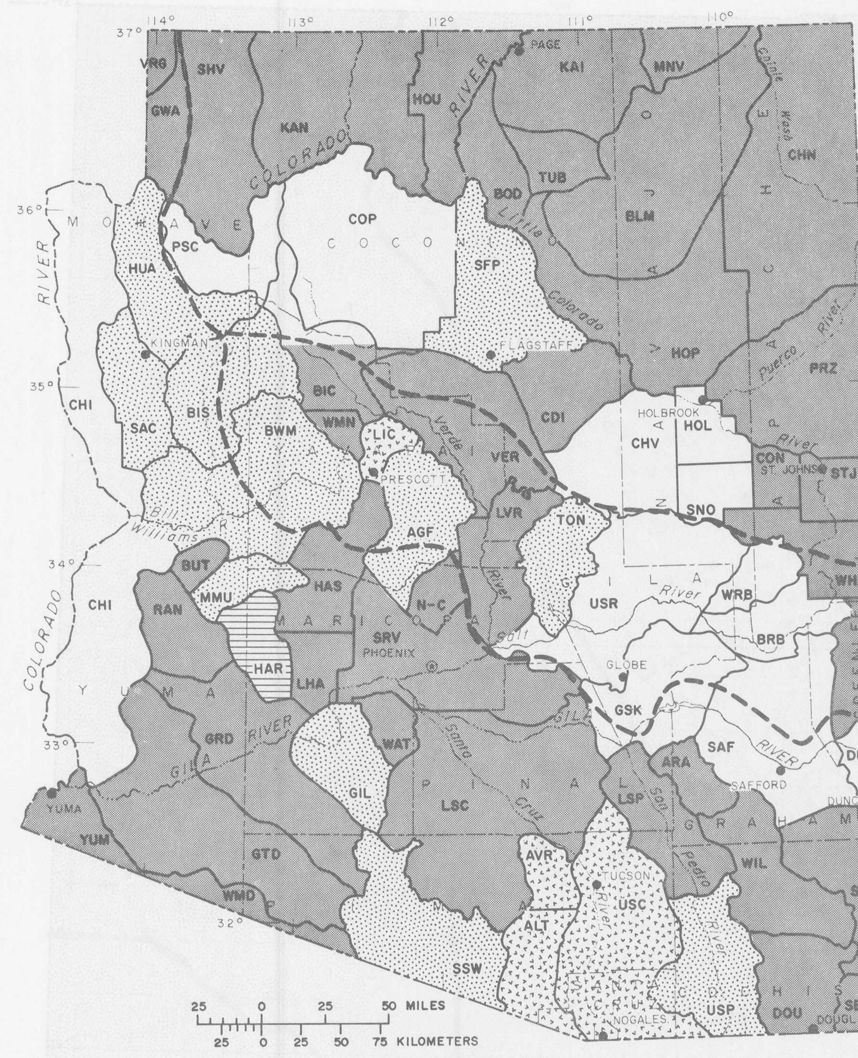
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
ARIZONA DEPARTMENT OF WATER RESOURCES

U.S. GEOLOGICAL SURVEY
WRD, LIBRARY
505 MARQUETTE NW, RM 720
ALBUQUERQUE, N.M. 87102

WATER-RESOURCES INVESTIGATIONS
OPEN-FILE REPORT 81-906
SHEET 1 OF 2

C.1



EXPLANATION

AREA FOR WHICH GROUND-WATER BASIC-DATA INVENTORY WAS IN PROGRESS—As of July 1980

AREA FOR WHICH A REPORT WAS IN PREPARATION—As of July 1980

AREA FOR WHICH A REPORT HAS BEEN RELEASED

AREA FOR WHICH A REPORT HAS BEEN RELEASED AND AN UPDATE IS IN PROGRESS

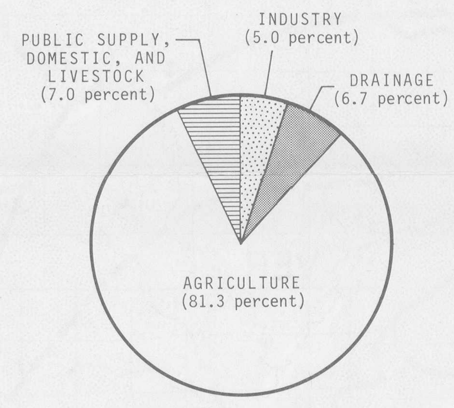
AREA BOUNDARY

WATER-PROVINCE BOUNDARY

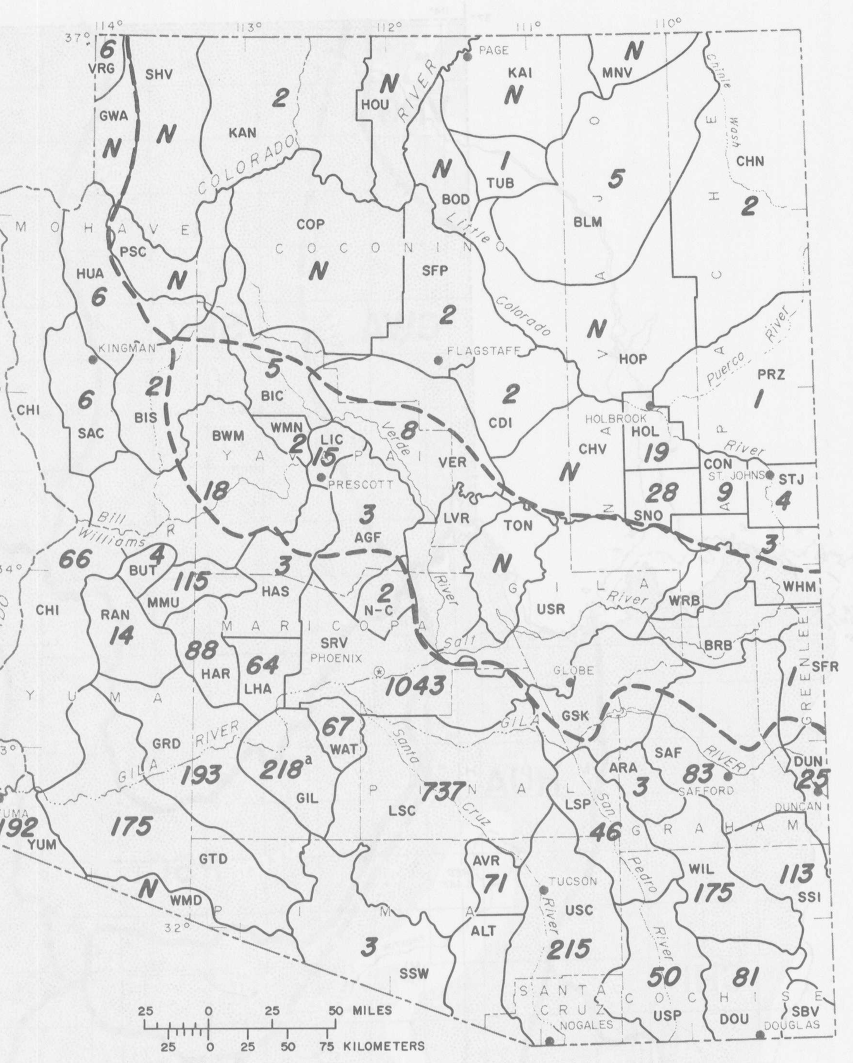
STATUS OF GROUND-WATER INVENTORY

AREAS AND ABBREVIATIONS

AGF = Agua Fria basin
ALT = Altar Valley
ARA = Aravaipa Valley
AVR = Avra Valley
BIC = Big Chino Valley
BIS = Big Sandy Valley
BWM = Bill Williams
BLM = Black Mesa
BRB = Black River basin
BOD = Bodaway Mesa
BUT = Butler Valley
CDI = Canyon Diablo
CHV = Chevelon
CHN = Chinle
COP = Coconino Plateau
CHI = Colorado River, Hoover Dam to Imperial Dam
CON = Concho
DOU = Douglas basin
DUN = Duncan basin
GIL = Gila Bend basin
GRD = Gila River drainage from Painted Rock Dam to Texas Hill
GSK = Gila River from head of San Carlos Reservoir to Kelvin
GTD = Gila River from Texas Hill to Dome
GWA = Grand Wash
HAR = Harquahala Plains
HAS = Hassayampa basin
HOL = Holbrook
HOP = Hopi
HOU = House Rock
HUA = Hualapai Valley
KAI = Kaibito
KAN = Kanab
LIC = Little Chino Valley
LHA = Lower Hassayampa
LSP = Lower San Pedro basin
LSC = Lower Santa Cruz basin
LVR = Lower Verde River
MMU = McMullen Valley
MNV = Monument Valley
N-C = New River-Cave Creek
PSC = Peach Spring Canyon
PRZ = Puerco-Zuni
RAN = Ranegras Plain
SAC = Sacramento Valley
SAF = Safford basin
SRV = Salt River Valley
SBV = San Bernardino Valley
SFP = San Francisco Peaks
SFR = San Francisco River basin
SSI = San Simon basin
SSW = San Simon Wash
SHV = Shivwits
SNO = Snowflake
STJ = Saint Johns
TON = Tonto basin
TUB = Tuba City
USR = Upper Salt River basin
USP = Upper San Pedro basin
USC = Upper Santa Cruz basin
VER = Upper Verde River
VRG = Virgin River
WAT = Waterman Wash
WMD = Western Mexican drainage
WHM = White Mountains
WRB = White River basin
WIL = Willcox basin
WMN = Williamson Valley
YUM = Yuma



USE OF GROUND-WATER PUMPAGE IN ARIZONA IN 1979



EXPLANATION

218ᵃ ESTIMATED GROUND-WATER PUMPAGE, IN THOUSANDS OF ACRE-FEET—Letter, a, denotes that figure is subject to revision pending acquisition of additional data

N PUMPAGE OF 500 ACRE-FEET OR LESS

AREA BOUNDARY

WATER-PROVINCE BOUNDARY

NOTE: In areas where no data are shown, the pumpage is mostly from domestic and stock wells, and the amount is unknown. The total pumpage in these areas is estimated to be about 15,000 acre-feet for 1979 (see table).

ESTIMATED GROUND-WATER PUMPAGE IN ARIZONA IN 1979

ESTIMATED ANNUAL GROUND-WATER PUMPAGE, IN THOUSANDS OF ACRE-FEET, IN ARIZONA, BY AREA
[NUMBERS ROUNDED TO NEAREST THOUSAND ACRE-FEET. AREA: AVR, SEE MAPS FOR LOCATION]

YEAR	AGF	ARA	AVR	BIC	BIS	BLM	BOD	BUT	BWM	CDI	CHV	CHN	COP	CHI	CON	DOU	DUN	GIL	GRD	GTD	GWA
PRIOR TO 1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--
1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	4	--
1916	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	4	--
1917	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	4	--
1918	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	4	--
1919	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	6	--
1920	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	6	--
1921	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	3	--
1922	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	3	--
1923	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	10	--
1924	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	15	--
1925	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	15	--
1926	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--
1927	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--
1928	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--
1929	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	10	--
1930	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	15	--
1931	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	20	--
1932	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	20	--
1933	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	15	--
1934	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	15	--
1935	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	20	--
1936	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	20	--
1937	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	25	--
1938	--	--	8	--	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	25	--
1939	--	--	9	--	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	25	--
1940	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	5	2	19	1	25	--
1941	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	5	1	19	1	25	--
1942	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	5	2	19	2	30	--
1943	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	5	7	20	2	35	--
1944	--	--	19	--	--	--	--	--	--	--	--	--	--	--	--	5	8	20	6	37	--
1945	--	--	23	--	--	--	--	--	--	--	--	--	--	--	--	8	6	20	9	35	--
1946	--	--	23	--	--	--	--	--	--	--	--	--	--	--	--	12	17	33	11	38	--
1947	--	--	34	--	--	--	--	--	--	--	--	--	--	--	--	17	21	40	11	43	--
1948	--	--	38	--	--	--	--	--	--	--	--	--	--	--	--	22	21	61	7	50	--
1949	--	--	48	--	--	--	--	--	--	--	--	--	--	--	--	30	11	67	13	45	--
1950	--	--	41	20	--	--	--	--	--	--	--	--	--	--	--	35	23	59	15	46	--
1951	--	--	75	20	--	--	--	--	--	--	--	--	--	--	--	38	33	104	21	50	--
1952	--	--	80	20	--	--	--	--	--	--	--	--	--	--	--	42	17	120	32	40	--
1953	--	--	85	20	--	--	--	--	--	--	--	--	--	--	--	45	30	145	42	16	--
1954	--	--	90	20	--	--	--	--	--	--	--	--	--	--	--	42	27	139	37	9	--
1955	--	--	95	20	--	--	--	--	--	--	--	--	--	--	--	50	25	140	31	8	--
1956	--	--	100	20	--	--	--	--	--	--	--	--	--	--	--	60	20	160	30	5	--
1957	--	--	110	20	--	--	--	--	--	--	--	--	--	--	--	55	20	180	30	5	--
1958	--	--	120	20	--	--	--	--	--	--	--	--	--	5	--	55	25	200	30	2	--
1959	--	--	130	20	--	--	--	--	--	--	--	--	--	10	--	55	25	250	40	2	--
1960	--	--	140	20	--	--	--	--	--	--	--	--	--	10	--	60	25	250	50	2	--
1961	--	--	145	20	--	--	--	--	--	--	--	--	--	10	--	65	25	200	50	140A	--
1962	--	--	140	20	--	--	--	--	--	--	--	--	--	10	--	65	25	170	50	215A	--
1963	--	--	115	20	--	--	--	--	--	--	--	--	--	10	--	65	25	130	60	201A	--
1964	--	--	115	20	--	--	--	--	--	--	--	--	--	15	--	60	25	130	65	181A	--
1965	--	--	125	20	--	--	--	--	--	--	--	--	--	13	--	90	25	115	65	186A	--
1966	--	--	95	20	--	--	--	--	--	--	--	--	--	12	--	105	25	145	80	217A	--
1967	--	--	121	9	--	--	--	--	--	--	--	--	--	20	--	120	25	198	100	213A	--
1968	--	--	134	9	--	--	--	--	--	--	--	--	--	17	--	120	25	153	126	220A	--
1969	--	--	155	9	--	--	--	--	--	--	--	--	--	12	--	104	25	166	120	218A	--
1970	--	--	157	9	--	--	--	--	--	--	--	--	--	12	--	103	25	162	108	218A	--
1971	--	--	140	9	--	--	--	--	--	--	--	--	--	16	--	95	25	212	122	215A	--
1972	--	--	146	8	--	--	--	--	--	--	--	--	--	19	--	89	25	238	125	201A	--
1973	--	--	152	8	--	--	--	--	--	--	--	--	--	25	--	110	25	198	143	208A	--
1974	--	--	129	11	--	5	N	4	--	2	N	1	N	28	3	138	25	249	191	206A	N
1975	--	--	159	12	--	5	N	5	--	3	N	2	N	32	5	118	25	288	164	210A	N
1976	--	--	115	10	--	6	N	5	--	3	N	3	N	43	7	112	30	287	182	204A	N
1977	--	--	110	9	--	6	N	4	--	4	N	2	N	53	7	87	30	300	210	201A	N
1978	--	--	66	6	8	5	N	4	--	4	N	2	N	53	7	80	30	292	193	191A	N
1979	3	3	71	5	2	5	N	4	18	2	N	2	N	66	9	81	25	218H	193	175A	N
TOTAL	3G	3G	3712	454	10F	32B	-B	26B	18G	18B	-B	12B	-B	491	38B	2478	858	5946H	2768	4724	-B

YEAR	HAR	HAS	HOL	HOP	HOU	HUA	KAI	KAN	LIC	LHA	LSP	LSC	MMU	MNV	N-C	PSC	PRZ	RAN	SAC	SAF	SRV
PRIOR TO 1915	--	--	--	--	--	--	--	--	--	--	--	200	--	--	--	--	--	--	--	--	57
1915	--	--	--	--	--	--	--	--	--	--	--	82	--	--	--	--	--	--	--	--	15
1916	--	--	--	--	--	--	--	--	--	--	--	83	--	--	--	--	--	--	--	--	15
1917	--	--	--	--	--	--	--	--	--	--	--	84	--	--	--	--	--	--	--	--	15
1918	--	--	--	--	--	--	--	--	--	--	--	85	--	--	--	--	--	--	--	--	40
1919	--	--	--	--	--	--	--	--	--	--	--	86	--	--	--	--	--	--	--	--	60
1920	--	--	--	--	--	--	--	--	--	--	--	88	--	--	--	--	--	--	--	--	95
1921	--	--	--	--	--	--	--	--	--	--	--	90	--	--	--	--	--	--	--	--	100
1922	--	--	--	--	--	--	--	--	--	--	--	93	--	--	--	--	--	--	--	--	200
1923	--	--	--	--	--	--	--	--	--	--	--	96	--	--	--	--	--	--	--	--	400
1924	--	--	--	--	--	--	--	--	--	--	--	99	--	--	--	--	--	--	--	--	500
1925	--	--	--	--	--	--	--	--	--	--	--	101	--	--	--	--	--	--	--	--	500
1926	--	--	--	--	--	--	--	--	--	--	--	104	--	--	--	--	--	--	--	--	500
1927	--	--	--	--	--	--	--	--	--	--	--	106	--	--	--	--	--	--	--	--	500
1928	--	--	--	--	--	--	--	--	--	--	--	109	--	--	--	--	--	--	--	--	500
1929	--	--	--	--	--	--	--	--	--	--	--	111	--	--	--	--	--	--	--	--	600
1930	--	--	--	--	--	--	--	--	--	--	--	135	--	--	--	--	--	--	--	--	650
1931	--	--	--	--	--	--	--	--	--	--	--	160	--	--	--	--	--	--	--	--	600
1932	--	--	--	--	--	--	--	--	--	--	--	185	--	--	--	--	--	--	--	--	300
1933	--	--	--	--	--	--	--	--	--	--	--	210	--	--	--	--	--	--	--	--	572
1934	--	--	--	--	--	--	--	--	--	--	--	235	--	--	--	--	--	--	--	--	711
1935	--	--	--	--	--	--	--	--	--	--	--	260	--	--	--	--	--	--	--	20	554
1936	--	--	--	--	--	--	--	--	--	--	--	285	--	--	--	--	--	--	--	20	684
1937	--	--	--	--	--	--	--	--	2	--	--	305	--	--	--	--	--	--	--	20	665
1938	--	--	--	--	--	--	--	--	3	--	--	325	--	--	--	--	--	--	--	20	905
1939	--	--	--	--	--	--	--	--	4	--	--	352	--	--	--	--	--	--	--	20	738
1940	1	--	--	--	--	--	--	--	4	--	--	372	N	--	--	--	--	--	N	25	943
1941	1	--	--	--	--	--	--	--	4	--	--	421	N	--	--	--	--	--	N	9	444
1942	1	--	--	--	--	--	--	--	5	--	--	500	N	--	--	--	--	--	N	19	1004
1943	1	--	--	--	--	--	--	--	6	--	--	515	N	--	--	--	--	--	N	35	1104
1944	1	--	--	--	--	--	--	--	7	--	--	530	N	--	--	--	--	--	N	52	1017
1945	1	--	--	--	--	--	--	--	7	--	--	610	2	--	--	--	--	--	N	35	1143
1946	1	--	--	--	--	--	--	--	8	--	--	660	2	--	--	--	--	--	N	115	1360
1947	1	--	--	--	--	--	--	--	9	--	--	700	2	--	--	--	--	--	N	100	1406
1948	1	--	--	--	--	--	--	--	12	--	--	950	2	--	--	--	--	--	N	110	1670
1949	1	--	--	--	--	--	--	--	12	--	--	1100	2	--	--	--	--	--	N	40	1644
1950	5	--	--	--	--	--	--	--	13	--	--	1000	2	--	--	--	--	2	N	90	1852
1951	7	--	--	--	--	--	--	--	13	--	--	1030	2	--	--	--	--	5	N	125	1910
1952	10	--	--	--	--	--	--	--	12	--	--	950	5	--	--	--	--	15	N	70	2020
1953	20	--	--	--	--	--	--	--	13	--	--	1400	6	--	--	--	--	22	N	120	2300
1954	33	--	--	--	--	--	--	--	12	--	--	1200	7	--	--	--	--	19	N	90	2300
1955	30	--	--	--	--	--	--	--	13	--	--	1200	9	--	--	--	--	16	N	90	2240
1956	40	--	--	--	--	--	--	--	14	--	--	1100	15	--	--	--	--	16	N	90	2300
1957	50	--	--	--	--	--	--	--	14	--	--	1100	21	--	--	--	--	9	N	100	2300
1958	60	--	--	--	--	--	--	--	14	--	--	1200	38	--	--	--	--	10	N	50	2300
1959	95	--	--	--	--	--	--	--	14	--	--	1200	50	--	--	--	--	10	N	100	2206
1960	125	--	--	--	--	N	--	--	14	--	--	1100	60	--	--	--	--	11	N	90	2005
1961	100	--	--	--	--	1	--	--	15	--	--	1150	70	--	--	--	--	12	N	140	2178
1962	200	--	--	--	--	1	--	--	15	--	--	1050	65	--	--	--	--	15	N	60	1976
1963	200	--	--	--	--	1	--	--	13	--	--	1000	75	--	--	--	--	17	N	80	2134
1964	200	--	--	--	--	2	--	--	13	--	--	1150	90	--	--	--	--	7	N	110	1972
1965	200	--	--	--	--	2	--	--	14	--	--	910	90	--	--	--	--	6	4	150	1500
1966	160	--	--	--	--	3	--	--	14	--	30	915	105	--	--	--	--	7	4	90	1350
1967	170	--	--	--	--	4	--	--	12	--	29	1120	98	--	--	--	--	12	4	145	1763
1968	165	--	--	--	--	4	--	--	12	--	42	910	95	--	--	--	--	15	6	78	1264
1969	145	--	--	--	--	4	--	--	12	--	51	1043	98	--	--	--	--	16	5	140	1600
1970	111	--	--	--	--	4	--	--	12	--	58	890	86	--	--	--	--	15	4	120	1700
1971	99	--	--	--	--	4	--	--	12	--	51	819	101	--	--	--	--	14	5	190	1800
1972	108	--	--	--	--	4	--	--	12	--	53	798	112	--	--	--	--	19	6	130	1800
1973	109	--	--	--	--	4	--	--	12	91	57	990	113	--	--	--	--	19	5	140	1200
1974	137	--	16	N	N	5	N	N	13	89	61	1171	134	N	--	N	1	22	7	110	1800
1975	130	--	16	N	N	4	N	2	15	94	59	1016	139	N	--	N	2	13	8	145	1750
1976	129	--	18	N	N	4	N	2	14	98	67	1007	129	N	--	N	2	6	8	170	1680
1977	123	--	19	N	N	4	N	2	18	84	62	1037	132	N	--	N	2	13	7	213	1709
1978	100	3	24	N	N	6	N	2	15	63	55	748	115	N	--	N	2	12	8	132	1098
1979	88	3	19	N	N	6	N	2	15	64	46	737	115	N	2	N	1	14	6	83	1043
TOTAL	3159	6F	112B	-B	-B	67	-B	8B	487	583C	721D	41368	2187	-B	2G	-B	10B	390	87	4081	77261

YEAR	SFP	SFR	SSI	SSW	SHV	SNO	STJ	TON	TUB	USP	USC	VER	VRG	WAT	WHM	WIL	WMD	WMN	YUM	OTHERS	TOTAL	YEAR
PRIOR TO 1915	--	--	5	--	--	--	--	--	--	--	80	--	--	--	--	--	--	--	--	--	347	PRIOR TO 1915
1915	--	--	10	--	--	--	--	--	--	--	7	--	--	--	--	2	--	--	2	--	123	1915
1916	--	--	8	--	--	--	--	--	--	--	7	--	--	--	--	2	--	--	2	--	122	1916
1917	--	--	8	--	--	--	--	--	--	--	8	--	--	--	--	1	--	--	2	--	122	1917
1918	--	--	6	--	--	--	--	--	--	--	8	--	--	--	--	N	--	--	3	--	146	1918
1919	--	--	6	--	--	--	--	--	--	--	10	--	--	--	--	N	--	--	4	--	172	1919
1920	--	--	5	--	--	--	--	--	--	--	35	--	--	--	--	N	--	--	4	--	233	1920
1921	--	--	5	--	--	--	--	--	--	--	20	--	--	--	--	N	--	--	4	--	222	1921
1922	--	--	5	--	--	--	--	--	--	--	30	--	--	--	--	N	--	--	4	--	335	1922
1923	--	--	5	--	--	--	--	--	--	--	37	--	--	--	--	N	--	--	4	--	552	1923
1924	--	--	5	--	--	--	--	--	--	--	45	--	--	--	--	N	--	--	4	--	668	1924
1925	--	--	5	--	--	--	--	--	--	--	42	--	--	--	--	N	--	--	5	--	668	1925
1926	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	1	--	--	6	--	675	1926
1927	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	1	--	--	7	--	678	1927
1928	--	--	4	--	--	--	--	--	--	--	45	--	--	--	--	2	--	--	8	--	688	1928
1929	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	2	--	--	9	--	776	1929
1930	--	--	4	--	--	--	--	--	--	--	38	--	--	--	--	1	--	--	10	--	854	1930
1931	--	--	4	--	--	--	--	--	--	--	25	--	--	--	--	1	--	--	11	--	822	1931
1932	--	--	3	--	--	--	--	--	--	--	20	--	--	--	--	1	--	--	12	--	543	1932
1933	--	--	3	--	--	--	--	--	--	--	16	--	--	--	--	1	--	--	13	--	832	1933
1934	--	--	3	--	--	--	--	--	--	--	30	--	--	--	--	1	--	--	14	--	1011	1934
1935	--	--	3	--	--	--	--	--	--	--	28	--	--	--	--	1	--	--	15	5	911	1935
1936	--	--	3	--	--	--	--	--	--	--	32	--	--	--	--	1	--	--	16	5	1071	1936
1937	--	--	3	--	--	--	--	--	--	--	35	--	--	--	--	1	--	--	17	10	1091	1937
1938	--	--	3	--	--	--	--	--	--	--	40	--	--	--	--	2	--	--	18	10	1364	1938
1939	--	--	3	--	--	--	--	--	--	--	50	--	--	--	--	2	--	--	19	20	1247	1939
1940	--	--	3	--	--	--	--	--	--	--	62	--	--	N	--	2	--	--	19	25	1520	1940
1941	--	--	3	--	--	--	--	--	--	--	70	--	--	N	--	5	--	--	20	25	1063	1941
1942	--	--	4	--	--	--	--	--	--	--	94	--	--	N	--	5	--	--	21	25	1742	1942
1943	--	--	4	--	--	--	--	--	--	--	95	--	--	N	--	5	--	--	22	25	1901	1943
1944	--	--	4	--	--	--	--	--	--	--	100	--	--	N	--	5	--	--	20	25	1856	1944
1945	--	--	5	--	--	--	--	--	--	--	106	--	--	N	--	9	--	--	22	25	2066	1945
1946	--	--	6	--	--	--	--	--	--	--	109	--	--	N	--	15	--	--	32	30	2472	1946
1947	--	--	6	--	--	--	--	--	--	--	136	--	--	N	--	20	--	--	39	30	2615	1947
1948	--	--	6	--	--	--	--	--	--	--	135	--	--	1	--	23	--	--	62	35	3206	1948
1949	--	--	6	--	--	--	--	--	--	--	132	--	--	1	--	28	--	--	65	35	3280	1949
1950	--	--	6	--	--	--	--	--	--	--	160	--	--	5	--	35	--	2	64	40	3515	1950
1951	--	--	6	--	--	--	--	--	--	--	180	--	--	10	--	38	--	2	70	50	3789	1951
1952	--	--	15	--	--	--	--	--	--	--	195	--	--	17	--	39	--	2	68	50	3819	1952
1953	--	--	25	--	--	--	--	--	--	--	200	--	--	28	--	94	--	2	69	50	4732	1953
1954	--	--	32	--	--	--	--	--	--	--	200	--	--	30	--	105	--	2	69	50	4513	1954
1955	--	--	40	--	--	--	--	--	--	--	200	--	--	40	--	110	--	2	72	50	4481	1955
1956	--	--	40	--	--	--	--	--	--	--	200	--	--	40	--	120	--	2	87	60	4539	1956
1957	--	--	48	--	--	--	--	--	--	--	200	--	--	40	--	135	--	2	114	60	4613	1957
1958	--	--	50	--	--	--	--	--	--	--	175	--	--	45	--	155	--	2	121	60	4737	1958
1959	--	--	50	--	--	--	--	--	--	--	165	--	--	50	--	183	--	2	122	60	4839	1959
1960	--	--	60	--	--	--	--	--	--	--	165	--	--	60	--	195	--	2	122	75	4641	1960
1961	--	--	65	--	--	--	--	--	--	--	175	--	--	65	--	184	--	2	124	90	5026	1961
1962	--	--	65	--	--	--	--	--	--	--	200	--	--	50	--	180	--	2	121	110	4805	1962
1963	--	--	65	--	--	--	--	--	--	--	180	--	--	50	--	180	--	2	121	110	4854	1963
1964	--	--	75	--	--	--	--	--	--	--	175	--	--	50	--	220	--	2	154	120	4951	1964
1965	--	--	70	--	--	--	--	--	--	--	200	--	--	45	--	250	--	2	179	150	4411	1965
1966	--	--	72	--	--	--	--	--	--	35	190	--	--	45	--	240	--	2	178	100	4239	1966
1967	--	--	76	--	--	--	--	--	--	34	200	--	--	52	--	300	--	2	229	100	5156	1967
1968	--	--	81	--	--	--	--	--	--	29	210	--	--	54	--	290	--	2	234	100	4395	1968
1969	--	--	78	--	--	--	--	--	--	28	236	--	--	60	--	291	--	2	231	100	4949	1969
1970	--	--	105	--	--	--	--	--	--	33	240	--	--	55	--	289	--	2	220	100	4838	1970
1971	--	--	107	--	--	--	--	--	--	36	258	--	--	55	--	309	--	2	233	100	5030	1971
1972	--	--	104	--	--	--	--	--	--	38	253	--	--	57	--	292	--	2	257	100	4996	1972
1973	--	--	115	--	--	--	--	--	--	41	280	--	--	55	--	305	--	2	272	100	4779	1973
1974	2	--	135	--	N	29	1	--	N	45	264	4	5	69	3	339	--	2	247	24	5727	1974
1975	4	--	122	--	N	21	3	--	1	52	280	4	5	64	3	293	--	2	255	21	5549	1975
1976	2	--	122	--	N	24	3	--	1	59	281	4	5	70	3	306	--	2	240	12	5475	1976
1977	2	--	117	--	N	28	3	--	1	54	257	9	6	72	2	220	--	2	233	15	5476	1977
1978	2	1	121	--	N	28	3	--	1	46	220	8	6	54	3	169	--	2	234	15	4238	1978
1979	2	1	113	3	N	28	4	N	1	50	215	8	6	67	3	175	N	2	192	15	4011	1979
TOTAL	14B	2F	2348	3G	-B	158B	17B	-G	5B	580D	8201	37B	33B	1456	18B	6181	-G	60	5467E	24171	179117	TOTAL

EXPLANATION OF SYMBOLS

N: PUMPAGE OF 500 ACRE-FEET OR LESS.

A: WITHDRAWAL MOSTLY FOR DRAINAGE PURPOSES.

B: PUMPAGE FOR THESE AREAS WAS NOT ESTIMATED PRIOR TO 1974. THUS, TOTAL IS FOR 1974-79 ONLY. ESTIMATED PUMPAGE BEFORE 1974 IS INCLUDED IN "OTHERS."

C: PUMPAGE FOR LHA AREA WAS INCLUDED IN SRV AREA PRIOR TO 1973. THUS, TOTAL IS FOR 1973-79 ONLY.

D: PUMPAGE FOR USP AND LSP AREAS WAS NOT ESTIMATED PRIOR TO 1966. THUS, TOTAL IS FOR 1966-79 ONLY. ESTIMATED PUMPAGE BEFORE 1966 IS INCLUDED IN "OTHERS."

E: YUM AREA INCLUDES SOUTH GILA VALLEY, YUMA MESA, AND YUMA VALLEY. BEGINNING IN 1947 IN YUMA VALLEY, IN 1961 IN SOUTH GILA VALLEY, AND IN 1970 IN YUMA MESA, PART OF THE PUMPAGE WAS FOR DRAINAGE OF WATERLOGGED LANDS.

F: PUMPAGE FOR BIS, HAS, AND SFR AREAS WAS NOT ESTIMATED PRIOR TO 1978. THUS, TOTAL IS FOR 1978-79 ONLY. ESTIMATED PUMPAGE BEFORE 1978 IS INCLUDED IN "OTHERS."

G: PUMPAGE FOR AGF, ARA, BWM, N-C, SSW, TON, AND WMD AREAS WAS NOT ESTIMATED PRIOR TO 1979. THUS, TOTAL IS FOR 1979 ONLY. ESTIMATED PUMPAGE BEFORE 1979 IS INCLUDED IN "OTHERS."

H: FIGURE SUBJECT TO REVISION PENDING ACQUISITION OF ADDITIONAL DATA.

I: "OTHERS" INCLUDES: ALTAR VALLEY, BLACK RIVER BASIN, GILA RIVER FROM HEAD OF SAN CARLOS RESERVOIR TO KELVIN, LOWER VERDE VALLEY, SAN BERNARDINO VALLEY, UPPER SALT RIVER BASIN, AND WHITE RIVER BASIN. PUMPAGE IN THESE AREAS IS MOSTLY FROM DOMESTIC AND STOCK WELLS, AND THE AMOUNT IS UNKNOWN. TOTAL ANNUAL PUMPAGE FOR THESE AREAS IS APPROXIMATED.

Introduction

In arid and semiarid regions such as Arizona, the availability of adequate water supplies has an effect on the type and extent of economic development. The nature and extent of the ground-water reservoirs must be known for proper management of this valuable resource. Since 1939, the U.S. Geological Survey has conducted a program of ground-water studies in cooperation with the State of Arizona, which is represented by the Arizona Department of Water Resources. The program includes the collection and analysis of the geologic and hydrologic data necessary to evaluate the ground-water resources of the State. The basic data collected, the results of areal studies, and research findings are presented mainly in publications of the U.S. Geological Survey, but some appear in technical journals and other publications. (See section entitled "Recent Publications Prepared by the Water Resources Division of the U.S. Geological Survey in Arizona.")

In spring 1974 the U.S. Geological Survey, in cooperation with the Arizona Department of Water Resources, formerly the Arizona Water Commission, revised the system of collecting ground-water data in Arizona. Under the revised system, the Arizona Department of Water Resources studies several selected ground-water areas (see map showing status of ground-water inventory) each year, and the U.S. Geological Survey maintains a statewide observation-well network in which water levels are measured annually. Until 1979, the ground-water areas were being studied by the Survey, and reports were published for 40 of the 68 areas. Data collected in the selected ground-water areas include information on wells drilled since previous inventories, water-level measurements, and water samples for chemical analysis. The data are entered into computer storage and are available to the public. The data for individual ground-water areas are analyzed, and the results are published in map form. Typically, the maps show depth to water; change in water levels; altitude of the water level; and quality-of-water data, such as specific conductance, dissolved solids, and fluoride.

Reporting of Data

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
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Availability and Use of Water

In Arizona the availability of adequate and potable water supplies has as great an influence on the location of cities and cropland as any other factor. Agriculture is dependent almost entirely on irrigation because rainfall is inadequate for raising crops. Some surface water is available in a few areas, but the amount is not sufficient to meet the continually increasing demand. For many years, nearly two-thirds of Arizona's water supply has been withdrawn from the ground-water reservoirs; the principal use of the ground water is for the irrigation of crops, although municipal and industrial uses are increasing steadily.

The map on sheet 2 shows potential well production, depth to water in selected wells in spring 1980, and change in water level in selected wells from 1975 to 1980. The map showing estimated ground-water pumpage gives the amount of water pumped in 1979; the annual and accumulated pumpage since the beginning of record are shown in the table. In 1979 the withdrawal of ground water was about 4.0 million acre-ft, which is about 200,000 acre-ft less than the amount withdrawn in 1978; the withdrawals in 1978 and 1979 are the smallest since the mid-1950's except in 1966. Nearly all the decrease was in the amount of ground water used for irrigation in the Basin and Range lowlands province. Possible causes for the decrease and the rising water levels in some areas are discussed in the section entitled "Basin and Range Lowlands Province." Nearly 3.3 million acre-ft of all ground water pumped in Arizona in 1979 was used for the irrigation of crops; nearly all the rest was for public-supply, industrial, domestic, and livestock needs, but some ground water was pumped to drain waterlogged lands. Through 1979, slightly more than 179 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in Arizona. In addition to the ground water pumped, about 3.3 million acre-ft of surface water was diverted for use in the State in 1979; about 2.5 million acre-ft of the water was consumptively used, and the rest was returned to the Colorado River. Thus, the total water use was about 6.5 million acre-ft in 1979. The use of ground water and the effects of this use on the ground-water reservoirs in each of the three water provinces (see map showing water provinces, sheet 2) are discussed separately in the following sections.

Basin and Range lowlands province.--The Basin and Range lowlands province is the most highly developed of the three water provinces. The major ground-water reservoirs are mainly sedimentary deposits in the central parts of the basins, but small supplies of water can be obtained locally from the crystalline and consolidated sedimentary rocks in the mountains that bound the basins. In 1979 about 3.9 million acre-ft of water was withdrawn in the province, of which nearly 3.2 million acre-ft was used for the irrigation of crops. Through 1979, slightly more than 175 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in the province. The amount of ground water withdrawn in 1979 is about 200,000 acre-ft less than that withdrawn in 1978; the decrease was in the quantity of ground water used for irrigation.

In the southeastern and south-central parts of the province precipitation averaged less than 1 in. above the long-term average for the first 6 months of 1979 and about half an inch below average for the last 6 months. The largest amounts of precipitation fell in January and March. (See U.S. Environmental Data Service, 1979, Climatological data—annual summary—Arizona: National Oceanic and Atmospheric Administration, v. 83, no. 13, 16 p.) Floods occurred in the Salt River basin in January and March, and although the floods were smaller than the flood of December 1978, the nearly full reservoirs on the Salt and Verde Rivers necessitated the release of most of the floodwater. Record peak flows occurred on the Salt River below Stewart Mountain Dam. The large amount of water in storage in the reservoirs increased the amount of surface water available for use in the Salt River Valley. About 1.2 million acre-ft of water was diverted at Granite Reef Dam in 1979, which is about 273,000 acre-ft more than the quantity diverted in 1978 and about 423,000 acre-ft more than the diversion in 1977. In the Salt River Valley slightly more than 1.0 million acre-ft of ground water was withdrawn in 1979, which is about 55,000 acre-ft less than that withdrawn in 1978 and 666,000 acre-ft less than the withdrawal in 1977. Water levels in wells throughout the Salt River Valley rose from spring 1979 to spring 1980, and measured water-level rises averaged 4.5 ft in 71 wells.

In the lower Santa Cruz basin the ground-water withdrawal in 1979 was about 11,000 acre-ft less than the withdrawal in 1978. About 422,000 acre-ft of surface water was diverted for use in the San Carlos Project area, and the amount of ground water withdrawn was nearly 17,000 acre-ft less in 1979 than in 1978. In the Stanfield-Maricopa area, however, the withdrawal in 1979 was nearly 32,000 acre-ft more than that in 1978. In most of the lower Santa Cruz basin water levels declined from spring 1979 to spring 1980; the measured water-level change averaged -5.6 ft in 47 wells.

In the Gila Bend basin the average water-level change in eight wells was +18.9 ft from spring 1979 to spring 1980. In places wells were inundated by water backed up by Painted Rock Reservoir on the Gila River and could not be measured. Flow that passes Gillespie Dam continues downstream and fills the reservoir behind Painted Rock Dam, which has stored large volumes of water for the past 2 years; in previous years Painted Rock Reservoir was nearly empty most of the time. The mean annual flow of the Gila River below Gillespie Dam was 3,782 ft^3/s in 1979, which is the highest of record beginning in 1922. The water-level rises in wells were caused by infiltration of water from flow in the river and from the storage of water in Painted Rock Reservoir. For the past 2 years, water has been released from the reservoir, and flow has been nearly continuous at the gaging station on the Gila River below Painted Rock Dam. The mean annual flow at the gaging station was 2,205 ft^3/s in 1979, which is the highest of record beginning in 1960. On October 1, 1979, more than 600,000 acre-ft of water was stored in Painted Rock Reservoir; by January 27, 1980, the reservoir was empty. The flow in the river below the dam caused water levels to rise in wells along the river in the Gila River drainage from Painted Rock Dam to Texas Hill. The water-level change measured in nine wells averaged +10.8 ft from spring 1979 to spring 1980.

Several techniques to conserve energy and irrigation water are being used that contributed to the decrease in ground-water withdrawals and the rise in water levels. Efficient and careful irrigation practices are resulting in more acreage being irrigated with less water, and economically marginal crops that require large amounts of water are being withdrawn from cultivation. In many areas farmers have increased the acreage planted in cotton but are using less water. Earlier harvesting of the cotton and the cessation of irrigation as early as August result in less water being used (I. J. Shields, Maricopa County Extension Director, oral commun., 1979). In some areas the land is being leveled using laser-guided landscrapers, which results in nearly table-smooth land that requires less water for saturation (J. W. Little, Pinal County Agricultural Extension Agent, oral commun., 1979). The use of the method is becoming more widespread, and as more land is leveled the amount of water used is expected to decrease.

Central highlands province.--In the Central highlands province, which is the smallest of the three water provinces, ground water is obtained from thick sedimentary deposits in a few areas, from thin sedimentary deposits along stream channels, and locally from fractured crystalline and consolidated sedimentary rocks. Only a few thousand acres of land is under cultivation, and the amount of ground water withdrawn annually is small—about 49,000 acre-ft in 1979. The small quantity of ground water withdrawn has not resulted in notable water-level declines except in parts of Chino Valley, where a decline of a few feet per year has been measured in the artesian aquifer.

Plateau uplands province.--In the Plateau uplands province ground-water development is small compared with that in the Basin and Range lowlands province, but it is somewhat greater than that in the Central highlands province. Most of the ground water is pumped from layered sandstone that stores ground water under both confined and unconfined conditions and from thin deposits of sediment along the major streams. The use of ground water is limited largely to scattered farms and homesites, industrial and utility sites, and a few population centers, such as Flagstaff, Holbrook, and the White Mountains recreational areas. In 1979 about 78,000 acre-ft of ground water was withdrawn in the province. For the most part, no pattern of rise or decline in water levels is discernible.

Recent Publications Prepared by the Water Resources Division of the U.S. Geological Survey in Arizona

The following reports on the water resources and geology of Arizona were published or released to the open file from July 1, 1979, through June 30, 1980.

Appel, C. L., and Bills, D. J., 1980, Map showing ground-water conditions in the Canyon Diablo area, Coconino and Navajo Counties, Arizona—1979: U.S. Geological Survey Open-File Report 80-747, scale 1:125,000.

Brown, S. G., 1980, Availability of groundwater for irrigation, municipal, and industrial use, Little Colorado River Basin, Arizona and New Mexico, in Millsaps, H. C., Goertz, Larry, and Stipe, Sterling, Surface water budgets (including pumped groundwater), Little Colorado River Basin, Arizona and New Mexico: U.S. Department of Agriculture Little Colorado River Basin Working Paper 7, p. 52-55.

Davidson, E. S., 1979, Summary appraisals of the Nation's ground-water resources—lower Colorado region: U.S. Geological Survey Professional Paper 813-R, 23 p.

Davidson, E. S., Feth, J. H., and Spieker, A. M., 1978, Applications in an arid environment, Tucson, Arizona—Controlling hillside development; protecting and conserving mineral and water resources, in Robinson, G. D., and Spieker, A. M., eds., Nature to be commanded: U.S. Geological Survey Professional Paper 950, p. 21-27.

Farrar, C. D., 1979, Map showing ground-water conditions in the Bodaway Mesa area, Coconino County, Arizona—1977: U.S. Geological Survey Open-File Report 79-1488, scale 1:125,000.

______1980, Maps showing ground-water conditions in the Hopi area, Coconino and Navajo Counties, Arizona—1977: U.S. Geological Survey Open-File Report 80-3, scale 1:125,000.

Leake, S. A., and Clay, D. M., 1979, Maps showing ground-water conditions in the Gila River drainage from Texas Hill to Dome area and in the western Mexican drainage area, Maricopa, Pima, and Yuma Counties, Arizona—1977: U.S. Geological Survey Open-File Report 79-1540, scale 1:125,000.

Levings, G. W., 1980, Water resources in the Sedona area, Yavapai and Coconino Counties, Arizona: Arizona Water Commission Bulletin 11, 37 p.

Levings, G. W., and Mann, L. J., 1980, Maps showing ground-water conditions in the upper Verde River area, Yavapai and Coconino Counties, Arizona—1978: U.S. Geological Survey Open-File Report 80-726, scale 1:125,000.

Mann, L. J., 1980, Maps showing hydrologic conditions in the San Francisco River area, Greenlee County, Arizona, 1978—a reconnaissance study: U.S. Geological Survey Open-File Report 80-441, scale 1:125,000.

Mann, L. J., and English, C. S., 1980, Maps showing ground-water conditions in the Douglas basin area, Cochise County, Arizona—1978: U.S. Geological Survey Open-File Report 80-700, scale 1:125,000.

Murphy, B. J., and Moore, R. T., 1980, Maps showing relative slope stability and relative erodibility, central Santa Cruz River valley, Tucson area, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-844-O, 2 sheets, scale 1:125,000.

Pawelek, D. W., Laney, R. L., and Bales, J. T., 1980, Method for estimating land subsidence in south-central Arizona [abs.]: Geological Society of America Abstracts with Programs, v. 12, no. 7, p. 497.

Raymond, R. H., Laney, R. L., Pankratz, L. W., Riley, F. S., and Carpenter, M. C., 1979, Relationship of earth fissures in alluvial basins in south-central Arizona to irregularities in the underlying formations [abs.]: Geological Society of America Abstracts with Programs, v. 11, no. 7, p. 501.

Raymond, R. H., Winikka, C. C., and Laney, R. L., 1978, Earth fissures and land subsidence, eastern Maricopa and northern Pinal Counties, Arizona, in Burt, D. M., and Pewe, T. L., eds., Guidebook to the geology of central Arizona: Arizona Bureau of Geology and Mineral Technology Special Paper 2, p. 107-113.

Ross, P. P., 1980, Simulated effects of a proposed well field on the ground-water system in the Salt River Indian Reservation, Maricopa County, Arizona: U.S. Geological Survey Open-File Report 80-503W, 22 p.

Ross, P. P., and Farrar, C. D., 1980, Map showing potential geothermal-resource areas, as indicated by the chemical character of ground water, in Verde Valley, Yavapai County, Arizona: U.S. Geological Survey Open-File Report 80-13, scale 1:125,000.

Sanger, H. W., and Appel, C. L., 1980, Maps showing ground-water conditions in the Hassayampa area, Maricopa and Yavapai Counties, Arizona—1978: U.S. Geological Survey Open-File Report 80-584, scale 1:125,000.

Schumann, H. H., Kirdar, Edib, and Warskow, W. L., 1980, Satellite snowcover and runoff monitoring in central Arizona, in Proceedings of the final workshop on operational applications of satellite snowcover observations: Sparks, Nev., 1979, p. 107-126.

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Turner, R. M., and Karpiscak, M. M., 1980, Recent vegetation changes along the Colorado River between Glen Canyon Dam and Lake Mead, Arizona: U.S. Geological Survey Professional Paper 1132, 125 p.

U.S. Geological Survey, 1979, Water resources data for Arizona, water year 1978: U.S. Geological Survey Water-Data Report AZ-78-1, 604 p.

______1980, Annual summary of ground-water conditions in Arizona, spring 1978 to spring 1979: U.S. Geological Survey Open-File Report 80-330, maps.

van Hylckama, T. E. A., 1980, Weather and evapotranspiration studies in a saltcedar thicket, Arizona: U.S. Geological Survey Professional Paper 491-F, 78 p.

White, N. D., Leake, S. A., and Clay, D. M., 1979, Maps showing ground-water conditions in the northern part of the Gila River drainage from Painted Rock Dam to Texas Hill area, Maricopa, Pima, and Yuma Counties, Arizona—1978: U.S. Geological Survey Open-File Report 79-1537, scale 1:125,000.

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1979 TO SPRING 1980

BY U.S. GEOLOGICAL SURVEY