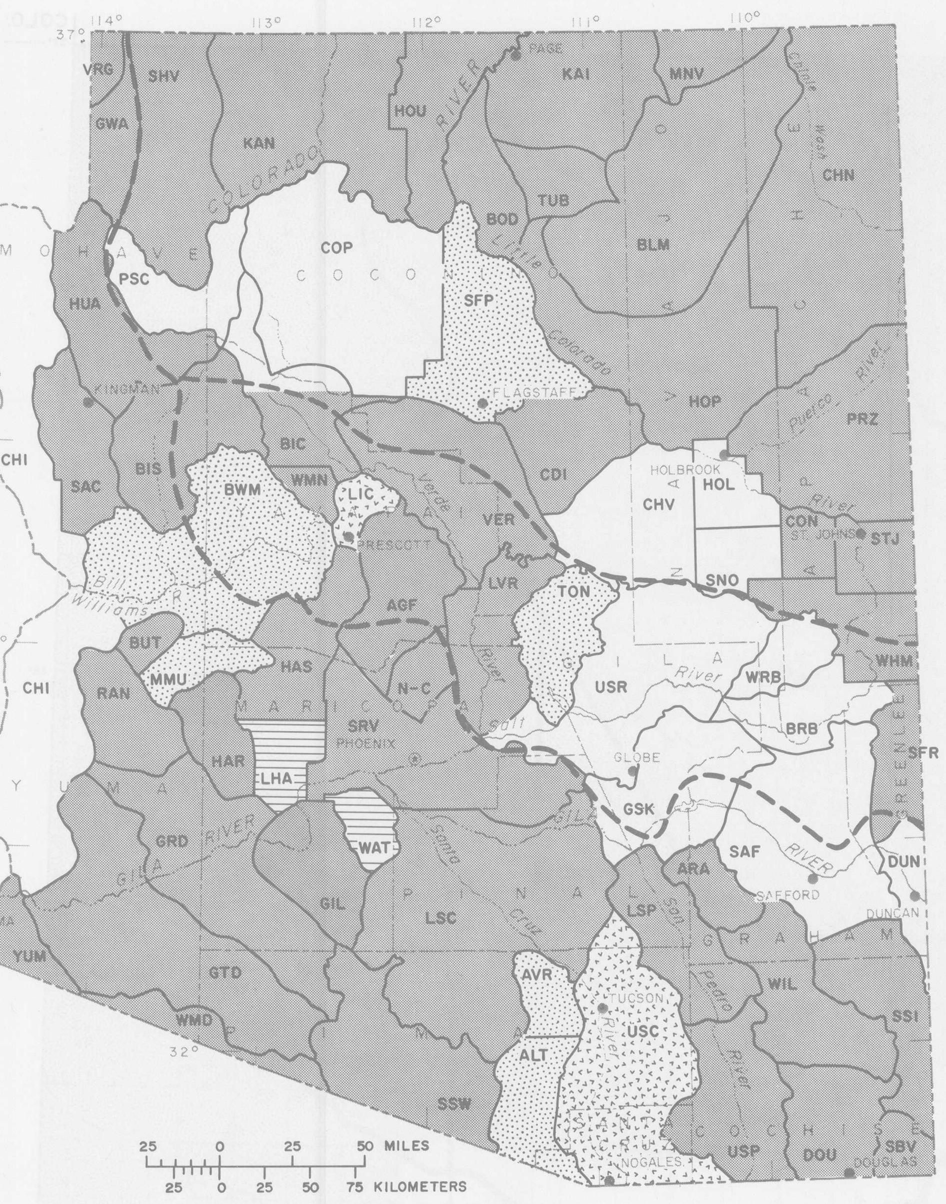
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

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 82-368
SHEET 1 OF 2

C.1



EXPLANATION

AREA FOR WHICH GROUND-WATER BASIC-DATA INVENTORY WAS IN PROGRESS—As of July 1981

AREA FOR WHICH A REPORT WAS IN PREPARATION—As of July 1981

AREA FOR WHICH A REPORT HAS BEEN RELEASED

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

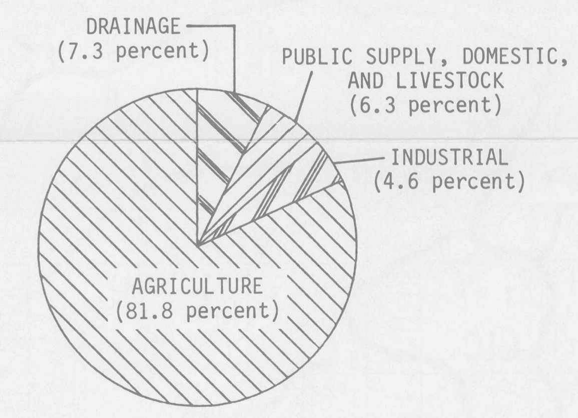
AREA BOUNDARY

WATER-PROVINCE BOUNDARY

STATUS OF GROUND-WATER INVENTORY

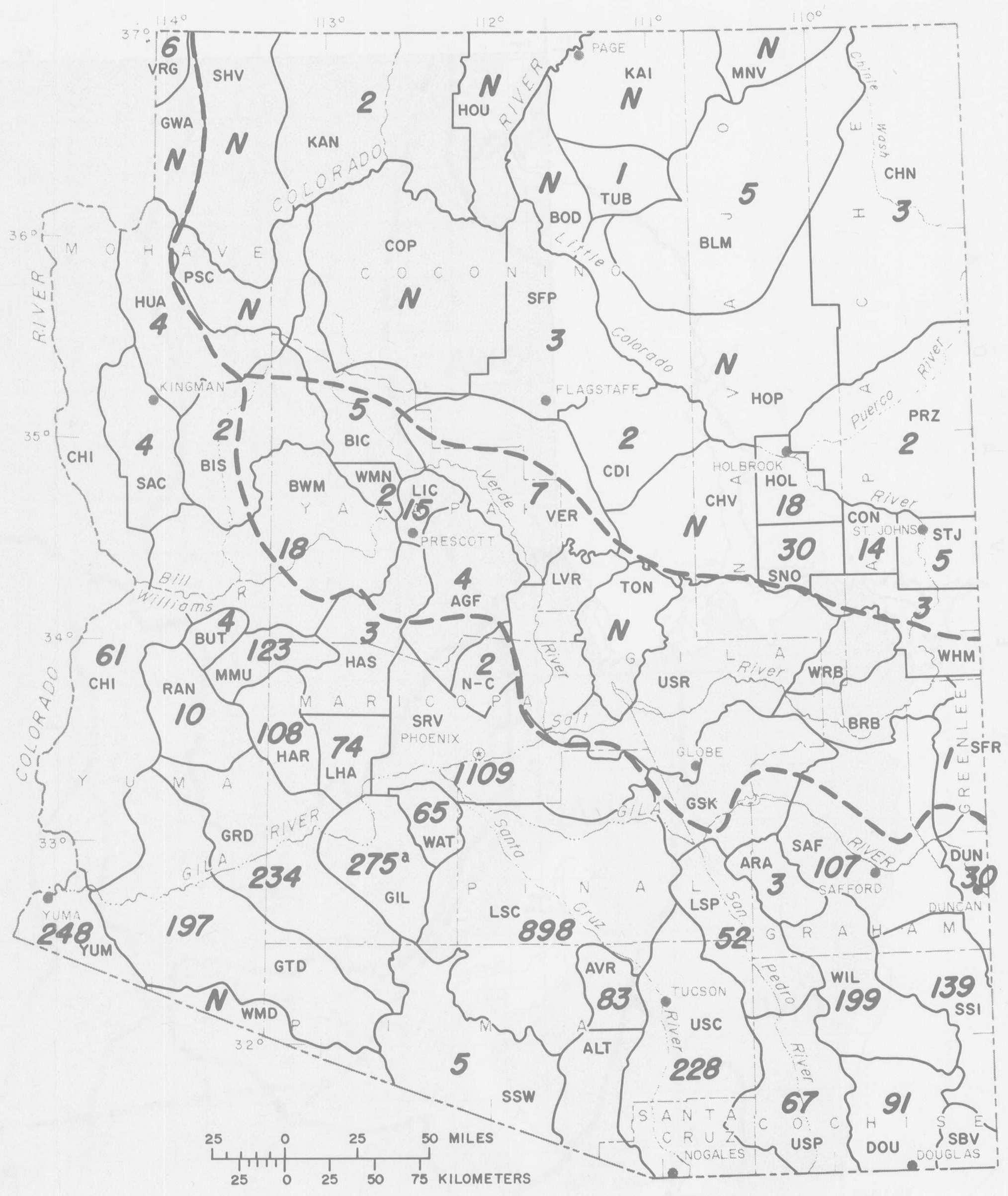
AREAS AND ABBREVIATIONS

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



TOTAL ESTIMATED GROUND-WATER PUMPAGE, 4.6 MILLION ACRE-FEET

ESTIMATED GROUND-WATER PUMPAGE BY TYPE OF USE IN 1980



EXPLANATION

275ª 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 1980 (see table).

ESTIMATED GROUND-WATER PUMPAGE IN ARIZONA IN 1980

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	180	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	208A	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
1980	4	3	83	5	2	5	N	4	18	2	N	3	N	61	14	91	30	275H	234	197A	N
TOTAL	7G	6G	3795	459	12F	37B	-B	30B	36G	20B	-B	15B	-B	552	52B	2569	888	6221H	3002	4921	-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	--	--	--	--	15	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	N	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
1980	108	3	18	N	N	4	N	2	15	74	52	898	123	N	2	N	2	10	4	107	1109
TOTAL	3267	9F	130B	-B	-B	71	-B	10B	502	657C	773D	42266	2310	-B	4G	-B	12B	400	91	4188	78370

YEAR	SFP	SFR	SSI	SSW	SHV	SNO	STJ	TON	TUB	USP	USC	VER	VRG	WAT	WHM	WIL	WMD	WMN	YUM	OTHERS	TOTAL
PRIOR TO 1915	--	--	5	--	--	--	--	--	--	--	80	--	--	--	--	--	--	--	--	--	347
1915	--	--	10	--	--	--	--	--	--	--	7	--	--	--	--	2	--	--	2	--	123
1916	--	--	8	--	--	--	--	--	--	--	7	--	--	--	--	2	--	--	2	--	122
1917	--	--	8	--	--	--	--	--	--	--	8	--	--	--	--	1	--	--	2	--	122
1918	--	--	6	--	--	--	--	--	--	--	8	--	--	--	--	N	--	--	3	--	146
1919	--	--	6	--	--	--	--	--	--	--	10	--	--	--	--	N	--	--	4	--	172
1920	--	--	5	--	--	--	--	--	--	--	35	--	--	--	--	N	--	--	4	--	233
1921	--	--	5	--	--	--	--	--	--	--	20	--	--	--	--	N	--	--	4	--	222
1922	--	--	5	--	--	--	--	--	--	--	30	--	--	--	--	N	--	--	4	--	335
1923	--	--	5	--	--	--	--	--	--	--	37	--	--	--	--	N	--	--	4	--	552
1924	--	--	5	--	--	--	--	--	--	--	45	--	--	--	--	N	--	--	4	--	668
1925	--	--	5	--	--	--	--	--	--	--	42	--	--	--	--	N	--	--	5	--	668
1926	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	1	--	--	6	--	675
1927	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	1	--	--	7	--	678
1928	--	--	4	--	--	--	--	--	--	--	45	--	--	--	--	2	--	--	8	--	688
1929	--	--	4	--	--	--	--	--	--	--	40	--	--	--	--	2	--	--	9	--	776
1930	--	--	4	--	--	--	--	--	--	--	38	--	--	--	--	1	--	--	10	--	854
1931	--	--	4	--	--	--	--	--	--	--	25	--	--	--	--	1	--	--	11	--	822
1932	--	--	3	--	--	--	--	--	--	--	20	--	--	--	--	1	--	--	12	--	543
1933	--	--	3	--	--	--	--	--	--	--	16	--	--	--	--	1	--	--	13	--	832
1934	--	--	3	--	--	--	--	--	--	--	30	--	--	--	--	1	--	--	14	--	1011
1935	--	--	3	--	--	--	--	--	--	--	28	--	--	--	--	1	--	--	15	5	911
1936	--	--	3	--	--	--	--	--	--	--	32	--	--	--	--	1	--	--	16	5	1071
1937	--	--	3	--	--	--	--	--	--	--	35	--	--	--	--	1	--	--	17	10	1091
1938	--	--	3	--	--	--	--	--	--	--	40	--	--	--	--	2	--	--	18	10	1364
1939	--	--	3	--	--	--	--	--	--	--	50	--	--	--	--	2	--	--	19	20	1247
1940	--	--	3	--	--	--	--	--	--	--	62	--	--	N	--	2	--	--	19	25	1520
1941	--	--	3	--	--	--	--	--	--	--	70	--	--	N	--	5	--	--	20	25	1063
1942	--	--	4	--	--	--	--	--	--	--	94	--	--	N	--	5	--	--	21	25	1742
1943	--	--	4	--	--	--	--	--	--	--	95	--	--	N	--	5	--	--	22	25	1901
1944	--	--	4	--	--	--	--	--	--	--	100	--	--	N	--	5	--	--	20	25	1856
1945	--	--	5	--	--	--	--	--	--	--	106	--	--	N	--	9	--	--	22	25	2066
1946	--	--	6	--	--	--	--	--	--	--	109	--	--	N	--	15	--	--	32	30	2472
1947	--	--	6	--	--	--	--	--	--	--	136	--	--	N	--	20	--	--	39	30	2615
1948	--	--	6	--	--	--	--	--	--	--	135	--	--	1	--	23	--	--	62	35	3206
1949	--	--	6	--	--	--	--	--	--	--	132	--	--	1	--	28	--	--	65	35	3280
1950	--	--	6	--	--	--	--	--	--	--	160	--	--	5	--	35	--	2	64	40	3515
1951	--	--	6	--	--	--	--	--	--	--	180	--	--	10	--	38	--	2	70	50	3789
1952	--	--	15	--	--	--	--	--	--	--	195	--	--	17	--	39	--	2	68	50	3819
1953	--	--	25	--	--	--	--	--	--	--	200	--	--	28	--	94	--	2	69	50	4732
1954	--	--	32	--	--	--	--	--	--	--	200	--	--	30	--	105	--	2	69	50	4513
1955	--	--	40	--	--	--	--	--	--	--	200	--	--	40	--	110	--	2	72	50	4481
1956	--	--	40	--	--	--	--	--	--	--	200	--	--	40	--	120	--	2	87	60	4539
1957	--	--	48	--	--	--	--	--	--	--	200	--	--	40	--	135	--	2	114	60	4613
1958	--	--	50	--	--	--	--	--	--	--	175	--	--	45	--	155	--	2	121	60	4737
1959	--	--	50	--	--	--	--	--	--	--	165	--	--	50	--	183	--	2	122	60	4839
1960	--	--	60	--	--	--	--	--	--	--	165	--	--	60	--	195	--	2	122	75	4641
1961	--	--	65	--	--	--	--	--	--	--	175	--	--	65	--	184	--	2	124	90	5026
1962	--	--	65	--	--	--	--	--	--	--	200	--	--	50	--	180	--	2	121	110	4805
1963	--	--	65	--	--	--	--	--	--	--	180	--	--	50	--	180	--	2	121	110	4854
1964	--	--	75	--	--	--	--	--	--	--	175	--	--	50	--	220	--	2	154	120	4951
1965	--	--	70	--	--	--	--	--	--	--	200	--	--	45	--	250	--	2	179	150	4411
1966	--	--	72	--	--	--	--	--	--	35	190	--	--	45	--	240	--	2	178	100	4239
1967	--	--	76	--	--	--	--	--	--	34	200	--	--	52	--	300	--	2	229	100	5156
1968	--	--	81	--	--	--	--	--	--	29	210	--	--	54	--	290	--	2	234	100	4395
1969	--	--	78	--	--	--	--	--	--	28	236	--	--	60	--	291	--	2	231	100	4949
1970	--	--	105	--	--	--	--	--	--	33	240	--	--	55	--	289	--	2	220	100	4838
1971	--	--	107	--	--	--	--	--	--	36	258	--	--	55	--	309	--	2	233	100	5030
1972	--	--	104	--	--	--	--	--	--	38	253	--	--	57	--	292	--	2	257	100	4996
1973	--	--	115	--	--	--	--	--	--	41	280	--	--	55	--	305	--	2	272	100	4779
1974	2	--	135	--	N	29	1	--	N	45	264	4	5	69	3	339	--	2	247	24	5727
1975	4	--	122	--	N	21	3	--	1	52	280	4	5	64	3	293	--	2	255	21	5549
1976	2	--	122	--	N	24	3	--	1	59	281	4	5	70	3	306	--	2	240	12	5475
1977	2	--	117	--	N	28	3	--	1	54	257	9	6	72	2	220	--	2	233	15	5476
1978	2	1	121	--	N	28	3	--	1	46	220	8	6	54	4	169	--	2	234	15	4238
1979	2	1	113	3	N	28	4	N	1	50	215	8	6	67	3	175	N	2	192	15	4011
1980	3	1	139	5	N	30	5	N	1	67	228	7	6	65	3	199	N	2	248	15	4586
TOTAL	17B	3F	2487	8G	-B	188B	22B	-G	6B	647D	8429	44B	39B	1521	21B	6380	-G	62	5715E	2432I	183703

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 1974-80 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 1973-80 ONLY.

D: PUMPAGE FOR USP AND LSP AREAS WAS NOT ESTIMATED PRIOR TO 1966. THUS, TOTAL IS FOR 1966-80 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 1978-80 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 1979-80 ONLY. ESTIMATED PUMPAGE BEFORE 1979 IS INCLUDED IN "OTHERS."

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

I: "OTHERS" INCLUDE: 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 geohydrologic data, results of areal studies, and research findings are presented mainly in publications of the U.S. Geological Survey, but some appear in reports of the Arizona Department of Water Resources and in technical journals and other publications. (See section entitled "Recent Publications.")

In spring 1974 the U.S. Geological Survey, in cooperation with the Arizona Department of Water Resources, revised the system of collecting ground-water data in Arizona. Under the revised system, several selected ground-water areas (see map showing status of ground-water inventory) are studied 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 43 of the 68 areas. In 1979 the Arizona Department of Water Resources assumed this responsibility and as of July 1981 had published reports for four 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 each of the selected 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.

Conversion Factors

For readers who prefer to use the International System of Units (SI) 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 SI 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)

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.

In 1980 the withdrawal of ground water was about 4.6 million acre-ft, which is about 600,000 acre-ft more than the amount withdrawn in 1979. Although this amount is a substantial increase from that withdrawn in 1978 and 1979, it is less than the amount of ground water used annually since the mid-1960's and nearly equivalent to the amount used during the 1950's. Most of the increase in 1980 was in the amount of ground water used for irrigation in the Basin and Range lowlands province. More than 3.7 million acre-ft of ground water was used for the irrigation of crops in 1980. The rest was used for public-supply, industrial, domestic, and livestock uses, and some ground water was pumped for drainage of waterlogged lands. Through 1980, nearly 184 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in Arizona. The amount of water pumped in 1980 is given on the map showing estimated ground-water pumpage; the annual and accumulated pumpage since the beginning of record are shown in the table. In addition to the ground water pumped, about 3.5 million acre-ft of surface water was diverted for use in the State in 1980; about 2.7 million acre-ft of the water was consumptively used, and the rest was returned to the Colorado River. Potential well production, depth to water in selected wells in spring 1981, and change in water level in selected wells from 1976 to 1981 are shown on the map on sheet 2. 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 sedimentary rocks in the mountains that bound the basins. In 1980, about 4.4 million acre-ft of water was withdrawn in the province, of which nearly 3.7 million acre-ft was used for the irrigation of crops. Through 1980, nearly 180 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in the province. The amount of ground water withdrawn in 1980 is about 600,000 acre-ft more than the amount withdrawn in 1979; most of the increase was in the amount of ground water used for irrigation.

In the southeastern and south-central parts of the province, precipitation averaged about 1 in. above the long-term average for the first 3 months of 1980, but was nearly half an inch below average for the rest of the year. The largest amount of precipitation fell in February. (See U.S. Environmental Data Service, 1980, Climatological data—monthly—Arizona: National Oceanic and Atmospheric Administration, v. 84, no. 1-12.) Two periods of flooding occurred in mid-February 1980—February 14-15 and February 19-20. Severe flooding occurred downstream from the water-storage reservoirs on the Salt, Verde, and Agua Fria Rivers; large releases were necessary because the reservoirs were nearly full as a result of extremely large quantities of runoff during 1978 and 1979. The period from 1978 through 1980 is the first since the reservoirs were completed in which large releases were made in 3 consecutive years. Record peak flows occurred on the Salt River in Phoenix, and the Agua Fria River downstream from Waddell Dam, and on the Gila River below the Salt River. The large amount of water in storage in the reservoirs increased the amount of surface water available for use in the Salt River Valley. Slightly more than 1.3 million acre-ft of water was diverted at Granite Reef Dam in 1980, which is about 126,000 acre-ft more than the amount diverted in 1979. In the Salt River Valley area slightly more than 1.1 million acre-ft of ground water was withdrawn in 1980, which is about 66,000 acre-ft more than the amount withdrawn in 1979. The amount withdrawn in 1980 is about half a million acre-feet less than the amount withdrawn annually since the 1950's. Water levels in wells throughout most of the Salt River Valley area rose from spring 1980 to spring 1981, and measured water-level rises averaged 4.3 ft in 87 wells.

In the lower Santa Cruz basin area the ground-water withdrawal in 1980 was about 898,000 acre-ft, which is about 167,000 acre-ft more than the withdrawal in 1979. In most of the lower Santa Cruz basin area, water levels declined from spring 1980 to spring 1981; the measured water-level declines averaged 2.0 ft in 42 wells.

Elsewhere in the Basin and Range lowlands province, water levels in wells measured in spring 1980 and spring 1981 rose in some areas and declined in others. The average change in water level from spring 1980 to spring 1981 and the number of measurements on which the average is based in the areas that are the most highly developed for agriculture are given in the following table.

Area[1]	Average water-level change, 1980-81, in feet	Number of measurements
AVR	-1.1	15
DOU	-1.9	18
GIL	+0.8	15
GRD	+0.2	16
GTD	-2.2	2
HAR	-8.2	14
LHA	+5.8	5
LSP	-0.6	19
LSC	-2.0	42
MMU	-7.5	6
RAN	-5.5	5
SAF	-1.0	24
SRV	+4.3	87
SSI	-2.8	23
USP	-2.1	25
USC	-1.9	22
WAT	-6.2	7
WIL	-2.9	41
YUM	-0.4	15

[1]See list of areas and abbreviations at top of sheet.

Central highlands province.--The Central highlands province is a transition zone between the Basin and Range lowlands province and the Plateau uplands province and is the smallest of the three water provinces. Ground water is obtained from thick sedimentary deposits in a few areas, from layered sandstone, limestone, and conglomerate in some areas, from thin sedimentary deposits along stream channels, and locally from fractured crystalline and sedimentary rocks. Only a few thousand acres of land is under cultivation, and the amount of ground water withdrawn annually is small—about 48,000 acre-ft in 1980. The small amount 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 an 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 somewhat greater than that in the Central highlands province. Most of the ground water is pumped from layered sandstone that stores ground water under 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 1980 about 88,000 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, although a few feet of decline has occurred in the Black Mesa, Snowflake, and Holbrook areas.

Recent Publications

The following reports on the water resources and geology of Arizona were published or were released to the open file from July 1, 1980, through June 30, 1981. These reports were prepared by the Water Resources Division of the U.S. Geological Survey in Arizona and by the Arizona Department of Water Resources.

Anderson, T. W., 1980, Study plan for the regional aquifer-system analysis of alluvial basins in south-central Arizona and adjacent states: U.S. Geological Survey Open-File Report 80-1197, 22 p.

Brown, D. E., Carmony, N. B., and Turner, R. M., 1981, Drainage map of Arizona showing perennial streams and some important wetlands: Arizona Game and Fish Department map, scale 1:1,000,000.

Cady, C. V., 1981, Map showing ground-water conditions in the Big Sandy area, Yavapai and Mohave Counties, Arizona—1980: Arizona Department of Water Resources Hydrologic Map Series Report 5, scale 1:125,000.

Eychaner, J. H., 1981, Effects of ground-water withdrawals from the N aquifer in the Black Mesa area, northeastern Arizona [abs.]: Geological Society of America Abstracts with Programs, v. 13, no. 2, p. 55.

Graf, C. G., 1980, Maps showing ground-water conditions in the Harquahala Plains area, Maricopa and Yuma Counties, Arizona—1980: Arizona Department of Water Resources Hydrologic Map Series Report 1, scale 1:125,000.

Hjalmarson, H. W., 1980, Delineation of flood hazards in the Biscuit Flat quadrangle and New River area, Maricopa County, Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-843-C, 2 sheets.

Hollett, K. J., 1981, Geohydrology of the Molenitus-Papago Farms area, Papago Indian Reservation, Arizona [abs.]: Geological Society of America Abstracts with Programs, v. 13, no. 2, p. 61.

__________ 1981, Maps showing ground-water conditions in the San Simon Wash area, Papago Indian Reservation, Arizona—1979: U.S. Geological Survey Open-File Report 81-530, scale 1:125,000.

Jones, S. C., 1980, Maps showing ground-water conditions in the lower San Pedro basin area, Pinal, Cochise, Pima, and Graham Counties, Arizona—1979: U.S. Geological Survey Open-File Report 80-954, scale 1:125,000.

Karpiscak, M. M., and Grosz, O. M., 1980, Dissemination trails of Russian thistle (Salsola kali L.) in recently fallowed fields: Arizona-Nevada Academy of Science Journal, v. 14, no. 2, p. 50-52.

Konieczki, A. D., 1980, Maps showing ground-water conditions in the upper San Pedro basin area, Pima, Santa Cruz, and Cochise Counties, Arizona—1978: U.S. Geological Survey Open-File Report 80-1192, scale 1:125,000.

Littin, G. R., 1981, Maps showing ground-water conditions in the Agua Fria area, Yavapai and Maricopa Counties, Arizona—1979: U.S. Geological Survey Open-File Report 81-804, scale 1:125,000.

Pfaff, C. L., and Clay, D. M., 1981, Map showing ground-water conditions in the Sacramento Valley area, Mohave County, Arizona—1979: U.S. Geological Survey Open-File Report 81-418, scale 1:125,000.

Remick, W. H., 1981, Map showing ground-water conditions in the Hualapai basin area, Mohave, Coconino, and Yavapai Counties, Arizona—1980: Arizona Department of Water Resources Hydrologic Map Series Report 4, scale 1:125,000.

Schumann, H. H., 1981, Operational applications of satellite snow-cover observations and data-collection systems in the Arizona Test Site: National Aeronautics and Space Administration Technical Paper 1823, v. 2, 54 p.

Sebenik, P. G., 1981, Maps showing ground-water conditions in the Gila Bend basin area, Maricopa County, Arizona—1979: Arizona Department of Water Resources Hydrologic Map Series Report 3, scale 1:125,000.

Turner, R. M., Applegate, L. H., Bergthold, P. M., Gallizioli, Steve, and Martin, S. C., 1980, Arizona range reference areas: U.S. Forest Service General Technical Report RM-79, 34 p.

U.S. Geological Survey, 1980, Water resources data for Arizona, water year 1979: U.S. Geological Survey Water-Data Report AZ-79-1, 614 p.

__________ 1981, Activities of the Water Resources Division of the U.S. Geological Survey in Arizona—1980: U.S. Geological Survey duplicated report, 31 p.

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1980 TO SPRING 1981

BY U.S. GEOLOGICAL SURVEY