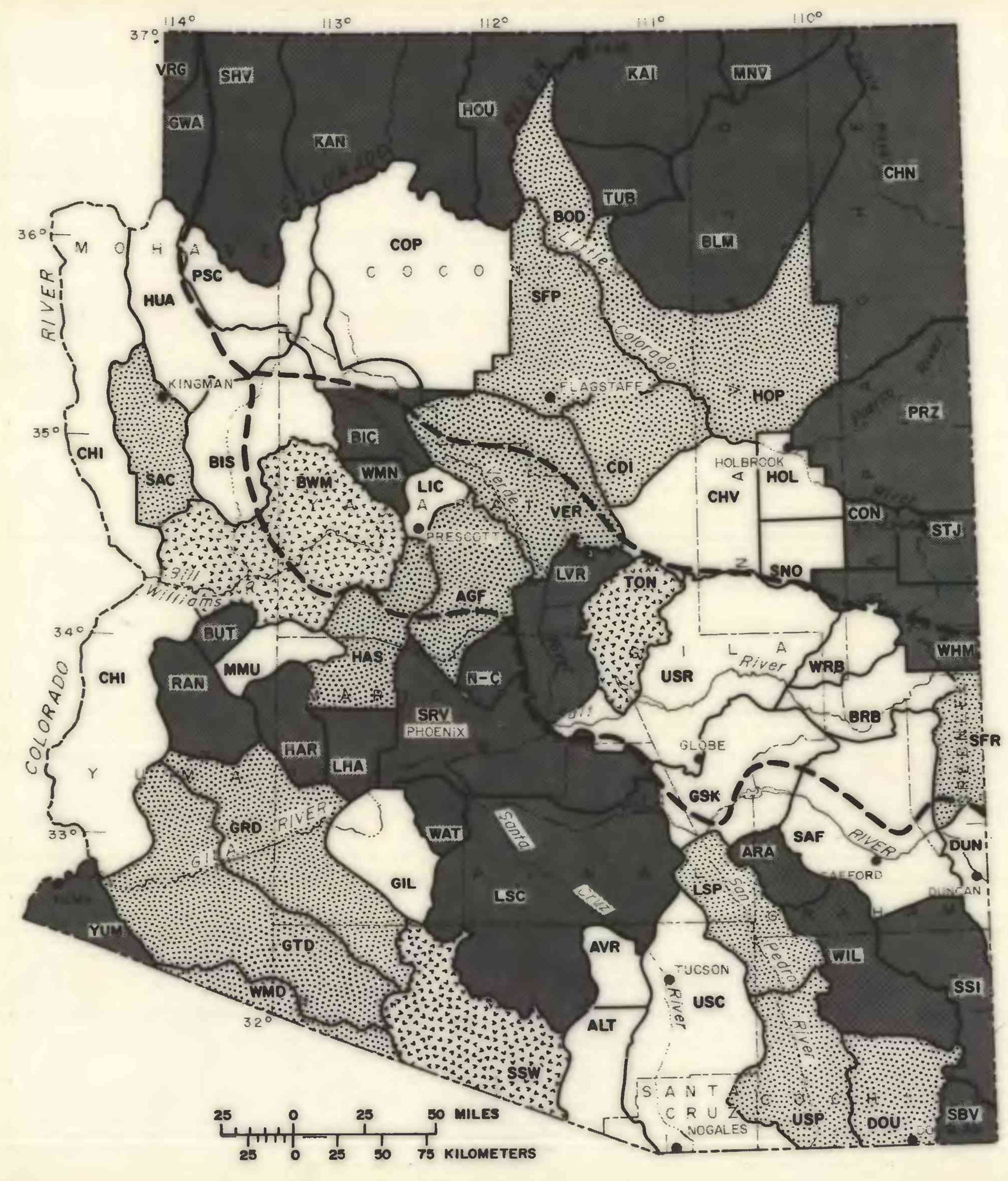
PREPARED IN COOPERATION WITH THE
ARIZONA WATER COMMISSION



EXPLANATION

AREA FOR WHICH GROUND-WATER BASIC-DATA INVENTORY IS IN PROGRESS—As of July 1979

AREA FOR WHICH A REPORT IS IN PREPARATION—As of July 1979

AREA FOR WHICH A REPORT HAS BEEN RELEASED

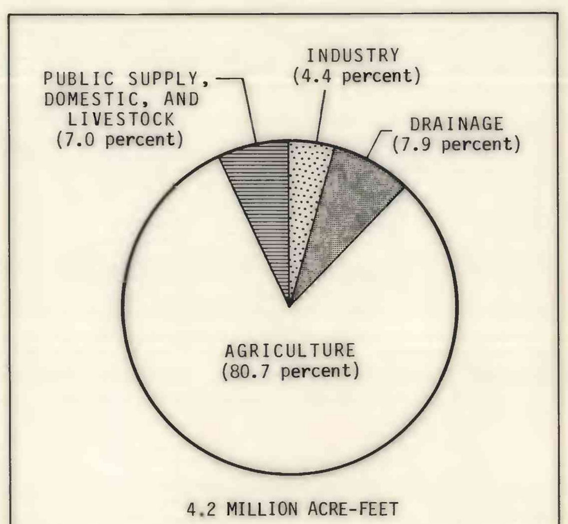
AREA BOUNDARY

WATER-PROVINCE BOUNDARY

STATUS OF GROUND-WATER INVENTORY

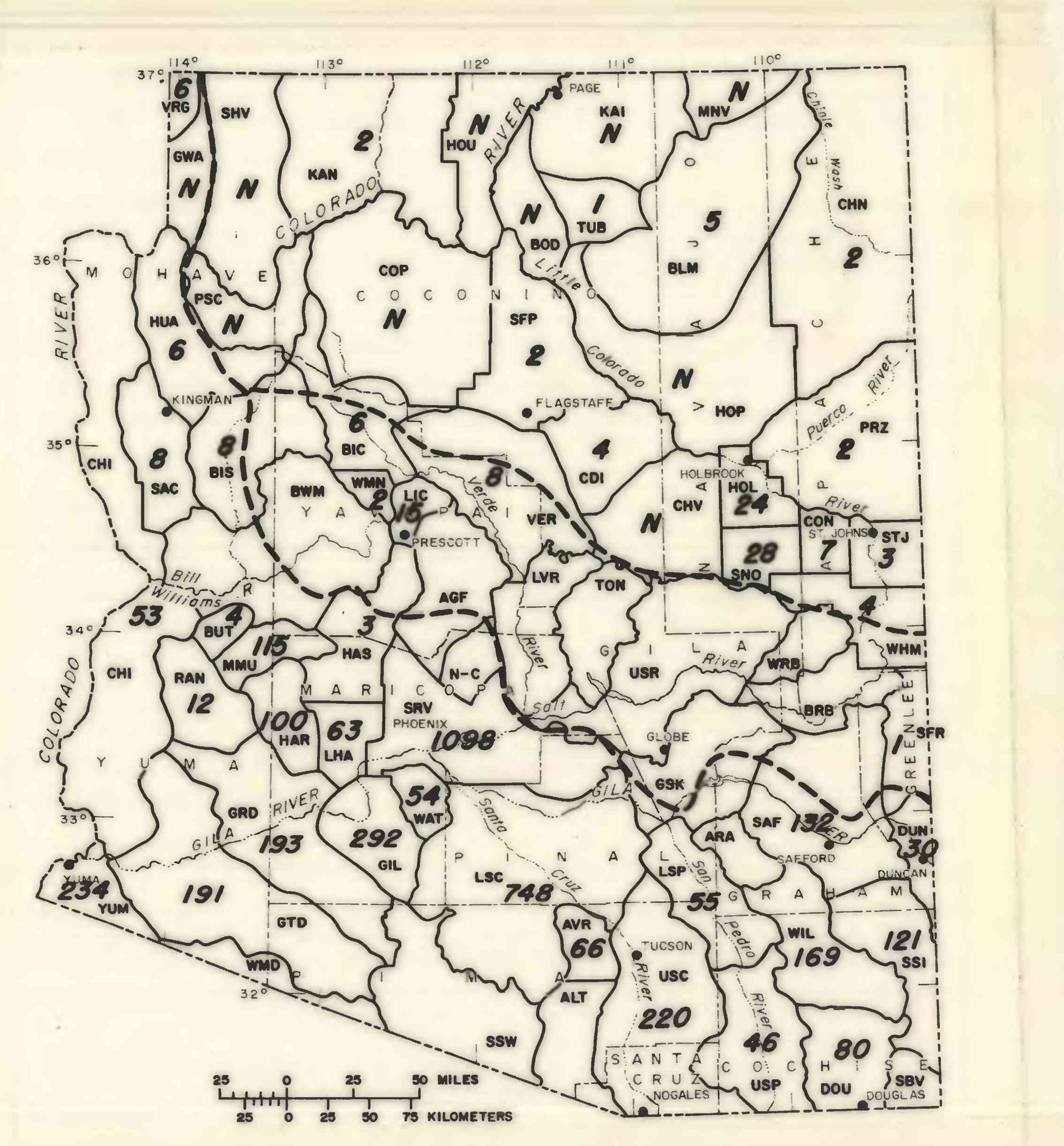
AREAS AND ABBREVIATIONS

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 = St. 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



4.2 MILLION ACRE-FEET

ESTIMATED GROUND-WATER WITHDRAWAL IN ARIZONA IN 1978



EXPLANATION

169 ESTIMATED GROUND-WATER PUMPAGE, IN THOUSANDS OF ACRE-FEET

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 1978 (see table).

ESTIMATED GROUND-WATER PUMPAGE IN ARIZONA DURING 1978

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	AVR	BIC	BIS	BLM	BOD	BUT	CDI	CHV	CHN	COP	CHI	CON	DOU	DUN	GIL	GRD	GTD	GWA	HAR	HAS	HOL	HOP	HOU	HUA	KAI	KAN	LIC	LHA	LSP	LSC
PRIOR TO 1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	200
1915	--	--	--	--	--	--	--	--	--	--	--	--	[illegible]	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	82
1916	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	83
1917	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	84
1918	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	85
1919	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	86
1920	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	88
1921	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	90
1922	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	93
1923	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	96
1924	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--	--	99
1925	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--	--	101
1926	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	104
1927	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	106
1928	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	109
1929	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	111
1930	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--	--	135
1931	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	160
1932	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	185
1933	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--	--	210
1934	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--	--	235
1935	1	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	20	--	--	--	--	--	--	--	--	--	--	--	--	260
1936	1	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	20	--	--	--	--	--	--	--	--	--	--	--	--	285
1937	4	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	25	--	--	--	--	--	--	--	--	--	2	--	--	305
1938	8	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	25	--	--	--	--	--	--	--	--	--	3	--	--	325
1939	9	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	25	--	--	--	--	--	--	--	--	--	4	--	--	352
1940	12	--	--	--	--	--	--	--	--	--	--	--	5	2	19	1	25	--	1	--	--	--	--	--	--	--	4	--	--	372
1941	10	--	--	--	--	--	--	--	--	--	--	--	5	1	19	1	25	--	1	--	--	--	--	--	--	--	4	--	--	421
1942	6	--	--	--	--	--	--	--	--	--	--	--	5	2	19	2	30	--	1	--	--	--	--	--	--	--	5	--	--	500
1943	20	--	--	--	--	--	--	--	--	--	--	--	5	7	20	2	35	--	1	--	--	--	--	--	--	--	6	--	--	515
1944	19	--	--	--	--	--	--	--	--	--	--	--	5	8	20	6	37	--	1	--	--	--	--	--	--	--	7	--	--	530
1945	23	--	--	--	--	--	--	--	--	--	--	--	8	6	20	9	35	--	1	--	--	--	--	--	--	--	7	--	--	610
1946	23	--	--	--	--	--	--	--	--	--	--	--	12	17	33	11	38	--	1	--	--	--	--	--	--	--	8	--	--	660
1947	34	--	--	--	--	--	--	--	--	--	--	--	17	21	40	11	43	--	1	--	--	--	--	--	--	--	9	--	--	700
1948	38	--	--	--	--	--	--	--	--	--	--	--	22	21	61	7	50	--	1	--	--	--	--	--	--	--	12	--	--	950
1949	48	--	--	--	--	--	--	--	--	--	--	--	30	11	67	13	45	--	1	--	--	--	--	--	--	--	12	--	--	1100
1950	41	20	--	--	--	--	--	--	--	--	--	--	35	23	59	15	46	--	5	--	--	--	--	--	--	--	13	--	--	1000
1951	75	20	--	--	--	--	--	--	--	--	--	--	38	33	104	21	50	--	7	--	--	--	--	--	--	--	13	--	--	1030
1952	80	20	--	--	--	--	--	--	--	--	--	--	42	17	120	32	40	--	10	--	--	--	--	--	--	--	12	--	--	950
1953	85	20	--	--	--	--	--	--	--	--	--	--	45	30	145	42	16	--	20	--	--	--	--	--	--	--	13	--	--	1400
1954	90	20	--	--	--	--	--	--	--	--	--	--	42	27	139	37	9	--	33	--	--	--	--	--	--	--	12	--	--	1200
1955	95	20	--	--	--	--	--	--	--	--	--	--	50	25	140	31	8	--	30	--	--	--	--	--	--	--	13	--	--	1200
1956	100	20	--	--	--	--	--	--	--	--	--	--	60	20	180	30	5	--	40	--	--	--	--	--	--	--	14	--	--	1100
1957	110	20	--	--	--	--	--	--	--	--	--	--	55	20	180	30	5	--	50	--	--	--	--	--	--	--	14	--	--	1100
1958	120	20	--	--	--	--	--	--	--	--	5	--	55	25	200	30	2	--	60	--	--	--	--	--	--	--	14	--	--	1200
1959	130	20	--	--	--	--	--	--	--	--	10	--	55	25	250	40	2	--	95	--	--	--	--	--	--	--	14	--	--	1200
1960	140	20	--	--	--	--	--	--	--	--	10	--	60	25	250	50	2	--	125	--	--	--	--	N	--	--	14	--	--	1100
1961	145	20	--	--	--	--	--	--	--	--	10	--	65	25	200	50	140A	--	100	--	--	--	--	1	--	--	15	--	--	1150
1962	140	20	--	--	--	--	--	--	--	--	10	--	65	25	170	50	215A	--	200	--	--	--	--	1	--	--	15	--	--	1050
1963	115	20	--	--	--	--	--	--	--	--	10	--	65	25	130	60	201A	--	200	--	--	--	--	1	--	--	13	--	--	1000
1964	115	20	--	--	--	--	--	--	--	--	15	--	60	25	130	65	181A	--	200	--	--	--	--	2	--	--	13	--	--	1150
1965	125	20	--	--	--	--	--	--	--	--	13	--	90	25	115	65	186A	--	200	--	--	--	--	2	--	--	14	--	--	910
1966	95	20	--	--	--	--	--	--	--	--	12	--	105	25	145	80	217A	--	160	--	--	--	--	3	--	--	14	--	30	915
1967	121	9	--	--	--	--	--	--	--	--	20	--	120	25	198	100	213A	--	170	--	--	--	--	4	--	--	12	--	29	1120
1968	134	9	--	--	--	--	--	--	--	--	17	--	120	25	153	126	220A	--	165	--	--	--	--	4	--	--	12	--	42	910
1969	155	9	--	--	--	--	--	--	--	--	12	--	104	25	166	120	218A	--	145	--	--	--	--	4	--	--	12	--	51	1043
1970	157	9	--	--	--	--	--	--	--	--	12	--	103	25	162	108	218A	--	111	--	--	--	--	4	--	--	12	--	58	890
1971	140	9	--	--	--	--	--	--	--	--	16	--	95	25	212	122	215A	--	99	--	--	--	--	4	--	--	12	--	51	819
1972	146	8	--	--	--	--	--	--	--	--	19	--	89	25	238	125	201A	--	108	--	--	--	--	4	--	--	12	--	53	798
1973	152	8	--	--	--	--	--	--	--	--	25	--	110	25	198	143	208A	--	109	--	--	--	--	4	--	--	12	91	57	990
1974	129F	11	--	5	N	4	2	N	1	N	28	3	138	25	249	191	206A	N	137	--	16	N	N	5	N	N	13	89	61	1171F
1975	159F	12	--	5	N	5	3	N	2	N	32	5	118	25	288	164	210A	N	130F	--	16	N	N	4	N	N	15	94	59	1016F
1976	115F	10	--	6	N	5	3	N	3	N	45F	7	112	30	287	182	204A	N	129F	--	18	N	N	4	N	2	14	98	67	1007F
1977	110F	9	--	6	N	4	4	N	2	N	53F	7	87	30	300	210	208A	N	123F	--	19	N	N	4	N	2	18	84	62	1037F
1978	66	6	8	5	N	4	4	N	2	N	53	7	80	30	292	193	191A	N	100	3	24	N	N	6	N	2	15	63	55	748
TOTAL	3641	449	8G	27B	-B	22B	16B	-B	10B	-B	425	29B	2397	833	5728	2575	4549	-B	3071	3G	93B	-B	-B	61	-B	6B	472	519C	675D	40631

YEAR	MMU	MNV	PSC	PRZ	RAN	SAC	SAF	SRV	SFP	SFR	SSI	SHV	SNO	STJ	TUB	USP	USC	VER	VRG	WAT	WHM	WIL	WMN	YUM	OTHERS	TOTAL	YEAR
PRIOR TO 1915	--	--	--	--	--	--	--	57	--	--	5	--	--	--	--	--	80	--	--	--	--	--	--	--	--	347	PRIOR TO 1915
1915	--	--	--	--	--	--	--	15	--	--	10	--	--	--	--	--	7	--	--	--	--	2	--	2	--	123	1915
1916	--	--	--	--	--	--	--	15	--	--	8	--	--	--	--	--	7	--	--	--	--	2	--	2	--	122	1916
1917	--	--	--	--	--	--	--	15	--	--	8	--	--	--	--	--	8	--	--	--	--	1	--	2	--	122	1917
1918	--	--	--	--	--	--	--	40	--	--	6	--	--	--	--	--	8	--	--	--	--	N	--	3	--	146	1918
1919	--	--	--	--	--	--	--	60	--	--	6	--	--	--	--	--	10	--	--	--	--	N	--	4	--	172	1919
1920	--	--	--	--	--	--	--	95	--	--	5	--	--	--	--	--	35	--	--	--	--	N	--	4	--	233	1920
1921	--	--	--	--	--	--	--	100	--	--	5	--	--	--	--	--	20	--	--	--	--	N	--	4	--	222	1921
1922	--	--	--	--	--	--	--	200	--	--	5	--	--	--	--	--	30	--	--	--	--	N	--	4	--	335	1922
1923	--	--	--	--	--	--	--	400	--	--	5	--	--	--	--	--	37	--	--	--	--	N	--	4	--	552	1923
1924	--	--	--	--	--	--	--	500	--	--	5	--	--	--	--	--	45	--	--	--	--	N	--	4	--	668	1924
1925	--	--	--	--	--	--	--	500	--	--	5	--	--	--	--	--	42	--	--	--	--	N	--	5	--	668	1925
1926	--	--	--	--	--	--	--	500	--	--	4	--	--	--	--	--	40	--	--	--	--	1	--	6	--	675	1926
1927	--	--	--	--	--	--	--	500	--	--	4	--	--	--	--	--	40	--	--	--	--	1	--	7	--	678	1927
1928	--	--	--	--	--	--	--	500	--	--	4	--	--	--	--	--	45	--	--	--	--	2	--	8	--	688	1928
1929	--	--	--	--	--	--	--	600	--	--	4	--	--	--	--	--	40	--	--	--	--	2	--	9	--	776	1929
1930	--	--	--	--	--	--	--	650	--	--	4	--	--	--	--	--	38	--	--	--	--	1	--	10	--	854	1930
1931	--	--	--	--	--	--	--	600	--	--	4	--	--	--	--	--	25	--	--	--	--	1	--	11	--	822	1931
1932	--	--	--	--	--	--	--	300	--	--	3	--	--	--	--	--	20	--	--	--	--	1	--	12	--	543	1932
1933	--	--	--	--	--	--	--	572	--	--	3	--	--	--	--	--	16	--	--	--	--	1	--	13	--	832	1933
1934	--	--	--	--	--	--	--	711	--	--	3	--	--	--	--	--	30	--	--	--	--	1	--	14	--	1011	1934
1935	--	--	--	--	--	--	20	554	--	--	3	--	--	--	--	--	28	--	--	--	--	1	--	15	5	911	1935
1936	--	--	--	--	--	--	20	684	--	--	3	--	--	--	--	--	32	--	--	--	--	1	--	16	5	1071	1936
1937	--	--	--	--	--	--	20	665	--	--	3	--	--	--	--	--	35	--	--	--	--	1	--	17	10	1091	1937
1938	--	--	--	--	--	--	20	905	--	--	3	--	--	--	--	--	40	--	--	--	--	2	--	18	10	1364	1938
1939	--	--	--	--	--	--	20	738	--	--	3	--	--	--	--	--	50	--	--	--	--	2	--	19	20	1247	1939
1940	N	--	--	--	--	N	25	943	--	--	3	--	--	--	--	--	62	--	--	N	--	2	--	19	25	1520	1940
1941	N	--	--	--	--	N	9	444	--	--	3	--	--	--	--	--	70	--	--	N	--	5	--	20	25	1063	1941
1942	N	--	--	--	--	N	19	1004	--	--	4	--	--	--	--	--	94	--	--	N	--	5	--	21	25	1742	1942
1943	N	--	--	--	--	N	35	1104	--	--	4	--	--	--	--	--	95	--	--	N	--	5	--	22	25	1901	1943
1944	N	--	--	--	--	N	52	1017	--	--	4	--	--	--	--	--	100	--	--	N	--	5	--	20	25	1856	1944
1945	2	--	--	--	--	N	35	1143	--	--	5	--	--	--	--	--	106	--	--	N	--	9	--	22	25	2066	1945
1946	2	--	--	--	--	N	115	1360	--	--	6	--	--	--	--	--	109	--	--	N	--	15	--	32	30	2472	1946
1947	2	--	--	--	--	N	100	1406	--	--	6	--	--	--	--	--	136	--	--	N	--	20	--	39	30	2615	1947
1948	2	--	--	--	--	N	110	1670	--	--	6	--	--	--	--	--	135	--	--	1	--	23	--	62	35	3206	1948
1949	2	--	--	--	--	N	40	1644	--	--	6	--	--	--	--	--	132	--	--	1	--	28	--	65	35	3280	1949
1950	2	--	--	--	2	N	90	1852	--	--	6	--	--	--	--	--	160	--	--	5	--	35	2	64	40	3515	1950
1951	2	--	--	--	5	N	125	1910	--	--	6	--	--	--	--	--	180	--	--	10	--	38	2	70	50	3789	1951
1952	5	--	--	--	15	N	70	2020	--	--	15	--	--	--	--	--	195	--	--	17	--	39	2	68	50	3819	1952
1953	6	--	--	--	22	N	120	2300	--	--	25	--	--	--	--	--	200	--	--	28	--	94	2	69	50	4732	1953
1954	7	--	--	--	19	N	90	2300	--	--	32	--	--	--	--	--	200	--	--	30	--	105	2	69	50	4513	1954
1955	9	--	--	--	16	N	90	2240	--	--	40	--	--	--	--	--	200	--	--	40	--	110	2	72	50	4481	1955
1956	15	--	--	--	16	N	90	2300	--	--	40	--	--	--	--	--	200	--	--	40	--	120	2	87	60	4539	1956
1957	21	--	--	--	9	N	100	2300	--	--	48	--	--	--	--	--	200	--	--	40	--	135	2	114	60	4613	1957
1958	38	--	--	--	10	N	50	2300	--	--	50	--	--	--	--	--	175	--	--	45	--	155	2	121	60	4737	1958
1959	50	--	--	--	10	N	100	2206	--	--	50	--	--	--	--	--	165	--	--	50	--	183	2	122	60	4839	1959
1960	60	--	--	--	11	N	90	2005	--	--	60	--	--	--	--	--	165	--	--	60	--	195	2	122	75	4641	1960
1961	70	--	--	--	12	N	140	2178	--	--	65	--	--	--	--	--	175	--	--	65	--	184	2	124	90	5026	1961
1962	65	--	--	--	15	N	60	1976	--	--	65	--	--	--	--	--	200	--	--	50	--	180	2	121	110	4805	1962
1963	75	--	--	--	17	N	80	2134	--	--	65	--	--	--	--	--	180	--	--	50	--	180	2	121	110	4854	1963
1964	90	--	--	--	7	N	110	1972	--	--	75	--	--	--	--	--	175	--	--	50	--	220	2	154	120	4951	1964
1965	90	--	--	--	6	4	150	1500	--	--	70	--	--	--	--	--	200	--	--	45	--	250	2	179	150	4411	1965
1966	105	--	--	--	7	4	90	1350	--	--	72	--	--	--	--	35	190	--	--	45	--	240	2	178	100	4239	1966
1967	98	--	--	--	12	4	145	1763	--	--	76	--	--	--	--	34	200	--	--	52	--	300	2	229	100	5156	1967
1968	95	--	--	--	15	6	78	1264	--	--	81	--	--	--	--	29	210	--	--	54	--	290	2	234	100	4595	1968
1969	98	--	--	--	16	5	140	1600	--	--	78	--	--	--	--	28	236	--	--	60	--	291	2	231	100	4949	1969
1970	86	--	--	--	15	4	120	1700	--	--	105	--	--	--	--	33	240	--	--	55	--	289	2	220	100	4838	1970
1971	101	--	--	--	15	5	190	1600	--	--	107	--	--	--	--	36	258	--	--	55	--	309	2	233	100	5030	1971
1972	112	--	--	--	19	6	130	1800	--	--	104	--	--	--	--	38	253	--	--	57	--	292	2	257	100	4996	1972
1973	113	--	--	--	19	5	140	1200	--	--	115	--	--	--	--	41	280	--	--	55	--	305	2	272	100	4779	1973
1974	134	N	N	1	22	7	110	1800	2	--	135	N	29	1	N	45	264F	4	5	69	3	339	2	247	24	5727F	1974
1975	139	N	N	2	13	8	145	1750	4	--	122	N	21	3	1	52F	280F	4	5	64	3	293	2	255	21	5549F	1975
1976	129	N	N	2	6	8	170	1680	2	--	122	N	24	3	1	59F	281F	4	5	70	3	306	2	240	12	5475F	1976
1977	132	N	N	2	13	7	213	1709	2	--	117	N	28	3	1	54F	257F	9	6	72	2	220	2	235	15	5476F	1977
1978	115	N	N	2	12	8	132	1098	2	1	121	N	28	3	1	46	220	8	6	54	4	169	2	234	15	4238	1978
TOTAL	2072	-B	-B	9B	376	81	3998	76218	12B	1G	2235	-B	130B	13B	4B	530D	7986	29B	27B	1389	15B	6006	58	5275E	2402H	175106	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 1974-78 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 1973-78 ONLY.

D: PUMPAGE FOR USP AND LSP AREAS WAS NOT ESTIMATED PRIOR TO 1966. THUS, TOTAL IS FOR 1966-78 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: PREVIOUSLY PUBLISHED FIGURE REVISED.

G: PUMPAGE FOR BIS, HAS, AND SFR AREAS WAS NOT ESTIMATED PRIOR TO 1978. ESTIMATED PUMPAGE BEFORE 1978 IS INCLUDED IN "OTHERS."

H: "OTHERS" INCLUDES: AGUA FRIA BASIN, ALTAR VALLEY, ARAVAIPA VALLEY, BILL WILLIAMS, BLACK RIVER BASIN, GILA RIVER FROM HEAD OF SAN CARLOS RESERVOIR TO KELVIN, LOWER VERDE VALLEY, NEW RIVER-CAVE CREEK, SAN BERNARDINO VALLEY, SAN SIMON WASH, TONTO BASIN, UPPER SALT RIVER BASIN, WESTERN MEXICAN DRAINAGE, 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 ESTIMATED.

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 Water Commission. 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 Personnel of the U.S. Geological Survey in Arizona.")

In spring 1974 the U.S. Geological Survey, in cooperation with the Arizona Water Commission, revised the system of collecting ground-water data in Arizona. Under the revised system, several selected areas (see map showing status of ground-water inventory) are studied in detail each year. The types of data collected include information on wells drilled since previous inventories, water-level measurements, pumpage data, and chemical quality-of-water data. The data collected for an area are entered into computer storage, and computer printouts are available to the public. In areas where sufficient data are available the computer printouts consist of three parts: (1) spring and well information, including construction and production data; (2) chemical analyses of ground water; and (3) water-level measurements for the period of record. The data are analyzed, and the results are presented in a series of maps. Typically, the maps show depth to water; change in water levels; altitude of the water table; 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)

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 1979, and change in water levels in selected wells from 1974 to 1979. The map showing estimated ground-water pumpage gives the amount of water pumped in 1978; the annual and accumulated pumpage since the beginning of record are shown in the table. In 1978 the withdrawal of ground water was about 4.2 million acre-ft, most of which was consumptively used. The amount of ground water withdrawn in 1978 decreased more than 1.2 million acre-ft from the amount withdrawn in 1977 and is the smallest amount withdrawn 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 this decrease are discussed in the section entitled "Basin and Range Lowlands Province." Slightly more than 3.4 million acre-ft of ground water was used for the irrigation of crops in 1978; the rest was for public supply, industrial, domestic, and livestock uses, and some ground water was pumped for drainage of waterlogged lands. Through 1978, slightly more than 175 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in Arizona. In addition to the ground water pumped, about 2.9 million acre-ft of surface water was diverted for use in the State in 1978; about 2.2 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 6.4 million acre-ft in 1978. 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. Although the province covers only about 45 percent of the State, it contains more than 90 percent of the cultivated land and more than 80 percent of the population. 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 1978 about 4.1 million acre-ft of water was withdrawn in the province, of which nearly 3.4 million acre-ft was used for the irrigation of crops. Through 1978, slightly more than 171 million acre-ft of ground water has been withdrawn from the ground-water reservoirs in this province. The amount of ground water withdrawn in 1978 is about 1.2 million acre-ft less than the revised amount withdrawn in 1977; nearly all the decrease was in the amount of ground water used for irrigation.

In the southeastern and south-central parts of the province, precipitation averaged nearly 2 in. above the long-term average for January through March, and slightly above-average precipitation continued through June. From July through September, precipitation was slightly below average, but from October through December precipitation was nearly 2 in. above the long-term average. (See U.S. Environmental Data Service, 1978, Climatological data—annual summary—Arizona: National Oceanic and Atmospheric Administration, v. 82, no. 13, 17 p.) The above-average precipitation from January through March increased the soil moisture at least into April in many places and eliminated the necessity for preplanting irrigation, a practice followed by most farmers. In areas where some surface water is used for irrigation, less ground water was pumped because more surface water was available from reservoir storage; for example, in the Salt River Valley nearly 928,000 acre-ft of surface water was diverted at Granite Reef Dam in 1978, which is about 150,000 acre-ft more than the amount diverted in 1977. In the lower Santa Cruz area nearly 265,000 acre-ft of surface water was diverted for use in the San Carlos Project area, which is about 200,000 acre-ft more than the amount diverted in 1977. The Salt River Valley and the lower Santa Cruz area are the largest agricultural areas in the State; the amount of ground water withdrawn for agricultural use in the Salt River Valley and the lower Santa Cruz area decreased nearly 613,000 and 291,000 acre-ft, respectively, between 1977 and 1978.

In addition to the above-average precipitation and the resultant increase in surface-water supplies, several new techniques to conserve energy and irrigation water are being put into practice. 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.

In most agricultural areas in the Basin and Range lowlands province, water levels generally have been declining for many years; in some areas the rate of decline has decreased in the past few years owing to small decreases in the amount of ground water pumped. In places in the southeastern and south-central parts of the province, water levels measured in spring 1979 were somewhat higher than those measured in spring 1978, which reflects a decrease in pumpage in 1978 and above-average precipitation for October through December. In mid-December, record floods along the Gila River upstream from San Carlos Reservoir and excessive runoff into the nearly full reservoirs on the Salt and Verde Rivers necessitated the release of large amounts of water into the Salt River. Along the Gila River in Safford basin, the average change in water level in 24 wells was +6.4 ft from spring 1978 to spring 1979; in the Salt River Valley the average change in water level in 75 wells was +7.0 ft. Significant average water-level rises also occurred in Avra Valley (+10.1 ft), lower San Pedro basin (+8.6 ft), and lower Santa Cruz basin (+3.3 ft). Smaller water-level rises occurred in other areas, but water levels continued to decline in some areas.

Central highlands province.--The Central highlands province is the smallest of the three water provinces. In this province 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 that are the dominant rock types in the province. Only a few thousand acres of land is under cultivation, and the amount of ground water withdrawn is small—about 32,000 acre-ft in 1978. 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 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 1978 about 84,000 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 Personnel 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, 1978, through June 30, 1979.

Anderson, T. W., and White, N. D., 1979, Statistical summaries of Arizona streamflow data: U.S. Geological Survey Water-Resources Investigations 79-5, 416 p.

Bentley, C. B., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area—Hoover Dam to Mount Davis, Arizona: U.S. Geological Survey Open-File Report 79-690, 37 p.

__________1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area—Mount Davis to Davis Dam, Arizona: U.S. Geological Survey Open-File Report 79-691, 34 p.

__________1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area—Opal Mountain to Davis Dam, Nevada: U.S. Geological Survey Open-File Report 79-692, 36 p.

Farrar, C. D., 1979, Map showing ground-water conditions in the Kaibito and Tuba City areas, Coconino and Navajo Counties, Arizona—1978: U.S. Geological Survey Water-Resources Investigations 79-58, map.

Konieczki, A. D., and English, C. S., 1979, Maps showing ground-water conditions in the lower Santa Cruz area, Pinal, Pima, and Maricopa Counties, Arizona—1977: U.S. Geological Survey Water-Resources Investigations 79-56, maps.

Laney, R. L., 1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area—Hoover Dam to Temple Bar, Arizona: U.S. Geological Survey Open-File Report 79-689, 42 p.

__________1979, Geohydrologic reconnaissance of Lake Mead National Recreation Area—Temple Bar to Grand Wash Cliffs, Arizona: U.S. Geological Survey Open-File Report 79-688, 72 p.

__________1979, Summary appraisal of the potential water resources in and near tract 01-113, Lake Mead National Recreation Area, Nevada: U.S. Geological Survey Open-File Report 79-698, 6 p.

Levings, G. W., and Farrar, C. D., 1979, Maps showing ground-water conditions in the Kanab area, Coconino and Mohave Counties, Arizona—1976: U.S. Geological Survey Open-File Report 79-1070, maps.

__________1979, Map showing ground-water conditions in the Virgin River, Grand Wash, and Shivwits areas, Mohave County, Arizona—1976: U.S. Geological Survey Water-Resources Investigations 79-57, map.

Littin, G. R., 1979, Maps showing ground-water conditions in the New River-Cave Creek area, Maricopa and Yavapai Counties, Arizona—1977: U.S. Geological Survey Open-File Report 79-1068, maps.

Loeltz, O. J., and Leake, S. A., 1979, Relation between proposed developments of water resources and seepage from the All-American Canal, eastern Imperial Valley, California: U.S. Geological Survey Open-File Report 79-744, 83 p.

Mann, L. J., 1979, Water budget and mathematical model of the Coconino aquifer, southern Navajo County, Arizona: U.S. Geological Survey Open-File Report 79-348, 58 p.

Roeske, R. H., 1978, Methods for estimating the magnitude and frequency of floods in Arizona: Arizona Department of Transportation Report ADOT-RS-15(121), 82 p.

Roeske, R. H., Cooley, M. E., and Aldridge, B. N., 1978, Floods of September 1970 in Arizona, Utah, Colorado, and New Mexico: U.S. Geological Survey Water-Supply Paper 2052, 135 p.

Schumann, H. H., 1978, Satellite snow-cover observations in Arizona, in Fall technical meeting of the American Society of Photogrammetry, 1978 Proceedings, Albuquerque, New Mexico: p. 480-489.

U.S. Geological Survey, 1978, Annual summary of ground-water conditions in Arizona, spring 1977 to spring 1978: U.S. Geological Survey Water-Resources Investigations 78-144, maps.

__________1978, Water resources data for Arizona, water year 1977: U.S. Geological Survey Water-Data Report AZ-77-1, 550 p.

Wilson, R. P., 1979, Availability of ground water on Federal land near the Ak-Chin Indian Reservation, Arizona—a reconnaissance study: U.S. Geological Survey Open-File Report 79-1165, 36 p.

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1978 TO SPRING 1979

BY U.S. GEOLOGICAL SURVEY