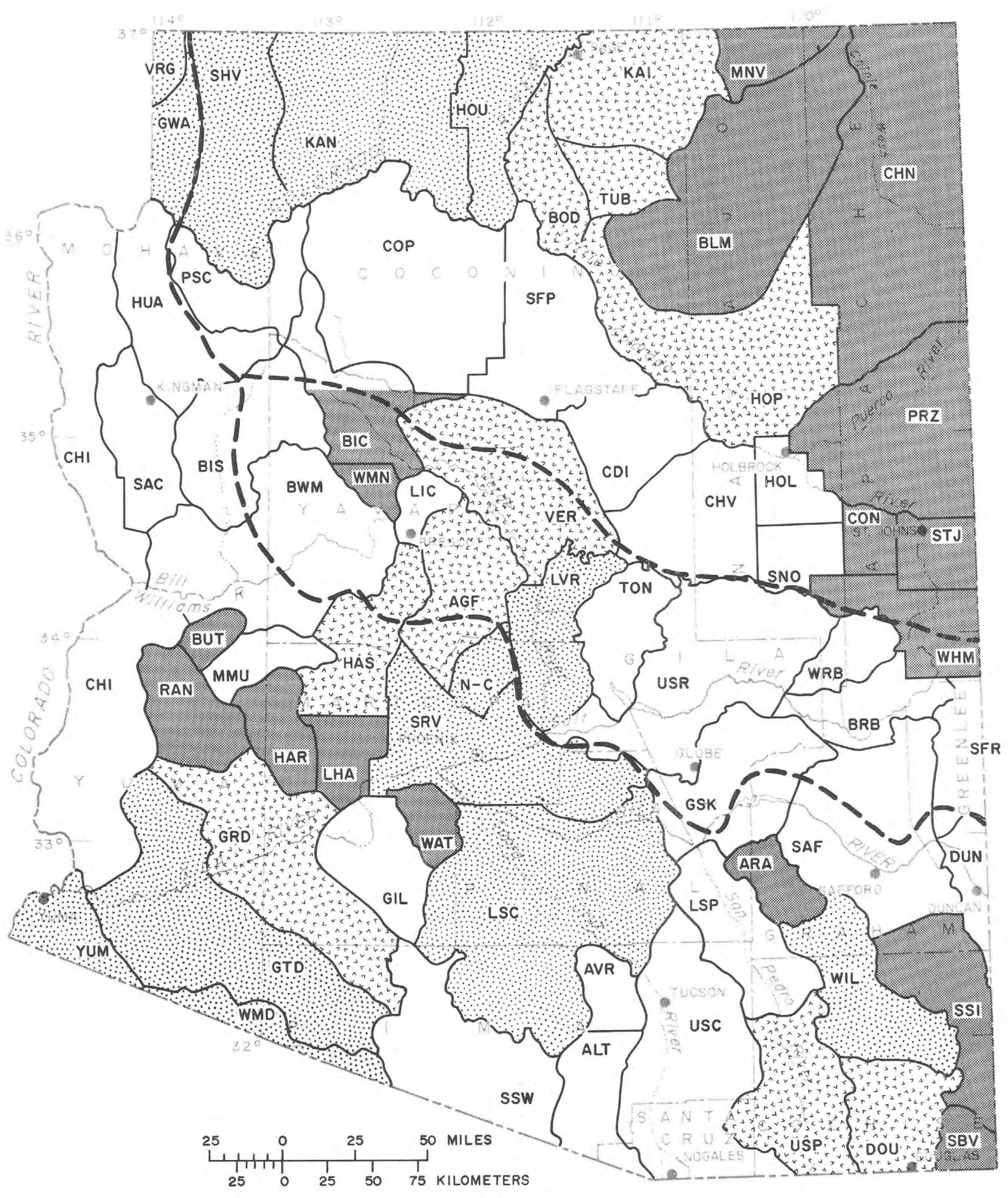
(200) WRi no.77-106



EXPLANATION

AREA FOR WHICH GROUND-WATER BASIC-DATA INVENTORY IS IN PROGRESS—As of July 1977

AREA FOR WHICH A REPORT IS IN PREPARATION—As of July 1977

AREA FOR WHICH A REPORT HAS BEEN RELEASED

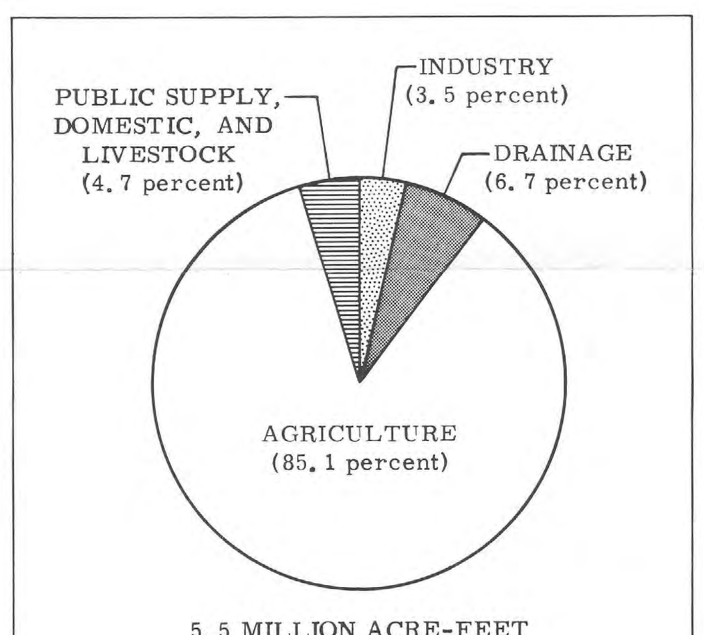
AREA BOUNDARY

WATER-PROVINCE BOUNDARY

STATUS OF GROUND-WATER INVENTORY

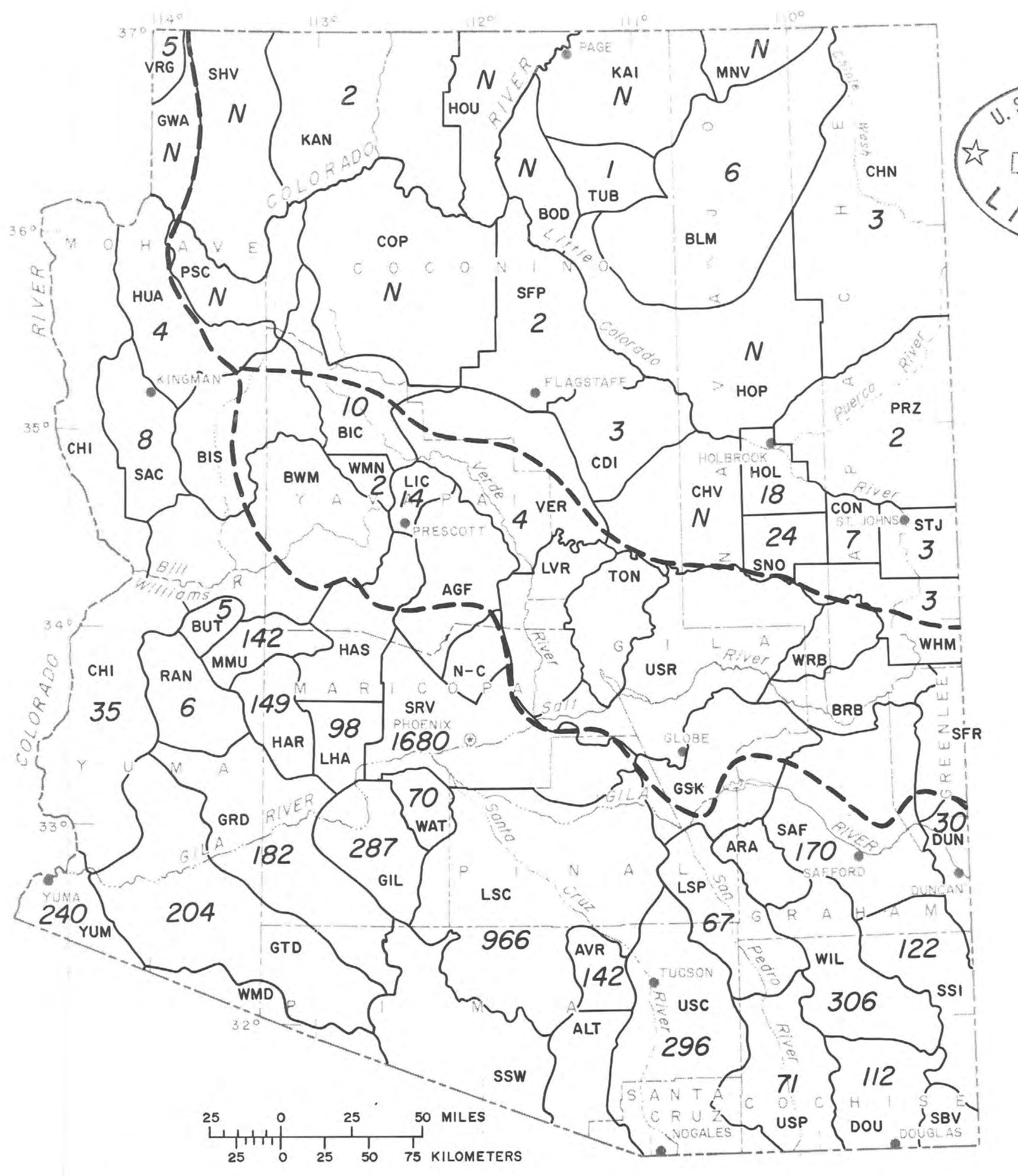
AREAS AND ABBREVIATIONS

- 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



5.5 MILLION ACRE-FEET

ESTIMATED GROUND-WATER WITHDRAWAL IN ARIZONA IN 1976



EXPLANATION

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

N PUMPAGE LESS THAN 500 ACRE-FEET

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 12,000 acre-feet for 1976 (see table).

ESTIMATED GROUND-WATER PUMPAGE IN ARIZONA DURING 1976

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	BLM	BOD	BUT	CDI	CHV	CHN	COP	CHI	CON	DOU	DUN	GIL	GRD	GTD	GWA	HAR	HOL	HOP	HOU	HUA	KAI	KAN	LIC	LHA	LSP	LSC
PRIOR TO 1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	200
1915	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	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	156	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	1130
1975	187	12	5	N	5	3	N	2	N	32	5	118	25	288	164	210A	N	140	16	N	N	4	N	N	15	94	59	973
1976	142	10	6	N	5	3	N	3	N	35	7	112	30	287	182	204A	N	149	18	N	N	4	N	2	14	98	67	966
TOTAL	3547	434	16B	-B	14B	8B	-B	6B	-B	311	15B	2230	773	5136	2172	4150	-B	2878	50B	-B	-B	51	-B	2B	439	372C	558D	38721

YEAR	MMU	MNV	PSC	PRZ	RAN	SAC	SAF	SRV	SFP	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	4395	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	1800	--	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	139	N	N	1	22	7	110	1800	2	135	N	29	1	N	45	279	4	5	69	3	339	2	247	24	5733	1974
1975	149	N	N	2	13	8	145	1750	4	122	N	21	3	1	63	295	4	5	64	3	293	2	255	21	5580	1975
1976	142	N	N	2	6	8	170	1680	2	122	N	24	3	1	71	296	4	5	70	3	306	2	240	12	5513	1976
TOTAL	1853	-B	-B	5B	351	66	3653	73411	8B	1997	-B	74B	7B	2B	453D	7554	12B	15B	1263	9B	5617	54	4808E	2376F	165471	TOTAL

EXPLANATION OF SYMBOLS

N: PUMPAGE OF 500 ACRE-FEET OR LESS.

A: WITHDRAWAL FOR DRAINAGE PURPOSES ONLY.

B: PUMPAGE FOR THESE AREAS WAS NOT ESTIMATED PRIOR TO 1974. THUS, TOTAL IS FOR 1974-76 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 1973-76 ONLY.

D: PUMPAGE FOR USP AND LSP AREAS WAS NOT ESTIMATED PRIOR TO 1966. THUS, TOTAL IS FOR 1966-76 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: "OTHERS" INCLUDES: AGUA FRIA BASIN, ALTAR VALLEY, ARAVAIPA VALLEY, BIG SANDY VALLEY, BILL WILLIAMS, BLACK RIVER BASIN, GILA RIVER FROM HEAD OF SAN CARLOS RESERVOIR TO KELVIN, HASSAYAMPA BASIN, LOWER VERDE VALLEY, NEW RIVER-CAVE CREEK, SAN BERNARDINO VALLEY, SAN FRANCISCO RIVER BASIN, 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 and the Arizona Water Commission, 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 use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

Multiply English units	By	To obtain metric units
feet (ft)	0.3048	meters (m)
gallons per minute (gal/min)	.06309	liters per second (l./s)
acre-feet (acre-ft)	.001233	cubic hectometers (hm^3)

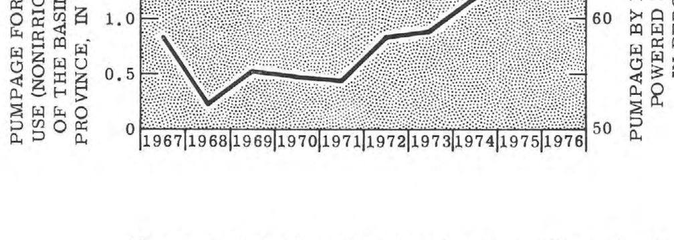
Availability and Use of Water

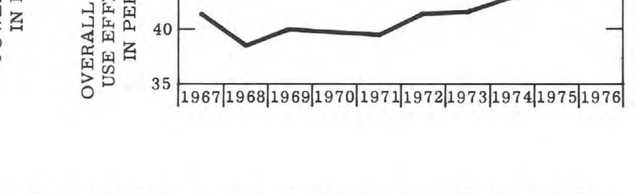
In Arizona the availability of adequate and potable water supplies has as great an influence on the location of cities and cropland as any other factor. Agriculture is dependent almost entirely on irrigation because rainfall is inadequate for raising crops. Some surface water is available in a few areas, 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 principal map (see sheet 2) shows potential well production, depth to water in selected wells in spring 1977, and change in water levels in selected wells from 1972 to 1977. The map showing estimated ground-water pumpage gives the amount of water pumped in 1976; the annual and accumulated pumpage since the beginning of record are shown in the table. In 1976 the withdrawal of ground water was about 5.5 million acre-ft. In the last 5 years the withdrawal of ground water has averaged 5.3 million acre-ft per year. About 4.7 million acre-ft of ground water was used for the irrigation of crops in 1976; the rest was for public supply, industrial, domestic, and livestock uses, and some ground water was pumped for drainage of waterlogged lands. Through 1976, more than 165 million acre-ft of ground water had been withdrawn from the ground-water reservoirs in Arizona. In addition to the ground water pumped, about 2.8 million acre-ft of surface water was withdrawn for use in the State in 1976; about 2.2 million acre-ft of the water was consumptively used, and the rest was returned to the river. Thus, the total water use was about 7.7 million acre-ft in 1976. The use of ground water and the effects of this use on the ground-water reservoirs in each of the three water provinces (see maps) 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 bounding the basins. In 1976 about 5.4 million acre-ft of water was withdrawn in the province; through 1976 nearly 162 million acre-ft of ground water had been withdrawn. As a result, water levels are declining in much of the area.

The following graphs show recent trends in power use for ground-water pumpage; the data are for private (nonirrigation district) agricultural use in most of the Basin and Range lowlands province. The trend during the 10-year period 1967-76 was a slight increase in pumpage and a marked increase in the use of electric power. In 1967-71, 55 percent of the pumpage was by electric-powered pumps, and 45 percent was by natural gas-powered pumps; in 1976, nearly 68 percent of the pumpage was by electric-powered pumps, and 32 percent was by natural gas-powered pumps. The increase in use of electric power is a result of the conversion from natural gas to electricity and to some extent reflects an increase in pumping lifts. The trend toward the use of electric power rather than gas power has resulted in an increase in the overall efficiency of energy used to pump ground water. Based on a weighted efficiency—assuming the average natural gas efficiency to be 15 percent and electric efficiency to be 60 percent—the increase in efficiency was from about 40 percent in 1967-71 to 45 percent in 1976.





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 30,000 acre-ft in 1976. The small amount of ground-water withdrawal has not resulted in any 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 1976 about 79,000 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, 1976, through June 30, 1977.

Anderson, T. W., 1976, Evapotranspiration losses from flood-plain areas in central Arizona: U.S. Geol. Survey open-file report 76-864, 91 p.

Babcock, H. M., 1977, Annual summary of ground-water conditions in Arizona, spring 1975 to spring 1976: U.S. Geol. Survey Water-Resources Inv. 77-10, maps.

Brown, D. E., Carmony, N. B., and Turner, R. M., 1977, Drainage map of Arizona showing perennial streams and some important wetlands: Arizona Game and Fish Dept. map, scale 1:1,000,000.

Brown, S. G., 1976, Preliminary maps showing ground-water resources in the lower Colorado River region, Arizona, Nevada, New Mexico, and Utah: U.S. Geol. Survey Hydrol. Inv. Atlas HA-542, 3 sheets.

________ 1976, Components of the water budget in the Tucson area, Arizona, 1970-72: U.S. Geol. Survey Misc. Inv. Ser. Map I-844-M, 1 sheet.

Cooley, M. E., 1976, Spring flow from pre-Pennsylvanian rocks in the southwestern part of the Navajo Indian Reservation, Arizona: U.S. Geol. Survey Prof. Paper 521-F, 15 p.

Cooley, M. E., Aldridge, B. N., and Euler, R. C., 1977, Effects of the catastrophic flood of December 1966, north rim area, eastern Grand Canyon, Arizona: U.S. Geol. Survey Prof. Paper 980, 43 p.

Gould, J. A., and Wilson, R. P., 1976, Map showing ground-water conditions in the Aravaipa Valley area, Graham and Pinal Counties, Arizona—1975: U.S. Geol. Survey Water-Resources Inv. 76-107, maps.

Harper, R. W., and Anderson, T. W., 1976, Maps showing ground-water conditions in the Concho, St. Johns, and White Mountains areas, Apache and Navajo Counties, Arizona—1975: U.S. Geol. Survey Water-Resources Inv. 76-104, maps.

Kipple, F. P., 1977, The hydrologic history of the San Carlos Reservoir, Arizona, 1929-71, with particular reference to evapotranspiration and sedimentation: U.S. Geol. Survey Prof. Paper 655-N, 40 p.

Laney, R. L., 1977, Effects of phreatophyte removal on water quality in the Gila River Phreatophyte Project area, Graham County, Arizona, with a section on Statistical analysis, by H. W. Hjalmarson: U.S. Geol. Survey Prof. Paper 655-M, 23 p.

Levings, G. W., 1976, Effects of ground-water withdrawal from the Navajo Sandstone near Black Mesa, Arizona [abs.]: Geol. Soc. America Abstracts with programs, v. 8, no. 6, p. 977-978.

Levings, G. W., and Farrar, C. D., 1977, Maps showing ground-water conditions in the Monument Valley and northern part of the Black Mesa areas, Navajo, Apache, and Coconino Counties, Arizona—1976: U.S. Geol. Survey Water-Resources Inv. 77-44, maps.

________ 1977, Maps showing ground-water conditions in the southern part of the Black Mesa area, Navajo, Apache, and Coconino Counties, Arizona—1976: U.S. Geol. Survey Water-Resources Inv. 77-41, maps.

________ 1977, Maps showing ground-water conditions in the northern part of the Chinle area, Apache County, Arizona—1976: U.S. Geol. Survey Water-Resources Inv. 77-35, maps.

________ 1977, Maps showing ground-water conditions in the southern part of the Chinle area, Apache County, Arizona—1976: U.S. Geol. Survey Water-Resources Inv. 77-50, maps.

Mann, L. J., 1977, Maps showing ground-water conditions in the Puerco-Zuni area, Apache and Navajo Counties, Arizona—1975: U.S. Geol. Survey Water-Resources Inv. 77-5, maps.

Osterkamp, W. R., and Ross, P. P., 1976, Map showing distribution of recoverable ground water in the Phoenix area, Arizona: U.S. Geol. Survey Misc. Inv. Ser. Map I-845-K, 1 sheet.

Patten, E. P., Jr., 1977, Analog simulation of the ground-water system, Yuma, Arizona: U.S. Geol. Survey Prof. Paper 486-I, 10 p.

Schumann, H. H., 1975, Operational applications of satellite snowcover observations and Landsat data-collection system operations in central Arizona, in Proceedings of the 19th annual Arizona watershed symposium: Arizona Water Comm. Rept. 7, p. 24-30.

U.S. Geological Survey, 1976, Water resources data for Arizona, water year 1975: U.S. Geol. Survey Water-Data Report AZ-75-1, 440 p.

Wilson, R. P., 1976, Maps showing ground-water conditions in the San Bernardino Valley area, Cochise County, Arizona—1975: U.S. Geol. Survey Water-Resources Inv. 76-81, maps.

Wilson, R. P., and White, N. D., 1976, Maps showing ground-water conditions in the San Simon area, Cochise and Graham Counties, Arizona, and in Hidalgo County, New Mexico—1975: U.S. Geol. Survey Water-Resources Inv. 76-89, maps.

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977

By

H. M. Babcock