PREPARED IN COOPERATION WITH THE
ARIZONA DEPARTMENT OF WATER RESOURCES

OPEN-FILE REPORT 94-476
SHEET 1 OF 2
Anning, D.W., and Duet, N.R., 1994, Summary of ground-water conditions in Arizona, 1987–90

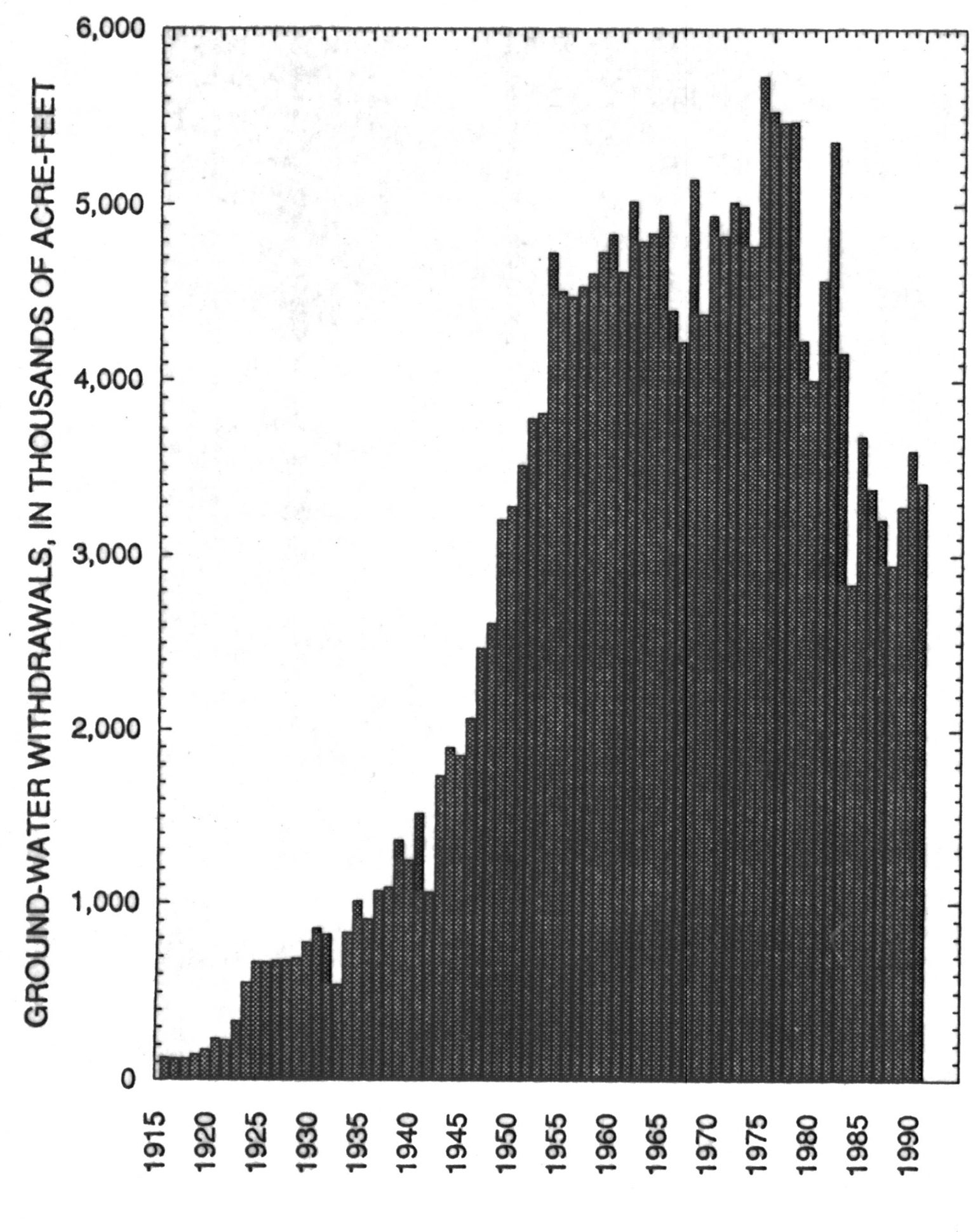


Figure 1. Estimated ground-water withdrawals in Arizona.

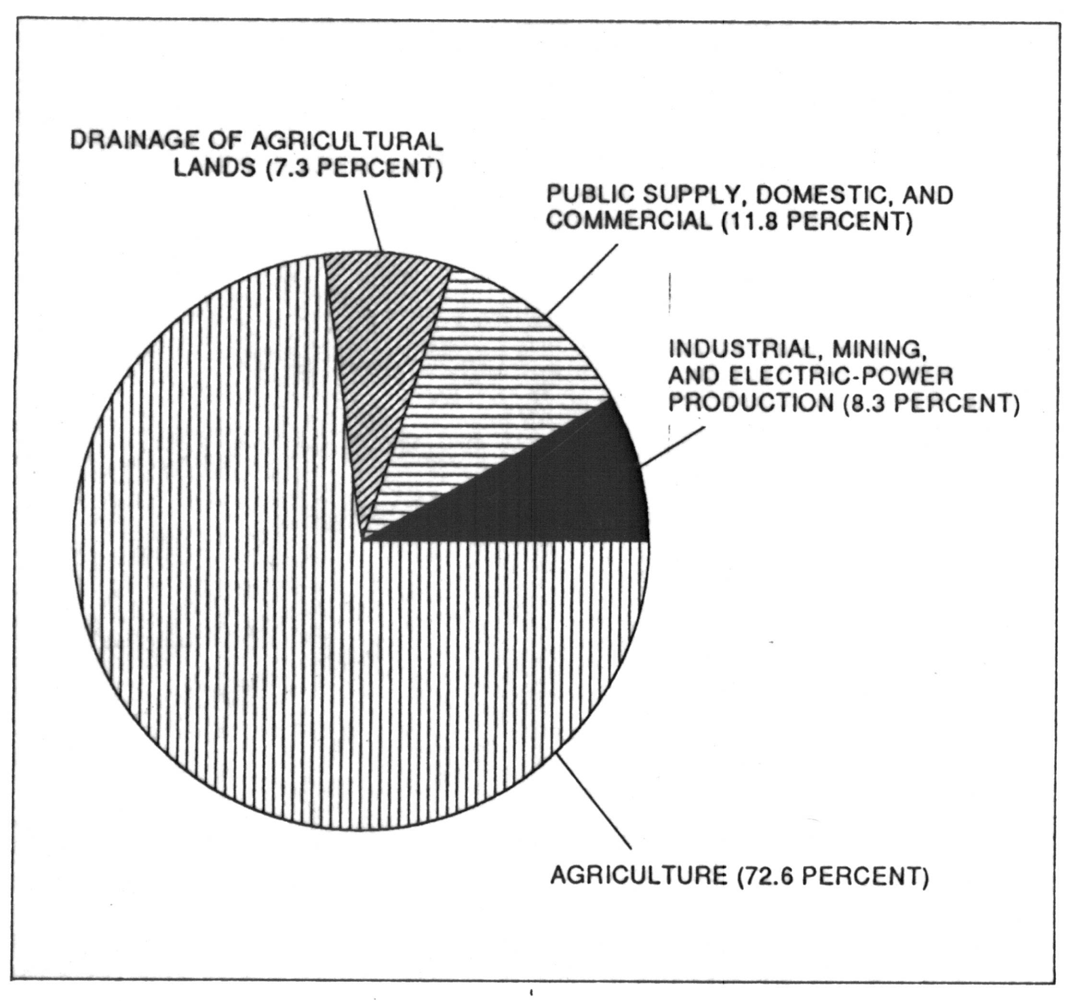
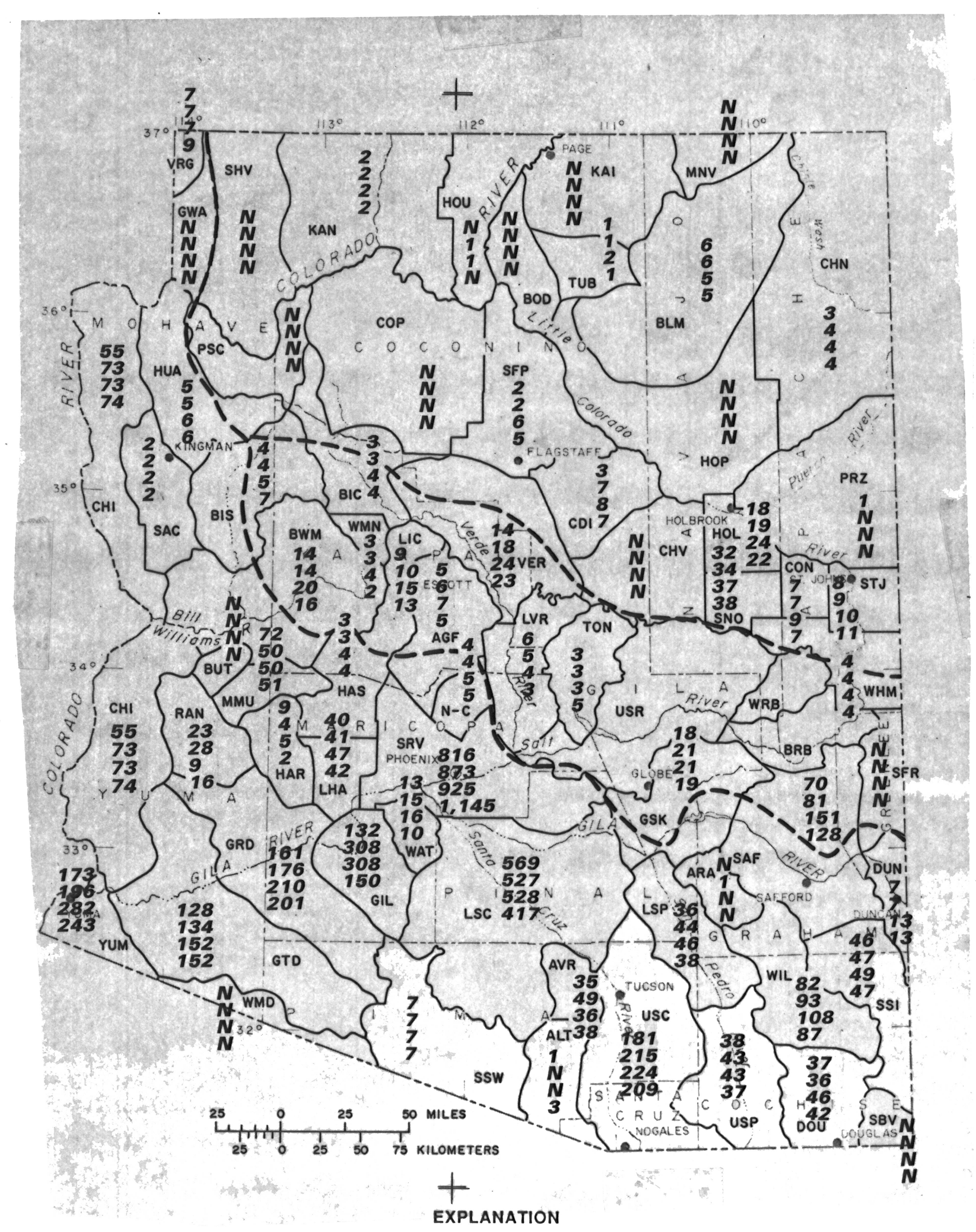


Figure 2. Distribution of estimated ground-water withdrawals in Arizona by use, 1987–90.



EXPLANATION

569 *527* *528* *417*	ESTIMATED GROUND-WATER WITHDRAWALS BY YEAR, IN THOUSANDS OF ACRE-FEET—Top number is for 1987, upper middle number is for 1988, lower middle number is for 1989, and bottom number is for 1990
N	WITHDRAWALS OF 500 ACRE-FEET OR LESS—The total ground-water withdrawals for all of the areas where no data are shown are estimated to be 28, 28, 31, and 32 thousand acre-feet for 1987, 1988, 1989, and 1990, respectively
————	GROUND-WATER AREA BOUNDARY
— — — —	WATER PROVINCE BOUNDARY

Figure 3. Estimated ground-water withdrawals in Arizona by basin, 1987–90.

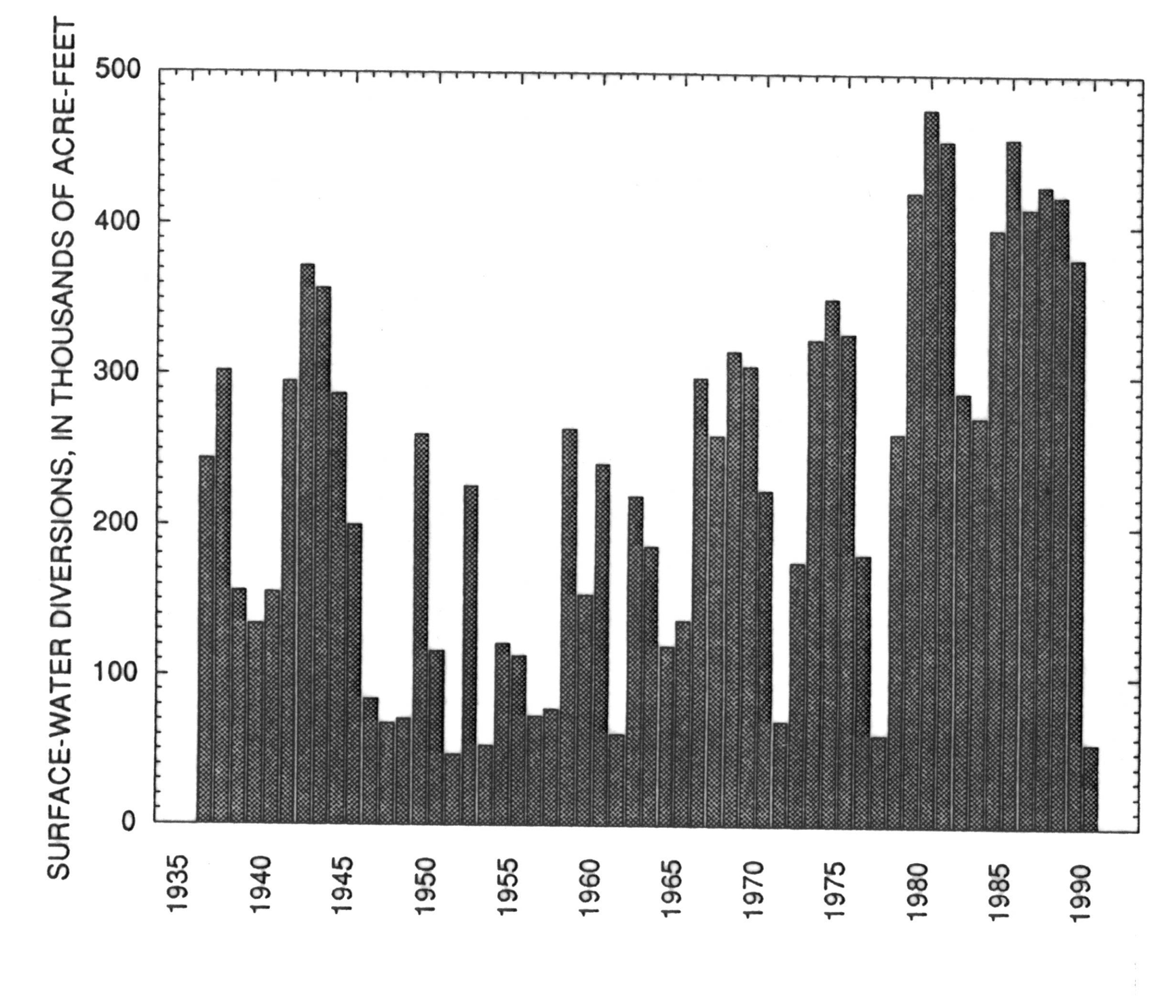


Figure 4. Diversions from the Gila River at the Ashurst-Hayden Dam. The water is used primarily for agriculture within the lower Santa Cruz basin. Data from the Gila Water Commissioner.

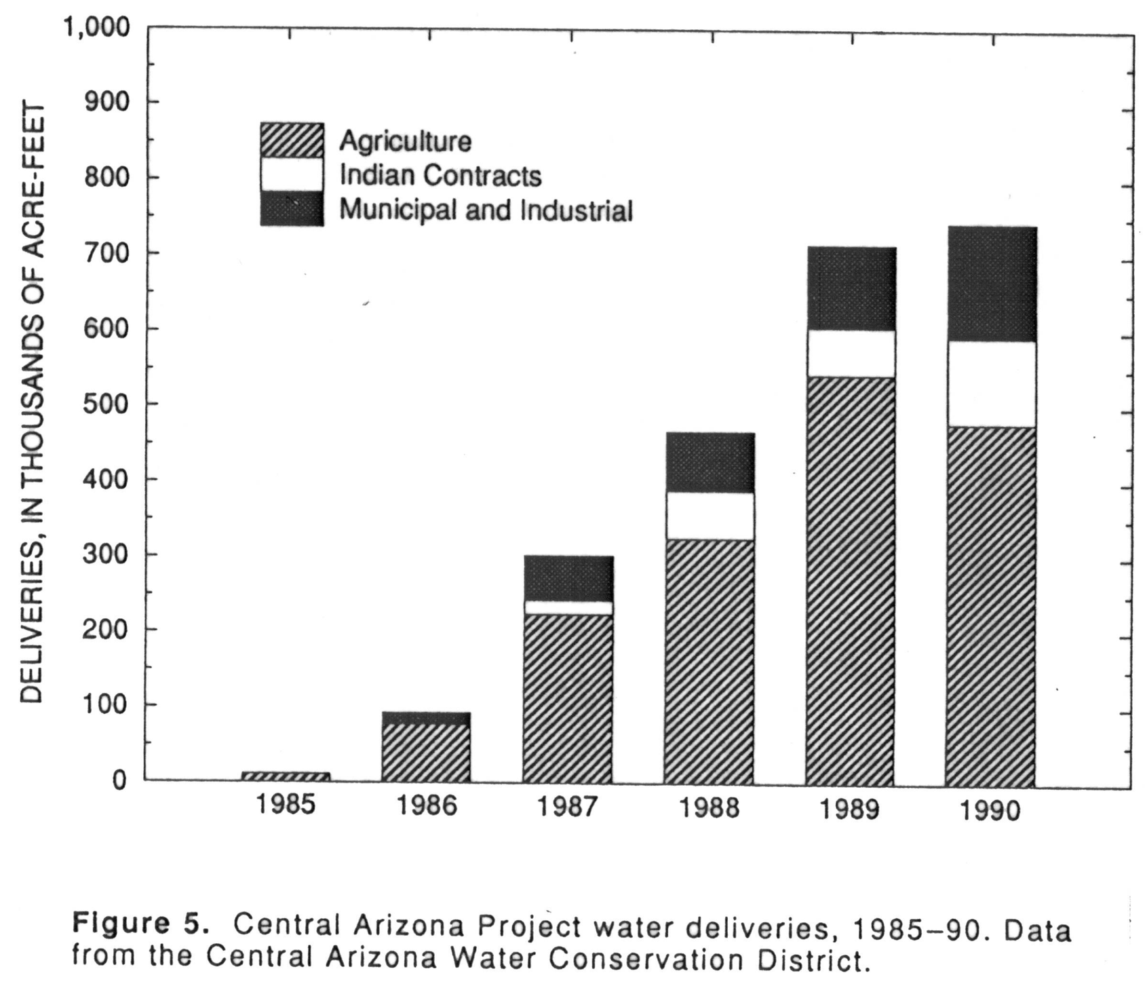


Figure 5. Central Arizona Project water deliveries, 1985–90. Data from the Central Arizona Water Conservation District.

Table 1. Ground-water withdrawals and percentage of use, 1987–90

	Ground-water withdrawals in thousands of acre-feet and percentage of use								
	Municipal		Industrial		Irrigation		Drainage		Total ground-water withdrawals, in thousands of acre-feet
Year	Acre-feet	Per-cent-age	Acre-feet	Per-cent-age	Acre-feet	Per-cent-age	Acre-feet	Per-cent-age	
1987	372	12.6	264	9.0	2,105	71.4	205	7.0	2,946
1988	389	11.9	294	9.0	2,377	72.4	219	6.7	3,279
1989	409	11.4	260	7.2	2,650	73.5	284	7.9	3,603
1990	388	11.4	277	8.1	2,493	73.0	255	7.5	3,413

Table 2. Estimated annual ground-water withdrawal by area, in thousands of acre-feet

[Numbers rounded to the nearest thousand acre-feet. See sheet 2 for area abbreviations and locations.]

YEAR	AGF	ALT	ARA	AVR	BIC	BIS	BLM	BOD	BUT	BWM	CDI	CHV	CHN	COP	CHI	CON	DOU	DUN	GIL	GRD	GSK
PRE-1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1915	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
1916	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
1917	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1918	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1919	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1920	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1921	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1922	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1923	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1924	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1925	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1926	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1927	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1928	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1929	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--
1930	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
1931	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
1932	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--
1933	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--
1934	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--
1935	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	--
1936	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	--
1937	--	--	--	4	--	--	--	--	--	--	--	--	--	--	--	--	2	N	2	--	--
1938	--	--	--	8	--	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	--
1939	--	--	--	9	--	--	--	--	--	--	--	--	--	--	--	--	2	1	2	--	--
1940	--	--	--	12	--	--	--	--	--	--	--	--	--	--	--	--	5	2	19	1	--
1941	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	5	1	19	1	--
1942	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	5	2	19	2	--
1943	--	--	--	20	--	--	--	--	--	--	--	--	--	--	--	--	5	7	20	2	--
1944	--	--	--	19	--	--	--	--	--	--	--	--	--	--	--	--	5	8	20	6	--
1945	--	--	--	23	--	--	--	--	--	--	--	--	--	--	--	--	8	6	20	9	--
1946	--	--	--	23	--	--	--	--	--	--	--	--	--	--	--	--	12	17	33	11	--
1947	--	--	--	34	--	--	--	--	--	--	--	--	--	--	--	--	17	21	40	11	--
1948	--	--	--	38	--	--	--	--	--	--	--	--	--	--	--	--	22	21	61	7	--
1949	--	--	--	48	--	--	--	--	--	--	--	--	--	--	--	--	30	11	67	13	--
1950	--	--	--	41	20	--	--	--	--	--	--	--	--	--	--	--	35	23	59	15	--
1951	--	--	--	75	20	--	--	--	--	--	--	--	--	--	--	--	38	33	104	21	--
1952	--	--	--	80	20	--	--	--	--	--	--	--	--	--	--	--	42	17	120	32	--
1953	--	--	--	85	20	--	--	--	--	--	--	--	--	--	--	--	45	30	145	42	--
1954	--	--	--	90	20	--	--	--	--	--	--	--	--	--	--	--	42	27	139	37	--
1955	--	--	--	95	20	--	--	--	--	--	--	--	--	--	--	--	50	25	140	31	--
1956	--	--	--	100	20	--	--	--	--	--	--	--	--	--	--	--	60	20	180	30	--
1957	--	--	--	110	20	--	--	--	--	--	--	--	--	--	--	--	55	20	180	30	--
1958	--	--	--	120	20	--	--	--	--	--	--	--	--	--	5	--	55	25	200	30	--
1959	--	--	--	130	20	--	--	--	--	--	--	--	--	--	10	--	55	25	250	40	--
1960	--	--	--	140	20	--	--	--	--	--	--	--	--	--	10	--	60	9K	250	50	--
1961	--	--	--	145	20	--	--	--	--	--	--	--	--	--	10	--	65	21K	200	50	--
1962	--	--	--	140	20	--	--	--	--	--	--	--	--	--	10	--	65	19K	170	50	--
1963	--	--	--	115	20	--	--	--	--	--	--	--	--	--	10	--	65	17K	130	60	--
1964	--	--	--	115	20	--	--	--	--	--	--	--	--	--	15	--	60	22K	130	65	--
1965	--	--	--	125	20	--	--	--	--	--	--	--	--	--	13	--	90	17K	115	65	--
1966	--	--	--	95	20	--	--	--	--	--	--	--	--	--	12	--	105	13K	145	80	--
1967	--	--	--	121	9	--	--	--	--	--	--	--	--	--	20	--	120	16K	198	100	--
1968	--	--	--	134	9	--	--	--	--	--	--	--	--	--	17	--	120	12K	153	126	--
1969	--	--	--	155	9	--	--	--	--	--	--	--	--	--	12	--	104	20K	166	120	--
1970	--	--	--	157	9	--	--	--	--	--	--	--	--	--	12	--	103	18K	162	108	--
1971	--	--	--	140	9	--	--	--	--	--	--	--	--	--	16	--	95	14K	212	122	--
1972	--	--	--	146	8	--	--	--	--	--	--	--	--	--	19	--	89	23K	238	125	--
1973	--	--	--	152	8	--	--	--	--	--	--	--	--	--	25	--	110	17K	198	143	--
1974	--	--	--	129	11	--	5	N	4	--	2	N	1	N	28	3	138	29K	249	191	--
1975	--	--	--	145K	12	--	5	N	5	--	3	N	2	N	32	5	118	23K	288	164	--
1976	--	--	--	115	10	--	6	N	5	--	3	N	3	N	43	7	112	28K	287	182	--
1977	--	--	--	110	9	--	6	N	4	--	4	N	3	N	53	7	87	30K	300	210	--
1978	--	--	--	66	6	2K	5	N	4	--	4	N	2	N	53	7	80	30K	292	193	--
1979	3	--	3	7	5	2K	5	N	4	18	2	N	2	N	66	9	81	16K	218	193	--
1980	4	--	3	83	5	2K	5	N	4	18	2	N	3	N	61	14	91	18K	275	234	--
1981	4	--	3	67	6	3K	5	N	4	18	3	N	3	N	63	9	85	20K	308	315	--
1982	4	--	3	55	N	3K	6	N	3	18	2	N	3	N	82	11	76	16K	253	221	--
1983	6	2	1	31	N	3K	6	N	2	18	3	N	3	N	53	10	50	6K	141K	123	14
1984	6	3	N	35	1	1K	6	N	4	18	2	N	3	N	80	10	46	11	316	176	21
1985	6	2	N	34	3	3	5	N	4	22	4	N	3	N	56	9	49	6	209	214	17
1986	9	1	N	29	5	4	6	N	4	22	6	N	3	N	47	7	38	7	179	173	17
1987	5	1	N	35	3	4	6	N	N	14	3	N	3	N	55	7	37	7	132	161	18
1988	6	N	N	49	3	4	6	N	N	14	7	N	4	N	73	7	36	7	308	176	21
1989	7	N	1	36	4	5	5	N	N	20	8	N	4	N	73	9	46	13	308	210	21
1990	5	3	N	38	4	7	5	N	N	16	7	N	4	N	74	7	42	13	150	201	19
TOTAL	65G	12I	14G	4190	488	43F	93B	-B	51B	216G	65B	-B	48B	-B	1208	138B	3074	861	8525	4972	148I

YEAR	GTD	GWA	HAR	HAS	HOL	HOP	HOU	HUA	KAI	KAN	LIC	LHA	LSP	LSC	LVR	MMU	MNV	N-C	PSC	PRZ	RAN
PRE-1915	5	--	--	--	--	--	--	--	--	--	--	--	--	200	--	--	--	--	--	--	--
1915	4	--	--	--	--	--	--	--	--	--	--	--	--	82	--	--	--	--	--	--	--
1916	4	--	--	--	--	--	--	--	--	--	--	--	--	83	--	--	--	--	--	--	--
1917	4	--	--	--	--	--	--	--	--	--	--	--	--	84	--	--	--	--	--	--	--
1918	4	--	--	--	--	--	--	--	--	--	--	--	--	85	--	--	--	--	--	--	--
1919	6	--	--	--	--	--	--	--	--	--	--	--	--	86	--	--	--	--	--	--	--
1920	6	--	--	--	--	--	--	--	--	--	--	--	--	88	--	--	--	--	--	--	--
1921	3	--	--	--	--	--	--	--	--	--	--	--	--	90	--	--	--	--	--	--	--
1922	3	--	--	--	--	--	--	--	--	--	--	--	--	93	--	--	--	--	--	--	--
1923	10	--	--	--	--	--	--	--	--	--	--	--	--	96	--	--	--	--	--	--	--
1924	15	--	--	--	--	--	--	--	--	--	--	--	--	99	--	--	--	--	--	--	--
1925	15	--	--	--	--	--	--	--	--	--	--	--	--	101	--	--	--	--	--	--	--
1926	20	--	--	--	--	--	--	--	--	--	--	--	--	104	--	--	--	--	--	--	--
1927	20	--	--	--	--	--	--	--	--	--	--	--	--	106	--	--	--	--	--	--	--
1928	20	--	--	--	--	--	--	--	--	--	--	--	--	109	--	--	--	--	--	--	--
1929	10	--	--	--	--	--	--	--	--	--	--	--	--	111	--	--	--	--	--	--	--
1930	15	--	--	--	--	--	--	--	--	--	--	--	--	135	--	--	--	--	--	--	--
1931	20	--	--	--	--	--	--	--	--	--	--	--	--	160	--	--	--	--	--	--	--
1932	20	--	--	--	--	--	--	--	--	--	--	--	--	185	--	--	--	--	--	--	--
1933	15	--	--	--	--	--	--	--	--	--	--	--	--	210	--	--	--	--	--	--	--
1934	15	--	--	--	--	--	--	--	--	--	--	--	--	235	--	--	--	--	--	--	--
1935	20	--	--	--	--	--	--	--	--	--	--	--	--	260	--	--	--	--	--	--	--
1936	20	--	--	--	--	--	--	--	--	--	--	--	--	285	--	--	--	--	--	--	--
1937	25	--	--	--	--	--	--	--	--	--	2	--	--	305	--	--	--	--	--	--	--
1938	25	--	--	--	--	--	--	--	--	--	3	--	--	325	--	--	--	--	--	--	--
1939	25	--	--	--	--	--	--	--	--	--	4	--	--	352	--	--	--	--	--	--	--
1940	25	--	1	--	--	--	--	--	--	--	4	--	--	372	--	N	--	--	--	--	--
1941	25	--	1	--	--	--	--	--	--	--	4	--	--	421	--	N	--	--	--	--	--
1942	30	--	1	--	--	--	--	--	--	--	5	--	--	500	--	N	--	--	--	--	--
1943	35	--	1	--	--	--	--	--	--	--	6	--	--	515	--	N	--	--	--	--	--
1944	37	--	1	--	--	--	--	--	--	--	7	--	--	530	--	N	--	--	--	--	--
1945	35	--	1	--	--	--	--	--	--	--	7	--	--	610	--	2	--	--	--	--	--
1946	38	--	1	--	--	--	--	--	--	--	8	--	--	660	--	2	--	--	--	--	--
1947	43	--	1	--	--	--	--	--	--	--	9	--	--	700	--	2	--	--	--	--	--
1948	50	--	1	--	--	--	--	--	--	--	12	--	--	950	--	2	--	--	--	--	--
1949	45	--	1	--	--	--	--	--	--	--	12	--	--	1100	--	2	--	--	--	--	--
1950	46	--	5	--	--	--	--	--	--	--	13	--	--	1000	--	2	--	--	--	--	2
1951	50	--	7	--	--	--	--	--	--	--	13	--	--	1030	--	2	--	--	--	--	5
1952	40	--	10	--	--	--	--	--	--	--	12	--	--	950	--	5	--	--	--	--	15
1953	16	--	20	--	--	--	--	--	--	--	13	--	--	1400	--	6	--	--	--	--	22
1954	9	--	33	--	--	--	--	--	--	--	12	--	--	1200	--	7	--	--	--	--	19
1955	8	--	30	--	--	--	--	--	--	--	13	--	--	1200	--	9	--	--	--	--	16
1956	5	--	40	--	--	--	--	--	--	--	14	--	--	1100	--	15	--	--	--	--	16
1957	5	--	50	--	--	--	--	--	--	--	14	--	--	1100	--	21	--	--	--	--	9
1958	2	--	60	--	--	--	--	--	--	--	14	--	--	1200	--	38	--	--	--	--	10
1959	2	--	95	--	--	--	--	--	--	--	14	--	--	1200	--	50	--	--	--	--	10
1960	2	--	125	--	--	--	--	N	--	--	14	--	--	1100	--	60	--	--	--	--	11
1961	140A	--	100	--	--	--	--	1	--	--	15	--	--	1150	--	70	--	--	--	--	12
1962	215A	--	200	--	--	--	--	1	--	--	15	--	--	1050	--	65	--	--	--	--	15
1963	201A	--	200	--	--	--	--	1	--	--	13	--	--	1000	--	75	--	--	--	--	17
1964	181A	--	200	--	--	--	--	2	--	--	13	--	--	1150	--	90	--	--	--	--	7
1965	186A	--	200	--	--	--	--	2	--	--	14	--	--	910	--	90	--	--	--	--	6
1966	217A	--	160	--	--	--	--	3	--	--	14	--	30	915	--	105	--	--	--	--	7
1967	213A	--	170	--	--	--	--	4	--	--	12	--	29	1120	--	98	--	--	--	--	12
1968	220A	--	165	--	--	--	--	4	--	--	12	--	42	910	--	95	--	--	--	--	15
1969	218A	--	145	--	--	--	--	4	--	--	12	--	51	1043	--	98	--	--	--	--	16
1970	218A	--	111	--	--	--	--	4	--	--	12	--	58	890	--	86	--	--	--	--	15
1971	215A	--	99	--	--	--	--	4	--	--	12	--	51	819	--	101	--	--	--	--	15
1972	201A	--	108	--	--	--	--	4	--	--	12	--	53	798	--	112	--	--	--	--	19
1973	208A	--	109	--	--	--	--	4	--	--	12	91	57	990	--	113	--	--	--	--	19
1974	206A	N	137	--	16	N	N	5	N	N	13	89	61	1171	--	134	N	--	N	1	22
1975	210A	N	130	--	16	N	N	4	N	N	15	94	59	1016	--	139	N	--	N	2	13
1976	204A	N	129	--	18	N	N	4	N	2	14	98	67	1007	--	129	N	--	N	2	6
1977	208A	N	123	--	19	N	N	4	N	2	18	84	62	1037	--	132	N	--	N	2	13
1978	191A	N	100	3	24	N	N	6	N	2	15	63	55	748	--	115	N	--	N	2	12
1979	175A	N	93K	3	19	N	N	6	N	2	15	64	46	737	--	115	N	2	N	1	14
1980	197A	N	108	3	18	N	N	4	N	2	15	74	52	898	--	123	N	2	N	2	10
1981	157A	N	129K	3	24	1	N	6	N	2	15	87	60	998	2	144	N	3	N	2	50
1982	152A	N	79K	3	24	1	N	5	N	2	14	70	52	858	2	90	N	3	N	2	40
1983	141A	N	56K	3	22	N	N	5	N	2	14	48	40	495	2	65	N	3	N	2	26
1984	70A	N	72	3	20	N	N	5	N	2	15	72	46	629	2	93	N	3	N	1	38
1985	129A	N	59	3	19	1	N	5	N	2	14	60	35	614	18	80	N	4	N	1	21
1986	123A	N	13	5	21	N	N	5	N	2	13	31	38	580	21	59	N	4	N	1	31
1987	128	N	9	3	18	N	N	5	N	2	9	40	36	569	6	72	N	4	N	1	23
1988	134	N	4	3	19	N	1	5	N	2	10	41	44	527	5	50	N	4	N	N	28
1989	152	N	5	4	24	N	1	6	N	2	15	47	46	528	4	50	N	5	N	N	9
1990	152	N	2	4	22	N	N	6	N	2	13	42	38	417	3	51	N	5	N	N	16
TOTAL	6259	-B	3700	43F	343B	3B	2B	124	-B	30B	634	1195C	1208D	48481	65H	3064	-B	42G	-B	22B	682

YEAR	SAC	SAF	SRV	SBV	SFP	SFR	SSI	SSW	SHV	SNO	STJ	TON	TUB	USP	USC	VER	VRG
PRE-1915	--	--	57	--	--	--	5	--	--	--	--	--	--	--	80	--	--
1915	--	--	15	--	--	--	10	--	--	--	--	--	--	--	7	--	--
1916	--	--	15	--	--	--	8	--	--	--	--	--	--	--	7	--	--
1917	--	--	15	--	--	--	8	--	--	--	--	--	--	--	8	--	--
1918	--	--	40	--	--	--	6	--	--	--	--	--	--	--	8	--	--
1919	--	--	60	--	--	--	6	--	--	--	--	--	--	--	10	--	--
1920	--	--	95	--	--	--	5	--	--	--	--	--	--	--	35	--	--
1921	--	--	100	--	--	--	5	--	--	--	--	--	--	--	20	--	--
1922	--	--	200	--	--	--	5	--	--	--	--	--	--	--	30	--	--
1923	--	--	400	--	--	--	5	--	--	--	--	--	--	--	37	--	--
1924	--	--	500	--	--	--	5	--	--	--	--	--	--	--	45	--	--
1925	--	--	500	--	--	--	5	--	--	--	--	--	--	--	42	--	--
1926	--	--	500	--	--	--	4	--	--	--	--	--	--	--	40	--	--
1927	--	--	500	--	--	--	4	--	--	--	--	--	--	--	40	--	--
1928	--	--	500	--	--	--	4	--	--	--	--	--	--	--	45	--	--
1929	--	--	600	--	--	--	4	--	--	--	--	--	--	--	40	--	--
1930	--	--	650	--	--	--	4	--	--	--	--	--	--	--	38	--	--
1931	--	--	600	--	--	--	4	--	--	--	--	--	--	--	25	--	--
1932	--	--	300	--	--	--	3	--	--	--	--	--	--	--	20	--	--
1933	--	--	572	--	--	--	3	--	--	--	--	--	--	--	16	--	--
1934	--	--	711	--	--	--	3	--	--	--	--	--	--	--	30	--	--
1935	--	20	554	--	--	--	3	--	--	--	--	--	--	--	28	--	--
1936	--	20	684	--	--	--	3	--	--	--	--	--	--	--	32	--	--
1937	--	20	665	--	--	--	3	--	--	--	--	--	--	--	35	--	--
1938	--	20	905	--	--	--	3	--	--	--	--	--	--	--	40	--	--
1939	--	20	738	--	--	--	3	--	--	--	--	--	--	--	50	--	--
1940	N	25	943	--	--	--	3	--	--	--	--	--	--	--	62	--	--
1941	N	9	444	--	--	--	3	--	--	--	--	--	--	--	70	--	--
1942	N	19	1004	--	--	--	4	--	--	--	--	--	--	--	94	--	--
1943	N	35	1104	--	--	--	4	--	--	--	--	--	--	--	95	--	--
1944	N	52	1017	--	--	--	4	--	--	--	--	--	--	--	100	--	--
1945	N	35	1143	--	--	--	5	--	--	--	--	--	--	--	106	--	--
1946	N	115	1360	--	--	--	6	--	--	--	--	--	--	--	109	--	--
1947	N	100	1406	--	--	--	6	--	--	--	--	--	--	--	136	--	--
1948	N	110	1670	--	--	--	6	--	--	--	--	--	--	--	135	--	--
1949	N	40	1644	--	--	--	6	--	--	--	--	--	--	--	132	--	--
1950	N	90	1852	--	--	--	6	--	--	--	--	--	--	--	160	--	--
1951	N	125	1910	--	--	--	6	--	--	--	--	--	--	--	180	--	--
1952	N	70	2020	--	--	--	15	--	--	--	--	--	--	--	195	--	--
1953	N	120	2300	--	--	--	25	--	--	--	--	--	--	--	200	--	--
1954	N	90	2300	--	--	--	32	--	--	--	--	--	--	--	200	--	--
1955	N	90	2240	--	--	--	40	--	--	--	--	--	--	--	200	--	--
1956	N	90	2300	--	--	--	40	--	--	--	--	--	--	--	200	--	--
1957	N	100	2300	--	--	--	48	--	--	--	--	--	--	--	200	--	--
1958	N	50	2300	--	--	--	50	--	--	--	--	--	--	--	175	--	--
1959	N	100	2206	--	--	--	50	--	--	--	--	--	--	--	165	--	--
1960	N	90	2005	--	--	--	60	--	--	--	--	--	--	--	165	--	--
1961	N	140	2178	--	--	--	65	--	--	--	--	--	--	--	175	--	--
1962	N	60	1976	--	--	--	65	--	--	--	--	--	--	--	200	--	--
1963	N	80	2134	--	--	--	65	--	--	--	--	--	--	--	180	--	--
1964	N	110	1972	--	--	--	75	--	--	--	--	--	--	--	175	--	--
1965	4	150	1500	--	--	--	70	--	--	--	--	--	--	--	200	--	--
1966	4	90	1350	--	--	--	72	--	--	--	--	--	--	35	190	--	--
1967	4	145	1763	--	--	--	76	--	--	--	--	--	--	34	200	--	--
1968	6	78	1264	--	--	--	81	--	--	--	--	--	--	29	210	--	--
1969	5	140	1600	--	--	--	78	--	--	--	--	--	--	28	236	--	--
1970	4	120	1700	--	--	--	105	--	--	--	--	--	--	33	240	--	--
1971	5	190	1800	--	--	--	107	--	--	--	--	--	--	36	258	--	--
1972	6	130	1800	--	--	--	104	--	--	--	--	--	--	38	253	--	--
1973	5	140	1200	--	--	--	115	--	--	--	--	--	--	41	280	--	--
1974	7	110	1800	--	2	--	135	--	N	29	1	--	N	45	264	4	5
1975	8	145	1750	--	4	--	122	--	N	21	3	--	1	52	280	4	5
1976	8	170	1680	--	2	--	122	--	N	24	3	--	1	59	281	4	5
1977	7	213	1709	--	2	--	117	--	N	28	3	--	1	54	257	9	6
1978	8	132	1098	--	2	1	121	--	N	28	3	--	1	46	220	8	6
1979	6	83	1043	--	2	1	113	3	N	28	4	N	1	50	215	8	6
1980	4	107	1109	--	3	1	139	5	N	30	5	N	1	67	228	7	6
1981	5	140	1620	--	3	1	127	8	N	33	7	N	1	75	225	8	6
1982	2	94	1115	--	3	1	75	10	N	38	6	N	1	71	187	9	6
1983	2	72	707	N	4	N	42	1	N	31	5	N	1	49	182	9	6
1984	2	70	1122	N	4	N	44	8	N	31	6	N	1	57	162	10	6
1985	2	67	891	N	3	N	45	5	N	26	9	3	1	31	198	12	6
1986	2	59	954	N	2	N	42	5	N	37	7	4	1	35	203	10	7
1987	2	70	816	N	2	N	46	7	N	32	8	3	1	38	181	14	7
1988	2	81	873	N	2	N	47	7	N	34	9	3	1	43	215	18	7
1989	2	151	925	N	6	N	49	7	N	37	10	3	2	43	224	24	7
1990	2	128	1145	N	5	N	47	7	N	38	11	5	1	37	209	23	9
TOTAL	114	5120	88538	-I	51	5F	3051	73G	-B	525B	100B	21G	17B	1126D	10415	181B	106B

YEAR	WAT	WHM	WIL	WMD	WMN	YUM	OTHERS	TOTAL
PRE-1915	--	--	--	--	--	--	--	34
1915	--	--	2	--	--	2	--	123
1916	--	--	2	--	--	2	--	122
1917	--	--	1	--	--	2	--	122
1918	--	--	N	--	--	3	--	146
1919	--	--	N	--	--	4	--	172
1920	--	--	N	--	--	4	--	233
1921	--	--	N	--	--	4	--	222
1922	--	--	N	--	--	4	--	335
1923	--	--	N	--	--	4	--	552
1924	--	--	N	--	--	4	--	668
1925	--	--	N	--	--	5	--	668
1926	--	--	1	--	--	6	--	675
1927	--	--	1	--	--	7	--	678
1928	--	--	2	--	--	8	--	688
1929	--	--	2	--	--	9	--	776
1930	--	--	1	--	--	10	--	854
1931	--	--	1	--	--	11	--	822
1932	--	--	1	--	--	12	--	543
1933	--	--	1	--	--	13	--	832
1934	--	--	1	--	--	14	--	1011
1935	--	--	1	--	--	15	5	911
1936	--	--	1	--	--	16	5	1071
1937	--	--	1	--	--	17	10	1091
1938	--	--	2	--	--	18	10	1364
1939	--	--	2	--	--	19	20	1247
1940	N	--	2	--	--	19	25	1520
1941	N	--	5	--	--	20	25	1063
1942	N	--	5	--	--	21	25	1742
1943	N	--	5	--	--	22	25	1901
1944	N	--	5	--	--	20	25	1856
1945	N	--	9	--	--	22	25	2066
1946	N	--	15	--	--	32	30	2472
1947	N	--	20	--	--	39	30	2615
1948	1	--	23	--	--	62	35	3206
1949	1	--	28	--	--	65	35	3280
1950	5	--	35	--	2	64	40	3515
1951	10	--	38	--	2	70	50	3789
1952	17	--	39	--	2	68	50	3819
1953	28	--	94	--	2	69	50	4732
1954	30	--	105	--	2	69	50	4513
1955	40	--	110	--	2	72	50	4481
1956	40	--	120	--	2	87	60	4539
1957	40	--	135	--	2	114	60	4613
1958	45	--	155	--	2	121	60	4737
1959	50	--	183	--	2	122	60	4839
1960	60	--	195	--	2	122	75	4625K
1961	65	--	184	--	2	124	90	5022K
1962	50	--	180	--	2	121	110	4799K
1963	50	--	180	--	2	121	110	4846K
1964	50	--	220	--	2	154	120	4948K
1965	45	--	250	--	2	179	150	4403K
1966	45	--	240	--	2	178	100	4227K
1967	52	--	300	--	2	229	100	5147K
1968	54	--	290	--	2	234	100	4382K
1969	60	--	291	--	2	231	100	4944K
1970	55	--	289	--	2	220	100	4831K
1971	55	--	309	--	2	233	100	5019K
1972	57	--	292	--	2	257	100	4994K
1973	55	--	305	--	2	272	100	4771K
1974	69	3	339	--	2	247	24	5731K
1975	64	3	293	--	2	255	21	5533K
1976	70	3	306	--	2	240	12	5473K
1977	72	2	220	--	2	233	15	5476K
1978	54	4	169	--	2	234	15	4232K
1979	67	3	175	N	2	192	15	4007K
1980	65	3	199	N	2	248	15	4574K
1981	65	3	180	N	2	238	15	5361K
1982	20	4	140	N	2	211	15	4163K
1983	13	3	82	N	2	222	10	2839K
1984	19	3	94	N	2	226	10	3687K
1985	26	3	91	N	2	224	27	3383
1986	17	3	86	N	2	211	25	3216
1987	13	4	82	N	3	173	28	2946
1988	15	4	93	N	3	196	28	3279
1989	16	4	108	N	4	282	31	3603
1990	10	4	87	N	2	243	32	3413
TOTAL	1735	56B	7423	-G	86	7941E	2653J	219445

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 1974-90 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 1973-90 ONLY.

D: PUMPAGE FOR LSP AND USP AREAS WAS NOT ESTIMATED PRIOR TO 1966. THUS, TOTAL IS FOR 1966-90 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 1978-90 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 1979-90 ONLY. ESTIMATED PUMPAGE BEFORE 1979 IS INCLUDED IN "OTHERS."

H: PUMPAGE FOR LVR AREA WAS NOT ESTIMATED PRIOR TO 1981. THUS, TOTAL IS FOR 1981-90 ONLY. ESTIMATED PUMPAGE BEFORE 1981 IS INCLUDED IN "OTHERS."

I: PUMPAGE FOR ALT, GSK, AND SBV AREAS WAS NOT ESTIMATED PRIOR TO 1983. THUS, TOTAL IS FOR 1983-90 ONLY. ESTIMATED PUMPAGE BEFORE 1983 IS INCLUDED IN "OTHERS."

J: "OTHERS" INCLUDE: BLACK RIVER BASIN, UPPER SALT RIVER BASIN, AND WHITE RIVER BASIN.

K: PREVIOUSLY PUBLISHED FIGURE REVISED.

INTRODUCTION

Arizona is an arid State in which economic development is influenced largely by the location of adequate water supplies. Water demand is met by pumping ground water from aquifers or by conveying surface water through a system of reservoirs and canals. Data on the nature and extent of the aquifers, quantity and quality of available ground water, and the effect of aquifer development are necessary for proper management of this valuable resource.

Since 1939, the U.S. Geological Survey has conducted ground-water studies in cooperation with the State of Arizona. The primary purposes of these studies are to define the quantity, chemistry, and areal distribution of the ground-water resources of Arizona and to monitor the effects of large-scale withdrawals of ground water. The results of these studies are presented in publications of the U.S. Geological Survey and the Arizona Department of Water Resources, technical journals, and other publications. The basic hydrologic data are in computer storage and are available to the public.

The U.S. Geological Survey and the Arizona Department of Water Resources collect and compile water-level and annual ground-water withdrawal data for most of the ground-water areas in Arizona. This report summarizes these data for calendar years 1987 through 1990.

AVAILABILITY AND WITHDRAWAL OF GROUND WATER

The availability of adequate and potable water supplies influences the development of cities and croplands. Surface water is available along the Gila River, Verde River, and Salt River Valleys, and along the lower Colorado River; however, the quantity is not sufficient to meet demands. For many years, more than half of Arizona's water supply has been withdrawn from ground-water reservoirs. The principal use of the ground water is for irrigation of crops, although municipal and industrial use is increasing steadily.

Annual ground-water withdrawals during the 1980's were much less than those during the 1950's through the 1970's. The total ground-water withdrawals in Arizona were 2.9, 3.3, 3.6, and 3.4 million acre-ft for 1987, 1988, 1989, and 1990, respectively (fig. 1). The average annual ground-water withdrawal for 1980–89 was 3.7 million acre-ft, which was the lowest average annual withdrawal for any decade since the 1940's. Since 1947, annual ground-water withdrawals in Arizona were at the lowest rate in 1983 and at the second lowest rate in 1987.

Ground-water withdrawals can be classified into four different uses: municipal, industrial, agricultural, and drainage. The distribution of ground-water withdrawals by each use is shown in figure 2 and in table 1. Municipal use includes water provided by public water suppliers and self-supplied water for domestic and commercial purposes. The main industrial water users include electric-power producers, mines, and other industries. Water for agricultural use is primarily for irrigating crops and to a much lesser extent for livestock. Some ground water is withdrawn to drain agricultural lands with shallow water levels in the Yuma (YUM) and Gila River from Texas Hill to Dome (GTD) ground-water areas.

The annual and accumulated ground-water withdrawals are shown by ground-water area in table 2 and in figure 3. Potential well production, depth to water in selected wells in the spring of 1990, and the change in water level in selected wells from 1985 to 1990 are shown in the large map on sheet 2. The withdrawal of ground water and the effects of withdrawals on the ground-water reservoirs in each of the three water provinces (small map, sheet 2) are discussed separately in the following sections.

Basin and Range Lowlands Province

The Basin and Range lowlands province is the most developed of the three water provinces, and more than 94 percent of Arizona's ground-water withdrawals occurred in this province from 1987 to 1990. The province is characterized by rugged mountain ranges separated by broad elongated basins filled with alluvial deposits. The ground-water reservoirs are mainly the alluvial deposits in the basins; however, small supplies of water can be obtained locally from the crystalline and sedimentary rocks in the mountains that bound the basins. In the Basin and Range lowlands province 2.8, 3.1, 3.4, and 3.2 million acre-ft of ground water were withdrawn in 1987, 1988, 1989, and 1990, respectively. About 214 million acre-ft of ground water has been withdrawn from the ground-water reservoirs in the province since pumping began.

The largest rates of ground-water withdrawal in Arizona occur in the Salt River Valley and lower Santa Cruz basin. Ground-water withdrawals in the lower Santa Cruz basin decreased through the 1980's, and the withdrawals for 1990 were the lowest since 1940. The average annual ground-water withdrawal for Salt River Valley from 1980 to 1989 is 1.013 million acre-ft, which is the lowest average annual withdrawal for any decade since the 1930's. Ground-water withdrawals in these two basins have been influenced during the 1980's, in part, by an above-normal surface-water supply from the Gila River and by the inception of the Central Arizona Project (figures 4 and 5).

In 1985, the Central Arizona Project began diverting water from the Colorado River to mitigate the ground-water overdraft in some of the basins in the Basin and Range lowlands province. The most notable example of this is in the Harquahala basin, which began receiving water from the Central Arizona Project in 1985. From 1985 to 1990, ground-water withdrawals in the Harquahala basin decreased from 59,000 to 2,000 acre-ft, and water levels rose as much as 70 ft.

The hydrographs of water levels in selected wells on sheet 2 represent conditions in several ground-water areas in the Basin and Range lowlands province. In general, most water levels declined significantly from the 1950's through the 1970's when the highest ground-water withdrawal occurred. In recent years, however, because of decreased ground-water withdrawal, the rate of water-level declines has been reduced, and in some areas water levels are rising.

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 alluvial deposits in a few areas; from layered sandstone, limestone, and conglomerate in some areas; from alluvial deposits along major stream channels; and locally from fractured crystalline and sedimentary rocks. Only a few thousand acres of land are under cultivation. Ground-water withdrawals in this province were 71,000, 76,000, 92,000, and 87,000 acre-ft for 1987, 1988, 1989, and 1990, respectively. Annual ground-water withdrawals in this province are generally increasing and reached an all time high of 92,000 acre-ft in 1989.

Plateau Uplands Province

In the Plateau uplands province, ground-water development is small compared with development in the Basin and Range lowlands province. The area is underlain by layers of sandstone, siltstone, and limestone that are overlain locally by volcanic rocks and thin deposits of alluvium. Most of the ground water is pumped from layered sandstone that yields ground water from confined or unconfined aquifers and from thin deposits of alluvium along the major streams. The use of ground water is limited largely to scattered farms and homesteads; industrial and utility sites; and population centers, such as Flagstaff, Holbrook, and the White Mountains recreation area. Ground-water withdrawals in this province were 87,000, 96,000, 112,000, and 106,000 acre-ft for 1987, 1988, 1989, and 1990, respectively. Annual ground-water withdrawals in this province generally have been increasing and reached an all-time high of 112,000 acre-ft in 1989. Although a few feet of decline has occurred in localized areas, no regional pattern of rise or decline in water levels is discernible.

CONVERSION FACTORS

Multiply	By	To obtain
foot (ft)	0.3048	meter
gallon per minute (gal/min)	0.06309	liter per second
acre-foot (acre-ft)	0.001233	cubic hectometer
acre-foot (volume of water 1 ft deep covering an area of 1 acre)	0.32585	million gallons

VERTICAL DATUM

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—A geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called "Sea Level Datum of 1929."

SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, 1987–90

By
D.W. Anning and N.R. Duet
1994