EXHIBIT 88

AN ASSESSMENT OF DIVERSIONS AND WATER RIGHTS SMITH AND MASON VALLEYS, NV

July 12, 2001

by

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Prepared for Bureau of Land Management, Carson City, NV.

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Executive Summary

Walker Lake has dropped over 140 feet in level and 7.0 million acre-feet in volume (74%) since 1882. The primary cause for the decline is irrigation development in the upstream basin. This report summarizes the water rights in the Smith and Mason Valleys of the Walker River basin on western Nevada in support of a programmatic environmental impact statement being completed by the Bureau of Land Management to purchase water rights for transfer to Walker Lake.

Water right types include natural, storage, flood, tailwater and groundwater. The groundwater rights are either full or supplemental to natural flow rights.

The Walker River is federally adjudicated with rights delineated in Decree C-125. A natural flow right is a right to the "run of the river" flow without benefit of storage. Irrigators in both Smith and Mason Valleys have surface water rights under the C-125 decree. Storage rights are rights to water stored in Bridgeport Reservoir and Topaz Lake. Lands with low priority natural flow rights receive the most storage rights. Flood rights are rights to river water that are surplus to all of the natural flow rights. They may be used on lands not usually irrigated with natural flow rights. There are four irrigated regions within the two valleys: Smith Valley, Main River of Mason Valley, Tunnel Section and the East Walker River.

In Smith Valley, the expected natural flow diversion rate is 68.34 cfs which is 54.9% of the total decree value. Full priority (1920 rights) was declared 37.4% of the time in Smith Valley between 1988 and 1997. For the East Walker River, the expected diversion rate is 96.41 cfs which is 50.9% of the total decree value of 191.15 cfs. Full priority was declared 36.5% of the time along the East Walker in Mason Valley between 1988 and 1997. For the main Walker River in Mason Valley, the expected diversion rate is 151.43 cfs which is 56.2% of the total decree value of 269.49 cfs. Almost 104.39 cfs of the expected value comes from the 38.7% of the time that 1920 is the priority on the Walker River. For the Tunnel Section, the expected diversion rate is 29.19 cfs which is 57.9% of the total decree value of 50.37 cfs. Full priority was declared 36.0% of the time along the Tunnel Section between 1988 and 1997.

The Tunnel section has the most natural flow rights water diverted per decree acre at 4.04 afa/ac. The Main River of Mason Valley has the lowest at 2.62 afa/ac which also has the lowest diversion of storage water at 0.35 afa/ac. Smith Valley has the highest amount of storage water diverted per total irrigated area. Smith Valley has the largest amount of new lands irrigated which explains the high storage diversion rate. The Tunnel section and East Walker River also have just under 1 afa/ac of storage diversions. Smith Valley has the highest amount of flood diversions.

Tailwater rights are rights to water running off of fields due to irrigation, or return flow. In Smith Valley there are almost 110 cfs of tailwater rights while in Mason Valley there are only about 10 cfs.

In Smith Valley, there were 29 supplemental wells with 7325.01 acres permitted. This is 44.3% by area of all groundwater permits in the Smith Valley. For the entire Mason Valley , 189 wells were found to be currently permitted irrigate 40,618 acres. There were 62 supplemental wells with 26,467 acres permitted or 65.2% by area of all Mason Valley groundwater permits. The proportion is similar throughout the valley.

It is essential that before the purchase for transfer of any right that detailed legal research be completed on that right. This includes documenting the impact on other rights, such as tailwater or groundwater rights.

Introduction

Walker Lake has dropped over 140 feet in level and 7.0 million af in volume (74%) since 1882. The primary cause for the decline is the irrigation development in the upstream basin. Pahl (1999) summarized the natural flow rights as decreed in by the C-125 decree which adjudicates the Walker River basin as 1575 cfs for use on about 110,852 acres within the basin. Pahl (1997) reported the average annual flows at gages 10293000 and 10296500 (W. Walker at Coleville and E. Walker above Bridgeport), gages which are above most irrigation use and below most substantial inflow to the basin, to equal about 400 cfs. This is an annual average while the natural flow rights are available only from March through October. It is not possible to quantify the amount of overappropriation, but it is clear that to meet all water rights throughout the entire irrigation season would require at least 4 times as much runoff from the basin as is naturally available[1].

To assure a permanent water supply for Walker Lake, on February 1, 2000, the Bureau of Land Management published a notice of intent to prepare an environmental impact statement "for obtaining Water and/or water rights from willing sellers in the Walker River Basin for the purposes of protecting the Walker Lake ecosystem from degradation resulting from increasing total dissolved solids (TDS) in the lake; possible use in a settlement of the United States' water rights claims in the Walker River Basin should a settlement be negotiated; and to assist in recovery of the threatened Lahontan cutthroat trout in the Walker River Basin." This report was prepared for the BLM in support of that EIS and provides substantial information regarding the quantity and type of water rights in the Mason and Smith Valley.

Agriculture in Mason and Smith Valley uses water from five types of water rights: river natural flow, storage, drainwater, supplemental groundwater, and regular groundwater rights. This report describes these rights including a summary quantification. The natural flow rights are prioritized by canal.

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[1]The irrigation season in the Bridgeport Valley ends September 15.

This report should not be considered legal research but provides summary data for environmental analyses. Each water right considered for transfer or purchase should be specifically researched.

Description of the Basin and Smith and Mason Valleys as Used in this Report

The Walker River basin contains almost 4,050 square miles in west central Nevada and eastern California. It heads in the Sierra Nevada Mountains and terminates in the terminal Walker Lake. The 25% of the basin in California produces most of the basin's runoff. According to the Walker River Atlas (CA Dept. of Water Resources, 1992), there are about 124,975 acres irrigated with Walker River surface water, but only 43,788 acres are in California. The U.S. Geological Survey (1995) estimates that just 15.5% of total consumptive use, including Walker Lake evaporation, occurs in California.

This report focuses on the Smith and Mason Valleys, two of the four major agricultural areas in the Walker River basin. This report does not consider Antelope Valley and the Bridgeport region. Antelope Valley is upstream of Smith Valley on the West Walker River and Bridgeport is upstream of Mason Valley on the East Walker River. Because the West Walker is significantly larger than the East Walker (inflow to Antelope Valley is 195,000 af/year and to Bridgeport is 132,000 af/year (USGS, 1995)) and because Bridgeport Valley uses substantially more water than Antelope Valley (25,000 af/year to 15,000 af/year (USGS, 1995)), there should be significantly more surface water flow available in Smith Valley. The length of the East Walker exceeds that of the West Walker which increases water lost to riparian vegetation.

In Mason and Smith Valley, there are four separate regions served by more than 30 canals. Figure 1 shows the canals and general areas served by the canals. The Smith Valley region is the entire Smith Valley basin. It includes the Artesia Basin although it drains inward to the terminal Alkali Lake. The Tunnel Section is the region of Mason Valley served by water from the West Walker River. The East Walker River section is the region of Mason Valley served by water from the East Walker River as well as the small irrigated acreage upstream from

Mason Valley on the East Walker. The Mason Valley region, also referred in this report as the Main River, is the section of Mason Valley lying downstream from Yerington.

Discussions and graphs presented herein that use flow rates are from the following U.S. Geological Survey gaging stations:

10293000	E. Walker R near Bridgeport CA
10293500*	E. Walker R above Strosnider Ditch near Mason, NV
10296500	W. Walker R near Coleville, CA
10297500	W. Walker R at Hoye Bridge nr Wellington
10300000*	W. Walker R near Hudson, NV
10301500	Walker River near Wabuska, NV

The gages noted with a * were operated only during the irrigation season from 1979 through 1994. These gages provide the inflow to Mason Valley. The Wabuska gage is the outflow from Mason Valley and probably best provides a measure of outflow from the irrigated regions of the basin. The gage at Hoye Bridge is the inflow to while the Hudson gage is the outflow from Smith Valley.

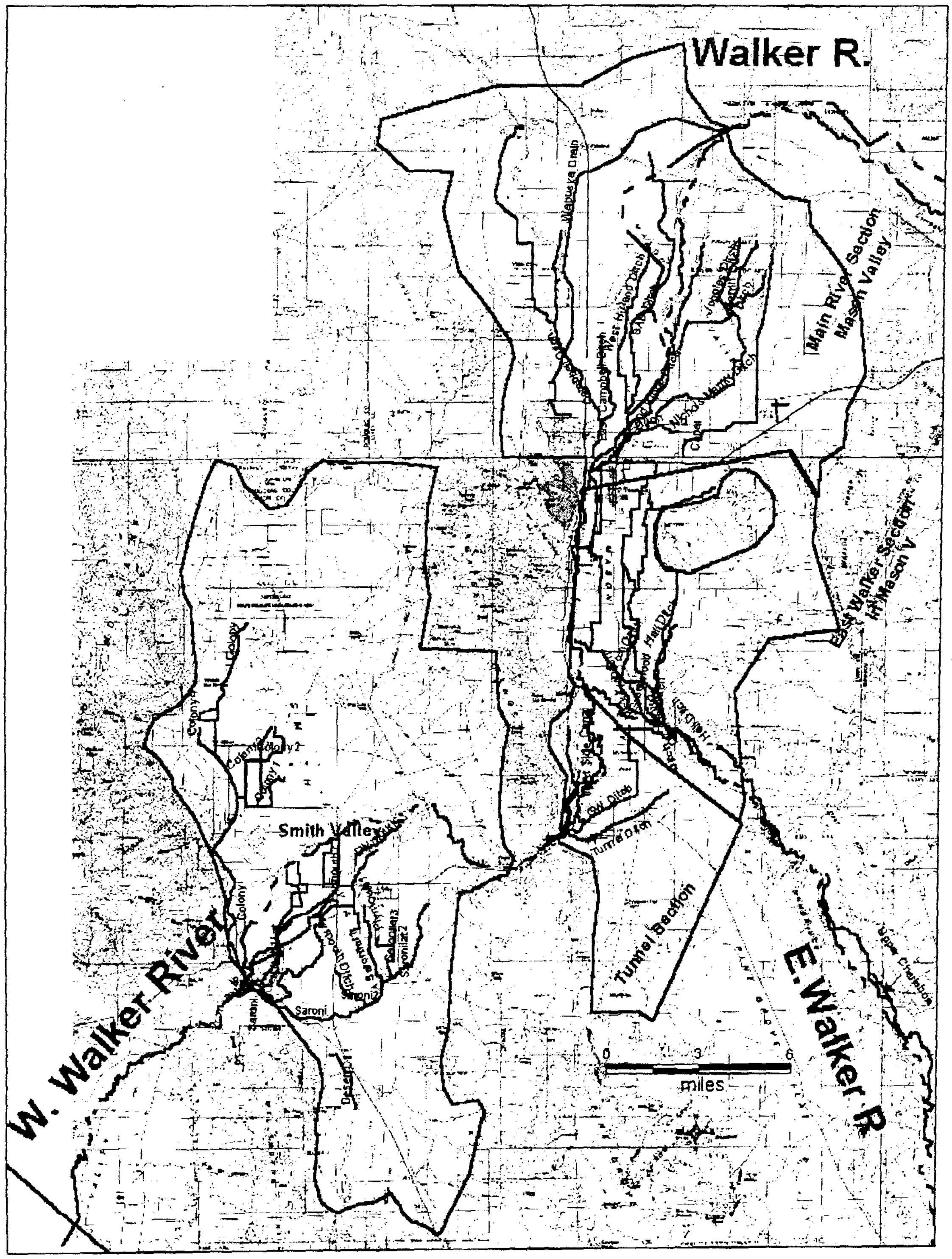

Figure 1: Smith and Mason Valleys: Canals and water rights sections.

Surface Water Rights

C-125 Natural Flow Rights

The Walker River is federally adjudicated with rights delineated in Decree C-125[2]. A natural flow right is a right to the "run of the river" flow without benefit of storage. Natural flow rights may depend on return flow. For example, rights holders in Mason Valley may depend on surface return flow from further upstream in Mason Valley or Smith Valley. The following highlights of the decree relevant to the environmental impact statement process are adapted and modified from Pahl (1999):

1. Walker River Indian Reservation rights are set at 26.25 cfs and is the earliest priority in the valley being 1859. This is to irrigate 2100 acres from March 1 to October 31.

2. Decree C-125 defines storage rights for Bridgeport and Topaz Reservoirs, but not Weber Reservoir.

3. Decree C-125 sets the diversion rate to which each party is entitled, the source of water (stream or river), the area to which it is to be applied, and the priority of use (year of first use). The majority of decreed diversion rates are either 1.6 cfs for 100 acres of irrigated land in Bridgeport and Antelope Valleys and 1.2 cfs for 100 acres in Smith and Mason Valleys. The rights for the Walker River Indian Reservation is 1.25 cfs per 100 acres.

4. Decree C-125 defines the irrigation season as March 1 to September 15 (199 days) for those areas above Bridgeport Reservoir and the Coleville gaging station on the West Walker River. The season for the remainder of the basin ranges from March 1 to October

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[2]Decree C-125, as amended on April 24, 1940 resulted from *United States of America V. Walker River Irrigation District, et al.* The following describes the scope of the decree: "*This decree shall be deemed to determine all of the rights of the parties to this suit and their successors in interest in and to the waters of Walker River and its tributaries, except the undetermined rights of Walker River Irrigation District under its applications to the State Water Commission of the State of California and the undetermined rights of the applicants for permits from the State Engineer of the State of Nevada hereinabove specified, and it is hereby ordered, adjudged and decreed that none of the parties to this suit has any right, title, interest or estate in or to the waters of said Walker River, its branches or its tributaries other than as above set forth, excepting the undetermined rights of Walker River Irrigation District and the several applicants for permits from the State Engineer of the State of Nevada.*"

31. The decree does not set an annual diversion duty (maximum amount applied per year)[3].

5. Decree C-125 does not address groundwater rights or the connection of surface water and groundwater.

6. Decree C-125 does not detail the distribution of water stored in Bridgeport and Topaz Reservoirs.

7. Decree C-125 does not provide protection of instream beneficial uses in the streams, tributaries and Walker Lake.

Pahl (1999) summarized the natural flow rights from C-125 for the Walker River basin as 1575.2869 cfs for use on about 110,852 acres within the basin. Pahl (1997) reported the average annual flows at W. Walker at Coleville and E. Walker above Bridgeport, gages which are above most irrigation use and below most substantial inflow , to equal about 400 cfs. This is an annual average while the natural flow rights are available only from March through October. It is not possible to quantify the amount of overappropriation, but it is clear that to meet all water rights throughout the entire irrigation season would require at least a 4.0 times as much runoff from the basin as is naturally available. Applying 4.0 feet/acre over 110,852 irrigated acres, the total water demand over the irrigation season is about 1.5 times the total annual flow.

The value of a water right depends on the frequency it is available which depends on the frequency with which each right may be diverted. Appendix 1 shows the most recent C-125 water rights for each canal in Smith and Mason Valley from the working abstract obtained from the Nevada Division of Water Planning.

Everyday between March 1 and October 31, the federal Water Master determines which priority water rights of the decree may be satisfied during that day. When full rights are available, all years up to and including 1920 may be served. The chosen priority depends on the

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[3]The State of Nevada limits supplemental water rights to 4.0 af/year. For most purposes, the total water applied to a field is 4.0 af/year (Roger Bezayif, Federal Water Master, personal communication).

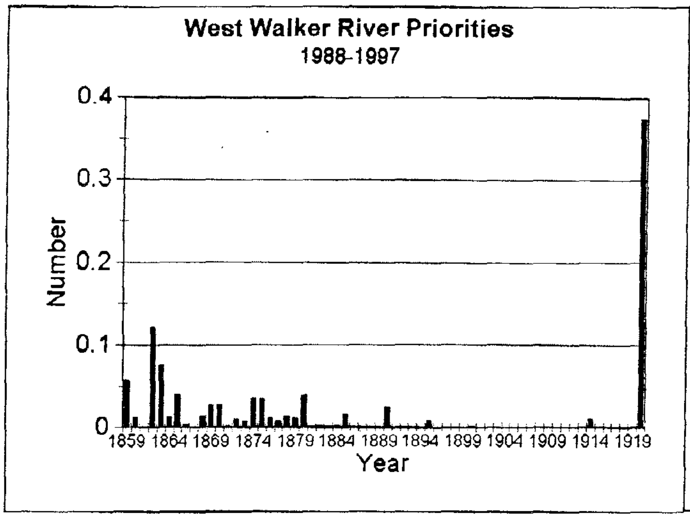

Figure 2a: Frequency of priority dates for Smith Valley, 1988-97.

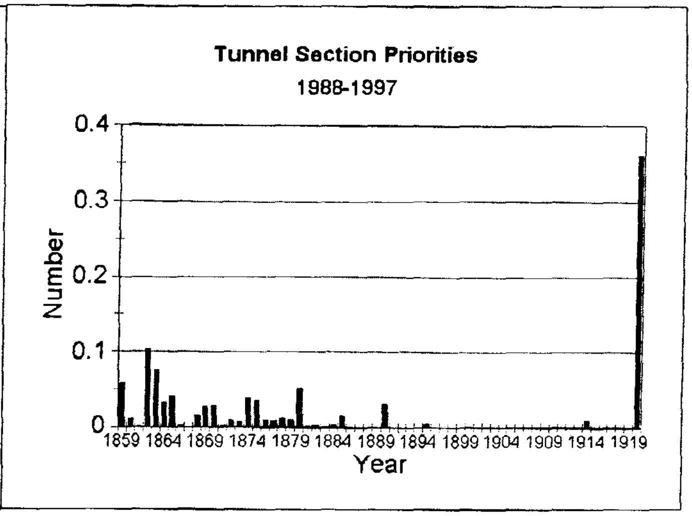

Figure 2b: Frequency of priority dates for the Tunnel Section, 1988-97.

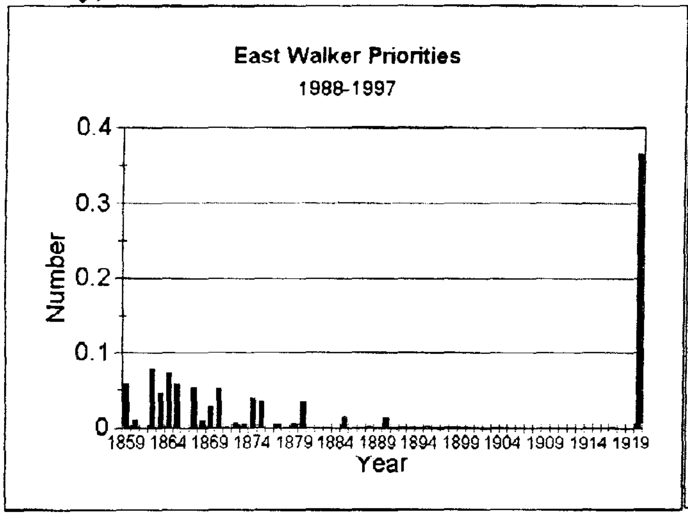

Figure 2c: Frequency of priority dates for the East Walker River, 1988-97

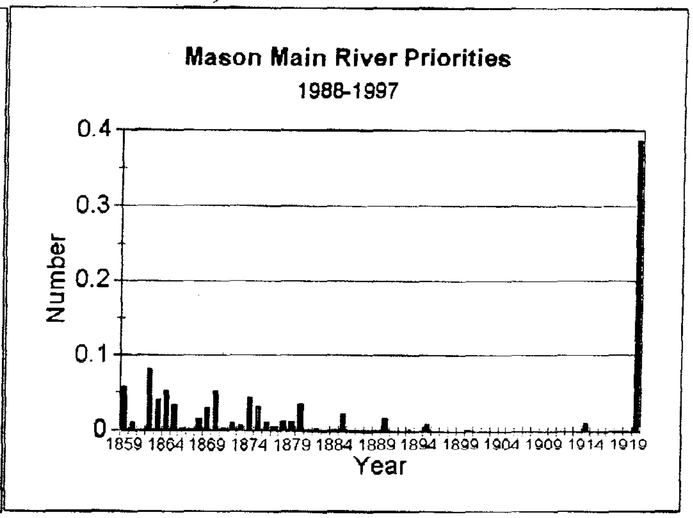

Figure 2d: Frequency of priority dates for Mason Valley, 1988-97.

natural river flows and the demand on the system. Early in the season when few irrigators need their water rights, low river flows may serve all of the demand resulting in a full priority declaration. Later in the year when most irrigators need water, the same low flows will serve a low priority. There is little correlation between river flows and priority served.

Water rights served for Smith Valley, the Tunnel Section, East Walker River, and the Mason Valley Main River from 1988 to 1997 were analyzed. Figure 2 shows the frequency that each year was the priority for each area. The shape is bimodal and similar among the four areas.

Full water rights (1920 priority) are served between 35 and 40% of the days and a priority earlier than 1865 are served for up to 40% of the days. During normal to dry years, by late July the priority usually drops below 1865. On approximately 6% of the days, only the 1859 priority, flow for the Walker Lake Paiute reservation, was provided. This corresponds only to the dry part of very dry years.

Not shown in Figure 2 is the annual variation. Most of the 1920 priorities occurred in 1995 and 1996. Most of the 1859 priorities occurred during August and September of 1992 and 1994 which were very dry years. Even in dry years, the March 1 priority is usually 1920. In 1992, it was 1920 for several days before dropping rapidly to the low 1860s (Figure 3). It rose briefly to 1890 in late April during the peak of the brief snowmelt before dropping back to 1862 and then 1859 in August. In contrast, the priority was 1920 until early August during 1995 (Figure 3). Even in 1995, the priority dropped to 1875 in September.

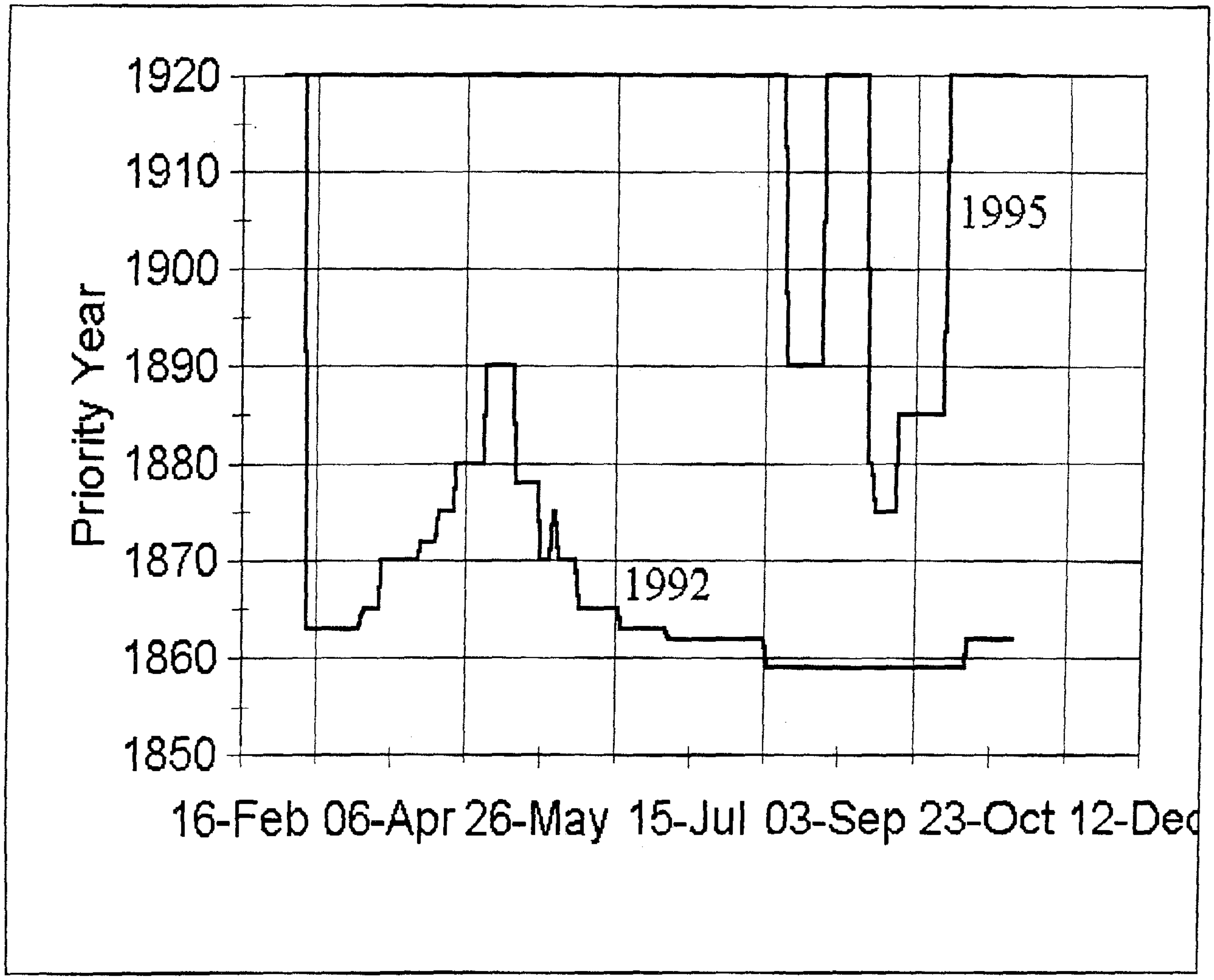

Figure 3: Priority years for Smith Valley for the dry 1992 and the wet 1995.

Method of Comparison: The expected value for water right in a region or on a canal is a function of the priority of rights and the distribution of priorities chosen on the system. It therefore provides a method of comparing the value of water rights among canals or regions. Expected flow value may be defined as follows (after Dudewicz and Mishra, 1988):

$$E(q) = \int_{-\infty}^{\infty} q_y p_{q_y}(q_y) dq$$

$$E(q) = \sum_{y=y_1}^{y=y_2} q_y f_y$$

Here, y_1 and y_2 are the beginning and ending priority years and f_y is the frequency distribution of those priority years (as in Figure 2) with q_y is the flow rate associated with a priority year. For the Walker River system, the beginning and ending years are 1859 and 1920, respectively. These equations will calculate the expected flow rate for individual canals, sections of rivers, or for the entire basin.

Smith Valley: Pahl (1999) identified a total of 154.5137 cfs for use on 11,560.25 acres (Pahl, 1999, Table 3). This is about 9.81 and 10.43% of the total natural flow diversion rights in cfs and acres for the entire Walker River basin (Figures 3 and 4 in Pahl, 1999). He also identified 40.0297 cfs and 3544.97 acres of rights north of the West Walker River in Smith Valley (Pahl, 1999, Table 3).

For Smith Valley, the expected diversion rate is 68.34 cfs which is 54.9% of the total decree value of 124.41 cfs for the valley (Table 1). The difference between the decree value used here for the valley and Pahl's report is that he included Desert Creek while this analysis does not. Almost 46.56 cfs of the expected value comes from the time that 1920 is the priority on the West Walker River. This means that full priority rights were declared 46.56/124.41 or 37.4% of the time.

Table 1: Decree Flow Rates and Expected Values for All Combined Canals in the Smith Valley

Priority Year	Area (acres)	Flow (cfs)	Cumulative Flow	Proportions	Expected Value for Year
1859			0	0.05796	0.00000
1860			0	0.01061	0.00000
1861	5	0.08	0.08	0.00122	0.00010
1862	13.12	0.16	0.24	0.12204	0.02929
1863	1409.22	18.71	18.95	0.07469	1.41545
1864	927.63	11.62	30.57	0.01265	0.38680
1865	260	4.16	34.73	0.03959	1.37502
1866	159	2.54	37.27	0.00286	0.10649
1867			37.27	0.00041	0.01521
1868	155.53	1.81	39.08	0.01429	0.55829
1869	30.83	0.37	39.45	0.02612	1.03053
1870	150.01	2.4	41.85	0.02776	1.16155
1871			41.85	0.00245	0.10249
1872			41.85	0.01020	0.42704
1873			41.85	0.00694	0.29039
1874			41.85	0.03551	1.48610
1875	139.99	2.24	44.09	0.03388	1.49366
1876			44.09	0.01102	0.48589
1877	600	9.6	53.69	0.00776	0.41637
1878	1079.37	14.44	68.13	0.01224	0.83424
1879			68.13	0.01143	0.77863
1880	385.99	5.95	74.08	0.03918	2.90273
1881			74.08	0.00122	0.09071
1882	56.49	0.91	74.99	0.00245	0.18365
1883	74.81	0.93	75.92	0.00041	0.03099
1884	117.9	1.92	77.84	0.00245	0.19063
1885	259.99	3.52	81.36	0.01551	1.26191
1886			81.36	0.00000	0.00000
1887			81.36	0.00000	0.00000
1888			81.36	0.00000	0.00000
1889			81.36	0.00000	0.00000
1890	1886	22.82	104.18	0.02408	2.50882
1891	80	0.96	105.14	0.00000	0.00000
1892	46.67	0.56	105.7	0.00000	0.00000
1893			105.7	0.00000	0.00000
1894			105.7	0.00000	0.00000
1895	300	3.36	109.06	0.00776	0.84577
1896			109.06	0.00000	0.00000
1897	322.39	3.54	112.6	0.00000	0.00000
1898			112.6	0.00000	0.00000
1899			112.6	0.00000	0.00000
1900	60	0.8	113.4	0.00082	0.09257
1901			113.4	0.00000	0.00000
1902			113.4	0.00000	0.00000

1903			113.4	0.00000	0.00000
1904			113.4	0.00000	0.00000
1905	120	1.43	114.83	0.00000	0.00000
1906			114.83	0.00000	0.00000
1907			114.83	0.00000	0.00000
1908			114.83	0.00000	0.00000
1909	80	1.8	116.63	0.00000	0.00000
1910	0	3.33	119.96	0.00000	0.00000
1911			119.96	0.00000	0.00000
1912	185.1	1.85	121.81	0.00000	0.00000
1913			121.81	0.00000	0.00000
1914	0	2.6	124.41	0.01020	1.26949
1915			124.41	0.00000	0.00000
1916			124.41	0.00000	0.00000
1917			124.41	0.00000	0.00000
1918			124.41	0.00000	0.00000
1919			124.41	0.00000	0.00000
1920			124.41	0.37429	46.56489
Expected Value					68.33570
Proportion					0.54928

Mason Valley: Pahl (1999) identified a total of 562.8164 cfs for use on a total 45,120.54 acres. Of this, the West Walker River provides 49.56 cfs to 3100.5 acres and the East Walker River provides 140.8582 cfs to 10,964.22 acres. Because of the differing priorities in the geographic Mason Valley, the Watermaster divides it into three sections: Tunnel, East Walker and Walker River Mason Valley. That breakdown is followed here in Tables 2 through 4. Figure 1 shows the valley regions.

Table 2: Decree Flow Rates and Expected Values for All Combined Canals on the East Walker River

Priority Year	Area (acres)	Flow (cfs)	Cumulative Flow	Proportions	Expected Value for Year
1859			0	0.05796	0.00000
1860			0	0.01061	0.00000
1861	8	0.13	0.13	0.00000	0.00000
1862	480	7.68	7.81	0.07837	0.61205
1863	80	1.28	9.09	0.04612	0.41925
1864			9.09	0.07347	0.66784
1865	2089.41	26.4	35.49	0.05796	2.05697
1866			35.49	0.00000	0.00000
1867	9	0.14	35.63	0.05388	1.91966
1868			35.63	0.00980	0.34903
1869			35.63	0.02776	0.98891
1870	1650.39	21.21	56.84	0.05184	2.94640
1871	50	0.8	57.64	0.00082	0.04705
1872	0	1.36	59	0.00653	0.38531
1873	10	0.12	59.12	0.00531	0.31370
1874	235	3.76	62.88	0.03837	2.41254
1875	2081.03	27.01	89.89	0.03469	3.11863
1876	78	1.24	91.13	0.00000	0.00000
1877	201	3.22	94.35	0.00367	0.34659
1878			94.35	0.00082	0.07702
1879	113	1.81	96.16	0.00571	0.54949
1880	1643.55	23.04	119.2	0.03469	4.13551
1881	100	1.6	120.8	0.00000	0.00000
1882			120.8	0.00000	0.00000
1883	150	2.4	123.2	0.00082	0.10057
1884			123.2	0.00041	0.05029
1885	784.84	11.78	134.98	0.01429	1.92829
1886			134.98	0.00000	0.00000
1887	90	1.44	136.42	0.00000	0.00000
1888	53.12	1.92	138.34	0.00286	0.39526
1889	10	0.16	138.5	0.00000	0.00000
1890	572.03	8.93	147.43	0.01388	2.04597
1891	70	1.12	148.55	0.00000	0.00000
1892	148	2.01	150.56	0.00000	0.00000
1893	40	0.64	151.2	0.00000	0.00000
1894	392	6.27	157.47	0.00041	0.06427
1895	609.84	9.1	166.57	0.00204	0.33994
1896	30	0.48	167.05	0.00000	0.00000
1897	250	4	171.05	0.00000	0.00000
1898	30	0.48	171.53	0.00000	0.00000
1899	190	3.04	174.57	0.00000	0.00000
1900	97.31	1.51	176.08	0.00000	0.00000
1901	25	0.4	176.48	0.00000	0.00000
1902	115	1.8	178.28	0.00000	0.00000

1903	90	1.44	179.72	0.00000	0.00000
1904	80	1.24	180.96	0.00000	0.00000
1905	40.31	0.6	181.56	0.00000	0.00000
1906	45	0.72	182.28	0.00000	0.00000
1907	20	0.32	182.6	0.00000	0.00000
1908			182.6	0.00000	0.00000
1909			182.6	0.00000	0.00000
1910			182.6	0.00000	0.00000
1911	0	4.37	186.97	0.00000	0.00000
1912			186.97	0.00000	0.00000
1913	0	0.8	187.77	0.00000	0.00000
1914			187.77	0.00000	0.00000
1915	0	1.91	189.68	0.00000	0.00000
1916	0	0.47	190.15	0.00000	0.00000
1917	0	1	191.15	0.00163	0.31208
1918			191.15	0.00000	0.00000
1919			191.15	0.00000	0.00000
1920			191.15	0.36531	69.82827
	12760.83			ACRES	96.41087
				Exp Prop	0.50437

For the East Walker River, the expected diversion rate is 96.41 cfs which is 50.9% of the total decree value of 191.15 cfs for the valley (Table 2). Almost 69.83 cfs of the expected value depends on the time that 1920 is the priority. For the main Walker River in Mason Valley, the expected diversion rate is 151.43 cfs which is 56.2% of the total decree value of 269.49 cfs for the valley (Table 3). Almost 104.39 cfs of the expected value depends on the time that 1920 is the priority. For the Tunnel Section, the expected diversion rate is 29.19 cfs which is 57.9% of the total decree value of 50.37 cfs for the section (Table 4). Almost 18.17 cfs of the expected value depends on the time that 1920 is the priority.

Table 3: Decree Flow Rates and Expected Values for All Combined Canals on the Walker River in Mason Valley

Priority Year	Area (acres)	Flow (cfs)	Cumulative Flow	Proportions	Expected Value for Year
1859			0	0.05796	0.00000
1860			0	0.01061	0.00000
1861			0	0.00000	0.00000
1862	100	1.2	1.2	0.08204	0.09845
1863	404.17	2.85	4.05	0.04163	0.16861
1864	672.3	7.98	12.03	0.05224	0.62851
1865	416.92	4.96	16.99	0.03429	0.58251
1866			16.99	0.00286	0.04854
1867			16.99	0.00122	0.02080
1868	758	9.6	26.59	0.01551	0.41242
1869	580	6.96	33.55	0.03020	1.01335
1870	2341.77	28.19	61.74	0.05143	3.17520
1871			61.74	0.00245	0.15120
1872	1603.17	17.88	79.62	0.01020	0.81245
1873	725.83	9.86	89.48	0.00694	0.62088
1874	2157.39	33.6	123.08	0.04449	5.47580
1875	2288.69	27.09	150.17	0.03143	4.71963
1876			150.17	0.01061	1.59364
1877	584.29	7.03	157.2	0.00571	0.89829
1878	231.43	3.95	161.15	0.01224	1.97327
1879	1211.58	13.89	175.04	0.01061	1.85757
1880	2677.14	40.6	215.64	0.03429	7.39337
1881	40	0.48	216.12	0.00163	0.35285
1882	45.84	1.88	218	0.00204	0.44490
1883	30	0.36	218.36	0.00041	0.08913
1884	40	0.48	218.84	0.00122	0.26797
1885	1177.35	15.29	234.13	0.02204	5.16042
1886			234.13	0.00000	0.00000
1887	69.4	0.81	234.94	0.00000	0.00000
1888	80	0.96	235.9	0.00000	0.00000
1889	50	0.6	236.5	0.00000	0.00000
1890	384.08	4.38	240.88	0.01714	4.12937
1891			240.88	0.00000	0.00000
1892	60	1.06	241.94	0.00000	0.00000
1893	15	0.18	242.12	0.00000	0.00000
1894	15	0.18	242.3	0.00000	0.00000
1895	273.59	3.08	245.38	0.00816	2.00310
1896	91.43	1.1	246.48	0.00000	0.00000
1897	87.5	0.09	246.57	0.00000	0.00000
1898	105.02	1.26	247.83	0.00000	0.00000
1899	0	0.14	247.97	0.00000	0.00000
1900	915.23	10.66	258.63	0.00082	0.21113
1901	15	0.18	258.81	0.00000	0.00000
1902	0	0.11	258.92	0.00000	0.00000

1903			258.92	0.00000	0.00000
1904	76.57	0.91	259.83	0.00000	0.00000
1905	761.64	8.75	268.58	0.00000	0.00000
1906	13.19	0.16	268.74	0.00000	0.00000
1907			268.74	0.00000	0.00000
1908			268.74	0.00000	0.00000
1909			268.74	0.00000	0.00000
1910			268.74	0.00000	0.00000
1911			268.74	0.00000	0.00000
1912			268.74	0.00000	0.00000
1913			268.74	0.00000	0.00000
1914			268.74	0.01020	2.74224
1915			268.74	0.00000	0.00000
1916	0	0.75	269.49	0.00000	0.00000
1917			269.49	0.00000	0.00000
1918			269.49	0.00000	0.00000
1919			269.49	0.00000	0.00000
1920			269.49	0.38735	104.38613
	21098.52				151.43171
					0.56192

Table 4: Decree Flow Rates and Expected Values for All Combined Canals on the Tunnel Section

Priority Year	Area (acres)	Flow (cfs)	Cumulative Flow	Proportions	Expected Value for Year
1859			00.05796	0.00000	
1860			0	0.01061	0.00000
1861	100	1.45	1.45	0.00122	0.00178
1862	60	0.95	2.4	0.10245	0.24588
1863	60	2.95	5.35	0.07469	0.39961
1864	75	1.19	6.54	0.03224	0.21088
1865			6.54	0.03959	0.25893
1866			6.54	0.00286	0.01869
1867			6.54	0.00041	0.00267
1868	460	7.36	13.9	0.01469	0.20424
1869	124.99	1.99	15.89	0.02612	0.41509
1870	40	0.64	16.53	0.02735	0.45204
1871			16.53	0.00245	0.04048
1872	640.53	10.23	26.76	0.00980	0.26214
1873			26.76	0.00694	0.18568
1874			26.76	0.03837	1.02671
1875	30.01	0.43	27.19	0.03469	0.94333
1876			27.19	0.01020	0.27745
1877	470.5	7.55	34.74	0.00776	0.26941
1878			34.74	0.01184	0.41121
1879	179.99	2.89	37.63	0.00939	0.35326
1880			37.63	0.05143	1.93526

1881			37.63	0.00122	0.04608
1882	130	2.08	39.71	0.00245	0.09725
1883	173	2.77	42.48	0.00041	0.01734
1884			42.48	0.00245	0.10403
1885	150	2.4	44.88	0.01551	0.69610
1886			44.88	0.00000	0.00000
1887			44.88	0.00000	0.00000
1888	50	0.8	45.68	0.00000	0.00000
1889			45.68	0.00000	0.00000
1890	129.99	2.1	47.78	0.02980	1.42365
1891			47.78	0.00000	0.00000
1892			47.78	0.00000	0.00000
1893			47.78	0.00000	0.00000
1894	32	0.51	48.29	0.00000	0.00000
1895			48.29	0.00327	0.15768
1896			48.29	0.00000	0.00000
1897			48.29	0.00000	0.00000
1898			48.29	0.00000	0.00000
1899	10	0.16	48.45	0.00000	0.00000
1900	93	1.49	49.94	0.00082	0.04077
1901			49.94	0.00000	0.00000
1902			49.94	0.00000	0.00000
1903	30.01	0.43	50.37	0.00000	0.00000
1904			50.37	0.00000	0.00000
1905			50.37	0.00000	0.00000
1906			50.37	0.00000	0.00000
1907			50.37	0.00000	0.00000
1908			50.37	0.00000	0.00000
1909			50.37	0.00000	0.00000
1910			50.37	0.00000	0.00000
1911			50.37	0.00000	0.00000
1912			50.37	0.00000	0.00000
1913			50.37	0.00000	0.00000
1914			50.37	0.01020	0.51398
1915			50.37	0.00000	0.00000
1916			50.37	0.00000	0.00000
1917			50.37	0.00000	0.00000
1918			50.37	0.00000	0.00000
1919			50.37	0.00000	0.00000
1920			50.37	0.36082	18.17432
					29.18593
					0.57943

Similar calculations have been completed for each canal (Table 5). Significant variation occurs for small canals. The larger canals all have expected proportions ranging from about 0.4 to about 0.62. The Colony Ditch in Smith Valley has the lowest value of the large canals at 0.4. The low expected value on the Colony Ditch is primarily due to the fact that 1890 is the highest priority (earliest) right on the canal. The highest expected value, as a proportion of the total flow decreed to the canal, occurs in the Mcleod Canal in the lower Mason Valley. However, its' total flow rights are only 5.8 cfs. The Burbank Canal and Gage Peterson in Smith Valley have high expected values of 0.72 and 0.68 of the total flow rights of 4.5 and 14.6 cfs, respectively. The West Side Canal has the highest expected proportion in the Tunnel Section at 0.66 but total rights are only about 4 cfs.

Table 5: Total Irrigated Acreage, Flow Rights, Expected Flow and Proportion by Canal.

Canal	Section	ACRES	Total Flow Rights	Expected Flow	Expected Proportion
EAST WALKER	EAST WALKER	2772	45.83	23.99444	0.5236
BAKER SNYDER	LOWER EAST WALKER	291.5	2.92	1.07420	0.3679
FOX	LOWER EAST WALKER	2885	39.16	21.32604	0.5446
GREENWOOD	LOWER EAST WALKER	2158	27.43	13.83705	0.5044
HALL	LOWER EAST WALKER	1587	24.07	10.29400	0.4277
HIGH	LOWER EAST WALKER		6.28		
HILBUN	LOWER EAST WALKER	420	7.6	3.04580	0.4008
MICKEY	LOWER EAST WALKER	1592	19.2	10.61701	0.5530
NELSON	LOWER EAST WALKER	105	1.68	0.65322	0.3888
UPPER EAST WALKER	UPPER EAST WALKER	950	15.24	8.53804	0.5602
	East Walker Total	12760	189.41		
CAMPBELL	MASON	4889	63.14	35.30756	0.5592
JOGGLES	MASON	4856	57.53	33.02708	0.5741
MCLEOD	MASON	650	5.8	4.52780	0.7807
NICHOL MERRITT	MASON	4413	55.15	32.10798	0.5822
RIVER PUMP	MASON	0	0.75		
SAB	MASON	2584	36.7	18.70402	0.5096
SPRAGG	MASON	995	12.38	7.24750	0.5854
WEST HYLAND	MASON	2614	36.9	19.42416	0.5264
	Mason Total	21001	268.25		
BURBANK	SMITH	376	4.49	3.24647	0.7230
COLONY	SMITH	2565	36.93	14.94938	0.4048
GAGE PETERSON	SMITH	918	14.6	9.90483	0.6784
LOWER FULSTONE	SMITH	315	5.05	2.97158	0.5884
PLYMOUTH	SMITH	1736	21.26	12.24939	0.5762
RIVER SIMPSON	SMITH	871	12.55	7.51398	0.5987
SARONI	SMITH	751	11.47	5.71167	0.4980
UPPER FULSTONE	SMITH	235	3.75	2.20661	0.5884
WEST WALKER	SMITH	1138	14.31	9.58180	0.6696
	Smith Total	8905	124.41		
D&GW	TUNNEL SECTION	541	8.62	5.36790	0.6227
KELLY ALKALI	TUNNEL SECTION	637	10.19	6.12105	0.6007
LEE SANDERS	TUNNEL SECTION	160	2.32	1.47456	0.6356
TUNNEL	TUNNEL SECTION	1542	26.7	14.10386	0.5282
WEST SIDE CANAL	TUNNEL SECTION	254	4.06	2.68602	0.6616
	Tunnel Section Total	3134	51.89		

Actual Diversions

Diversions by Region: Canal diversion records were obtained from the Nevada Division of Water Planning in Spring, 2000. These records include decree (natural) flow, storage and flood diversions by canal for each of the four regions. Decree flow shows substantial variation from year to year which mostly parallels the inflows to the different regions (Figure 4). This is expected because, as explained, the decree diversions depend on the declared priority year.

Mason Valley has had the highest diversion flow rate since 1931, but its' diversion rate per area is the smallest (Table 6). Graphically, the distribution of this region's diversions are the most normal (Figure 5). A normal distribution suggests that the call on water depends on water availability and that irrigation conditions in the region are relatively constant through the time period.

Table 6: Diversions of Decree Water by Region (1931-95)

Region	Average Diversion (af/y)	Decree Area (ac)	Total Diversion (afa/ac)	Expected Diversion (afa/ac)
East Walker	40,023	12,670	3.16	2.02
Mason Valley	55,076	21,001	2.62	2.25
Smith Valley	30,765	8905	3.45	2.20
Tunnel Section	12,663	3134	4.04	2.32

The Tunnel section has the lowest average diversion, but the highest per irrigated area (Table 6). Its diversions cluster around the mean (Figure 5). Smith Valley has the most skewed diversion distribution, averaging just 30,765 af/y, but having diversions during 1983, 1984 and 1986 exceed 80,000, respectively. Based on the decree area in Table 6, these diversions substantially exceeded 4 feet/year. It is possible that these diversions were improperly labeled and were actually flood diversions. The East Walker also had very high diversions during these years.

Decree diversions for all regions far exceed the expected diversion rate. This suggests that diversions have exceeded the allowable amount based on the specified priority. However, the years of calculation for total diversions were 1931 through 1995 while for the expected value were 1988 through 1997. The years for calculating expected value were drier than the longer time period. But the actual diversions vary more than the expected diversions which suggests that diverters do not always make a call when water is available. The low diversion rate for Mason Valley suggests that irrigators substitute storage water or groundwater for their allowable natural flow diversions.

Diversions by Canal: The distribution of diversions on a canal reflects the certainty that water is available on that canal. The coefficient of variation (CV, standard deviation/mean) represents the variability of annual diversions. As the CV approaches 1.0, the distribution becomes exponential. An exponential distribution has a low mean value and a long tail to the right. It occurs on canals that have several very high values that exceed most year's diversions by several times. The mean, range and area served by each canal also allows a comparison of whether the irrigators on a canal use more than allotted. Low minimums indicate canals on which a substantial portion of flow diverted may increase the transmission loss for other diverters in the canal. Table 7 summarizes these statistics.

Many canals in the diversion database have names that are no longer in use. The only canals reported that are not presently operating are those with names similar to the current names. The Campbell and the Con. Campbell and the Nichol Merritt and Con. Nichol Merritt along the Main River in Mason Valley appear to be the same or at least serve the same land. There are no substantial differences in their statistics. The Hall and Hall-Daniels along the East Walker also have similar statistics. However, the Fox-Mickey, which operated between 1950

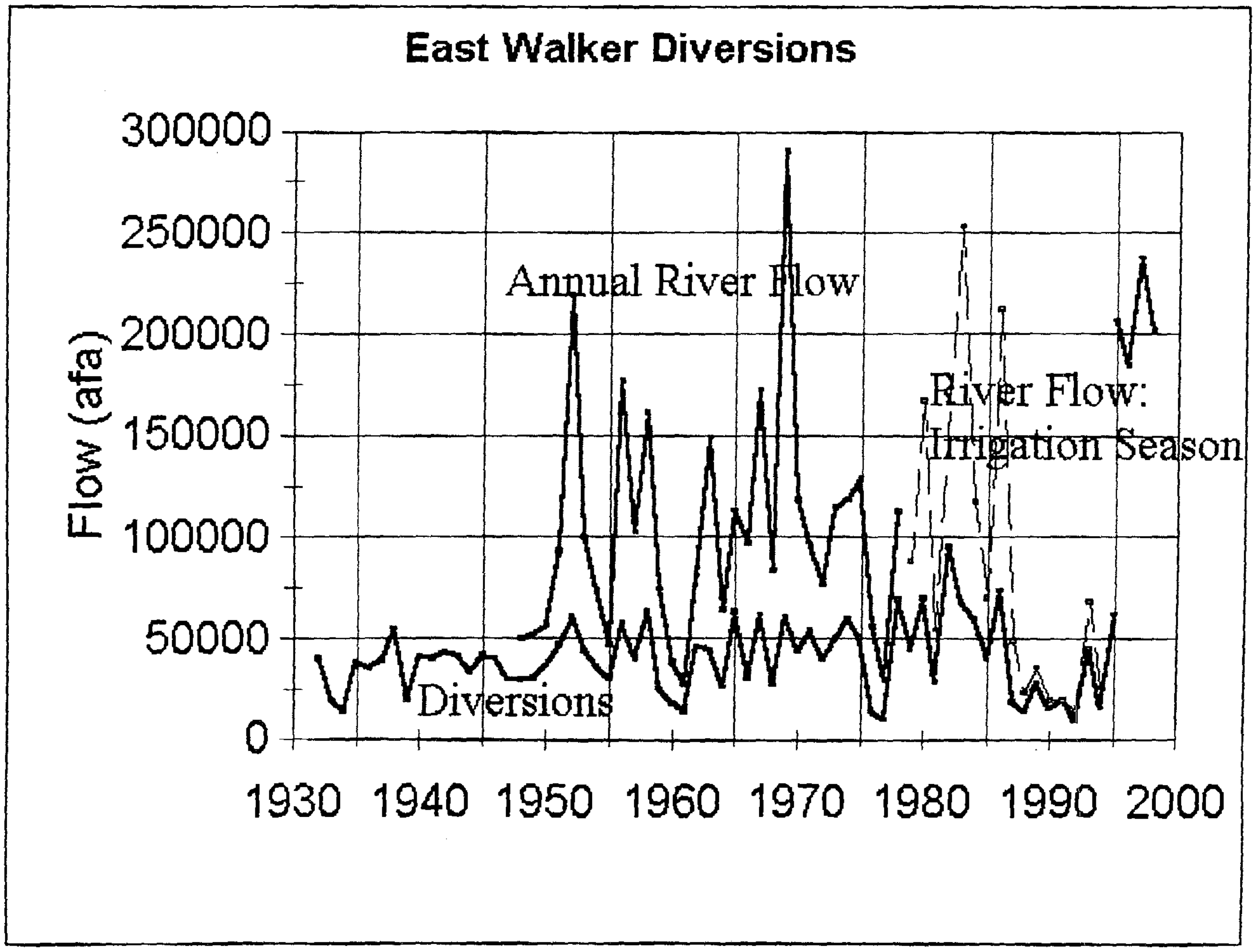

Figure 4a: Annual diversions from all canals in the East Walker region and annual or irrigation season flows at the East Walker above Strosnider Ditch gage.

and 1975, appears to have been a combination of the current Fox and Mickey canals.

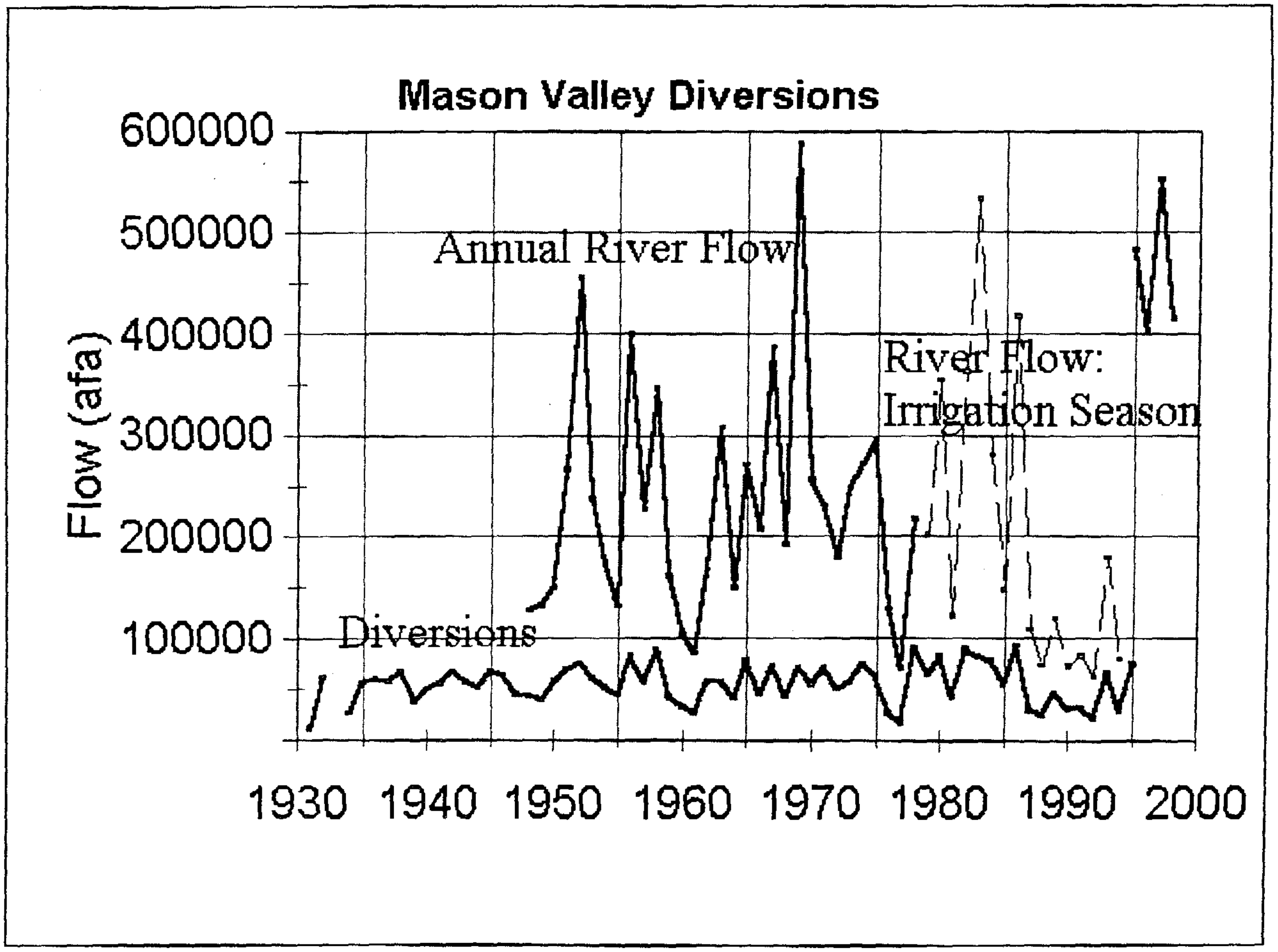

Figure 4b: Annual diversions from all canals in the Main Walker River in Mason Valley region and the sum of annual or irrigation season flows at the East Walker above Strosnider Ditch gage and West Walker at Hudson Canyon gage.

Comparison of the average diversion and minimum and maximum diversions to the volume column in Table 7 allows an assessment of the amount and time that individual canals receive their allotment. Comparison of actual to expected diversions above can help further determine the value of water rights from a region. If a water rights transfer increases the call from water rights on a specific canal, the priority date for a certain valley may change. That could affect the amount of time that others in the valley receive their water rights.

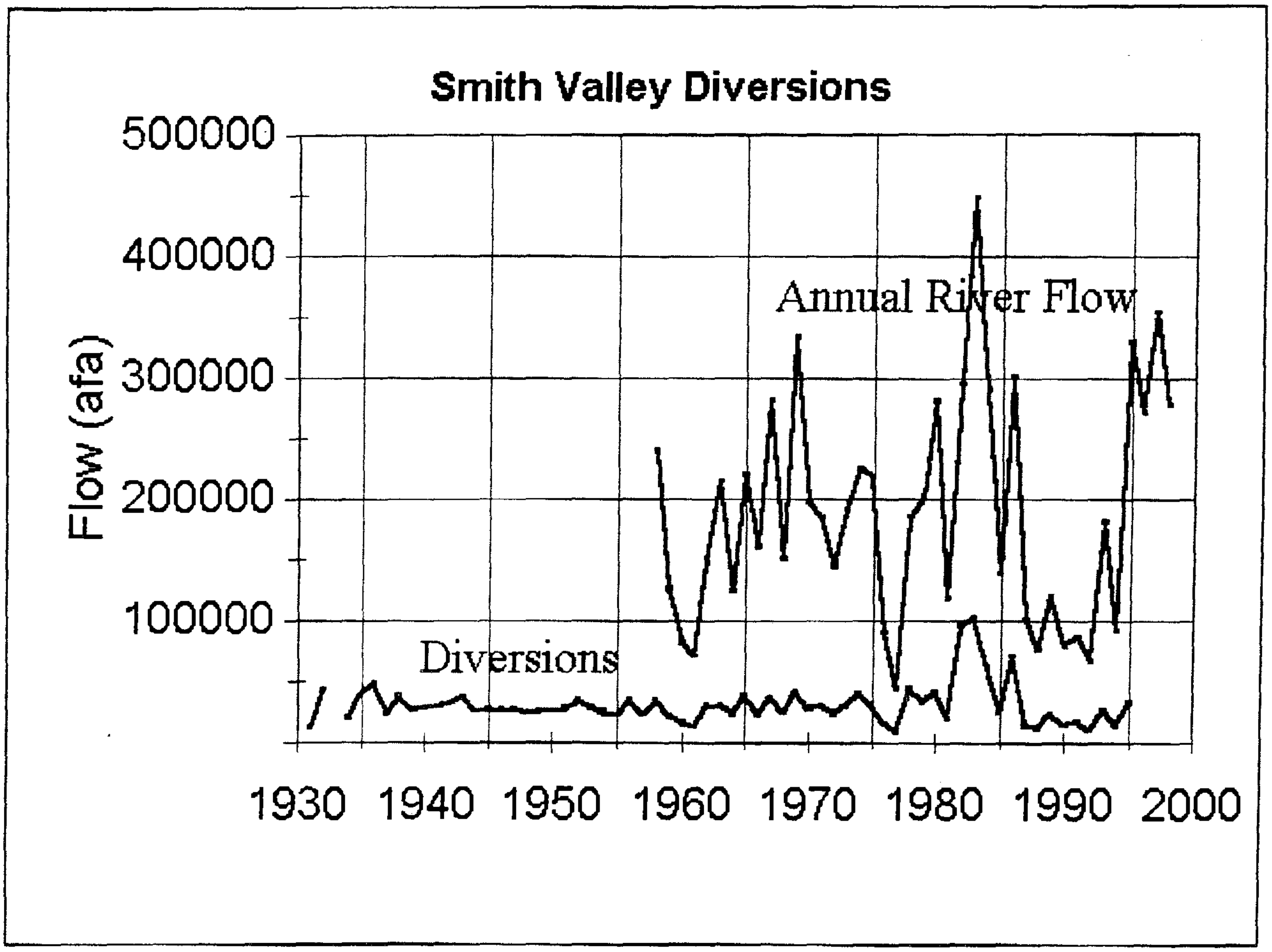

Figure 4c: Annual diversions from all canals in Smith Valley and annual flows at the West Walker at Hoye Canyon gage.

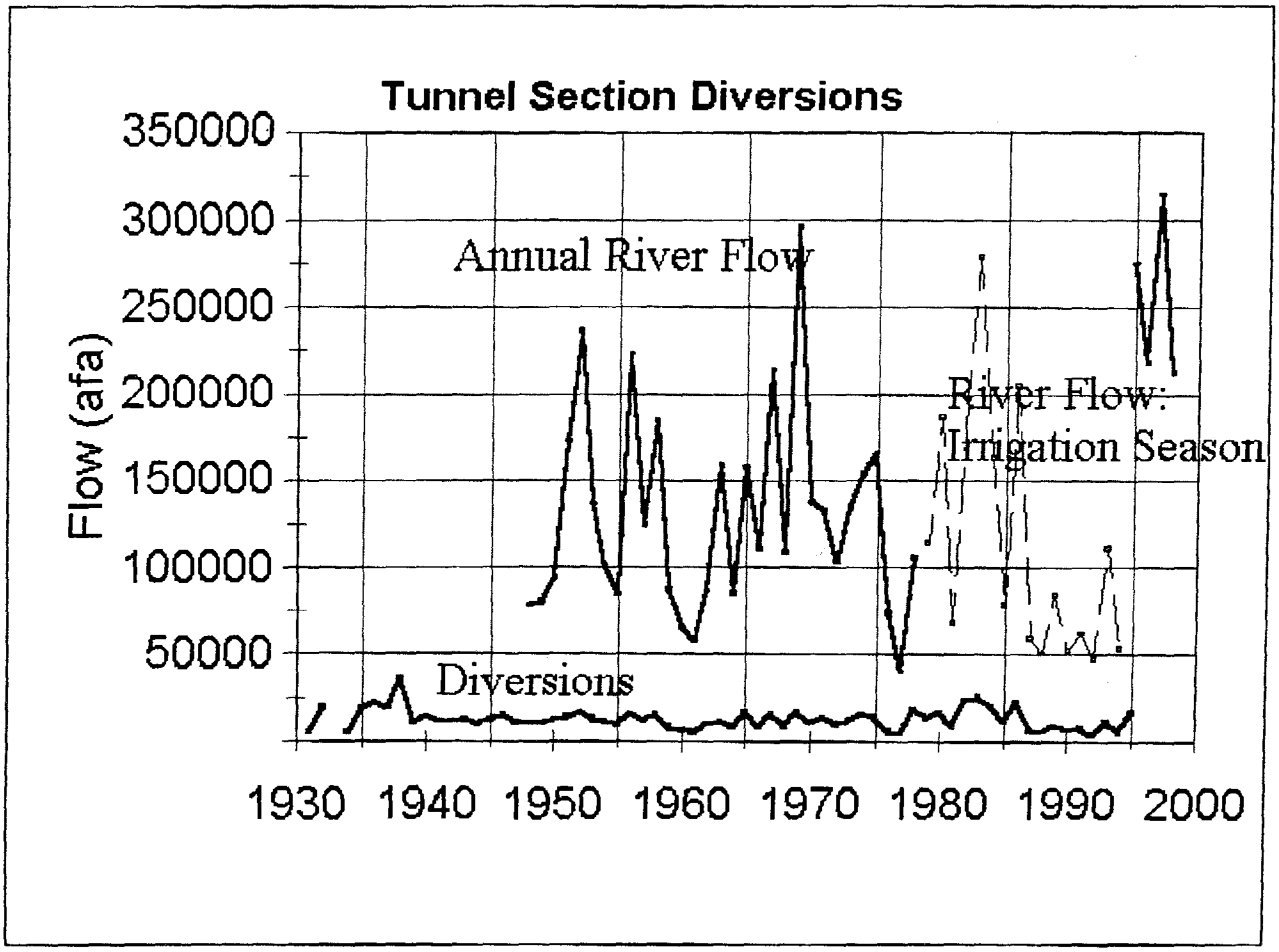

Figure 4d: Annual diversions from all canals in the Tunnel section and annual or irrigation season flows at the West Walker at Hudson gage.

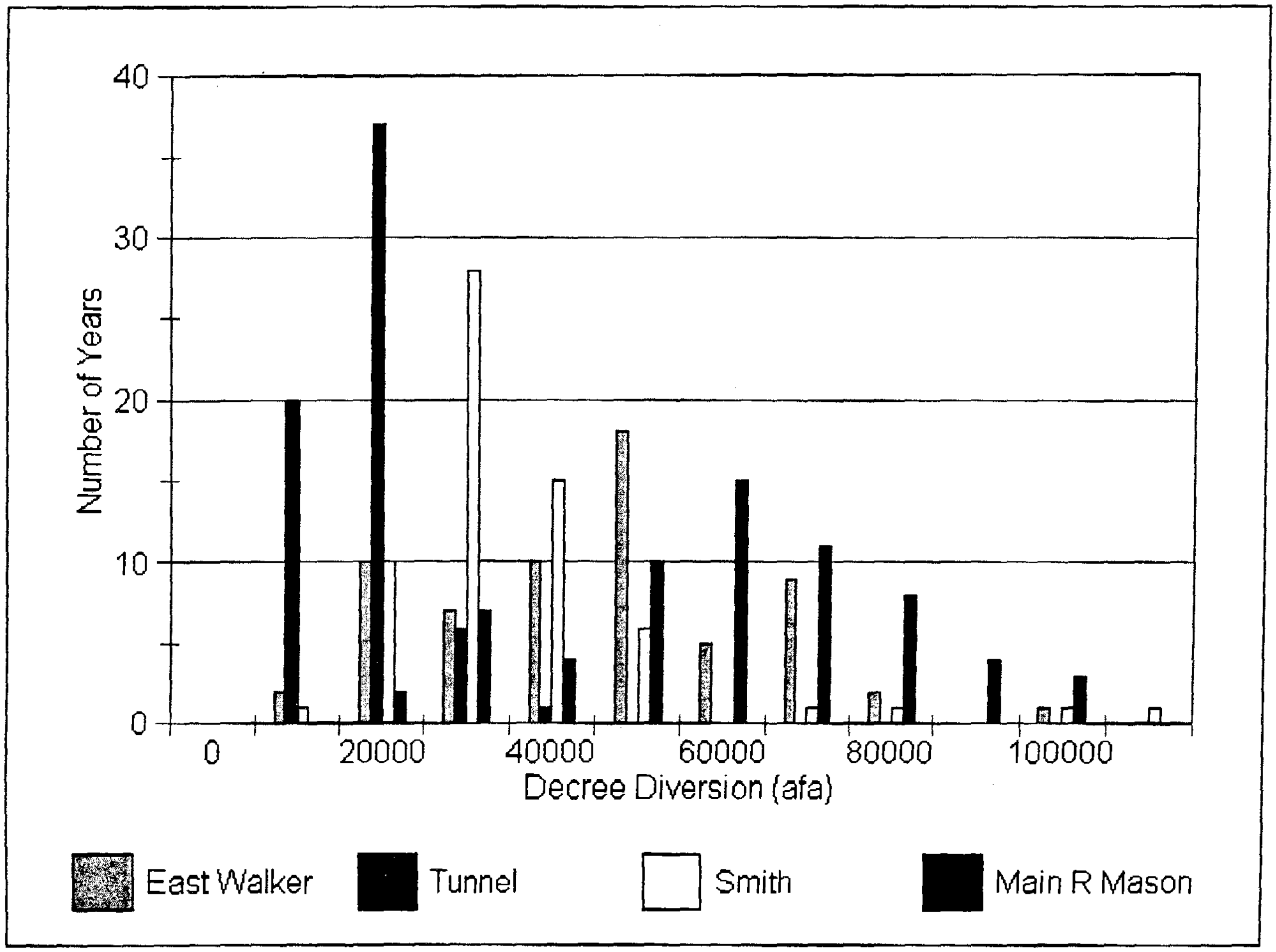

Figure 5: Frequency distribution for annual decree diversions for the four regions.

Table 7: Descriptive Statistics (af/year) for Currently Operating Canals

Canal	Years	Avg	Std. Dev	CV(%)	Min	Max	Area (acres)	Permitted Volume (af)
Mason Valley, Main River								
Campbell	64-95	14,019	6250	44.6	3619	26,938	4889.32	19,557.28
Con. Campbell	31-63	12,664	4209	33.2	2168	20,566		
Dairy	31-95	397	363	91.4	12	2190		
Joggles	31-95	9611	4278	44.5	596	21,518	4858.36	19,433.33
McLeod	31-95	1583	442	27.9	300	2600	650	2600
Nichol Merritt	78-95	11,667	4710	40.4	4750	18,214	4412.51	17,650.04
Con. Nichol Merritt	31-77	11,914	3769	31.6	2279	19,827		
River Pumps	31-34, 44,47-95	70	142	202	0	726		
SAB	31-34, 36-95	6359	2717	42.7	1333	12,741	2584.23	10,336.92
Sciarani	88-95	959	572	59.6	388	2030		
Spragg	82-95	3638	2091	57.5	1401	7009	995.06	3980.24
West Hyland	31-95	8153	3885	47.8	1703	17,317	2614.04	10,456.16
Smith Valley								
Burbank	31-95	1188	400	33.7	78	3164	376.14	1504.56
Colony	31-95	7865	8014	102	76	44,977	2565.1	10,260.4
Gage Peters	31-95	3698	884	23.9	1408	5594	918	3672
Lower Fullstone	31-95	404	346	85.6	0	1285	314.99	1259.96
Plymouth	31-95	5969	1922	32.1	1767	10,242	1735.57	6942.28
River Simpson	31-95	2951	1008	34.2	1003	7463	870.76	3483.04
Saroni	31-95	3845	5141	134	232	29,228	751	3004
Upper Fulstone	90-95	752	440	58.5	391	1562	235	940

West Walker	31-95	3136	1033	32.9	922	6594	1138.48	4553.92
East Walker in Mason Valley								
Baker Snyder	31-50, 75-95	971	755	77.8	0	2683	291.5	1166
East Walker	89-95	5486	2785	50.8	2831	10,930	2772	11,088
Fox	31-50, 76-95	8850	3811	43.0	2156	16,768	2885.39	11541.56
Fox-Mickey	51-75	14,993	4943	33.0	4064	21,499		
Greenwood	31-50, 75-95	5578	2880	51.6	1035	10,923	2157.83	8631.32
Hall	82-95	4763	4801	101	204	13,849	1586.73	6346.92
Hall Daniels	31-50, 75-81	3065	2274	74.2	214	9434		
High	31-95	1188	1365	115	0	7201		
Hilbun	31-95	757	599	79.1	0	2675	420	1680
Howard	75-95	261	200	76.6	22	611		
Mickey	31-50, 76-95	4568	1989	43.5	1036	10,604	1592.38	6369.52
Nelson	31-50, 75-96	470	589	125	0	2988	105	420
Upper E. Walker	89-95	3351	1823	54.4	1604	6647	950	3800
Tunnel Section								
D&GW	31-95	2152	1265	58.8	703	6578	541.41	2165.64
Kelly Alkali	31-95	1829	881	48.2	24	4910	636.51	2546.04
Lee Sanders	31-95	1057	509	48.2	72	1983	159.6	638.4
Tunnel	31-95	6369	3097	48.6	1544	15,980	1542.5	6170
West Side	31-95	1375	1254	91.2	16	7410	254	1016

The total water rights for Campbell and Joggles Canal serve approximately 4850 acres. At a duty of four feet per year and dependent on adequate priorities, about 19,500 af/year could be diverted. However, the average diversion on the Joggles Canal is only about 68.6% of that on the Campbell Canal. The lowest priority diversion for each canal is 1905 and the total diversion rate is 63.14 and 57.53 cfs for the Campbell and Joggles Canals, respectively (Figure 6). Even though the Joggles Canal has more high priority rights, as represented by the cumulative diversion of up to 9 cfs, the dominance of the Campbell Canal in 1870 to 1890 rights probably leads to the higher average diversion for that canal. This conclusion ignores annual changes in cropping plans of the irrigators.

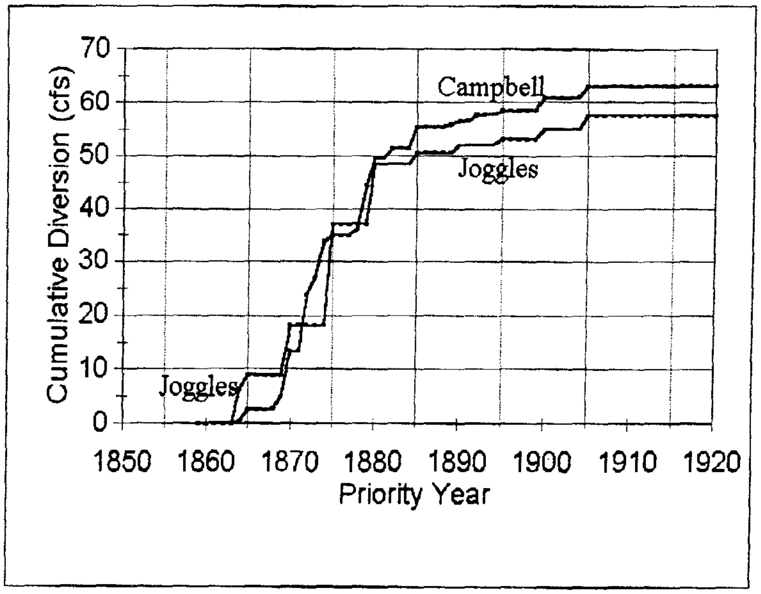

Figure 6: Water rights distribution for the Joggles and Campbell canals.

The water rights curve for the Joggles Canal also illustrates the sensitivity of flows on that canal to slight changes in priority (Figure 6). Approximately 18 cfs have an 1874 priority date. (See the listing in Appendix 1 for all other canals.) As the priority allowed to be diverted changes from 1874 to 1873, approximately one third of the rights on that canal will no longer be able to be diverted.

Based on the diversion record, the Tunnel Section canals divert an amount closest to their average, however there are also years during which the observed diversions substantially exceed the allowable. The cv values, however, suggest diversions that essentially follow a normal distribution. This region also has the highest diversion per area ratio (Table 6).

Table 7 shows which canals have average diversions closest to the allowable diversions, but these averages are all skewed by years in which diversions exceeded the allowable diversion. On all canals, the maximum diversion exceeds the allowable. For example, in 1983 on the Colony Ditch, diversions equaled 44,977 acre-feet which exceeded the apparent allowable diversion by four times. During the same year, the Saroni Ditch diverted 29,228 af when its apparent allowable diversion is 3004 af/y. The allowable diversion rate is based strictly on the C-125 natural flow rights and does not include any information regarding storage or flood diversions.

The tabulation in Appendix 1 provides the data for the preparation of curves similar to Figure 6 for each canal. Because of the dependence of priority years on the call on the river, all water rights purchased should be analyzed to determine the actual call on that water right. Rights that are not often used but are purchased and used every year in the future will change the priorities on the river and affect all other irrigators.

Storage Rights

Storage rights are rights to water stored in Topaz and Bridgeport Reservoirs. Topaz Reservoir, located offstream from the West Walker River, has a usable storage capacity of about 60,000 af and a dead storage of about 65,000 af. Bridgeport Reservoir, located on the East Walker River, has a storage capacity of 44,000 af. Both supplement decreed natural flow rights. Small reservoirs on tributaries upstream from these facilities serve Bridgeport or Antelope Valleys. Weber Reservoir, downstream from Mason Valley, serves the Walker River Indian Reservation.

Storage rights may be diverted at any time there is water available. Lower priority rights holders have rights to store more water because their natural flow rights are less firm. The total amount available for storage is based on an average number of days that natural flow rights are not available. There are also "new lands" for which up to 2.0592 af/acre may be stored. New lands are irrigated areas that have no natural flow rights and depend solely on storage water. Presumably, they also use groundwater because storage water alone will not provide enough for a crop. The Water Master provided a table showing the amount of storage capacity allowed for each priority date. Table 8 shows the amount of storage available based on priority year. Table

Table 8: Amount of Storage Capacity Required for Each Priority

	Priority Date	Required Days of Storage	Storage Per Acre, 3.2076 ft.	Storage Per Acre, 4.2768 ft.
	1859-1873	0	0	0
	1874	4	0.095	0.1267
	1875	8	0.1901	0.2534
	1876	9	0.2138	0.2851
	1877	11	0.2614	0.3485
	1878	17	0.4039	0.5386
	1879	22	0.5227	0.697
	1880	25	0.594	0.792
	1881	27	0.6415	0.8554
	1882-83	28	0.6653	0.887
	1884-88	29	0.689	0.9187
	1889-90	30	0.7128	0.9504
	1891-93	31	0.7366	0.9821
	1894-97	32	0.7603	1.0138
	1898-1901	33	0.7841	1.0454
	1902-05	34	0.8078	1.0771
	1906	35	0.8316	1.1088
	Excl.		0.0	0.0
	Newlands	65	1.5444	2.0592
	Source: Walker River Water Master			

Table 9: Area of New Land By Canal

DITCH	VALLEY	ACRES
EAST WALKER	EAST WALKER	4628.29
BAKER SNYDER	LOWER EAST WALKER	107.5
FOX	LOWER EAST WALKER	849.08
GREENWOOD	LOWER EAST WALKER	1060.01
HALL	LOWER EAST WALKER	1994.28
HIGH	LOWER EAST WALKER	971.67
HILBUN	LOWER EAST WALKER	154
MICKEY	LOWER EAST WALKER	775.76
NELSON	LOWER EAST WALKER	174
UPPER EAST WALKER	UPPER EAST WALKER	460.67
	East Walker	11175.26
CAMPBELL	MASON	2783.68
JOGGLES	MASON	477.51
NICHOL MERRITT	MASON	1013.79
RIVER PUMP	MASON	235
SAB	MASON	944.85
SPRAGG	MASON	1227.68
WEST HYLAND	MASON	1230.65
	Mason Valley	7913.16
BURBANK	SMITH	85.02
COLONY	SMITH	4808.52
GAGE PETERSON	SMITH	112
LOWER FULSTONE	SMITH	220
PLYMOUTH	SMITH	2248.38
RIVER SIMPSON	SMITH	381.57
SARONI	SMITH	3106.27
UPPER FULSTONE	SMITH	327.08
WEST WALKER	SMITH	556.75
WEST WALKER PUMPS	SMITH	40
	Smith	11885.59
D&GW	TUNNEL SECTION	829.99
KELLY ALKALI	TUNNEL SECTION	566.42
LEE SANDERS	TUNNEL SECTION	160.46
TUNNEL	TUNNEL SECTION	1816.85
WEST SIDE CANAL	TUNNEL SECTION	152.1
	Tunnel Section	3525.82
TOTAL		34499.83

Source: Nevada Division of Water Planning, personal communication, 2000.

The canal diversion database included storage and flood diversions as well. With the third lowest total area, the storage diversion by area is highest for Smith Valley (Table 10). The Walker River portion of Mason Valley had both the lowest average diversion and diversion by area. This reflects the relative high priority natural flow rights in Mason Valley (Table 3) and the substantial number of groundwater wells in northern Mason Valley.

Table 10: Diversions of Storage Water by Region

Region	Average Diversion (af/y)	Total Area (ac)	Newlands Area (ac)	Diversion by Total Area (afa/ac)
East Walker	22,043	23,935	11,175	0.92
Mason Valley	9975	28,914	7913	0.35
Smith Valley	27,499	20,791	11,886	1.32
Tunnel Section	6426	6659	3525	0.97

Source: Nevada Division of Water Planning, personal communication, 2000

Flood Water Rights: These are rights to divert excess water from the system. Pahl (1999) quoted the "1953 Rules and Regulations" of the federal Water Master as:

> If at any time the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all of the vested users including the rights of the Walker River Irrigation District and others similarly situated to store water, then he shall prorate such excess water to all users in proportion to the rights already established.

The irrigation district controls these flows and the lands to which they are applied. There is no systematic way of analyzing these flows, therefore the impacts of purchasing them is beyond the scope of this analysis. However, historic diversions (Figure 7) can be instructive in understanding the flood rights in Smith and Mason Valleys.

As expected, the flood diversions parallel the river flows at Wabuska. Total flood diversions have not exceeded about 110,000 af/year which suggests there may be an upper limit to the diversions. In 1957, total flood diversions almost equal the Wabuska flows while in 1952 and 1969 the diversions are a much smaller proportion of the Wabuska flows. There are probably two reasons for the upper limit.

First is the capacity of the infrastructure to divert extra water. Canal capacity and the total irrigated area served by canals limits the flow diversions. When flood water is available, all natural flow rights are also available. Irrigators are not limited to applying flood water to the same land that normally receives natural flow rights. The amount of flood water diverted depends on the natural flow diversions as well. If many irrigators call for natural flow, the amount of flood water available is less.

Second is the timing of flood water. During some years, the heaviest flooding occurs during the off-season. The year 1986 is a good example of this; the high flows occurred during late February and March in response to a rain-on-snow flood event. Flows during the irrigation season were normal. Exceptions are 1983 and 1984 which had very high runoff but almost no flood diversions.

The scatter plot of flood diversions to flow at Wabuska shows correlation with significant scatter (Figure 8). This data is inappropriate for linear regression because the flood diversions have a lower threshold of zero which was the recorded value for 23 years since 1945, but the coefficient of determination is low ($R^2 = 0.27$). The statistical analysis utilizes data since 1945 because of breaks in earlier data for the Wabuska gage.

Smith Valley and the Walker River in Mason Valley receives the most and least flood water by area, respectively (Table 11). The difference may be caused by topography. Smith Valley has more relief and does not flood as much as Mason Valley, particularly the northern end, for a flood of similar return interval. Therefore, the irrigators can actually make use of the flood water. The north end of Mason Valley has little relief and most of the fields are only a few feet above the river. They are frequently flooded during high river flow conditions, therefore there is no desire to divert extra flow unto the fields. A potential second reason is that flood diversions upstream in Smith Valley may help to decrease flooding in Yerington.

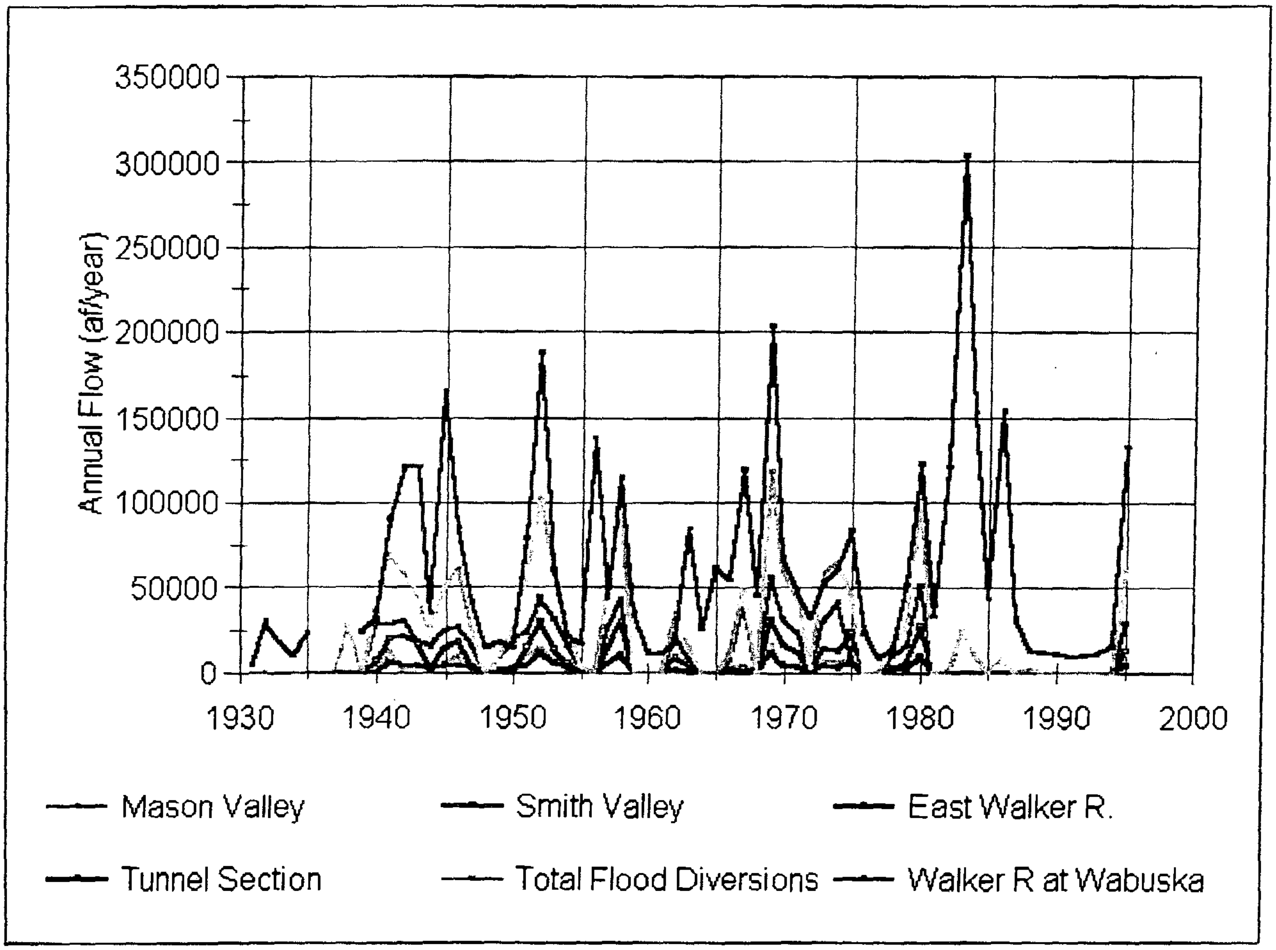

Figure 7: Annual flood diversions by region and flows at the Walker River at Wabuska.

Table 11: Diversions of Flood Water by Region

Region	Average Diversion (af/y)	Total Area (ac)	Diversion by Total Area (afa/ac)
East Walker	7422	23,935	0.31
Mason Valley	3195	28,914	0.11
Smith Valley	13,208	20,791	0.64
Tunnel Section	2339	6659	0.35

Floodwater is variable for all regions, but the Main River portion of Mason Valley is most variable with a CV of 1.44. Smith, East Walker and the Tunnel section have CVs equal to 1.24, 1.33, and 1.42, respectively. This probably reflects the fact that northern Mason Valley has low and many zero flood flow values during high flow years. The years 1983 and 1984 provide an excellent example; only the East Walker River diverted flood flows during those years.

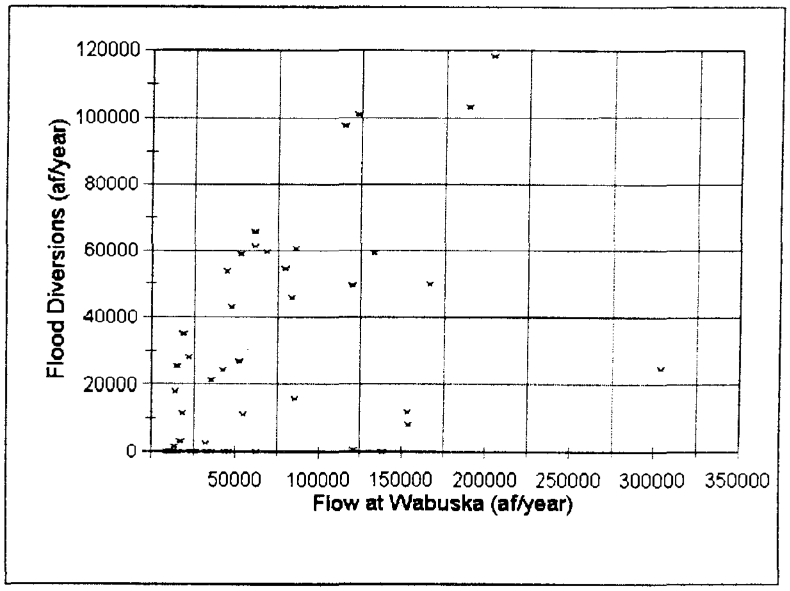

Figure 8: Scatter plot of flood diversions and flows at Wabuska.

Certificated Tailwater Rights

There are rights to water downstream from various ditches administered by the Nevada State Engineer rather than the Water Master. These rights may depend on return flow from fields that do not return to the Walker River. In this study, these rights are referred to as tailwater rights. In the Artesia Basin portion of Smith Valley, several of these rights are used for irrigation; the Honker Gun Club and the Nevada Division of Wildlife hold rights to water for ponds and Artesia Lake, respectively. In the Artesia Basin portion of Smith Valley, there are approximately 70 cfs of rights to tailwater from the canals and irrigated fields. In the entire Smith Valley, there are rights to about 112.8 cfs of tailwater. Mason Valley has 10.129 cfs of tailwater rights.

Table 12 summarizes the tailwater rights, the vast majority of which occur in the Artesia Basin. The total tailwater right is 60.625 cfs plus 6346.68 af/year or 50,160 af/year. These rights would be limited to a total duty of 4 feet/year when used for irrigation. The amount of acreage irrigated with tailwater rights is not known. There does not appear to be a limit or duty that can be determined when the water is used for fish and wildlife. The tailwater rights for the Honker Ranch are all specified to be for irrigation, but they appear to be used to water three ponds used for creating hunting opportunities. The NDOW rights are used for water for the Alkali Lake Wildlife Management Area.

Table 12: Surface Water Rights Administered by the State Engineer Dependent on Tailwater from Irrigation

Permit	Current Owner	Flow Rate (cfs)	Certificate	Year
16689	Honker Gun Club	8.0	5635	1963
16754	Honker Ranch	1600 af/y	5637	1963
16753	Honker Ranch	2.0	5636	1963
29074	Red Creek Ranch	3.0	9380	1980
28995	Red Creek Ranch	1.6	9379	1980
unreadable	C.C. Perrin and Sons	6.0	7773	1972
44475	Glen Peters	8.0	6197	1967
16861	Glen Peters	4.0	6198	1967
16358	Glen Peters	5.0	5667	1963
13344	Glen Peters	0.025	4287	1956
14037	Hunewill L&L	3.0	5002	1960
14038	Hunewill L&L	5.0	5003	1960
14039	Hunewill L&L	5.0	5004	1960
47450[1]	NDOW	10.0 nte 4746.68 afa	14439	1996

1. This application is a change in point of use for permit 31004 and 31005.

The tailwater rights are very high compared with the rights and actual diversions of water into the Colony Ditch. Some of the tailwater probably comes from pumped groundwater. It is also probable that these rights partially include surface water storm runoff and flow from various springs. All of the rights are certificated, therefore the flow must have been available at some time.

NDOW has rights to flow from the DGW drainage channel for the Alkali Lake Wildlife Management Area. Permit number 47450 entitles NDOW to rates up 10.0 cfs with volumes not to exceed 4746.68 af/year. When certificating this right, NDOW's consultant, Rice Engineering, measured flow into the lake in two years, 1989 and 1995. There was only 192.3 af of inflow during the drought year 1989 and 4746.68 af of inflow during the wet year, 1995. During 1989, flow occurred only during the spring runoff period, while during 1995, the peak flow occurred late in the irrigation season. During wet years, the lake receives substantial return flow. Diversions on the Colony Ditch were fifth and second highest in 1989 and 1995, respectively, for the period 1988 to 1997. The differences appear to be caused by a substantial threshold. In the middle of dry periods (1987 to 1993), even normal flow years (1989) produce little return flow. Dry antecedent conditions allow very little return flow to reach the lake. Myers (2001b) describes this in significant detail.

Much of the flow to NDOW's diversion point is from the Nevada Hot Springs southwest of the lake. During a site visit by the author on July, 11, 1998, approximately 3 cfs was flowing under the road from this spring. This is probably a consistent source of water but it may infiltrate before it reaches the lake in many years. However, it probably made up at least a quarter of the flow measured for certifying NDOW's permit during the wet 1995.

Return Flow

Return flow is water that flows off of a field or through the subsurface from a field to a downgradient water body. It contributes to flow in surface waters and may help satisfy downstream water rights holders. Water rights transfers may not interfere with downstream rights, whether junior or senior. This section analyzes the return flows from Smith Valley and discusses why there are no return flows of consequence in the Mason Valley.

Smith Valley

The West Walker River in Smith Valley is a gaining river. Most diversions occur at the mouth of Hoye Canyon below the gaging station. The river gains flow through the valley so that the gaged flow leaving Smith Valley exceeds the difference between gaged inflows and diversions. Portions of some diversions return to the river. Appendix 3 contains hydrographs of Smith Valley inflow, outflow, diversions and calculated return flow (inflow-outflow-diversions).

There is a one to two month lag period between diversion and return flow. In 1980, the peak return flow is in August when about 8500 af reached the river with only 20,000 af being diverted. In 1981, peak return flow is in July when it is about 40% of diversions and 60% of the amount of valley outflow. Return flow represents a significant portion of the flow leaving the valley during late summer most years. Peaks occur in all years, but are more obvious during dry and normal flow years. Total return flow is higher during wet years such as 1983 and 1984 when the proportion of diversions that return to the river over the year is about 40%. Return flow remains high throughout the season during these years. The exception is 1993, a wet year that followed six drought years, during which return flow is only about 10% of diversions. This shows that as for Artesia Basin return flow analyzed above, dry antecedent conditions result in little return flow.

The years 1981 and 1982 were relatively dry; the first half of 1982 had negative return flow reflecting in a losing river. Only three other months in the period, all during low flow, had negative return flows. Dry years, such as 1992 had very low return flows of only 10% of diversion.

From 1980 through 1994, return flow as a percent of diversion was 27, 31, -6, 34, 42, 25, 39, 28, 30, 24, 27, 28, 12, 11 and 40%, respectively. The driest three years averaged about 11%, but remaining years ranged from 24 to 42%, and ignoring 1994 which appears to be anomalously high, the average is 30.4%.

The average total diversion between 1980 and 1994 was 60,204 af/year. The average return flow was 16,279 af/year. Neglecting the contribution from groundwater pumpage, the proportion is 27%. Average diversions to the Colony Ditch are 14,369 af/year. Based on acreage irrigated, about 80% of this is north of the divide (Myers, 2001b). Therefore, about 11,500 af/year are diverted from the river to Artesia Lake. The total return flow from portions of the valley south of the groundwater divide is about 33% (average return flow divided by the average diversion that does not go into the Artesia basin, or 16,279/(60,204-11,500)). During dry years, the amount is only about 11%. Return flow peaks 1 to 2 months after the diversion peaks.

Mason Valley

Myers (2001a) found that Mason Valley is a losing river, therefore there is no return flow that is important for the valley as a whole. There is no way to estimate whether any water that returns to the river from the fields or drains in the East Walker or Tunnel section is available for canals along the main river in northern Mason Valley.

Groundwater Rights

Groundwater rights are either full, meaning that they are for an entire 4 af/acre/season of water, or they are supplemental, meaning they are for an amount of water not available from other water sources but not to exceed 4 af/acre/season from all sources. Full rights are probably not available on land served by Decree C-125 because they have natural flow rights. Rush and Schoer (1976) stated that most well development in the Smith Valley was supplemental but Pahl (1997) found that only 45% of the groundwater development was supplemental.

Lists of irrigation wells in each valley were obtained from Gallagher (undated) and updated using maps in the State Engineer's office and the US Geological Survey's database of wells water levels measured. Gallagher (undated) did not indicate which wells were supplemental. For this study, the final permit applications and certificates for most wells were searched at the State Engineer's office. Notations in the remarks section or on the certificate indicate whether a permit is supplemental or full. For this study, the assumption was made that any well without a notation was a full groundwater permit[4]. No attempt has been made to determine whether the full groundwater permits occur within lands surface with C-125 natural flow rights. Appendix 2 lists wells researched, permit numbers, their supplemental status and their pumpage from 1994-1996[5].

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[4]There are many potential problems with the determination of whether a well is supplemental as well as the permitted acreage and duty. This is because many original permits (and certificates) have been abrogated. In some cases many permits now exist where one originally existed. The certificated rights may have changed. In some cases, several permits have summed acreage which together they may not exceed. In other cases, one permit may be partially full and partially supplemental. The type of notation on the permits or certificates has changed with time.

[5]The State Division of Water Resources issued an updated report showing pumpage from 1997 through 1999. This report was not available by the time this report was compiled.

Smith Valley

For the entire Smith Valley , there were 169 wells researched with 16,499.65 acres permitted for irrigation. There were 29 supplemental wells with 7325.01 acres permitted. By irrigated area, this is 44.3% of all groundwater permits in the Smith Valley which agrees with Pahl (1997). North of the river, of 8505.45 acres of permitted irrigation with groundwater from 95 wells; only 12 wells and 2063.41 acres (24.4%) were supplemental. Plate 1 in Appendix 2 shows all of the wells and indicates their supplemental status.

Gallagher (undated) reported pumpage throughout Smith Valley from 1994 through 1996 as 33,968, 11,405 and 18,145 af/season. Based on observed pumpage at wells determined to be supplemental, there was 18,653, 5,142 and 8,006 af/season of supplemental pumping in Smith Valley. North of the river, total pumpage was 17,329, 11,405, and 10,607 af/season with 7,692, 3,937 and 4,946 af/season of supplemental for 1994, 1995 and 1996, respectively. As expected, the dry year 1994 had the most supplemental pumpage. The supplemental proportion remained relatively constant with time.

Mason Valley

For the entire Mason Valley , there were 327 wells researched. Of these, 189 were found to be currently permitted for irrigation of 40,618 acres. The remaining wells were either not permitted for irrigation, have been abrogated or are domestic wells. Plate 2 in Appendix 2 shows all of the wells and indicates their supplemental status. The table in Appendix 2 lists wells, permit numbers, irrigated acreage and supplemental status. There were 62 supplemental wells with 26,467 acres, or 65.2% by area of all Mason Valley groundwater permits. Throughout the valley, the proportion is 64.5% north of Yerington, 61.9% between Yerington and the confluence and 75.3 % in the region between the rivers south of the confluence (Table 13 and Figure 1).

Gallagher (undated) reported pumpage throughout Mason Valley from 1994 through 1996 as 119,358, 38,432 and 44,637 af/season, respectively. There was 42,600, 22,100 and 27,500 af/season of supplemental pumping in Mason Valley. No portion of the valley obviously has more supplemental pumping. As expected, the dry year 1994 had the most pumpage with a higher proportion of supplemental pumping.

Table 13: Summary of Groundwater Permits and Pumpage (af/season)

Subbasin	Supplemental	Permitted Pumpage	1994 Pumpage	1995 Pumpage	1996 Pumpage
North of Yerington	Yes	70,591	23,265	5066	6994
	No	38,643	36,726	19,286	20,030
	Unknown	280	9077	6359	6300
South of Yerington	Yes	20,284	17,514	2896	4595
	No	11,242	14,479	3159	3470
	Unknown	1241	2735	995	1702
South of Confluence	Yes	14,992	10,066	521	708
	No	4919	3092	121	826
	Unknown	2404	28	11	
Total	Yes	105867	50,845	8484	12,297
	No	54,804	54,296	22,566	24,327
	Unknown	1520	14,216	7382	8013
North of Yerington	Total	109,514	69,066	30,710	33,324
South of Yerington	Total	32,727	34,727	7,050	9767
South of Confluence	Total	19,911	15,562	671	1546

Summary of Water Rights

This report summarizes the water rights in the Smith and Mason Valleys of the Walker River basin on western Nevada. The types of water rights include natural, storage, flood, tailwater and groundwater. Groundwater rights are either full or supplemental to other rights.

The Walker River is federally adjudicated with rights delineated in Decree C-125. A natural flow right is a right to the "run of the river" flow without benefit of storage. Irrigators in both Smith and Mason Valleys have surface water rights under the C-125 decree. Storage rights are rights to water stored in Bridgeport Reservoir and Topaz Lake. Lands with low priority natural flow rights receive the most storage rights. Flood rights are rights to river water that are surplus to all of the natural flow rights. They may be used on lands not usually irrigated with natural flow rights. There are four irrigated regions within the two valleys: Smith Valley, Main River of Mason Valley, Tunnel Section and the East Walker River.

In Smith Valley, the expected natural flow diversion rate is 68.34 cfs which is 54.9% of the total decree value. Full priority (1920 rights) was declared 37.4% of the time in Smith Valley between 1988 and 1997. For the East Walker River, the expected diversion rate is 96.41 cfs which is 50.9% of the total decree value of 191.15 cfs. Full priority was declared 36.5% of the time along the East Walker in Mason Valley between 1988 and 1997. For the main Walker River in Mason Valley, the expected diversion rate is 151.43 cfs which is 56.2% of the total decree value of 269.49 cfs. Almost 104.39 cfs of the expected value comes from the 38.7% of the time that 1920 is the priority on the Walker River. For the Tunnel Section, the expected diversion rate is 29.19 cfs which is 57.9% of the total decree value of 50.37 cfs. Full priority was declared 36.0% of the time along the Tunnel Section between 1988 and 1997.

The Tunnel section has the most natural flow rights water diverted per decree acre at 4.04 afa/ac. The Main River of Mason Valley has the lowest at 2.62 afa/ac which also has the lowest diversion of storage water at 0.35 afa/ac. Smith Valley has the highest amount of storage water diverted per total irrigated area. Smith Valley has the largest amount of new lands irrigated which explains the high storage diversion rate. The Tunnel section and East Walker River also have just under 1 afa/ac of storage diversions. Smith Valley has the highest amount of flood diversions. Table 14 summarizes the average diversion by area for the four regions. The area on which each type of water may be applied varied, therefore these values should not be summed to determine the total average applied to each region.

Table 14: Summary of Diversion by Total Area for the Three Diversion Types (afa/acre)

Region	Natural	Flood	Storage
East Walker	3.16	0.31	0.92
Mason Valley	2.62	0.11	0.35
Smith Valley	3.45	0.64	1.32
Tunnel Section	4.04	0.35	0.97

Tailwater rights are rights to water running off of fields due to irrigation, or return flow. In Smith Valley there are almost 110 cfs of tailwater rights while in Mason Valley there are only about 10 cfs.

In Smith Valley, there were 29 supplemental wells with 7325.01 acres permitted. This is 44.3% of all groundwater permits in the Smith Valley. For the entire Mason Valley , 189 wells were found to be currently permitted irrigate 40,618 acres. There were 62 supplemental wells with 26,467 acres permitted or 65.2% by area of all Mason Valley groundwater permits. The proportion is similar throughout the valley.

Recommendations

The analysis of water rights permits presented in this report suffices for an environmental impact analysis. However, it is not a legal analysis of all the rights in the basin or even of specific rights discussed in the report. Prior to the purchase for transfer of any right, detailed legal research be completed . This should include documenting the impact on other rights, including tailwater and groundwater rights. When considering state certificated groundwater rights, it is essential to research these rights to determine the history of changes to that right.

This report also documented the past use of flood and storage rights. With regard to flood and storage rights, past usage does not represent future usage. Flood water rights are not limited to existing fields. Future research should be completed to better determine how flood water rights are used. There should be specific environmental analyses completed of any transfer. Specific agreements with the irrigation district are probably necessary.

The BLM should begin to monitor flows on the drains returning to the Walker River. The analysis concluded that Smith Valley has about 33% return flow and that Mason Valley has no return flow. There is no more specific breakdown by area nor is there any evidence of return flow affecting irrigation within Mason Valley.

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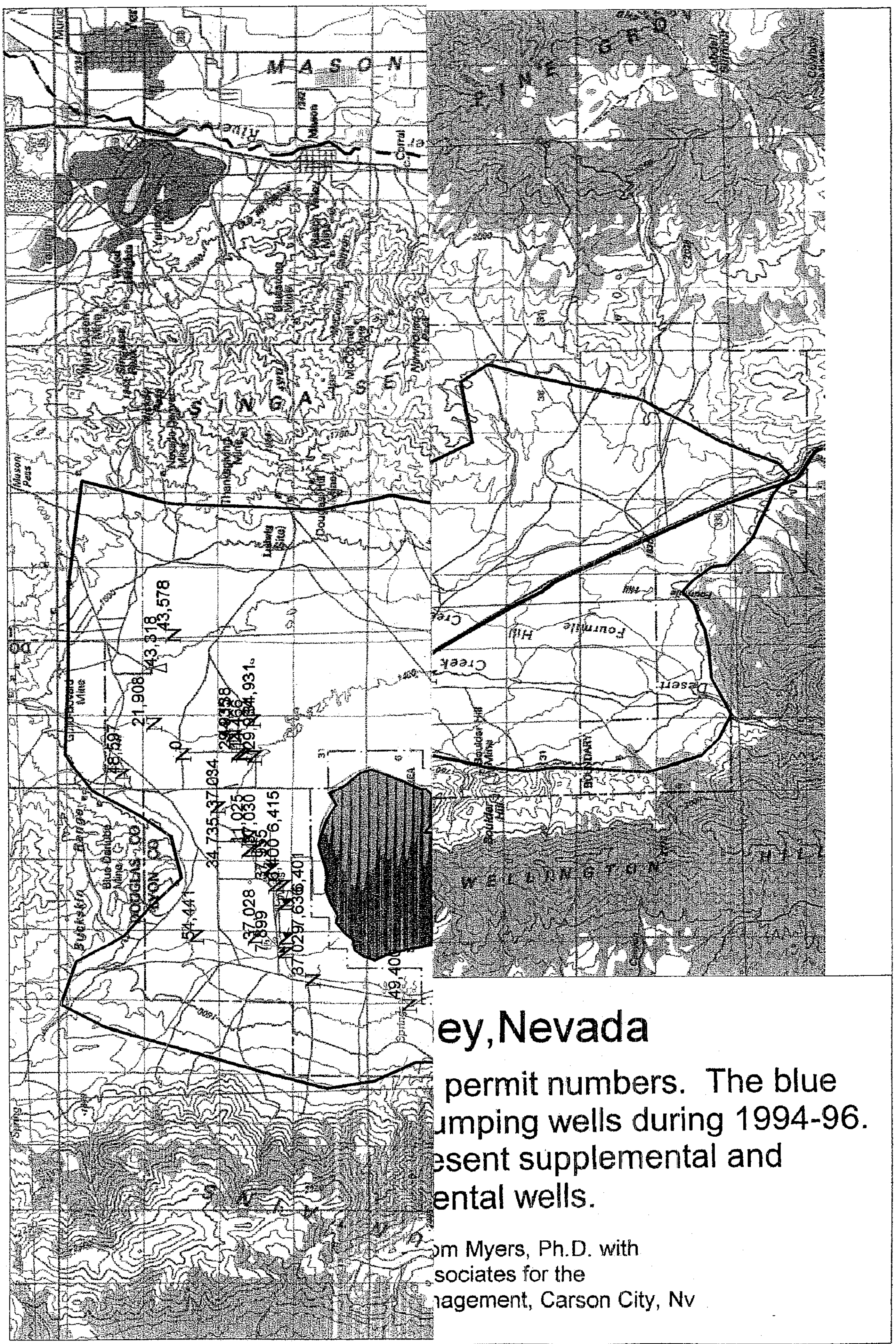

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Appendix 1

Water Rights by Canal

NICHOL MERRITT		MASON	1875	283.58	3.4
NICHOL MERRITT		MASON	1877	510	6.17
NICHOL MERRITT		MASON	1878	151.43	2.99
NICHOL MERRITT		MASON	1879	454	5.44
NICHOL MERRITT		MASON	1880	150	1.8
NICHOL MERRITT		MASON	1884	40	0.48
NICHOL MERRITT		MASON	1885	129	1.54
NICHOL MERRITT		MASON	1895	14	0.17
NICHOL MERRITT		MASON	1898	105.02	1.26
NICHOL MERRITT		MASON	1900	159.98	1.91
NICHOL MERRITT		MASON	1902	0	0.11
NICHOL MERRITT		MASON	1904	25	0.3
NICHOL MERRITT		MASON	ACRES	1013.79	
RIVER PUMP		MASON	1916	0	0.75
RIVER PUMP		MASON	ACRES	235	
SAB		MASON	1864	97.21	1.17
SAB		MASON	1865	38.92	0.46
SAB		MASON	1870	147.79	1.74
SAB		MASON	1874	229.17	6.41
SAB		MASON	1875	303.17	3.58
SAB		MASON	1880	663.07	10.35
SAB		MASON	1885	258.87	3.04
SAB		MASON	1890	181.13	2.14
SAB		MASON	1895	120.55	1.41
SAB		MASON	1900	233.25	2.74
SAB		MASON	1905	311.1	3.66
SAB		MASON	ACRES	944.85	
SPRAGG		MASON	1863	49.17	0.59
SPRAGG		MASON	1870	466.87	5.89
SPRAGG		MASON	1880	327.49	4.09
SPRAGG		MASON	1885	147.15	1.81
SPRAGG		MASON	1895	4.2	0
SPRAGG		MASON	1905	0.18	0
SPRAGG		MASON	ACRES	1227.68	
WEST HYLAND		MASON	1873	250	3
WEST HYLAND		MASON	1874	1162.22	15.99
WEST HYLAND		MASON	1877	74.29	0.86
WEST HYLAND		MASON	1880	413.6	7.75
WEST HYLAND		MASON	1881	40	0.48
WEST HYLAND		MASON	1887	69.4	0.81
WEST HYLAND		MASON	1888	80	0.96
WEST HYLAND		MASON	1891	183.34	2.83
WEST HYLAND		MASON	1894	15	0.18
WEST HYLAND		MASON	1896	91.43	1.1
WEST HYLAND		MASON	1899	0	0.14
WEST HYLAND		MASON	1900	140	1.67
WEST HYLAND		MASON	1901	15	0.18
WEST HYLAND		MASON	1904	26.57	0.31
WEST HYLAND		MASON	1905	40	0.48
WEST HYLAND		MASON	1906	13.19	0.16

WEST HYLAND	MASON	ACRES	1230.65	
BURBANK	SMITH	1862	3.57	0.05
BURBANK	SMITH	1863	242.31	2.89
BURBANK	SMITH	1868	41.32	0.49
BURBANK	SMITH	1878	88.94	1.06
BURBANK	SMITH	ACRES	85.02	
COLONY	SMITH	1890	1840	22.08
COLONY	SMITH	1895	300	3.36
COLONY	SMITH	1900	40	0.48
COLONY	SMITH	1905	120	1.43
COLONY	SMITH	1909	80	1.8
COLONY	SMITH	1910	0	3.33
COLONY	SMITH	1912	185.1	1.85
COLONY	SMITH	1914	0	2.6
COLONY	SMITH	ACRES	4808.52	
GAGE PETERSON	SMITH	1862	0.25	0
GAGE PETERSON	SMITH	1863	359.5	5.71
GAGE PETERSON	SMITH	1865	260	4.16
GAGE PETERSON	SMITH	1868	3.42	0.04
GAGE PETERSON	SMITH	1875	40	0.64
GAGE PETERSON	SMITH	1878	6.83	0.08
GAGE PETERSON	SMITH	1880	228	3.65
GAGE PETERSON	SMITH	1900	20	0.32
GAGE PETERSON	SMITH	ACRES	112	
LOWER FULSTONE	SMITH	1861	2.86	0.05
LOWER FULSTONE	SMITH	1863	54.41	0.87
LOWER FULSTONE	SMITH	1870	85.91	1.37
LOWER FULSTONE	SMITH	1875	57.27	0.92
LOWER FULSTONE	SMITH	1880	57.27	0.92
LOWER FULSTONE	SMITH	1885	57.27	0.92
LOWER FULSTONE	SMITH	ACRES	220	
PLYMOUTH	SMITH	1862	3.88	0.05
PLYMOUTH	SMITH	1863	376.12	4.54
PLYMOUTH	SMITH	1864	275	3.29
PLYMOUTH	SMITH	1868	50.45	0.61
PLYMOUTH	SMITH	1878	411.86	5.23
PLYMOUTH	SMITH	1882	56.49	0.91
PLYMOUTH	SMITH	1883	74.81	0.93
PLYMOUTH	SMITH	1884	37.9	0.64
PLYMOUTH	SMITH	1885	80	0.96
PLYMOUTH	SMITH	1892	46.67	0.56
PLYMOUTH	SMITH	1897	322.39	3.54
PLYMOUTH	SMITH	ACRES	2248.38	
RIVER SIMPSON	SMITH	1862	3.41	0.03
RIVER SIMPSON	SMITH	1863	220.42	2.65
RIVER SIMPSON	SMITH	1866	159	2.54
RIVER SIMPSON	SMITH	1868	39.17	0.47
RIVER SIMPSON	SMITH	1878	322.76	4.84

RIVER SIMPSON	SMITH	1884	80	1.28
RIVER SIMPSON	SMITH	1890	46	0.74
RIVER SIMPSON	SMITH	ACRES	381.57	
SARONI	SMITH	1877	600	9.6
SARONI	SMITH	1878	13	0.21
SARONI	SMITH	1880	58	0.7
SARONI	SMITH	1891	80	0.96
SARONI	SMITH	ACRES	3106.27	
UPPER FULSTONE	SMITH	1861	2.14	0.03
UPPER FULSTONE	SMITH	1863	40.6	0.65
UPPER FULSTONE	SMITH	1870	64.1	1.03
UPPER FULSTONE	SMITH	1875	42.72	0.68
UPPER FULSTONE	SMITH	1880	42.72	0.68
UPPER FULSTONE	SMITH	1885	42.72	0.68
UPPER FULSTONE	SMITH	ACRES	327.08	
WEST WALKER	SMITH	1862	2.01	0.03
WEST WALKER	SMITH	1863	115.86	1.4
WEST WALKER	SMITH	1864	652.63	8.33
WEST WALKER	SMITH	1868	21.17	0.2
WEST WALKER	SMITH	1869	30.83	0.37
WEST WALKER	SMITH	1878	235.98	3.02
WEST WALKER	SMITH	1885	80	0.96
WEST WALKER	SMITH	ACRES	556.75	
WEST WALKER PUMPS	SMITH	ACRES	40	
D&GW	TUNNEL SECTION	1861	22.1	0.36
D&GW	TUNNEL SECTION	1862	13.26	0.2
D&GW	TUNNEL SECTION	1863	13.26	0.2
D&GW	TUNNEL SECTION	1864	28.26	0.44
D&GW	TUNNEL SECTION	1868	101.7	1.63
D&GW	TUNNEL SECTION	1869	22.9	0.35
D&GW	TUNNEL SECTION	1870	40	0.64
D&GW	TUNNEL SECTION	1872	173.65	2.77
D&GW	TUNNEL SECTION	1875	6.63	0.1
D&GW	TUNNEL SECTION	1877	48.73	0.77
D&GW	TUNNEL SECTION	1879	4.41	0.08
D&GW	TUNNEL SECTION	1890	59.88	0.98
D&GW	TUNNEL SECTION	1903	6.63	0.1
D&GW	TUNNEL SECTION	ACRES	829.99	
KELLY ALKALI	TUNNEL SECTION	1861	18.48	0.29
KELLY ALKALI	TUNNEL SECTION	1862	11.09	0.18
KELLY ALKALI	TUNNEL SECTION	1863	11.09	0.18
KELLY ALKALI	TUNNEL SECTION	1864	11.09	0.18
KELLY ALKALI	TUNNEL SECTION	1868	115.99	1.86
KELLY ALKALI	TUNNEL SECTION	1869	74.56	1.2
KELLY ALKALI	TUNNEL SECTION	1872	243.74	3.89
KELLY ALKALI	TUNNEL SECTION	1875	5.55	0.09
KELLY ALKALI	TUNNEL SECTION	1877	24.03	0.39
KELLY ALKALI	TUNNEL SECTION	1879	3.7	0.06

DITCH	VALLEY	PRIORITY DATE	ACRES	CFS
EAST WALKER	EAST WALKER	1861	8	0.13
EAST WALKER	EAST WALKER	1862	350	5.6
EAST WALKER	EAST WALKER	1863	80	1.28
EAST WALKER	EAST WALKER	1865	231	3.7
EAST WALKER	EAST WALKER	1867	9	0.14
EAST WALKER	EAST WALKER	1874	235	3.76
EAST WALKER	EAST WALKER	1875	356	5.7
EAST WALKER	EAST WALKER	1877	110	1.76
EAST WALKER	EAST WALKER	1879	98	1.57
EAST WALKER	EAST WALKER	1880	165	2.64
EAST WALKER	EAST WALKER	1881	100	1.6
EAST WALKER	EAST WALKER	1885	200	3.2
EAST WALKER	EAST WALKER	1887	90	1.44
EAST WALKER	EAST WALKER	1889	10	0.16
EAST WALKER	EAST WALKER	1890	200	3.2
EAST WALKER	EAST WALKER	1893	40	0.64
EAST WALKER	EAST WALKER	1894	92	1.47
EAST WALKER	EAST WALKER	1895	143	2.29
EAST WALKER	EAST WALKER	1897	170	2.72
EAST WALKER	EAST WALKER	1900	40	0.64
EAST WALKER	EAST WALKER	1906	45	0.72
EAST WALKER	EAST WALKER	1916	0	0.47
EAST WALKER	EAST WALKER	1917	0	1
EAST WALKER	EAST WALKER	ACRES	4628.29	
BAKER SNYDER	LOWER EAST WALKER	1876	39	0.62
BAKER SNYDER	LOWER EAST WALKER	1883	70	1.12
BAKER SNYDER	LOWER EAST WALKER	1891	70	1.12
BAKER SNYDER	LOWER EAST WALKER	1899	50	0.8
BAKER SNYDER	LOWER EAST WALKER	1902	52.5	0.84
BAKER SNYDER	LOWER EAST WALKER	1907	10	0.16
BAKER SNYDER	LOWER EAST WALKER	ACRES	107.5	
FOX	LOWER EAST WALKER	1865	829.69	9.84
FOX	LOWER EAST WALKER	1870	746.66	9.26
FOX	LOWER EAST WALKER	1871	50	0.8
FOX	LOWER EAST WALKER	1875	595.73	7.14
FOX	LOWER EAST WALKER	1880	253.47	3.6
FOX	LOWER EAST WALKER	1883	80	1.28
FOX	LOWER EAST WALKER	1885	82.67	1.84
FOX	LOWER EAST WALKER	1888	13.12	0.8
FOX	LOWER EAST WALKER	1890	32.96	0.92
FOX	LOWER EAST WALKER	1895	121.4	2.41
FOX	LOWER EAST WALKER	1896	30	0.48
FOX	LOWER EAST WALKER	1900	37.69	0.6
FOX	LOWER EAST WALKER	1905	12	0.19
FOX	LOWER EAST WALKER	ACRES	849.08	
GREENWOOD	LOWER EAST WALKER	1865	473.32	5.81
GREENWOOD	LOWER EAST WALKER	1870	123.05	1.53

GREENWOOD	LOWER EAST WALKER	1875	471.71	5.8
GREENWOOD	LOWER EAST WALKER	1880	593.08	7.58
GREENWOOD	LOWER EAST WALKER	1885	186.72	2.33
GREENWOOD	LOWER EAST WALKER	1888	0	0.48
GREENWOOD	LOWER EAST WALKER	1890	145.02	1.84
GREENWOOD	LOWER EAST WALKER	1895	159.29	2.01
GREENWOOD	LOWER EAST WALKER	1905	5.64	0.05
GREENWOOD	LOWER EAST WALKER	ACRES	1060.01	
HALL	LOWER EAST WALKER	1865	91.01	1.09
HALL	LOWER EAST WALKER	1870	83.66	1.24
HALL	LOWER EAST WALKER	1875	134.95	1.73
HALL	LOWER EAST WALKER	1876	39	0.62
HALL	LOWER EAST WALKER	1877	91	1.46
HALL	LOWER EAST WALKER	1880	365.21	5.2
HALL	LOWER EAST WALKER	1885	82.15	1.08
HALL	LOWER EAST WALKER	1888	40	0.64
HALL	LOWER EAST WALKER	1890	74.05	1.01
HALL	LOWER EAST WALKER	1892	58	0.93
HALL	LOWER EAST WALKER	1895	64.1	0.85
HALL	LOWER EAST WALKER	1897	80	1.28
HALL	LOWER EAST WALKER	1898	30	0.48
HALL	LOWER EAST WALKER	1899	140	2.24
HALL	LOWER EAST WALKER	1901	25	0.4
HALL	LOWER EAST WALKER	1902	52.5	0.84
HALL	LOWER EAST WALKER	1903	90	1.44
HALL	LOWER EAST WALKER	1904	15	0.24
HALL	LOWER EAST WALKER	1905	21.1	0.34
HALL	LOWER EAST WALKER	1907	10	0.16
HALL	LOWER EAST WALKER	1913	0	0.8
HALL	LOWER EAST WALKER	ACRES	1994.28	
HIGH	LOWER EAST WALKER	1911	0	4.37
HIGH	LOWER EAST WALKER	1915	0	1.91
HIGH	LOWER EAST WALKER	ACRES	971.67	
HILBUN	LOWER EAST WALKER	1872	0	1.36
HILBUN	LOWER EAST WALKER	1873	10	0.12
HILBUN	LOWER EAST WALKER	1892	90	1.08
HILBUN	LOWER EAST WALKER	1894	300	4.8
HILBUN	LOWER EAST WALKER	1902	10	0.12
HILBUN	LOWER EAST WALKER	1904	10	0.12
HILBUN	LOWER EAST WALKER	ACRES	154	
MICKEY	LOWER EAST WALKER	1865	364.39	4.36
MICKEY	LOWER EAST WALKER	1870	497.02	5.98
MICKEY	LOWER EAST WALKER	1875	422.64	5.04
MICKEY	LOWER EAST WALKER	1880	66.79	0.82
MICKEY	LOWER EAST WALKER	1885	98.3	1.17
MICKEY	LOWER EAST WALKER	1895	122.05	1.54
MICKEY	LOWER EAST WALKER	1900	19.62	0.27
MICKEY	LOWER EAST WALKER	1905	1.57	0.02
MICKEY	LOWER EAST WALKER	ACRES	775.76	

NELSON	LOWER EAST WALKER	1879	15	0.24
NELSON	LOWER EAST WALKER	1885	35	0.56
NELSON	LOWER EAST WALKER	1904	55	0.88
NELSON	LOWER EAST WALKER	ACRES	174	
CAMPBELL	MASON	1864	33.1	0.4
CAMPBELL	MASON	1865	173.23	2.08
CAMPBELL	MASON	1868	20	0.24
CAMPBELL	MASON	1869	180	2.16
CAMPBELL	MASON	1870	702.8	8.43
CAMPBELL	MASON	1872	980.67	10.41
CAMPBELL	MASON	1873	210.83	3.28
CAMPBELL	MASON	1874	387	6.66
CAMPBELL	MASON	1875	103.26	1.24
CAMPBELL	MASON	1878	80	0.96
CAMPBELL	MASON	1879	757.58	8.45
CAMPBELL	MASON	1880	296.74	5.16
CAMPBELL	MASON	1882	45.84	1.88
CAMPBELL	MASON	1885	210.69	3.93
CAMPBELL	MASON	1889	50	0.6
CAMPBELL	MASON	1890	61.69	0.74
CAMPBELL	MASON	1892	60	1.06
CAMPBELL	MASON	1893	15	0.18
CAMPBELL	MASON	1895	41.05	0.49
CAMPBELL	MASON	1897	87.5	0.09
CAMPBELL	MASON	1900	199.42	2.39
CAMPBELL	MASON	1904	25	0.3
CAMPBELL	MASON	1905	167.92	2.01
CAMPBELL	MASON	ACRES	2783.68	
JOGGLES	MASON	1864	541.99	6.41
JOGGLES	MASON	1865	204.77	2.42
JOGGLES	MASON	1870	778.31	9.18
JOGGLES	MASON	1875	1598.68	18.87
JOGGLES	MASON	1880	826.24	11.45
JOGGLES	MASON	1885	248.3	2.14
JOGGLES	MASON	1890	141.26	1.5
JOGGLES	MASON	1895	93.79	1.01
JOGGLES	MASON	1900	182.58	1.95
JOGGLES	MASON	1905	242.44	2.6
JOGGLES	MASON	Storage	477.51	
MCLEOD	MASON	1862	100	1.2
MCLEOD	MASON	1863	355	2.26
MCLEOD	MASON	1870	165	1.98
MCLEOD	MASON	1883	30	0.36
NICHOL MERRITT	MASON	1868	738	9.36
NICHOL MERRITT	MASON	1869	400	4.8
NICHOL MERRITT	MASON	1870	81	0.97
NICHOL MERRITT	MASON	1871	277.5	3.33
NICHOL MERRITT	MASON	1872	345	4.14
NICHOL MERRITT	MASON	1873	170	2.44
NICHOL MERRITT	MASON	1874	379	4.54

KELLY ALKALI	TUNNEL SECTION	1890	16.64	0.26
KELLY ALKALI	TUNNEL SECTION	1903	5.55	0.09
KELLY ALKALI	TUNNEL SECTION	1905	95	1.52
KELLY ALKALI	TUNNEL SECTION	ACRES	566.42	
LEE SANDERS	TUNNEL SECTION	1861	9.42	0
LEE SANDERS	TUNNEL SECTION	1862	5.65	0.09
LEE SANDERS	TUNNEL SECTION	1863	5.65	0.09
LEE SANDERS	TUNNEL SECTION	1864	5.65	0.09
LEE SANDERS	TUNNEL SECTION	1868	43.31	0.69
LEE SANDERS	TUNNEL SECTION	1869	7.53	0.12
LEE SANDERS	TUNNEL SECTION	1872	54.14	0.87
LEE SANDERS	TUNNEL SECTION	1875	2.83	0
LEE SANDERS	TUNNEL SECTION	1877	12.24	0.2
LEE SANDERS	TUNNEL SECTION	1879	1.88	0.03
LEE SANDERS	TUNNEL SECTION	1890	8.47	0.14
LEE SANDERS	TUNNEL SECTION	1903	2.83	0
LEE SANDERS	TUNNEL SECTION	ACRES	160.46	
TUNNEL	TUNNEL SECTION	1861	25	0.4
TUNNEL	TUNNEL SECTION	1862	15	0.24
TUNNEL	TUNNEL SECTION	1863	15	2.24
TUNNEL	TUNNEL SECTION	1864	15	0.24
TUNNEL	TUNNEL SECTION	1868	115	1.84
TUNNEL	TUNNEL SECTION	1869	20	0.32
TUNNEL	TUNNEL SECTION	1872	144	2.3
TUNNEL	TUNNEL SECTION	1875	7.5	0.12
TUNNEL	TUNNEL SECTION	1877	353	5.67
TUNNEL	TUNNEL SECTION	1879	165	2.64
TUNNEL	TUNNEL SECTION	1882	130	2.08
TUNNEL	TUNNEL SECTION	1883	173	2.77
TUNNEL	TUNNEL SECTION	1885	150	2.4
TUNNEL	TUNNEL SECTION	1888	50	0.8
TUNNEL	TUNNEL SECTION	1890	22.5	0.36
TUNNEL	TUNNEL SECTION	1894	32	0.51
TUNNEL	TUNNEL SECTION	1899	10	0.16
TUNNEL	TUNNEL SECTION	1900	93	1.49
TUNNEL	TUNNEL SECTION	1903	7.5	0.12
TUNNEL	TUNNEL SECTION	ACRES	1816.85	
WEST SIDE CANAL	TUNNEL SECTION	1861	25	0.4
WEST SIDE CANAL	TUNNEL SECTION	1862	15	0.24
WEST SIDE CANAL	TUNNEL SECTION	1863	15	0.24
WEST SIDE CANAL	TUNNEL SECTION	1864	15	0.24
WEST SIDE CANAL	TUNNEL SECTION	1868	84	1.34
WEST SIDE CANAL	TUNNEL SECTION	1872	25	0.4
WEST SIDE CANAL	TUNNEL SECTION	1875	7.5	0.12
WEST SIDE CANAL	TUNNEL SECTION	1877	32.5	0.52
WEST SIDE CANAL	TUNNEL SECTION	1879	5	0.08
WEST SIDE CANAL	TUNNEL SECTION	1890	22.5	0.36
WEST SIDE CANAL	TUNNEL SECTION	1903	7.5	0.12
WEST SIDE CANAL	TUNNEL SECTION	ACRES	152.1	
UPPER EAST WALKER	UPPER EAST WALKER	1862	130	2.08

UPPER EAST WALKER	UPPER EAST WALKER	1865	100	1.6
UPPER EAST WALKER	UPPER EAST WALKER	1870	200	3.2
UPPER EAST WALKER	UPPER EAST WALKER	1875	100	1.6
UPPER EAST WALKER	UPPER EAST WALKER	1880	200	3.2
UPPER EAST WALKER	UPPER EAST WALKER	1885	100	1.6
UPPER EAST WALKER	UPPER EAST WALKER	1890	120	1.96
UPPER EAST WALKER	UPPER EAST WALKER	ACRES	460.67	

Appendix 2

List of Groundwater Wells, Permit Numbers and Supplemental Status

Plates of Groundwater Wells

Wells in Smith Valley

Permit Number	GW Acres	Supplemental?	Permitted Rate	1994 Pumpage af/season	1995 Pumpage af/season	1996 Pumpage af/season
16798	215	"n"	859	768	402	605
0	0	"n"	0	0	0	0
37034	508	"n"	2030	1	142	137
37030	131	"n"	524	0	0	237
48597	0	"n"	188	0	0	0
0	0	"n"	0	0	0	0
44138	154	"n"	617	425	253	0
29935	80	"n"	320	0	0	0
34931	163	"n"	654	0	0	0
29934	152	"n"	608	319	140	0
53835	0	"n"	116	4	0	112
57362	0	"n"	0	0	0	0
53836	0	"n"	0	0	0	0
46622	0	"n"	45	0	0	0
25347	76	"n"	304	0	0	0
25690	319	"n"	1278	428	390	515
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
24815	237	"y"	948	921	267	124
0	0	"n"	0	0	0	0
18368	332	"n"	1328	718	115	198
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
16628	278	"n"	695	528	326	114
0	0	"n"	0	0	0	0
36525	130	"n"	520	0	0	0
36524	415	"n"	1661	745	96	470
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
16477	270	"y"	906	0	0	0
54655	42	"n"	168	18	32	11
16440	252	"n"	1008	221	0	26
18661	188	"y"	754	290	0	60
13494	198	"n"	792	0	0	0
12278	95	"n"	144	0	0	0
19734	603	"y"	2414	1556	41	105
18938	513	"y"	2052	1842	214	792
60814	137	"n"	489	481	387	523
23668	112	"n"	448	386	7	43
19602	0	"y"	0	0	0	0
0	0	"n"	0	18	56	37
0	0	"n"	0	0	0	0
19924	558	"y"	2232	420	173	504
12215	459	"n"	1836	286	1	574
25279	159	"y"	636	684	4	196
55085	20	"n"	80	43	30	0

57854	25	"y"	100	64	13	100
18953	200	"y"	800	914	864	1230
22936	639	"n"	1967	334	134	21
0	0	"n"	0	0	0	0
18689	160	"y"	640	768	189	578
27317	277	"n"	1106	1240	584	684
57495	53	"n"	210	286	1	84
18222	385	"n"	1542	986	0	217
12575	215	"n"	650	608	248	356
25411	180	"n"	720	968	346	394
19600	275	"y"	1101	2458	1352	1922
20351	312	"y"	1250	909	86	302
26804	267	"y"	1068	631	584	696
21279	179	"n"	717	355	337	356
18990	73	"y"	292	518	595	94
25506	163	"y"	650	285	358	154
18680	300	"y"	1200	1627	13	29
26730	680	"y"	2720	849	62	226
14987	293	"y"	1172	509	15	44
18879	287	"y"	1148	627	79	98
25374	76	"n"	304	0	0	0
22904	150	"n"	602	464	271	0
26883	379	"n"	1516	2477	703	1361
28293	170	"n"	681	364	331	468
18435	604	"y"	2414	729	81	159
20014	296	"y"	1183	292	60	349
27704	0	"n"	43	37	21	7
23627	239	"n"	956	614	433	1194
0	0	"n"	0	0	0	0
18804	400	"y"	1600	573	0	0
49400	53	"n"	213	0	0	0
37029	239	"n"	958	494	263	544
37028	381	"n"	1524	62	91	137
43578	0	"n"	18	0	0	3
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
25872	0	"y"	0	0	0	0
60037	0	"n"	8.59	0	0	0
0	0	"n"	0	0	0	0
32015	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
19983	316	"y"	1264	1187	92	244
26937	9	"n"	37	69	38	49
55840	80	"n"	320	196	0	73
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
0	0	"n"	0	0	0	0
14466	34	"n"	136	372	85	589
20406	0	"n"	80.34	0	0	0
51546	0	"n"	133.93	0	0	0
55254	0	"n"	160	0	0	0

55254	0	"n"	0.55	0	0	0
59173	0	"n"	0.21	0	0	0
48833	0	"n"	44.99	0	0	0
22446	80	"n"	320	0	0	0
53907	4.4	"n"	17.6	0	0	0
21277	0	"n"	0.74	0	0	0
12262	0	"y"	10.86	0	0	0
23800	6	"y"	24	0	0	0
17755	15	"n"	60	0	0	0
50926	3.2	"n"	12.8	0	0	0
18327	46.5	"n"	186	0	0	0
27298	20	"n"	80	0	0	0
19919	6.6	"y"	26.4	0	0	0
48738	40.54	"n"	0	0	0	0
48739	0	"n"	38.36	0	0	0
12271	0	"n"	3.59	0	0	0
0	0	"n"	0	0	0	0
32742	0	"n"	3.84	0	0	0
53075	0	"n"	2.88	0	0	0
56746	0	"n"	3.22	0	0	0
19302	2	"n"	8	0	0	0
62214	11.1	"n"	44.4	0	0	0
12374	10	"n"	32.59	0	0	0
14818	88	"n"	352	0	0	0
12276	30	"n"	120	0	0	0
12277	28	"n"	112	0	0	0
12309	0	"n"	2.24	0	0	0
12281	0	"n"	18.11	0	0	0
22913	41.1	"n"	134.83	0	0	0
12372	0	"n"	1.66	0	0	0
13344	92.7	"n"	9.87	0	0	0
12465	141.2	"n"	564.8	0	0	0
0	0	"n"	0	0	0	0
12465	0	"n"	18.11	0	0	0
12466	0	"n"	28.97	0	0	0
16824	36	"n"	129	0	0	0
0	0	"n"	0	0	0	0
57772	0	"n"	0	0	0	0
16827	0	"n"	0.74	0	0	0
57771	0	"n"	11.2	0	0	0
23162	0	"n"	22.4	0	0	0
58992	35	"n"	140	0	0	0
12344	0	"n"	14.49	0	0	0
16629	61	"n"	244	0	0	0
60723	5	"n"	20	0	0	0
60721	2.5	"n"	10	0	0	0
12264	7.18	"n"	0	0	0	0
12304	0	"n"	4.36	0	0	0
18313	133.41	"y"	533.64	0	0	0
12265	0	"n"	14.49	0	0	0
12263	0	"n"	4.36	0	0	0
12305	0	"n"	4.82	0	0	0
14282	0	"n"	15.93	0	0	0
60719	21.5	"n"	86	0	0	0

55027	24.68	"n"	98.72	0	0	0
54900	5	"n"	20	0	0	0
54441	0	"n"	8.96	0	0	0
11025	146.3	"n"	619.9	0	0	0
34735	0	"n"	22.4	0	0	0
37955	0	"n"	67.21	.0	0	0
6401	18.7	"n"	90.71	0	0	0
6415	29.92	"n"	145.14	0	0	0
6400	39.9	"n"	193.85	0	0	0
7899	3.86	"n"	18.7	0	0	0
7636	78.36	"n"	380	0	0	0
21908	0	"n"	73.65	0	0	0
43318	0	""	39.13	0	0	0

Wells in Mason Valley

Permit Number	GW Acres	Supplemental	1994 Pumpage af/season	1995 Pumpage af/season	1996 Pumpage af/season
18715	410	y"	880.2	25.7	0
30518	1022.44	y"	1245.5	0	212.4
19758	348.82	n"	753.8	1	150.6
12389	468.6	y"	769.7	77.1	263.3
26368	153	u"	437.7	92.7	325.6
18730	162	n"	776.5	168.6	0
28195	344.7	n"	1620	1204.1	844.4
19828	432	y"	637.2	20.3	47.7
19113	197	y"	611.3	67.9	392.4
19706	359	y"	816.9	10.5	0
19728	393	y"	0	0	0
28268	153	n"	238.5	0	10.4
18654	0	n"	935.8	0	0
40853	0	u"	0	0	0
18654	0	u"	935.8	0	1.9
47014	36	u"	0	0	0
18816	188	y"	656.7	63	141.5
55955	97.2	y"	614.8	0	4.3
58486	167	y"	1613.4	8.3	74.8
19692	0	u"	0	0	0
25892	234	n"	795.3	48.2	214.7
16889	0	u"	0	0	0
30259	336.6	y"	1008.3	131.9	303.4
18706	512	y"	997.4	155.9	225.9
25813	11774.26	y"	1779.3	0	0
19841	315	y"	1092.9	68.7	10.9
19159	0	n"	0	0	0
18676	434	y"	1196.8	0	10
35974	0	u"	0	0	0
22788	0	n"	263.3	341.2	206
19667	283	y"	1284.5	159.5	0
57247	0	u"	0	0	0
30190	154	n"	639.6	52.5	146.6
41363	24.38	y"	1910.2	380.5	480.3
30166	365	n"	1332.1	30.2	54.7
18682	198	y"	1194.1	24.5	0.1
19829	347	y"	1081.5	100.6	296
28290	21.5	n"	0	0	0
19750	117	y"	483.8	97.7	75.8
26717	0	u"	0	0	0
19114	158	y"	0	0	0
30841	0	u"	0	0	0
18931	400.74	y"	575.5	55.2	48.8
25201	186	n"	594.8	81.1	261.9
18550	0	u"	0	0	0
18957	0	u"	0	0	0
18735	265	y"	1441.7	500.8	842
30191	697	n"	2092.9	447.8	840.1

18872	389	y"	1504.8	281	845.9
18672	147	y"	377	22.2	0
28066	148	n"	1375.3	370.6	325.3
18633	0	y"	0	0	0
21537	0	u"	0	0	0
18986	231	y"	1020.8	501.3	680.5
17659	0	u"	0	0	0
17660	80	n"	143.9	125	172.4
17065	0	u"	0	0	0
28347	0	u"	0	0	0
15946	0	u"	0	0	0
17403	0	u"	0	0	0
25916	158	n"	640.4	720.4	716.4
27839	175	y"	915	373	835.6
18806	280	y"	1239.2	0	0
19599	367	y"	1625.9	0	0
27123	126	n"	1278	52.4	0
18712	155	y"	847.8	0	0
30990	332.1	n"	931	0	17.9
16895	0	u"	0	0	0
28743	20.6	n"	138.4	159.7	194.6
19516	423.5	y"	1655.9	1285.4	1362.5
30192	303	n"	621.2	176.5	183.4
27558	0	u"	0	0	0
30263	144.94	n"	1330.8	245.4	310.1
30068	362.2	n"	1463.3	160.9	130.9
30265	20	n"	0	0	0
24013	396.67	n"	856.4	2142	343.2
30521	396.67	n"	817.6	376.6	632.7
31565	0	n"	394.9	277.6	448.4
50669	318.5	n"	1301.3	1076.4	1083.6
36924	318.5	n"	1060.2	908.2	1061.5
30383	199.11	n"	922.5	469.9	995.2
30193	135.1	n"	515.9	93.1	134.7
30433	0	u"	0	0	0
38153	0	u"	0	0	0
19068	240	y"	991.7	16.2	0
19101	312	y"	1269.7	473.1	582.7
30926	155	n"	0	0	0
19873	224.09	y"	1349.9	0	328.8
35867	0	n"	0	0	0
53913	8.4	y"	522	339.2	299.7
56856	0	u"	612.4	347.9	236.8
27302	13.05	n"	0	0	0
51939	252.8	y"	495.4	4.4	6.8
18867	254	y"	856.1	11.6	181.1
30992	42	y"	645.6	0	42.3
18914	138.7	y"	486.7	0	1
56595	0	y"	577.2	149.6	0
30396	138.1	n"	1503.1	0	96
51938	393	y"	829	273	157.1
17756	0	n"	0	0	0
56020	649	y"	429	105.3	83.9
18444	70	u"	335.1	181	416.6

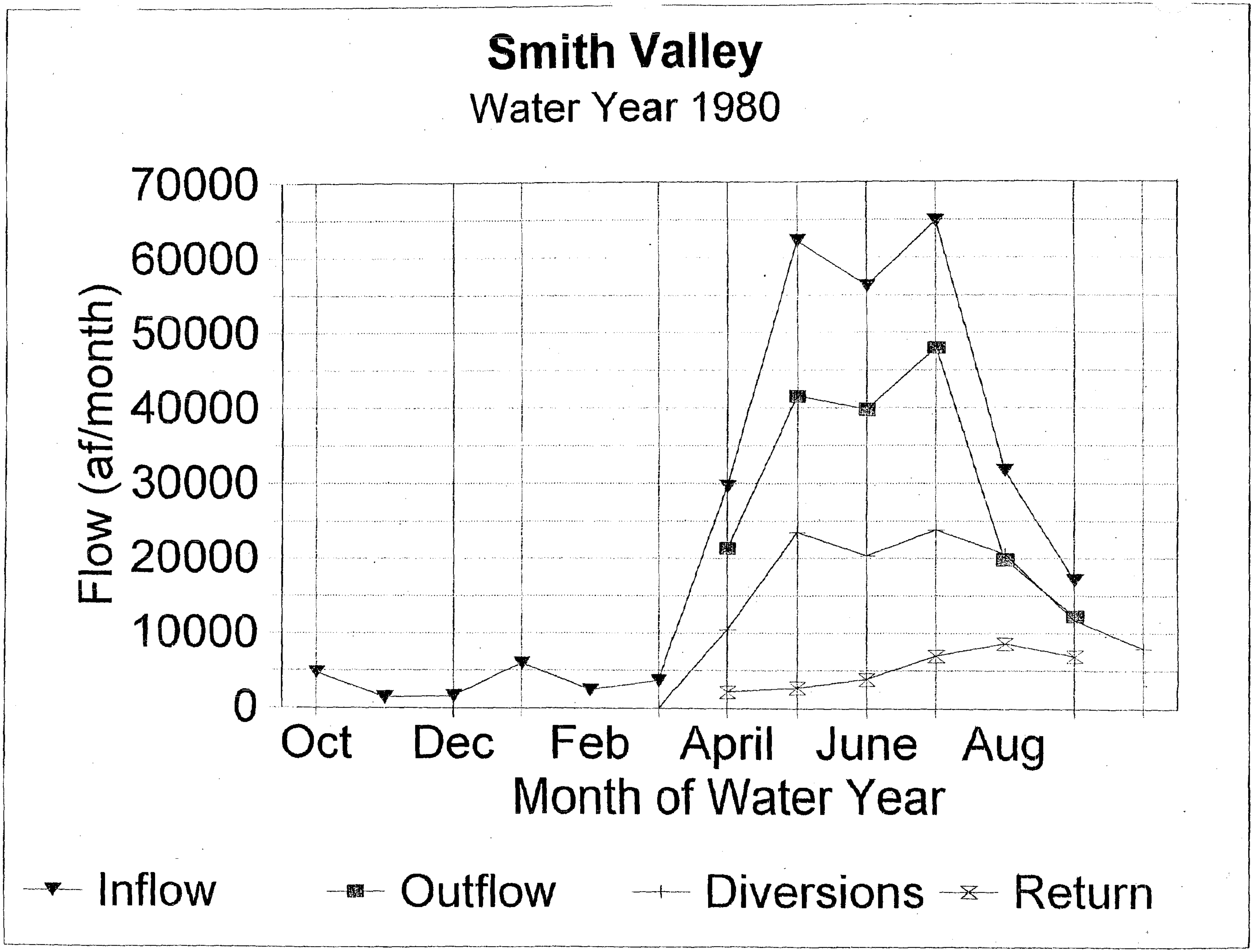
18688	0	n"	0	0	0
56476	0	u"	0	0	0
49258	0	u"	0	0	0
60013	0	u"	0	0	0
57258	0	u"	0	0	0
18934	295.68	y"	318.6	32.6	8
58174	0	u"	0	0	0
27929	270.3	n"	1650.1	1507	1457
18925	355	y"	885.5	230.1	0
27300	0	u"	0	0	0
28324	0	u"	0	0	0
19839	136	y"	863.1	144.1	206.2
21921	0	u"	0	0	0
44197	0	u"	0	0	0
30830	0	u"	0	0	0
58092	0	u"	0	0	0
53315	520	n"	1084.9	1135	1414.4
54419	0	u"	1468.5	28.3	9.5
19935	144.9	n"	753.4	9.8	316.4
58482	112	y"	0	26.3	0
58481	112	y"	0.1	47	167.4
28194	100	n"	415.9	36.7	361.4
24583	152	n"	710	65.3	269.5
56251	171.1	n"	633.5	108.7	6.7
0	121.2	u"	648.9	96.2	164
19062	122	y"	427.5	0	0
56597	0	y"	1213.5	55.4	0
19057	24	y"	982.2	0.2	49.7
13879	502	n"	789.2	62.3	144.6
30050	148.3	n"	1265.4	274.8	290.9
18707	649	y"	826.5	100	18.7
0	0	u"	0	0	527.3
28067	185	n"	432.9	149.6	202.8
18766	80	y"	0	0	93.5
0	0	u"	804.6	482.9	302.8
19744	180	y"	954.3	244.2	261.8
57526	0	n"	1081.5	153.7	211.4
54473	24.38	y"	714	123.3	190
57249	35	n"	622	0	132.8
30439	182.3	y"	896	779.5	588.2
55676	35	y"	346.3	1	0
0	0	u"	560.6	46.6	176.5
0	0	u"	283	276.3	205.6
55677	224.2	n"	752.8	440.2	307.8
30362	188	n"	739.7	40.2	194.2
18736	114	y"	610.8	5.6	170.4
35325	41.5	n"	101.6	113.5	182.8
50668	0	n"	112.7	8.6	7.6
19077	96	y"	115	0	791.5
51767	0	n"	118.5	116.3	119.6
48628	111.2	n"	85.5	105.5	178.6
26312	0	u"	1349.8	3574.4	2902.9
45323	0	u"	0	0.9	19.5
50520	937	n"	986.9	365.1	277.1

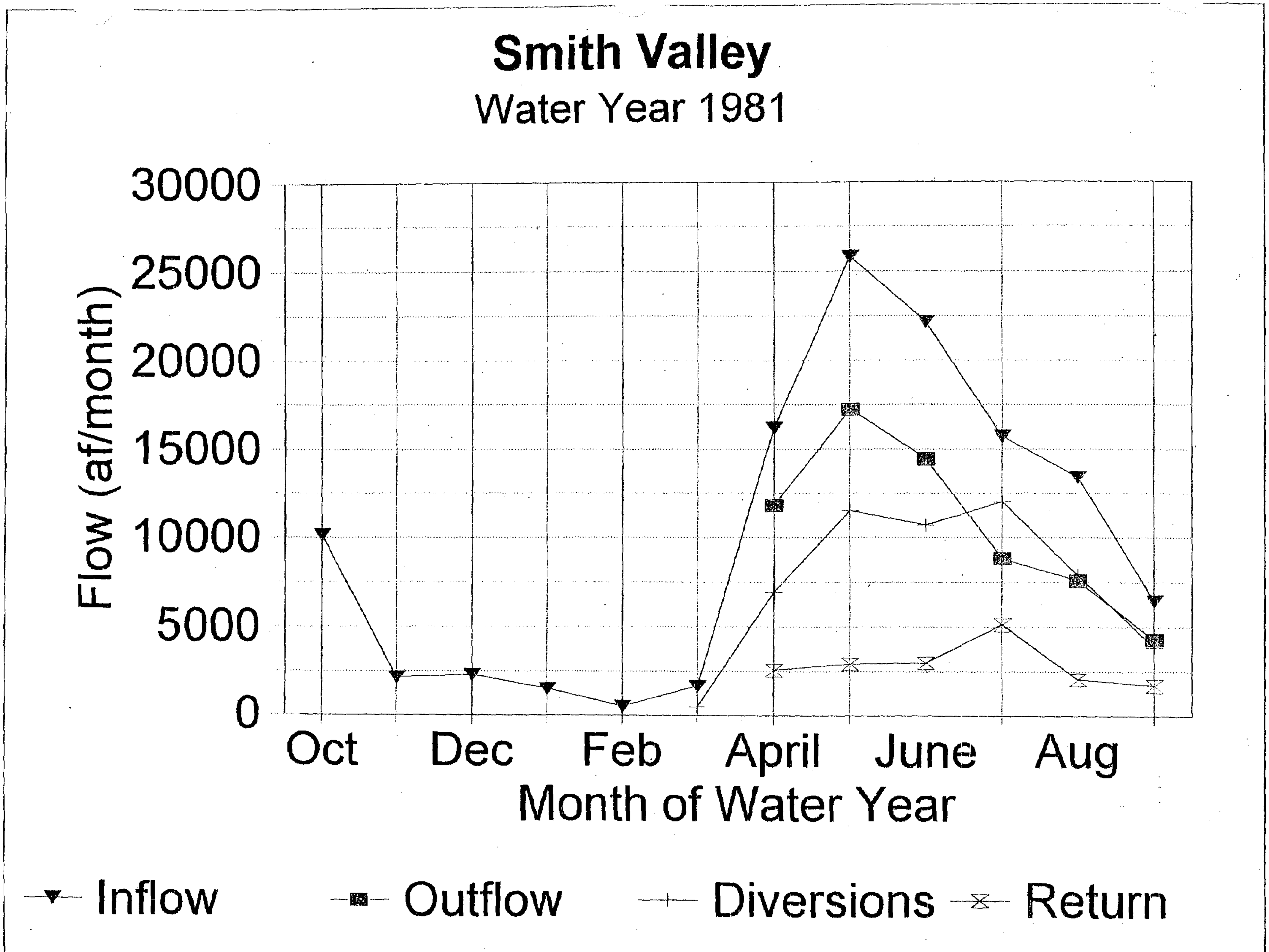
30409	336.4	n"	1675.5	466.9	952.6
0	0	u"	920.5	565.6	692.5
22091	0	u"	30.3	0	0
51014	0	u"	903.7	188.9	335.8
38330	248	n"	738.7	532.7	825.8
29291	474.5	n"	1736.6	692.5	456.7
45288	520	n"	691	793.7	703.4
59760	0	n"	1916.6	284.7	191.5
60550	71	n"	189.8	0	0
48730	557	n"	992.9	226.6	218.1
26311	0	u"	2089.8	1182.1	1250.8
58758	0	u"	1566.8	242.9	341.3
28323	0	u"	523.9	37.4	29.6
18672	147	y"	597.3	364.3	412.7
57867	0	u"	736	29	51.8
48958	670.5	n"	935.1	201.2	393.6
56279	60	n"	25	26.8	10.3
56281	80	n"	232.6	175.6	80.2
56280	40	n"	786.2	728	552
17364	98	n"	99.9	132.2	70
20821	105.8	y"	1137.9	547.1	464
50706	0	n"	145.7	628.1	454.9
50704	0	n"	1321.3	874.5	621.4
50703	0	n"	178.5	26.9	217.3
50702	0	n"	2091.4	571.9	641.9
33521	0	n"	928.3	0	387.6
30447	119.4	n"	475.6	401.1	431.9
29299	119.4	n"	557.5	474	511.5
21496	79.7	n"	624.3	687.2	723.8
19062	116	y"	426	0	36.9
30218	65	n"	280.4	219.6	231.1
61208	0	u"	0	0	13.7
61207	0	u"	8.96	8.96	8.96

Appendix 3

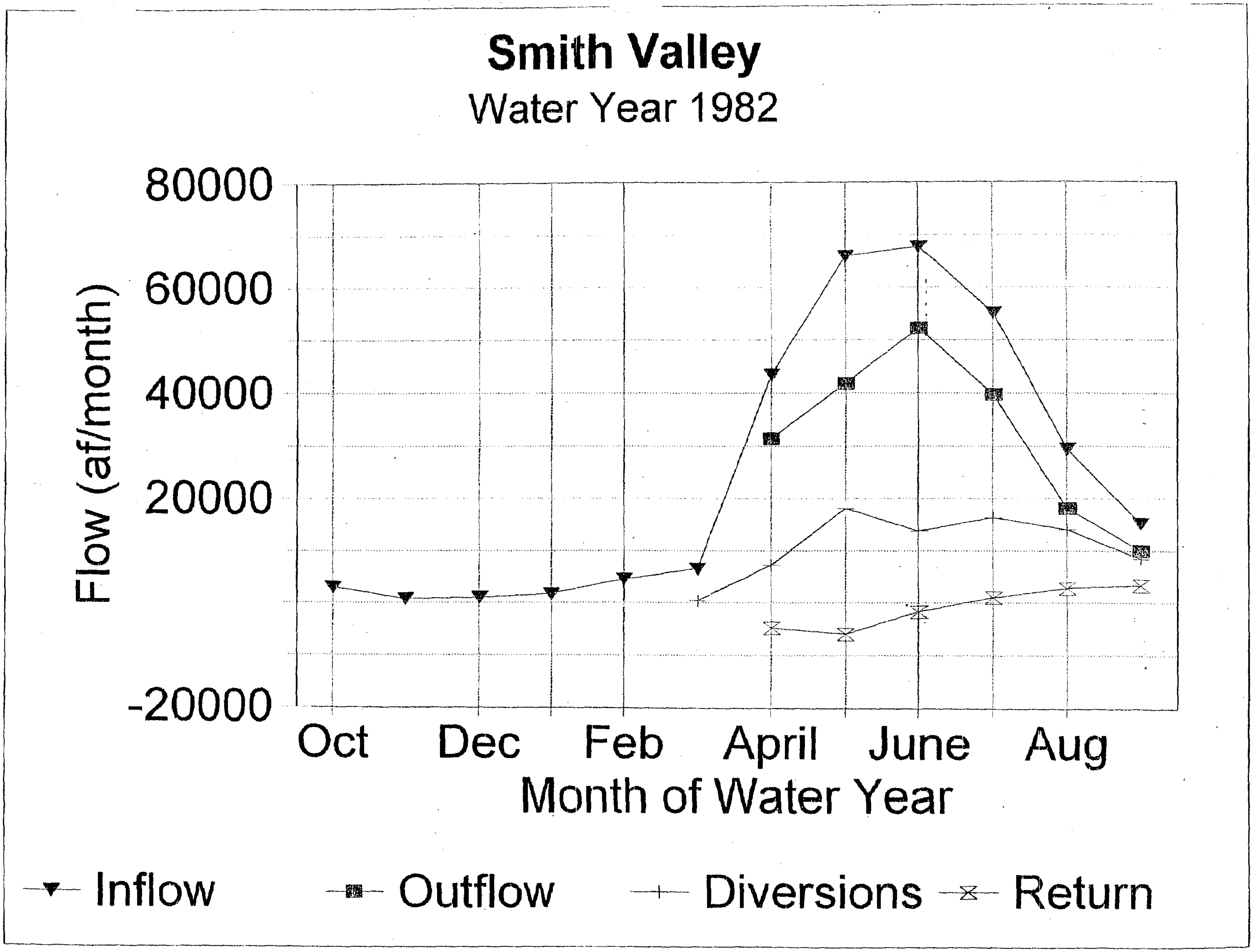
Plates of

Smith Valley Inflow, Outflow, Diversions and Return Flow

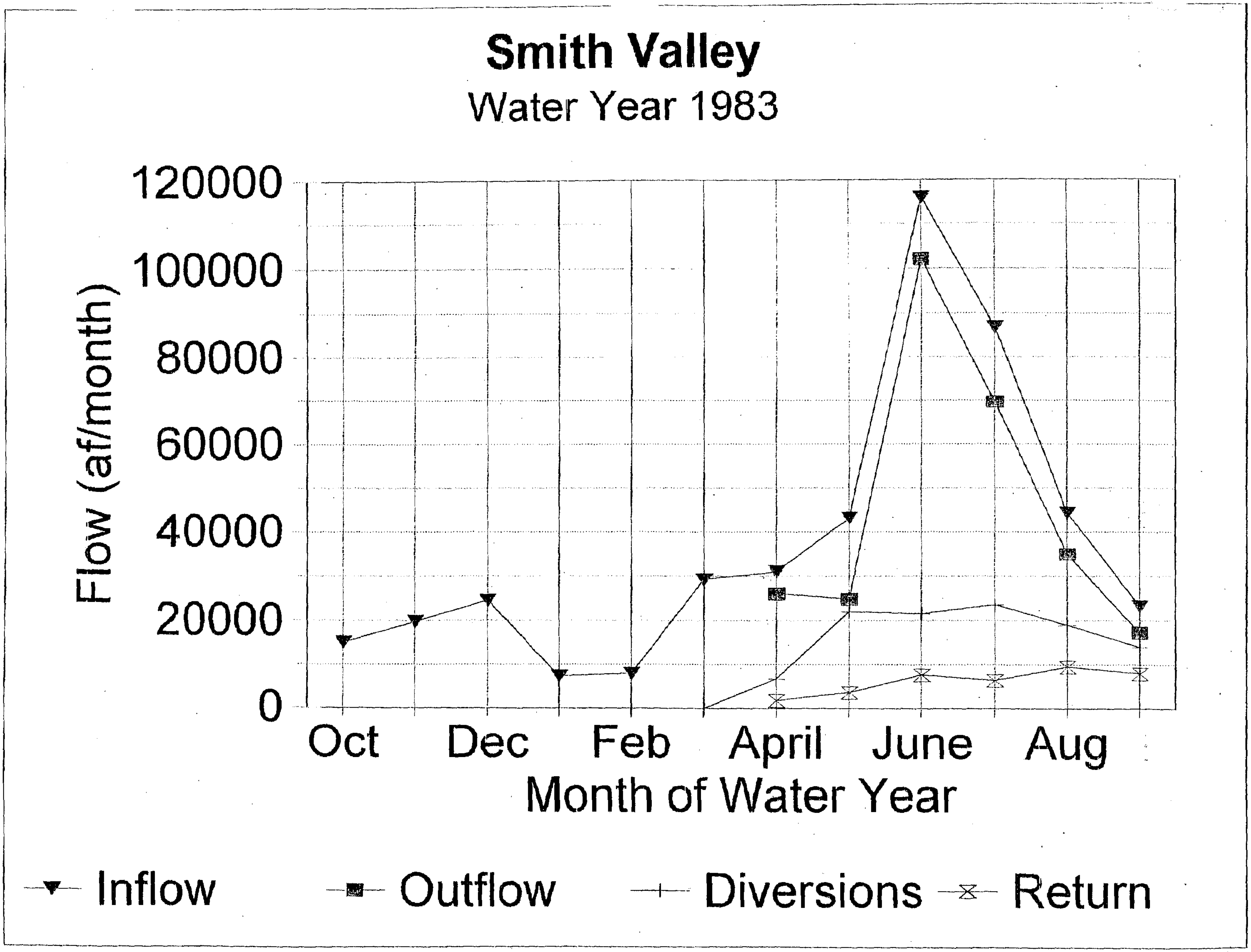

Smith Valley
Water Year 1980
70000
60000
50000
40000
30000
20000
10000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

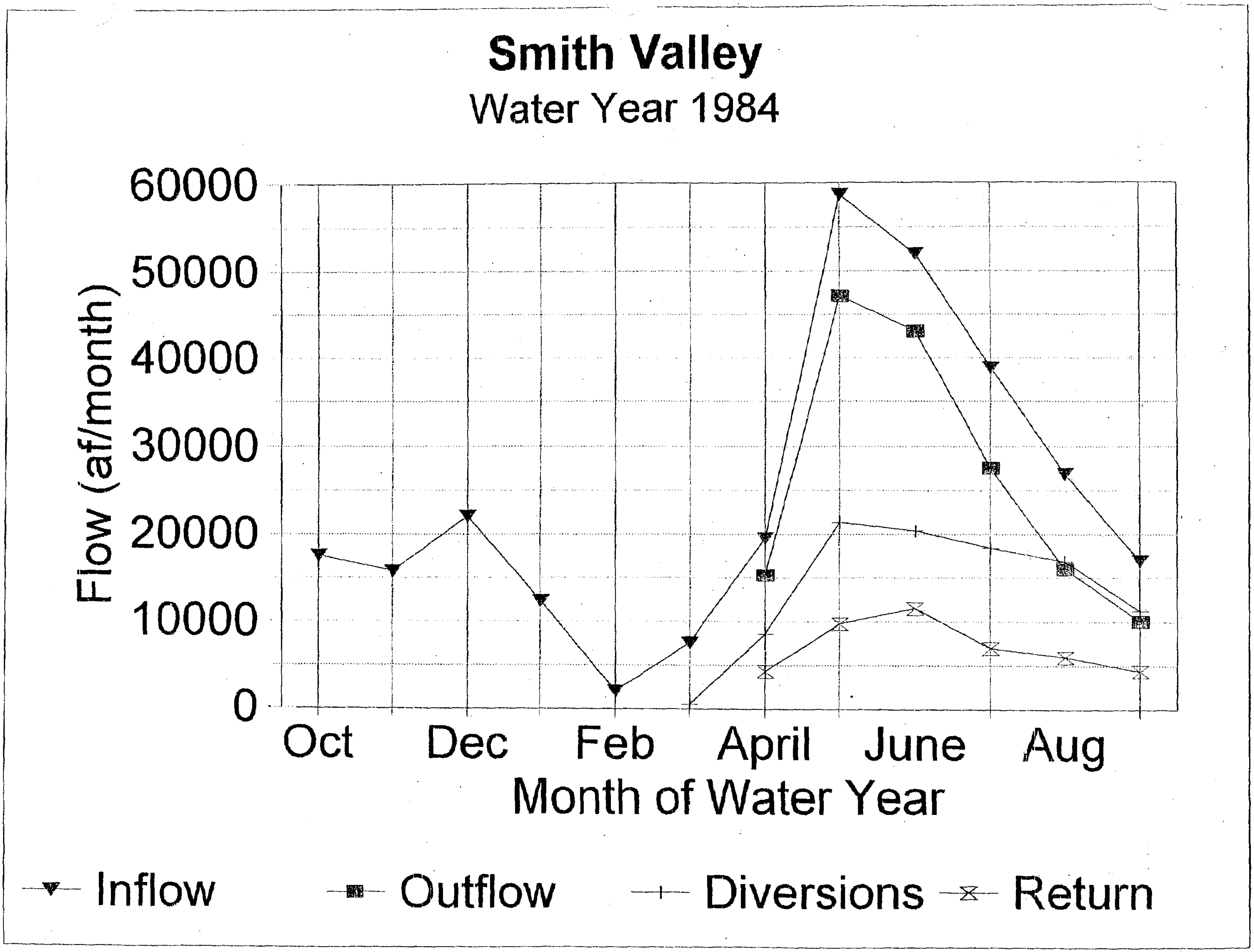


Smith Valley
Water Year 1981
30000
25000
20000
15000
10000
5000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

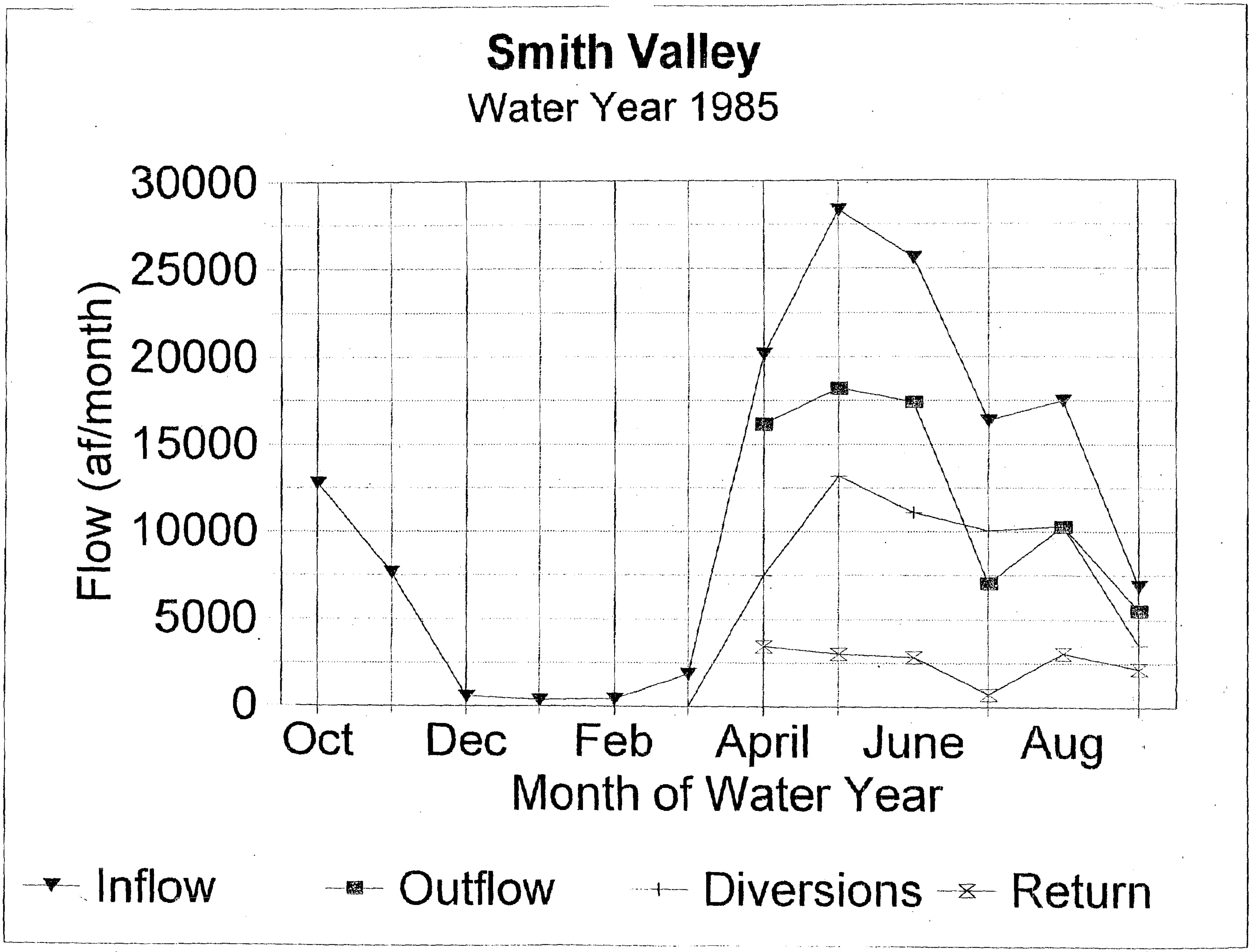


Smith Valley
Water Year 1982
80000
60000
40000
20000
-20000
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

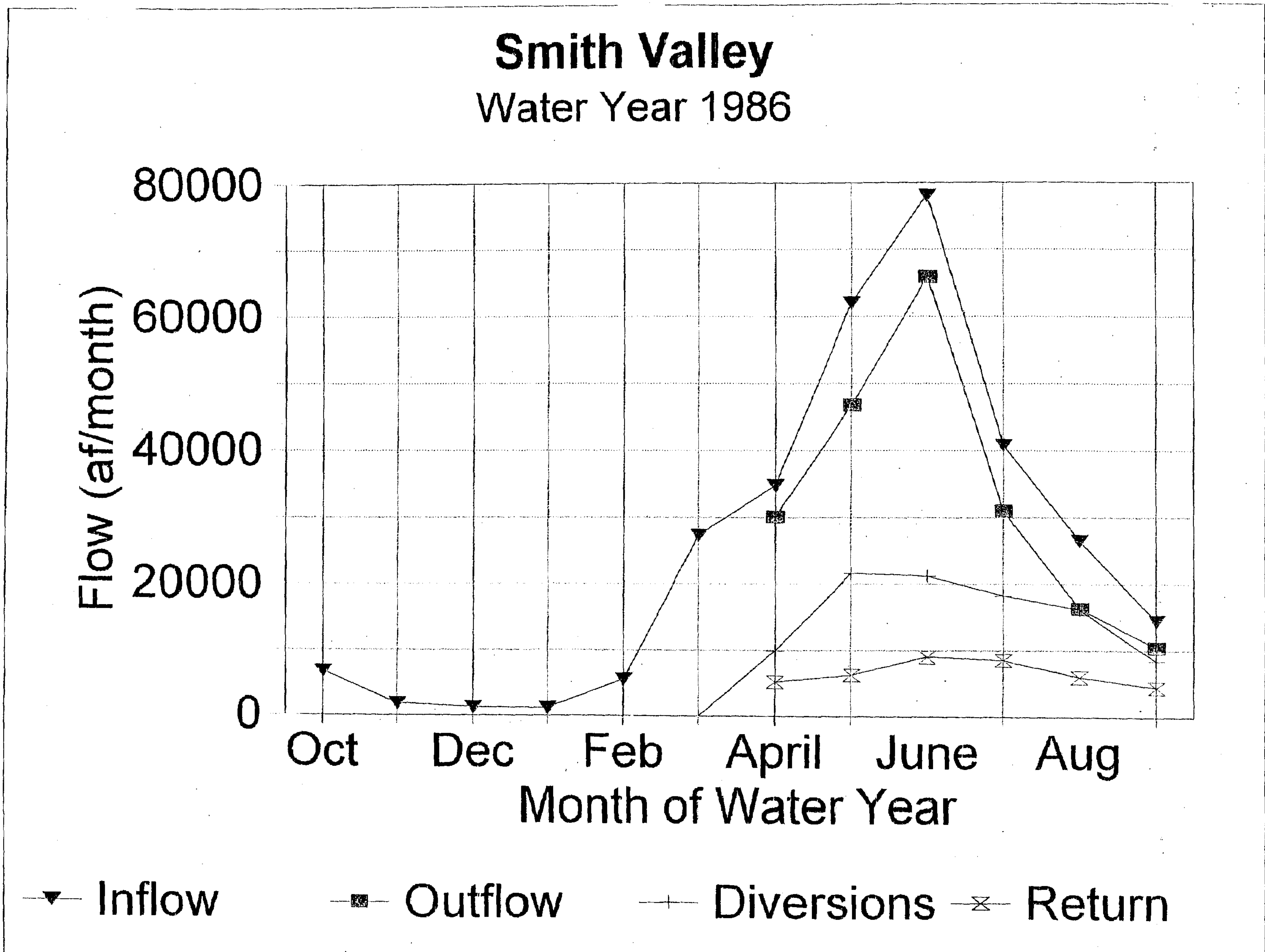

Smith Valley
Water Year 1983
120000
100000
80000
60000
40000
20000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

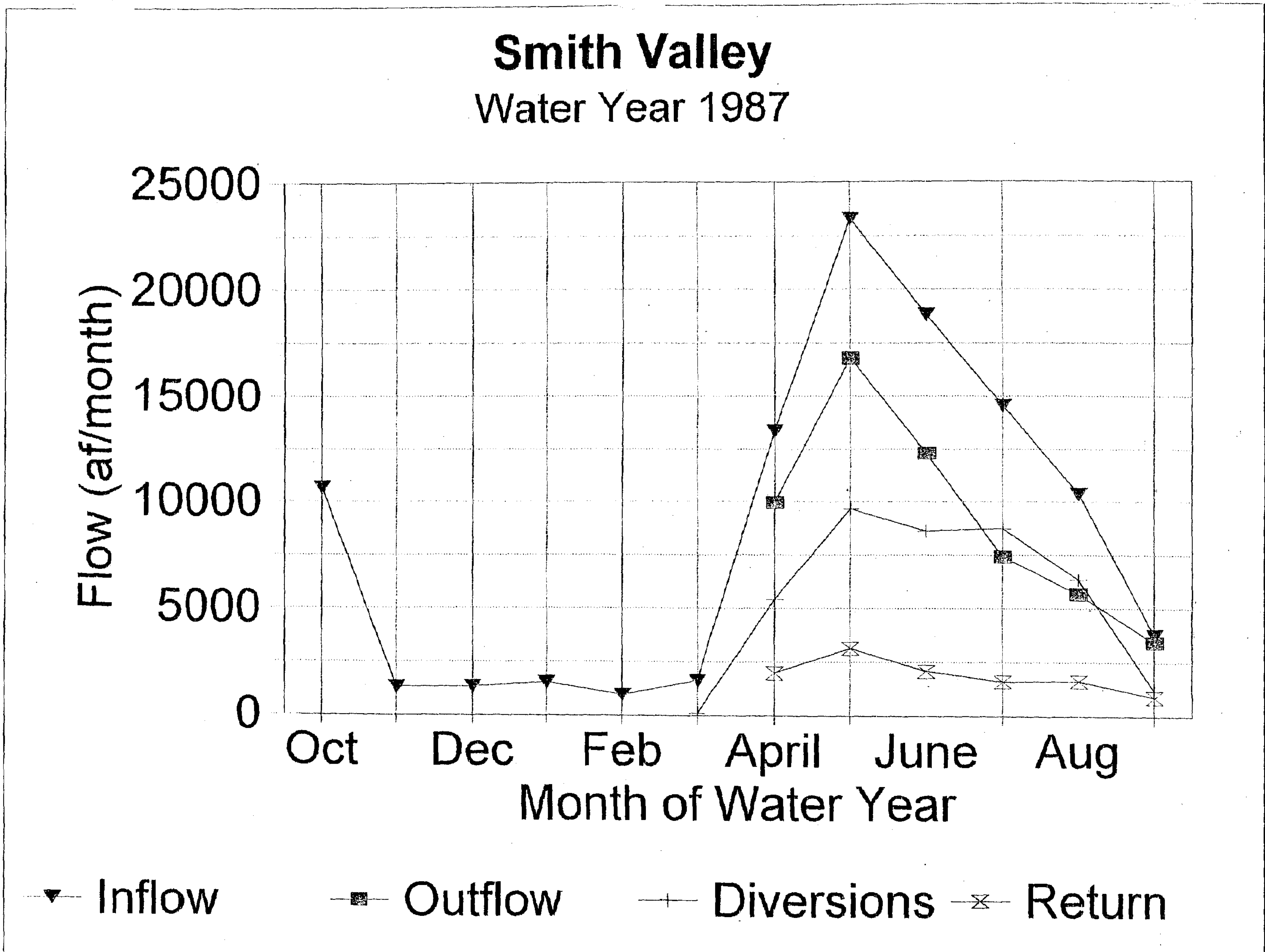


Smith Valley
Water Year 1984
Flow (af/month)
60000
50000
40000
30000
20000
10000
0
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

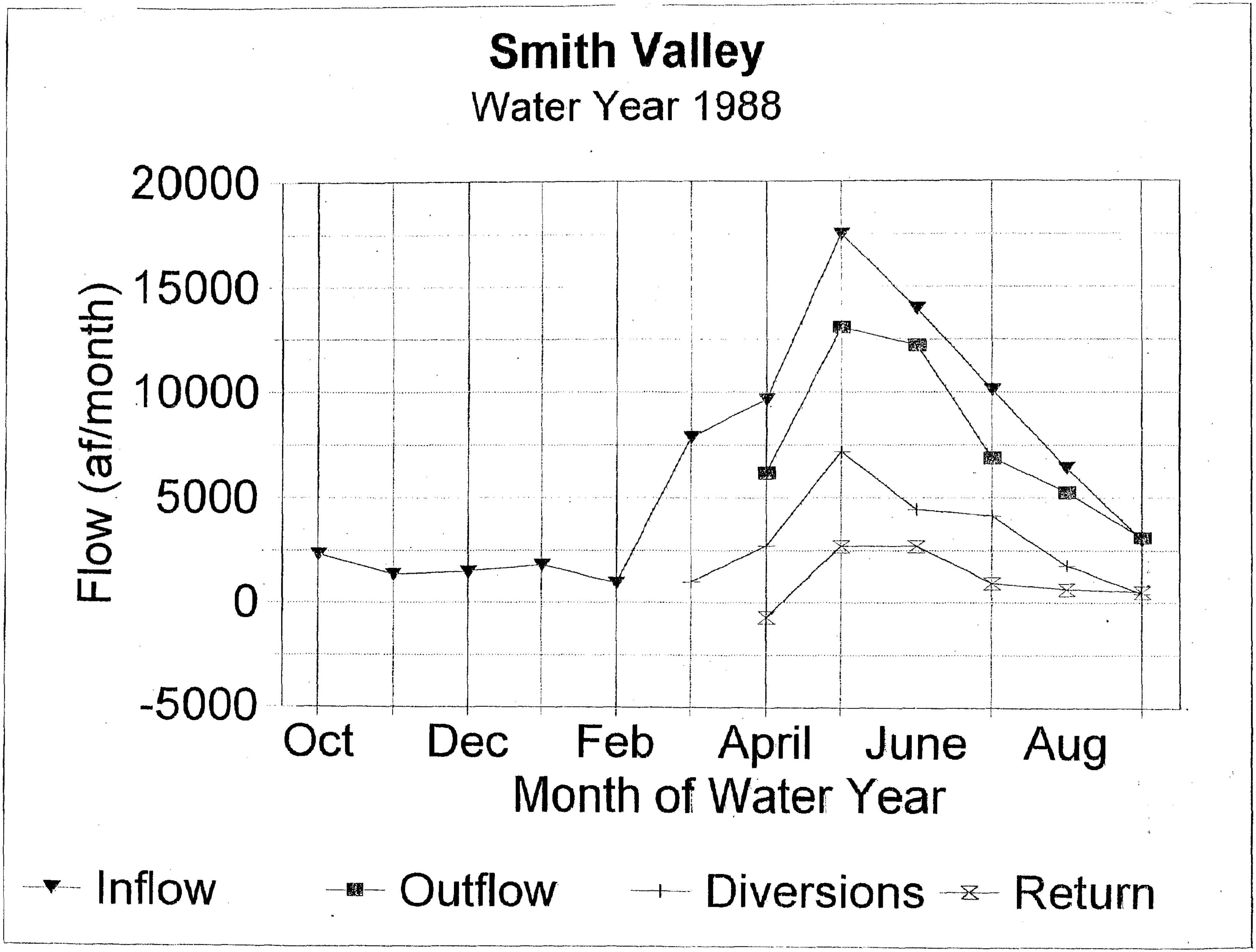


Smith Valley
Water Year 1985
Flow (af/month)
30000
25000
20000
15000
10000
5000
0
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

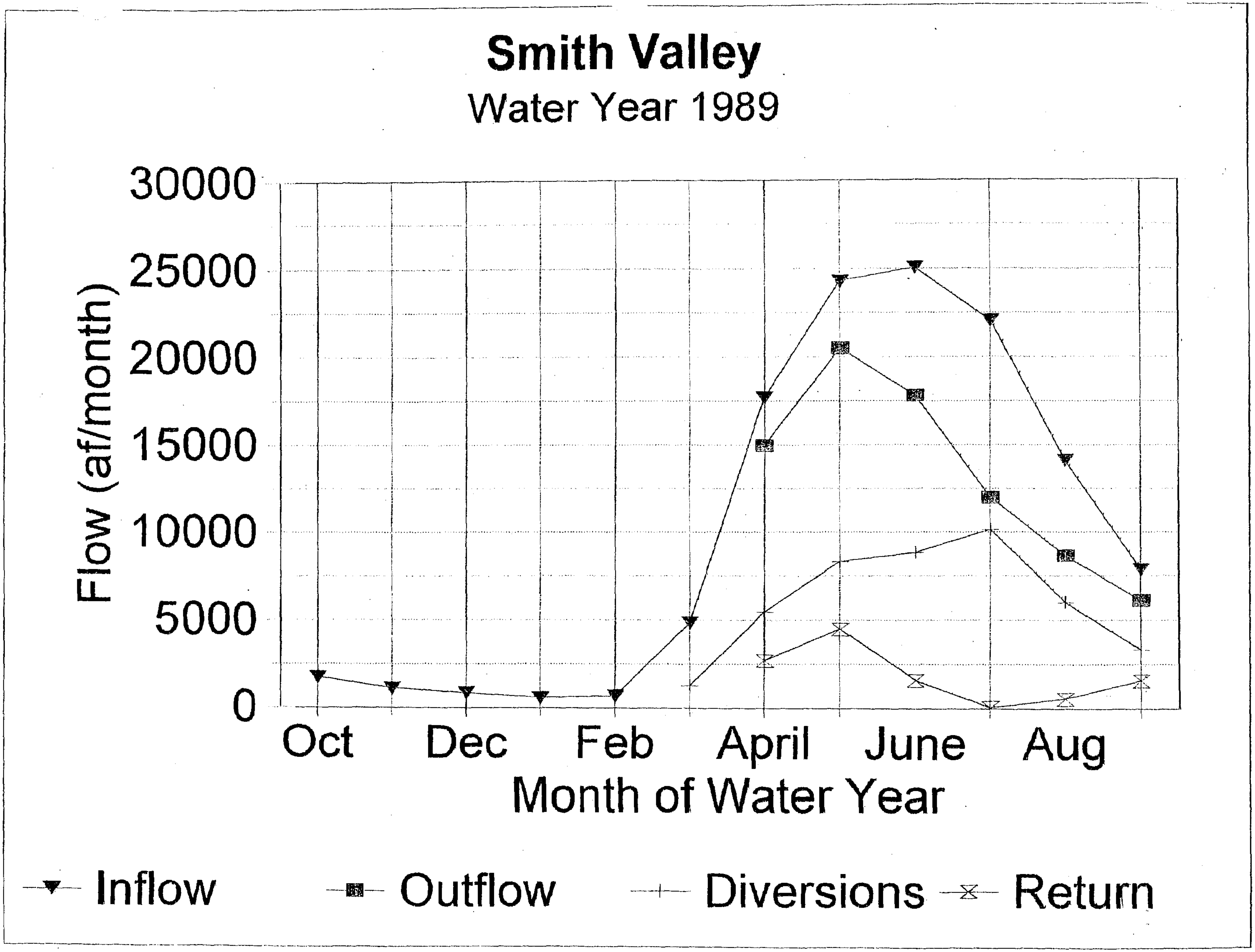

Smith Valley
Water Year 1986
80000
60000
40000
20000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return



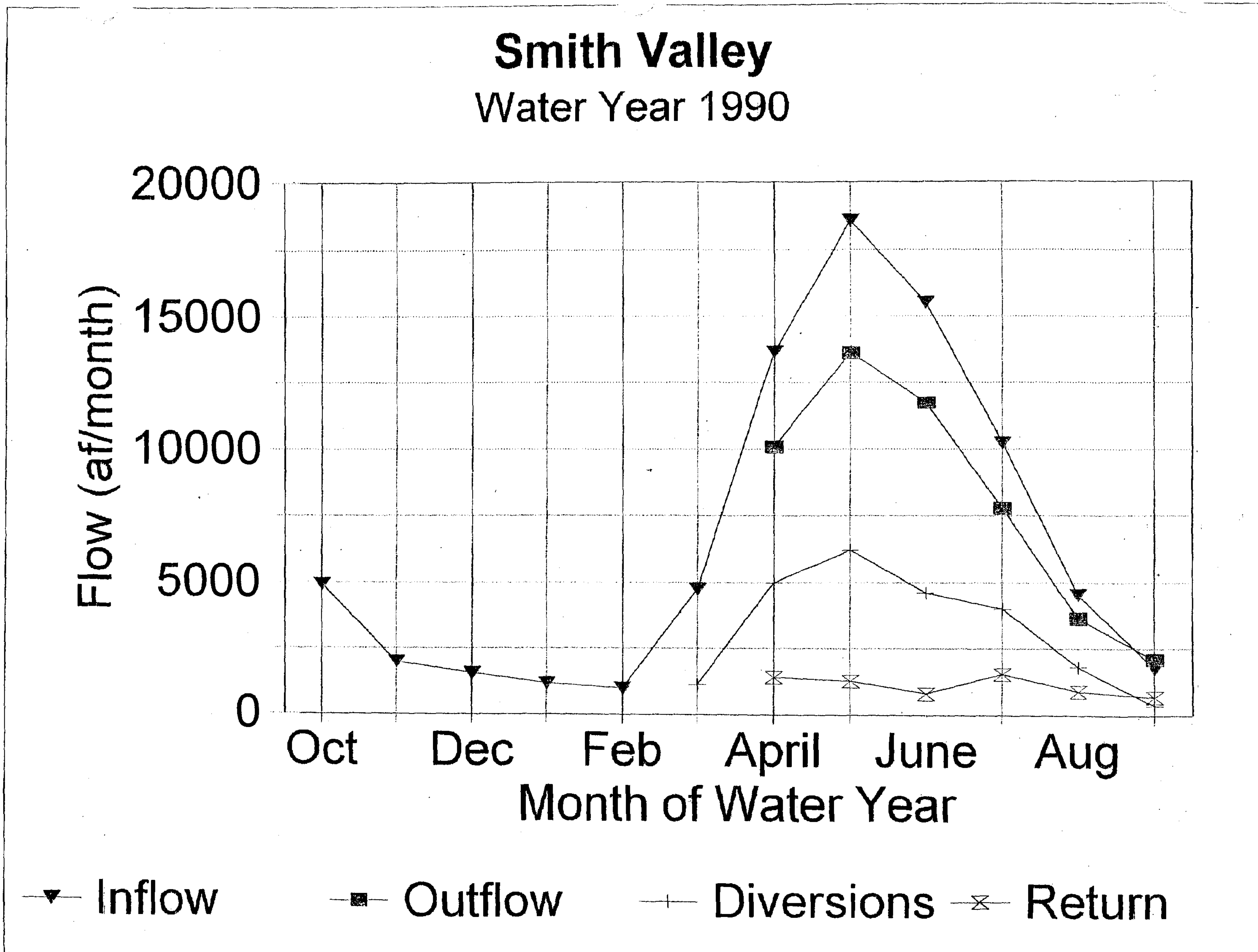
Smith Valley
Water Year 1987
25000
20000
15000
10000
5000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return



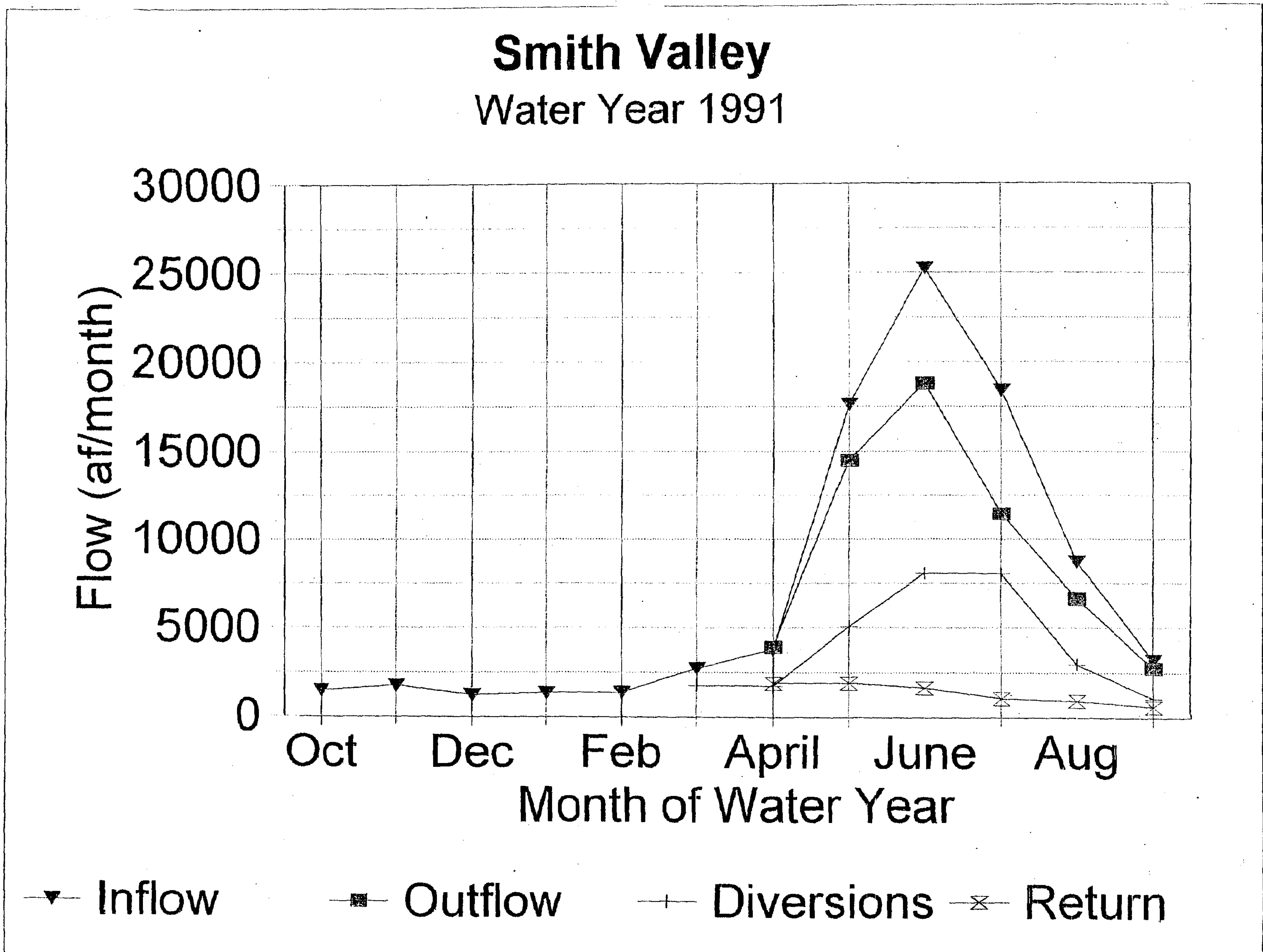
Smith Valley
Water Year 1988
20000
15000
10000
5000
0
-5000
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

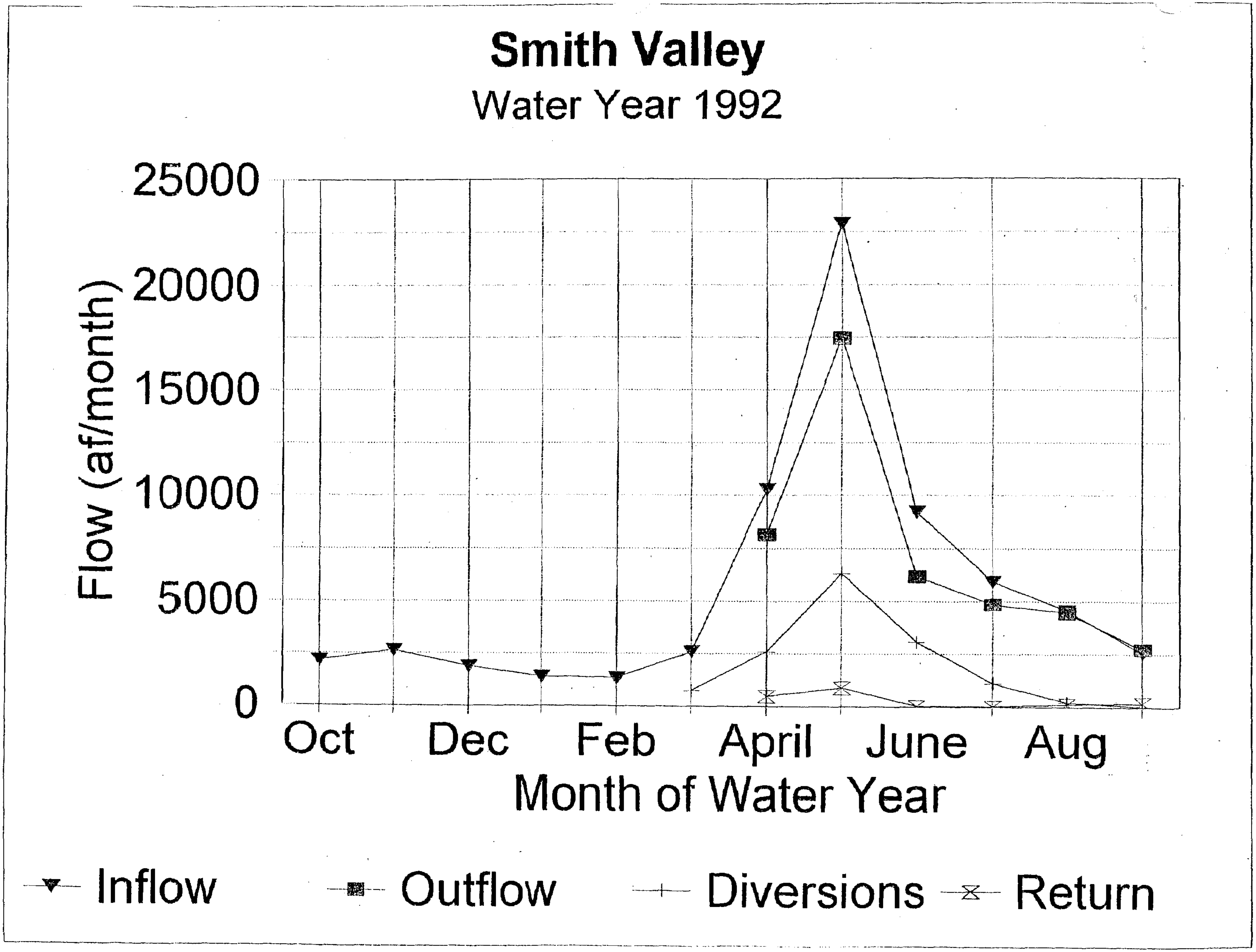


Smith Valley
Water Year 1989
30000
25000
20000
15000
10000
5000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

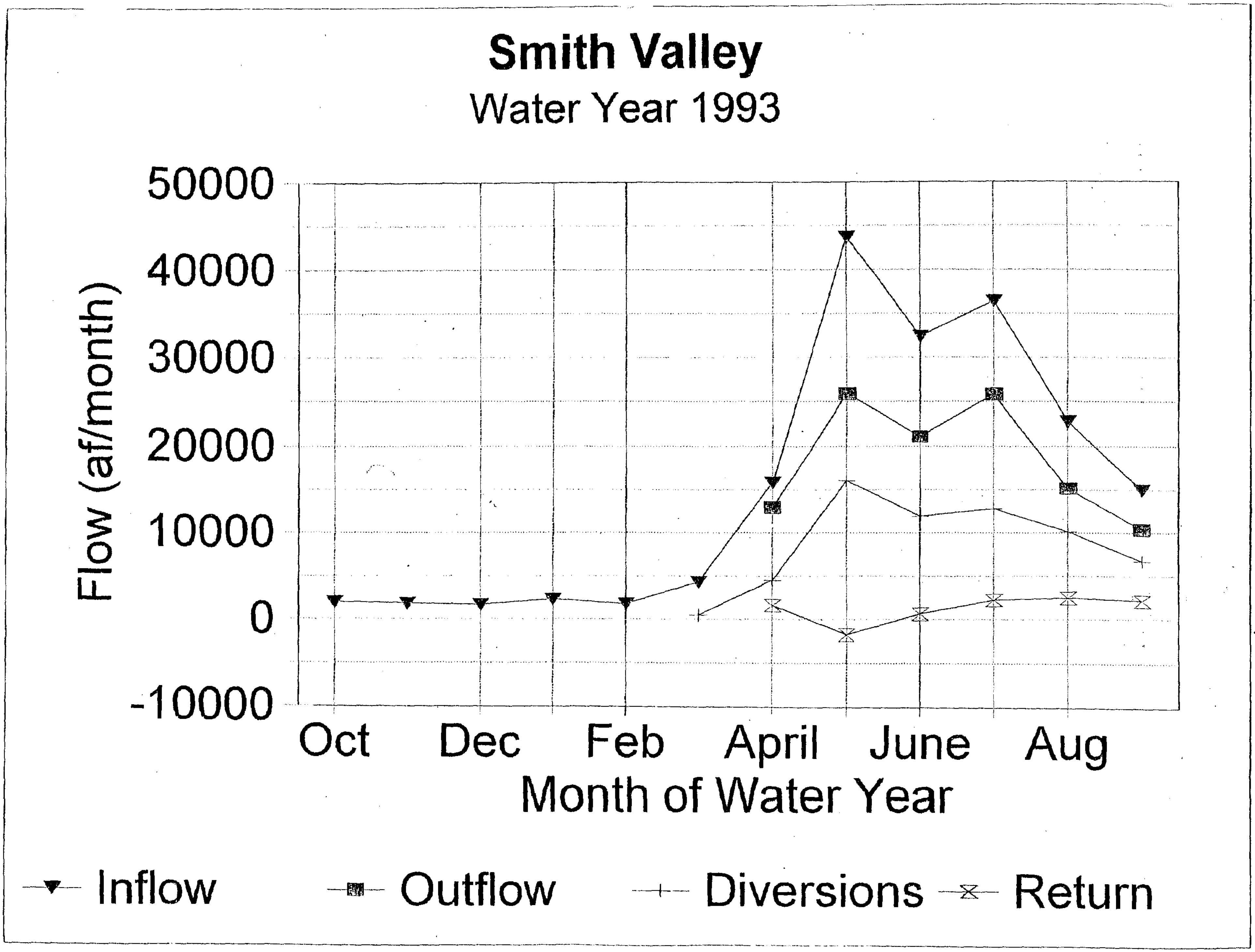


Smith Valley
Water Year 1990
20000
15000
10000
5000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return

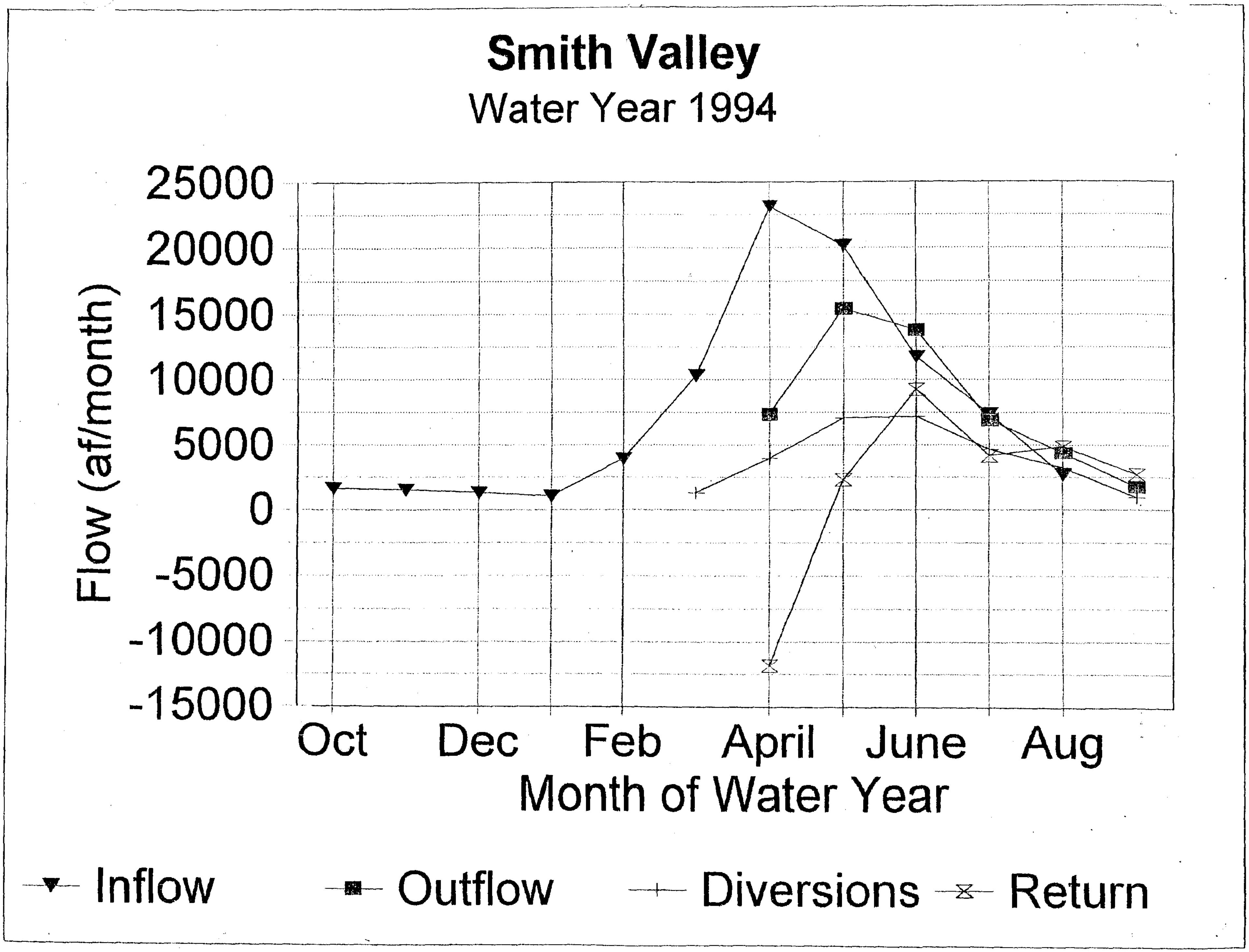

Smith Valley
Water Year 1991
30000
25000
20000
15000
10000
5000
0
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return



Smith Valley
Water Year 1992
Flow (af/month)
25000
20000
15000
10000
5000
0
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return



Smith Valley
Water Year 1993
50000
40000
30000
20000
10000
0
-10000
Flow (af/month)
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return



Smith Valley
Water Year 1994
Flow (af/month)
25000
20000
15000
10000
5000
0
-5000
-10000
-15000
Oct
Dec
Feb
April
June
Aug
Month of Water Year
Inflow
Outflow
Diversions
Return